Weaver Consultants Group

July 6, 2015

Ms. Barbara Brown
Section Head
Maryland Department of the Environment
Voluntary Cleanup Program
1800 Washington Boulevard – Suite 625
Baltimore, Maryland 21230-1719

Re: Phase II Environmental Site Assessment (ESA)/Response Action Plan (RAP)
Sparrows Point - Parcel A1
VCP Applicant: Sparrows Point Terminal, LLC

Dear Ms. Brown:

Weaver Consultants Group North Central, LLC (WCG) has prepared this correspondence in response to draft comments received from the Maryland Department of the Environment's (MDE) Voluntary Cleanup Program (VCP) in an email correspondence dated June 3, 2015. The revised submittal was also based upon our subsequent follow up communications on June 10, 2015, June 17, 2015, as well as information received from MDE in an email on July 2, 2015. We understand this email included additional comments from both MDE and the United States Environmental Protection Agency (USEPA).

The above referenced parcel has been previously entered into the Maryland VCP for purposes of attaining a No Further Action (NFA) Letter and ultimately a Certificate of Completion (COC). Specifically, the MDE's comments addressed the Phase II Environmental Site Assessment Report/Response Action Plan (Phase II ESA/RAP) dated April 23, 2015 prepared in support of our request for a NFA Letter for Parcel A1 located on the Sparrows Point Peninsula in Sparrows Point, Maryland (Site).

The following includes a response to each of the comments in the June 3, 2015 MDE correspondence. Within the section below, we have duplicated MDE's comments in *italics* followed by the response. Many of the comments reference a revised Phase II ESA/RAP, which is enclosed. To facilitate MDE review, a "redlined" version of the text to the document was submitted for MDE review on June 19, 2015. MDE's July 2, 2015 email was prepared in response to the June 19, 2015 submission.

Enclosed, please find a clean version of the Phase II ESA/RAP, which has been revised to reflect the above comments. The enclosed document contains the text and all of the attachments, other than Appendix C (Laboratory Analytical Reports). Because this appendix is comprised of over 7,500 pages and

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has not been modified since the original April 2015 submission, the laboratory analytical reports are not being resubmitted herein.

Response to MDE June 3, 2015 Draft Comments

1. *General Comment/Introduction-Property Description:*

   The Schematic Design Documents for Fed Ex Warehouse Building submitted with the RAP, indicates that the property acreage is 48.47 acres. A complete metes and bounds description of the property will be required prior to issuing a No Further Action (NFA) letter and subsequent Certificate of Completion for Area A.

A complete metes and bounds description of the property will be submitted to the MDE and USEPA with the report documenting completion of the implementation of RAP activities.

2. *General Comment- USEPA RSL Comparison:*

   The revised RAP must include comparison to USEPA RSLs for all sampling discussions.

Soil sample results were compared to both USEPA Regional Screening Levels (RSLs) and MDE standards. However, this may not have been clear in certain cases where sampling discussions in the text indicated exceedances of MDE standards only. In these cases, the USEPA RSLs were not exceeded, but this may not have been explicitly stated in the text. For clarification, in these instances, the text has been revised to indicate the USEPA RSLs were not exceeded.

Groundwater sample results were compared to MDE Groundwater Standards (GWS) and USEPA Maximum Contaminant Levels (MCLs). However, MCLs are not available for all of the constituents analyzed. Therefore, USEPA RSLs for Tapwater were added to the groundwater analytical table (Table 2) when MCLs were not available. In addition, the text was revised to reflect this comparison to Tapwater RSLs.

Pursuant to our follow up communications on June 10, 2015, comparisons to the MDE standards has been retained within the text, tables, and figures of the document.

3. *Section 2.3 Site History, Section 3.2.6 Metals and Section 3.3.6 Dissolved Metals:*

   The first paragraph of Section 2.3 Site History includes the following statement:

   A portion of the former East Pond associated with the former Rod and Wire Mill was located on the northwestern corner of the site.

The revised RAP should make a clear distinction between the areas investigated as part of the Phase II investigation and the subsequent alteration of the boundaries of Parcel A1 throughout the sections summarizing the sampling results and sample results tables.

Section 2.3 (Site History) was revised to clarify that a portion of the East Pond area was investigated as part of the Phase II ESA, but this area was subsequently excluded from the Site. Subsequent sections of the document have also been revised to clearly distinguish between the samples collected that ultimately ended up being considered outside the boundaries of Parcel A1. This (off-site) data was mentioned as having been collected for completeness, but the results from the off-site samples are not subsequently discussed in the sections concerning concentrations found to exceed applicable screening levels. The off-site data is also included in the tables and figures illustrating the analytical results for completeness, but the tables have been revised to identify the off-site data separately. Revised tables are also enclosed.

4. *Section 5 Exposure Assessment:*

   This section contains the following statement:

   Based on communication with MDE during a meeting held on November 19, 2014, ecological exposures will need to be addressed on[ly] in non-developable areas of the Property.

   This statement is inaccurate and must be removed from the revised RAP for Parcel A1.

This statement has been removed from Section 5 of the RAP.

5. *Section 5.1.4 Soil Gas:*

   Ground water data must be screened against OSWER screening values. Comparisons of soil data to MDE cleanup standards for soil is not relevant for soil gas. Vapor intrusion screening via groundwater and soil gas must be performed for any future construction activities or vapor control measures must be put in place on the COC for future construction activities.

The Office of Solid Waste and Emergency Response (OSWER) screening levels were added to Table 2 for comparison to the groundwater data. Revised versions of the Tables are enclosed. A discussion of the comparison is provided in Section 5.1.4 of the revised Phase II/RAP document. Based on this comparison, vapor intrusion resulting from groundwater impacts is not a concern at the Site. In addition, based on the soil and groundwater analytical data, it is not expected that vapor from volatile chemicals will be a concern during future construction activities (i.e., after RAP implementation is complete).

6. *<u>Section 5.2 Potential Exposure Pathways and Receptors of Concern</u>:*
   The table of exposure pathways must be revised to include subsurface soil in the media list.

The table in Section 5.2 has been revised to include subsurface soil in the media list. The revised text to the RAP is enclosed.

7. *<u>Section 5.3 Risk-Based Screening and Selection of Chemicals of Potential Concern:</u>*
   This section should be revised to include a discussion of subsurface soil. If significant COC's at depths exist this record and assessment should reflect this.

   This section should also include an evaluation of the elevated levels of TPH DRO at SP-4, SP-28 and B-11. The RAP must address whether the soils will be removed or have some vapor control mechanism in place in open areas.

Section 5.3 has been revised to include a discussion of subsurface soil. In addition, an evaluation of the elevated levels of TPH DRO in the above borings has been included in this section (see revised RAP enclosed). In summary, while elevated levels of TPH DRO were identified at these locations, concentrations of VOCs and SVOCs did not exceed applicable standards. Consequently, soil vapors are not expected to be a significant concern during implementation of the RAP. However, as an added precaution, soils at SP-4 (located at the edge of the proposed building) will be relocated so that they are beneath the paved/concrete areas outside the footprint of the building.

8. *<u>Section 5.4 Complete Exposure Pathways:</u>*
   This section must be revised to include surface and subsurface soil.

This section has been revised to include surface and subsurface soil.

9. *<u>Section 6 Cleanup Criteria</u>:*
   The table should be revised to screen soil against the USEPA RSL levels except for TPH DRO which can be screened against the MDE cleanup levels.

This table has been revised to screen soil against the USEPA RSLs except for TPH DRO, which is screened against the MDE cleanup level. Pursuant to follow up communications with MDE on June 10, 2015, MDE cleanup levels have been retained within the tables and figures following the main text to the document.

10. *<u>Section 7 Selected Technologies and Land Use Controls and Section 7.6 Post Remediation Requirements:</u>*

The description of proposed institutional controls should also include a restriction to provide notification to MDE of future excavation or intrusive landscaping after completion of the RAP as shown in the following example:

The property owner shall submit written notification, to the attention of the Chief, State Assessment and Remediation Division, Land Management Administration, Maryland Department of the Environment, at least 30 days prior to any planned future excavation or intrusive landscaping activities on the property. In the event of an unplanned emergency excavation on the property, the property owner shall verbally or electronically notify the Department within 24 hours following initiation of the emergency excavation activities. Within ten days following completion of an unplanned emergency excavation, the property owner shall file a detailed written report with the Department.

All excavated soil from the property shall be analyzed before disposal and the analytical results shall be the basis for appropriate disposition of the material in accordance with applicable local, State, and federal laws and regulations. No excavated material from the property shall be disposed in areas with current or proposed residential or commercial use.

Section 7 and Section 7.6 have been revised to include a restriction that requires notification to MDE for future excavation or intrusive landscaping that is required beneath the geotextile after completion of the RAP. Soils above the geotextile are not impacted and therefore no prior notification is required.

11. *<u>Section 7.1 Paved and Concrete Areas and Section 7.2 Landscaped Areas:</u>*
Based on the cleanup criteria proposed in Section 6, there are areas outside the proposed "capped areas" that have sample results that exceed the soil screening levels. There is not sufficient sampling to define the specific areas shown on Figure 5 as capped and subject to the deed restriction. Therefore, the revised RAP must include either a sampling plan to clearly define the capped areas or the whole site must be subject to the capping requirements.

The Phase II sampling program was designed to evaluate potential environmental impacts associated with recognized environmental conditions (RECs), areas of concern (AOC), and solid waste management units (SWMUs) identified during prior Phase I ESA activities. The sampling locations were therefore focused on the specific areas previously identified as AOCs and SWMUs (shown on Figure 4). Other soil and groundwater sampling locations were distributed throughout the site to evaluate possible off-site concerns and to evaluate the nature of the fill material, which forms the surficial layer over most of the site. The numerous soil probes/borings advanced as part of both the Phase II ESA and the geotechnical investigation indicated that the characteristics of the fill material are generally consistent across Parcel A1.

Upon receipt of the analytical data from the first round of sampling performed in November 2014, the data was submitted to MDE and USEPA, along with a Workplan For Supplemental Phase II ESA sampling. This Workplan included a table with specific additional soil sampling locations intended to provide a reasonable evaluation of the extent of the impacts originally identified with the November 2014 data. The focus of the additional sampling efforts included soil impacts identified at three specific locations (SWM-2, SP-4, and SP-6). Additional sampling locations were not believed warranted because the data collected during the initial round of Phase II sampling was sufficient to provide a reasonable characterization of the site soils. The results suggest more widespread impacts for certain naturally occurring metals within near surface soils, with deeper impacts observed only at select limited areas, generally located near prior AOCs, SWMUs, or RECs. This scope for additional sampling was conditionally approved by MDE with a February 2, 2015 email. The two approval conditions were to notify MDE prior to initiating field activities and that all investigation derived waste must be containerized and properly managed.

Although we believe that the sampling data collected to date is sufficient to support the engineered barriers as depicted in the RAP submittal, in the interests of moving this project forward, we herein agree to extend the capped areas. The revised configuration of the engineered barriers is shown on the revised Figure 5 enclosed.

The revised Figure 5 also depicts the footprint of the proposed submerged gravel wetlands to be used for future storm water management. Soil in these areas will be excavated to depths ranging from three feet below grade to 6 feet below grade to allow for installation of the submerged gravel wetlands. It is anticipated that the excavated soil will be relocated beneath proposed capped areas or properly disposed offsite (if not geotechnically suitable). These submerged gravel wetlands, which will be installed with an impermeable liner at the base of the structure, will also serve as engineered barriers.

12. *<u>Section 7.2 Landscaped Areas:</u>*
    The revised RAP must include a description of the non-woven geotextile including a manufactures specification sheet to be used as the marker barrier.

    Please note that the RAP does not currently include the installation of trees in the landscaped areas. If the local jurisdiction requires the planting of trees, the RAP must include provisions [to] either increase the thickness of the clean fill layer or an alternate approved method to install a tree well etc.

Section 7.2 has been revised to include a description of the non-woven geotextile proposed for use (i.e., TenCate Mirafi 140N). The manufacturer's specification sheet has been added to Appendix E in the RAP. In addition, this section has been revised to indicate that the thickness of the clean fill cap will be adjusted accordingly if trees are planted.

13. *Section 7.3 Future Excavation/Utility Trenching:*
This section contains the following statement:

This protocol will be followed in areas with impacted soil to depths of 2-3 feet, below which impacted soils is not anticipated to be encountered based on soil analytical data.

This statement is not supported and must be removed from the revised RAP. This section must describe in detail procedures for installing shallow and deep utilities. All soil excavated from Parcel A-1 must be properly managed.

Section 7.3 of has been revised to remove the above statement and provide additional detail concerning the procedures for installing utilities.

14. *Section 8.1 Criteria for No Further Action Letter (and final Certificate of Completion per ACO)*
Revise this Section to state the criteria to be met for issuance of a NFA to be followed by a COC per the requirements of the ACO.

This section has been revised to state the criteria to be met for issuance of a NFA and subsequent COC in accordance with the requirements of the ACO.

15. *Section 8.2 Criteria for Contingency Measures:*
Replace, MDE will be verbally notified in a timely manner, with the MDE project coordinator will be notified within 24 hours.

This revision has been made to Section 8.2.

16. *Section 9 Proposed Response Action Plan Implementation:*
This section must clearly identify the company and individuals that will be responsible for implementation of the RAP, who will be documenting the RAP activities and the anticipated schedule for any third party oversight.

This section has been updated to provide additional information concerning the companies and individuals that will be responsible for implementation of the RAP. Scannell Properties and its contractors/consultants are expected to take the lead with implementation of the RAP.

17. *Section 9.2 Dust Control Requirements:*
    This section must include specific procedures for performing dust monitoring and dust suppression throughout all construction activities including removal of existing foundations/utilities, soil excavation and transport, site wide grading and cap placement.

Additional detailed procedures for performing dust monitoring and dust suppression have been added to Section 9.2 within the enclosed revised RAP.

18. *Section 9.6 Clean Fill:*
    Please add a statement that all fill materials, included recycled building materials from Parcel A1, if proposed, must be approved by MDE prior to transport and/or use at the site.

A statement has been added to Section 9.6 indicating that all fill materials must be approved by MDE prior to transport and/or use at the site.

19. *Section 9.8 Groundwater:*
    Describe in detail the procedure for disposal of water generated during dewatering activities, including sampling. List any limitations on water that may be discharged to Humphrey Creek Waste Water Treatment Plant. (Checking w/WMA)

Additional information has been added to Section 9.8 concerning the procedure for disposal of water potentially generated during dewatering activities. Prior to discharge of groundwater, the applicable permit requirements associated with the Humphrey Creek Waste Water Treatment Plant will be satisfied. Additional information concerning methods for managing treated storm water have also been added to Section 2.2 of the enclosed revised Soil Management Plan.

20. *Section 10.1 Preliminary Implementation Schedule:*
    Please revise the preliminary implementation schedule in the revised RAP.

The preliminary implementation schedule in Section 10.1 has been revised within the enclosed revised document.

21. *Section 10.2 Administrative Requirements:*
    Please include a statement in this section that the VCP requirement for a bond or other security has been addressed by the ACO.

    Please include documentation that the public meeting notice was posted in the paper for two consecutive weeks as required.

A statement has been added to Section 10.2 of the revised document that the requirement for a bond or other security has been addressed by the ACO.

Although attempts were made to publish the public notice before the May 11, 2015 public meeting in the local weekly paper (Dundalk Eagle), through circumstances completely beyond our control and for unknown reasons, the Dundalk Eagle failed to publish the formal notice. The email chain documenting these circumstances, along with the proof received from the Dundalk Eagle that was expected to be published is enclosed.

To satisfy the public meeting notice requirement, a formal legal notice of the public meeting was published on two separate occasions in the Baltimore Sun, on April 30, 2015 and May 8, 2015. Certification that the public notices were published in the Baltimore Sun are enclosed. In addition, the Dundalk Eagle also published an article dated May 6, 2015 providing notice of the May 11, 2015 public meeting. A copy of this article is also enclosed. Further, the public meeting was advertised at a Public Open House hosted by Sparrows Point Terminal on April 29, 2015 and also publicized on the SPT Facebook page as well.

22. *<u>Soil Management Plan Section 2.2 Storage Locations/Sediment Control:</u>*
This section contains the following statement:

> *The submerged gravel wetlands will not have liners unless the local jurisdiction requires it.*

However, sheet C-12, Stormwater Management Plan, Submerged Gravel Wetland Typical Section indicates that the submerged gravel wetlands will have an impermeable liner installed.

Please provide a detailed description included proposed construction materials for the proposed storm water management facilities including whether an impermeable liner will be installed or not within the RAP implementation section.

Additional information concerning the proposed storm water management facilities has been added to Section 2.2 of the enclosed revised Soil Management Plan, along with a specification sheet for the low density polyethylene geomembrane proposed for use.

23. *<u>Soil Management Plan Section 2.3 Disposal Locations:</u>*
Please provide the name and address for all proposed disposal locations for materials removed from Parcel A1, including asphalt, concrete and soil.

Contact information for proposed disposal locations has been added to Section 2.3 of the enclosed revised SMP.

Response to MDE July 2, 2015 Draft Comments

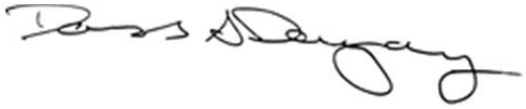
MDE's comments presented in the July 2, 2015 email have been incorporated into the enclosed revised document. The primary revisions relate to the following:

- Clarification that the latest set of USEPA Regional Screening Levels (RSLs) (dated June 2015) were utilized for comparison to the Phase II soil and groundwater data. Use of the June 2015 RSLs did not alter the evaluation, since comparisons were consistent with earlier comparisons, and no new exceedances were observed using the new RSLs;
- Addition of TPH-DRO to list of groundwater constituents of potential concern;
- Addition of language to Section 7.1 concerning relocation of soils near SP-4 outside the footprint of the proposed building; and
- Removal of background discussion in Section 9.2 concerning how the dust action levels were calculated (the action levels themselves were not changed).

We look forward to your review of this submittal. Feel free to contact us should there be any questions concerning the enclosed submittal.

Sincerely,
Weaver Consultants Group





Michael B. Maxwell, LPG
EPG Chicago Operations Manager

Douglas G. Dorgan, Jr., LPG
Principal

Cc: Mr. Andrew Fan, USEPA (w/ encl.)
Mr. Tim Elam, Scannell (w/ encl. – email)
Mr. Chuck McMahon, SPT (w/ encl. – email)

Enclosures: Revised Phase II ESA Report/RAP
Documentation Related to Notice of Public Meeting

Documentation Related to Notice of Public Meeting

nable with the late-round selections.

At this time of year, there always is ntering among the teams and their icials about picks, but Ravens general nager Ozzie Newsome is being straight en he says the Ravens won't trade up in first round unless they can get a player y covet. Instead, he might be better off ding down and still getting a top tight end h as Minnesota's Maxx Williams or ami's Clive Walford.

The second and third rounds could be asures.

"You want your early picks to be really took receiver Mark Clayton out of Oklahoma with the No. 22 overall pick, and safety Matt Elam has struggled since the Ravens selected him with the No. 32 pick overall in 2013. With Elam, the Ravens relied too much on inside contacts instead of staying with the reports from their own scouts.

But the philosophy remains the same and won't change tonight. They've won too many games to move in a different direction now.

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ARROLL COUNTY

7840

April, 2015, by the Circuit the sale of the property escribed as 4290 Millers ade and reported by the CONFIRMED, unless cause efore the 11th day of May, e inserted in some daily each of three successive

at the Foreclosure sale to

3204607

HEARING NOTICE
Sunell Property,
Lots 1 to 39 and O.S.
Lots 40 to 47 and
metery Accommodation
and Boundary Plan
Planning Board Case
No. 414 (SP-15-002)

, 2015, Hearing Beginning
0 p.m.
n Sunell for the Estate of
Sunell, Owner and Petitioner

is hereby given that a pub- aring as scheduled above held by the Planning Board ward County in the Colum- licott Meeting Room of the Howard Building, 3430 House Drive, Ellicott City, MD petition filed under Section G.3. of the Howard County Regulations for approval of prehensive Sketch Plan, SP- 2, to subdivide Parcel 25 into ilding lots and 8 open space nd for a Cemetery Accom- tion and Boundary Plan in the (Residential - Single) Zoning consisting of 25.23 acres d and being developed under ED (Residential - Environmen- velopment) Zoning Regula- The subject site is located on st side of Old Frederick Road, ast of Rogers Avenue and ing on the north side of U.S. 70, situated on Tax Map No. identified as Parcel No. 25, in the Second Election Dis- Howard County, Maryland. lan is on file with the Division d Development, Department nning and Zoning, 3430 Court Drive, Ellicott City, MD.

Marsha McLaughlin
Executive Secretary
ing Board of Howard County

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IN THE CIRCUIT COURT FOR CARROLL COUNTY
CARRIE M. WARD, ET AL.
6003 EXECUTIVE BLVD., SUITE 101
ROCKVILLE, MD 20852
Substitute Trustee(s)
Plaintiff(s)
vs.
WILLIAM L. KEMERER
537 TREVANION TERRACE
TANEYTOWN, MD 21787
Defendant(s)

CASE No. 06C14067799
NOTICE

Notice is hereby issued this 8th day of April, 2015, by the Circuit Court for Carroll County, Maryland, that the sale of the property mentioned in these proceedings and described as 537 Trevanion Terrace, Taneytown, MD 21787, made and reported by the Substitute Trustee, will be RATIFIED and CONFIRMED, unless cause to the contrary thereof be shown on or before the 11th day of May, 2015, provided a copy of this NOTICE be inserted in some daily newspaper printed in said County once in each of three successive weeks before the 1st day of May, 2015.

The report states the purchase price at the Foreclosure sale to be $152,000.00.

DONALD B SEALING, II,
Clerk of the Ciruit Court for Carroll County
16-R April 16, 23, 30 3204623

IN THE CIRCUIT COURT FOR CARROLL COUNTY
CARRIE M. WARD, ET AL.
6003 EXECUTIVE BLVD., SUITE 101
ROCKVILLE, MD 20852
Substitute Trustee(s)
Plaintiff(s)
vs.
NICHOLAS W. HAILSTONE, KAREN B. HAILSTONE
2176 TREVANION ROAD
TANEYTOWN, MD 21787
Defendant(s)

CASE No. 06C14067848
NOTICE

Notice is hereby issued this 8th day of April, 2015, by the Circuit Court for Carroll County, Maryland, that the sale of the property mentioned in these proceedings and described as 2176 Trevanion Road, Taneytown, MD 21787, made and reported by the Substitute Trustee, will be RATIFIED and CONFIRMED, unless cause to the contrary thereof be shown on or before the 11th day of May, 2015, provided a copy of this NOTICE be inserted in some daily newspaper printed in said County once in each of three successive weeks before the 1st day of May, 2015.

The report states the purchase price at the Foreclosure sale to be $116,655.38.

DONALD B SEALING, II,
Clerk of the Ciruit Court for Carroll County
16-P April 16, 23, 30 3204530

IN THE CIRCUIT COURT FOR ANNE ARUNDEL COUNTY
JEFFREY B. FISHER, ET AL., SUBSTITUTE TRUSTEE(S)
Versus
PAUL D. BARBER (DECEASED), DEFENDANT(S)
No. C-02-CV-15-000113
NOTICE

Notice is hereby issued this **Thursday, April 16, 2015**, that the sale of the property in the proceedings mentioned, made and reported by **William K. Smart, Substitute Trustee**, BE RATIFIED AND CONFIRMED, unless cause to the contrary thereof be shown on or before the **18th day of May 2015**, next; provided, a copy of this Notice be inserted in some newspaper published in Anne Arundel County, once in each of three successive weeks before the **18th day of May 2015** next. The report states that the amount of sale of the property at **1009 HILLTOP ROAD, GLEN BURNIE, MD 21060** to be **$125,000.00**.

ROBERT P. DUCKWORTH, Clerk
True Copy Test
ROBERT P. DUCKWORTH, Clerk
17-GG April 23, 30, May 7 3223847

PUBLIC NOTICE OF A RESPONSE ACTION PLAN AND PUBLIC INFORMATIONAL MEETING
Sparrows Point
Parcel A1

The property located at 1430 Sparrows Point Blvd. in Sparrows Point, Maryland has applied to Maryland's Voluntary Cleanup Program under the provisions of an Administrative Consent Order. The property is comprised of approximately 48 acres along Bethlehem Boulevard immediately west of the New Cold Mill Building. A proposed response action plan (RAP) has been submitted to the Maryland Department of the Environment (MDE) for approval. Contaminants of concern have been identified as certain metals, Aroclor 1260, select PAHs, and TPH. These chemicals have been identified in the soil and groundwater and the RAP is intended to address these constituents primarily through installation of various engineering controls together with reliance on various institutional controls.

This RAP is based upon future use of the property for industrial purposes.

Participant:
Sparrows Point Terminal, LLC
1600 Sparrows Point Blvd.
Sparrows Point, MD 21219

Contact:
Aaron Tomarchio
atomarchio@sparrowspoint.com

Eligible Property:
Sparrows Point Parcel A1
1430 Sparrows Pt. Blvd.
Sparrows Point, MD 21219

Public Informational Meeting:
May 11, 2015 6:30-8 PM
North Point Public Library
1716 Merritt Blvd.
Dundalk, MD 21222

Any person wishing to request further information or make comments regarding the proposed RAP must do so in writing. Comments or requests should be submitted to the attention of the Voluntary Cleanup Program project manager, Ms. Barbara Brown, at the Maryland Department of the Environment, 1800 Washington Blvd., Suite 625, Baltimore, Maryland 21230; telephone 410-537-3493.

All comments and requests must be received by the Department in writing no later than May 30, 2015.

501 N. Calvert St., P.O. Box 1377
Baltimore, Maryland 21278-0001
tel: 410/332-6000
800/829-8000

WE HEREBY CERTIFY, that the annexed advertisement of Order No 3249769

Sold To:
Weaver Boos Consultants - CU00080050
35 E Wacker Dr
Chicago,IL 60601

Bill To:
Weaver Boos Consultants - CU00080050
35 E Wacker Dr
Chicago,IL 60601

Was published in "The Baltimore Sun", "Daily", a newspaper printed and published in Baltimore City on the following dates:

Apr 30, 2015

The Baltimore Sun Media Group

By _____

Subscribed and sworn to before me this 30 day of Apr 2015,

By _____

Michele Elaine

Notary Public

My commission expires 10/5/15

MICHELE ELAINE GRIESBAUER NOTARY PUBLIC BALTIMORE COUNTY, MD

THE BALTIMORE SUN MEDIA GROUP

501 N. Calvert St., P.O. Box 1377
Baltimore, Maryland 21278-0001
tel: 410/332-6000
800/829-8000

WE HEREBY CERTIFY, that the annexed advertisement of Order No 3276720

Sold To:
Weaver Boos Consultants - CU00080050
35 E Wacker Dr
Chicago,IL 60601

Bill To:
Weaver Boos Consultants - CU00080050
35 E Wacker Dr
Chicago,IL 60601

Was published in "The Baltimore Sun", "Daily", a newspaper printed and published in Baltimore City on the following dates:

May 08, 2015

The Baltimore Sun Media Group

By Allison Thomas

Subscribed and sworn to before me this 8 day of May 2015,

By Michele Elaine

Notary Public

My commission expires 10/3/15

MICHELE ELAINE GRIESBAUER NOTARY PUBLIC BALTIMORE COUNTY, MD

TTING

e addressed to the Board of il of Baltimore and **marked elope Improvements** will oller, Room 204, City **Hall**, on **Wednesday, June 10,** l after 11:00 A.M. Bids will iates in Room 215, City Hall

amined, without charge, in ie Abel Wolman Municipal imore, Maryland 21202 as iy be purchased for a **non-**

: Bid are found in the bid

ct must first be **prequalified** Qualification Committee. 33 or contact the **Committee** laryland 21215. **If a bid is , then in that event, the be submitted with the bid** cation Category required for hree Story

k shall be **$2,000,000.01 to**

will be conducted at The **, MD 21202 on Thursday,**

: are:
uppression
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ll/Painting
ical
Scaffolding

S 15813
PPROVED:
teve Sharkey
irector Department of
eneral Services

ALTIMORE CITY COUNCIL
TICE OF PUBLIC HEARING
ON BILL NO. 15-0522

Taxation, Finance and Eco- ic Development Committee e Baltimore City Council will t on Thursday, May 21, 2015 :45 a.m. in the City Council nbers, 4th floor, City Hall, V. Holliday Street to conduct olic hearing on City Council lo. 15-0522.

5-0522 ORDINANCE – pleton Special Obligation ds

the purpose of authorizing ssuance of special obligation s, authorizing the pledge by city, subject to appropriation, x increment Revenues and ial Tax Revenues (as such s are defined herein) to the nent of debt service on such ial obligation bonds, the nishment of any reserves, he payment of certain ex- es and administrative costs; ding that such bonds may sued from time to time and e or more issues or series aggregate principal amount xceeding $58,311,000 e purpose of financing structure improvements and ed costs, including, without ation, the Project (defined n), and other necessary ovements to, from, or within evelopment district, and in other infrastructure ovements permitted by the

True Copy - Test: JULIE L. ENSOR
Clerk
3883 (4/24, 5/1, 5/8)

MARYLAND DEPARTMENT OF THE ENVIRONMENT
AIR AND RADIATION MANAGEMENT ADMINISTRATION

NOTICE OF INTENT TO ISSUE PART 70 OPERATING PERMIT, OPPORTUNITY TO SUBMIT WRITTEN COMMENTS OR TO REQUEST A PUBLIC HEARING

The Department of the Environment, Air and Radiation Management Administration (ARMA) has completed its review of the application for a renewal Part 70 Operating Permit submitted by the Motiva Enterprises, LLC, located in Baltimore, MD. The facility consists of bulk storage tanks and loading racks.

The applicant is represented by:

Mr. Kevin Brown, Terminal Manager
Motiva Enterprises, LLC Baltimore Terminal Facility
2400 Petrolia Avenue
Baltimore, MD 21226

The Department has prepared a draft Part 70 Operating Permit for review and is now ready to receive public comment. A docket containing the draft permit, application, supporting documentation and fact sheet is available for review. Ask for Docket #24-510-0728 the following locations during normal business hours:

Enoch Pratt Free Library
Brooklyn Branch
300 East Patapsco Avenue
Baltimore, MD 21225-1828

Maryland Department of the Environment
Air and Radiation Management Administration
1800 Washington Boulevard
Baltimore, Maryland 21230-1720

Interested persons may submit written comments or request a public hearing on the draft permit. Written comments must be received by the Department no later than 30 days from the date of this notice. Requests for a public hearing must be submitted in writing and must also be received by the Department no later than 30 days from the date of this notice.

Comments and requests for a public hearing will be accepted by the Department if they raise issues of law or material fact regarding applicable requirements of Title V of the Clean Air Act, and/or regulations implementing the Title V Program in Maryland found in COMAR.

A Request for public hearing shall include the following:

1) The name, mailing address, and telephone number of the person making the request;

2) The names and addresses of any other persons for whom the person making the request is representing; and

3) The reason why a hearing is requested, including the air quality concern that forms the basis for the request and how this concern relates to the person making the request.

All written comments and requests for a public hearing should be directed to the attention of Ms. Shannon Heafey, Air Quality Permits Program, Air and Radiation Management Administration, 1800 Washington Boulevard Suite 720, Baltimore, Maryland 21230-1720.

Further information may be obtained by calling Ms. Shannon Heafey at (410) 537-4433.

IN THE CIRCUIT COURT OF RALEIGH COUNTY, WEST VIRGINIA

IN THE INTEREST OF
Liam Kearney 11/04/2008

Juvenile Abuse Neglect No. 15-JA-009-B
Judge Robert A. Burnside, Jr., Division 10

ORDER OF PUBLICATION

TO WHOM IT MAY CONCERN:

The purpose of this action is to determine guardianship of Liam Kearney, DOB 11/04/2008. Petitioner, the West Virginia Department of Health and Human Resources, is seeking continued legal and physical custody of said children, and/or Termination of Parental Rights.

It appearing that the whereabouts of Sean Kearney, Jr., or of any known or unknown father, or of any named or unnamed father, or of anyone claiming paternity of infant child, is presently unknown at this time, it is ORDERED that Sean Kearney, Jr., or any known or unknown father, or any named or unnamed father, or anyone claiming paternity of infant child, appear in the Office of the Honorable Robert A. Burnside, Jr., Judge of the Circuit Court of Raleigh County, West Virginia, for an adjudicatory hearing on Tuesday, the...

True Copy - Test: JULIE L. ENSOR
Clerk
3900 (4/24, 5/1, 5/8)

MARYLAND BOARD OF AIRPORT ZONING APPEALS
Notice of Hearing

The Maryland Board of Airport Zoning Appeals (BAZA) will hold a hearing on Tuesday, May 19, 2015. The hearing will begin at 10:30 a.m. in the Board Room of the Maryland Department of Transportation located at 7201 Corporate Center Drive, Hanover, Maryland 21076. The Board will hear the following case(s):

Docket Number 400

PPE Casino Resorts Maryland, LLC proposes to utilize a temporary crane during the construction of a multi-story hotel located at 7002 Arundel Mills Circle, Hanover, Maryland. This location is approximately 12,000 feet southwest of Future Runway 10R at BWI Marshall Airport. The proposed height of the temporary crane is 270 feet above ground level (AGL)/440 feet mean sea level (MSL), and the proposed structure height is 230 feet AGL/400 feet MSL. The temporary crane and structure heights will exceed the Code of Federal Regulations (FAR) Part 77, Objects Affecting Navigable Airspace by 15 feet and 18 feet, respectively. Code of Maryland Regulations (COMAR) 11.03.06.03 and 11.03.06.04, Height Limits in Airport Districts enables the proponents to seek a variance from the Board of Airport Zoning Appeals (BAZA) for any proposed penetration of FAR Part 77. Therefore, the Maryland Aviation Administration requests to present BAZA Case 400 to the Board of Airport Zoning Appeals on Tuesday, May 19, 2015 at 10:30 a.m. For additional information, please contact Deborah Mahoney-Fowler 410-865-1233. Appropriate auxiliary aids and services for qualified individuals with disabilities will be provided upon request. Please call 410-865-1233 (voice) or MD Relay (TTY Users).

City of Baltimore
Department of Finance
Bureau of Purchases

Sealed proposals addressed to the Board of Estimates of Baltimore will be received until, but not later than 11:00a.m. local time on the following date(s) for the stated requirements:

May 27, 2015

- ASH BORER TREATMENT B50004010
- MANAGEMENT OF PARKING GARAGES – GROUP IV B50004027
- PROVIDE DAILY ROUNDTRIP TRANSPORTATION FOR NON-AMBULATORY AND OTHER CHILDREN B50004035
- ENTERPRISE TECHNOLOGY STAFFING SUPPORT B50004056
- JOHN DEERE GATORS B50004068

June 3, 2015

PUBLIC NOTICE OF A RESPONSE ACTION PLAN AND PUBLIC INFORMATIONAL MEETING
Sparrows Point
Parcel A1

The property located at 1430 Sparrows Point Blvd. in Sparrows Point, Maryland has applied to Maryland's Voluntary Cleanup Program under the provisions of an Administrative Consent Order. The property is comprised of approximately 48 acres along Bethlehem Boulevard immediately west of the New Cold Mill Building. A proposed response action plan (RAP) has been submitted to the Maryland Department of the Environment (MDE) for approval. Contaminants of concern have been identified as certain metals, Aroclor 1260, select PAHs, and TPH. These chemicals have been identified in the soil and groundwater and the RAP is intended to address these constituents primarily through installation of various engineering controls together with reliance on various institutional controls.

This RAP is based upon future use of the property for industrial purposes.

Participant:
Sparrows Point Terminal, LLC
1600 Sparrows Point Blvd.
Sparrows Point, MD 21219

Contact:
Aaron Tomarchio
atomarchio@sparrowspoint.com

Eligible Property:
Sparrows Point Parcel A1
1430 Sparrows Pt. Blvd.
Sparrows Point, MD 21219

Public Informational Meeting:
May 11, 2015 6:30-8 PM
North Point Public Library
1716 Merritt Blvd.
Dundalk, MD 21222

Any person wishing to request further information or make comments regarding the proposed RAP must do so in writing. Comments or requests should be submitted to the attention of the Voluntary Cleanup Program project manager, Ms. Barbara Brown, at the Maryland Department of the Environment, 1800 Washington Blvd., Suite 625, Baltimore, Maryland 21230; telephone 410-537-3493.

All comments and requests must be received by the Department in writing no later than May 30, 2015.

NOTICE OF PUBLIC SALE OF PERSONAL PROPERTY

Notice is hereby given that the undersigned will sell, to satisfy lien of the owner, at public sale by competitive bidding via www.storagetreasures.com on May 13, 2015 at 1pm EST for

True Copy - Test: JULIE L
3906 (4/24,

ANNE ARUNDEL FORECLOSURE

THE FISHER LAW GROUP, PLLC
9440 Pennsylvania Avenue-Suite 35
Upper Marlboro, Maryland 20772
Telephone (301) 599-7700
Case No.: C-02-CV-15-000730

FORECLOSURE SALE

VALUABLE IMPROVED DWELLIN

2608 Tallwind Court,
Crofton, MD 21114

In enforcement of a Security Instrument gran Jeffrey Nelson dated February 22, 2011 and re among the Land Records of Anne Arundel County, Ma in Liber 23515 at folio 064, the undersigned, will public auction at the Courthouse entrance of the:

CIRCUIT COURT FOR ANNE ARUNDEL COUNTY a
the Court House Door, 8 Church Circle,
Annapolis, Maryland 21401 on

Monday, May 11, 2015
at 11:30 AM

All that fee simple property described in said S Instrument, being in the 2 Election District of Anne A County, Maryland, and being improved by a d bearing the street address of 2608 Tallwind Court, C MD 21114. Subject to all covenants, restriction easements of record, if any. (NOTE WELL: For adminis convenience, other sales may have been scheduled f specific time and date. Prior to commencement sales, an announcement will be made as to the or sale. Additional information is available at www legal.com.)

TERMS OF SALE: A cash or cash equivalent dep $29,000.00 will be required at the time of sale, the b to be payable in cash within ten (10) business day ratification of the sale by the Circuit Court, with inter said balance from the date of sale to date of rec funds by the undersigned at the rate of 5.00000 annum. Failure of the purchaser to settle may re resale of the property at purchaser's risk and cos forfeiture of deposit, at the election of the unders who specifically preserve all legal and equitable re available to them. The undersigned reserve the r waive the deposit requirements as to a pur representing the interests of the party secured Security Instrument. Sale is "AS-IS" and the under make no warranty regarding the physical condition, p description, title, or any other matter with respect property. All due and/or unpaid water and sewer fa charges and front foot benefit payments are payable purchaser without adjustment. Taxes, rents (other ground rents) and any other annually payable charges and assessments, including any condominiu and/or homeowner's association dues, if applicable, adjusted to the day of sale and thereafter assumed Purchaser. All costs of conveyancing, including tr taxes and recordation taxes will be paid by the Purc The Purchaser will pay a reasonable fees for any se rendered by counsel for the undersigned at the requ the purchaser or due to the failure of the purcha comply with the terms of sale. The Purchaser sh responsible for obtaining possession of the property. event the undersigned are unable to convey mark title or in the event the borrower entered into a repa plan, reinstated or paid the loan off prior to the sale, o any other reason, the undersigned did not have the ri sell, the sale is null and void and the Purchaser entitled to any legal or equitable remedy other than of the deposit without interest and any and all other of the purchaser are hereby released. Other term

Maxwell, Mike

From: legals <legals@chespub.com>
Sent: Thursday, May 07, 2015 1:10 PM
To: Maxwell, Mike
Subject: Re: 2550588, Sparrows Point

Again, please accept our apologies. We'll refund your credit card
$105.45 for the ad that did not publish.

--
Rocky Brooks
APG Media of Chesapeake, LLC
410-822-1500, ext. 4080
410-770-4080 direct
410-770-4064 fax
legals@chespub.com

On 5/7/2015 2:02 PM, Maxwell, Mike wrote:
> The public notice was intended to provide notice for a public meet scheduled for Monday May 11, so there is no point in publishing it after the meeting date. Please refund the charges to my credit card. We don't need to publish the add now.
>
> Thanks.
>
>
>
> Mike Maxwell, LPG, CHMM
> Environmental Practice Group, Chicago Operations Manager
>
> Weaver Consultants Group
> 35 E. Wacker Drive | Suite 1250
> Chicago,IL 60601
> O. 312-922-1030 | F. 312-922-0201 | M. 312-617-5858
> http://www.wcgrp.com | mailto:mmaxwell@wcgrp.com
>
>
> IMPORTANT NOTICE: The information contained in this email message (including any attachments) may be confidential, privileged or both, and is intended exclusively for the addressee(s) intended by the sender. If it appears you have received this email message in error, please notify the sender immediately and then delete; any other use of this email message is prohibited. Thank you.
>
> -----Original Message-----
> From: legals@chespub.com [mailto:legals@chespub.com]
> Sent: Thursday, May 07, 2015 10:59 AM
> To: Maxwell, Mike
> Subject: Ad: 2550588, Sparrows Point
>
> Mr. Maxwell,

> It has just been brought to my attention that your ad did not publish in today's Dundalk Eagle as requested. Would it be OK to publish next week?
> Please reply.
> Thank you and please accept our apologies, Rocky Brooks APG Media of Chesapeake 410-822-1500, ext. 4080 410-770-4080, direct legals@chespub.com

Maxwell, Mike

From: Maxwell, Mike
Sent: Wednesday, April 29, 2015 1:14 PM
To: 'legals@chespub.com'
Subject: RE: 2550588, Sparrows Point
Attachments: MAXWELL-21-2550588-1.pdf

Rocky:

The only revision I have to this proof is the first word in the heading at the top: "pubic" should of course be "public".

I will call you this afternoon with a credit card for payment.

Thanks.

Mike

-----Original Message-----
From: legals@chespub.com [mailto:legals@chespub.com]
Sent: Tuesday, April 28, 2015 9:48 AM
To: Maxwell, Mike
Subject: Ad: 2550588, Sparrows Point

Revised proof and cost of ad for Sparrows Point to publish in the Dundalk Eagle on May 7. Please reply with OK or any changes you might need. **NOTE:
Prepayment is required. I can be reached at either of the numbers below.
Thank you,
Rocky Brooks
APG Media of Chesapeake
410-822-1500, ext. 4080
410-770-4080, direct
legals@chespub.com

Chesapeake Publishing **04/28/15**
29088 Airpark Drive
Easton, MD 21601

Phone: Fax:
http://www.chespub.com

Cust. AcctID:	**400060**	Creation Date:	**04/28/15**
		Ad Date:	**05/07/15**
		Class:	**1010**
Name:	**MIKE MAXWELL**	Ad ID:	**2550588**
Company:	**ENVIRONMENTAL**	Ad Taker:	**RBROOKS**
PRACTICE GROUP		Sales Person:	**503**
Address:	**35 E. WACKER DRIVE**	Words:	**266**
	SUITE 1250	Lines:	**49**
	CHICAGO, IL 60601	Agate Lines:	**132**
		Depth:	**5.55**
		Inserts:	**1**
Telephone:	**(312) 922-1030**	Blind Box:	

Other Charges:	**$0.00**	Total:	**$105.45**
Discount:	**$0.00**		
Surcharge:	**$0.00**	Paid Amount:	**- $0.00**
Credits:	**$0.00**		
Bill Depth:	**5.55**	Amount Due:	**$105.45**

CREDIT CARD DETAILS

PT	CT	CN	Number	Exp.	Amnt.

Publication	Start	Stop	Inserts	Cost
The Dundalk Eagle	05/07/15	05/07/15	1	**$105.45**

Ad Note:

Customer Note:

We Appreciate Your Business!
Thank You MIKE MAXWELL!

PUBIC NOTICE OF A RESPONSE ACTION PLAN AND PUBLIC INFORMATIONAL MEETING
Sparrows Point
Parcel A1

The property located at 1430 Sparrows Point Blvd. in Sparrows Point, Maryland has applied to Maryland's Voluntary Cleanup Program under the provisions of an Administrative Consent Order. The property is comprised of approximately 48 acres along Bethlehem Boulevard immediately west of the New Cold Mill Building. A proposed response action plan (RAP) has been submitted to the Maryland Department of the Environment (MDE) for approval. Contaminants of concern have been identified as certain metals, Aroclor 1260, select PAHs, and TPH. These chemicals have been identified in the soil and groundwater and the RAP is intended to address these constituents primarily through installation of various engineering controls together with reliance on various institutional controls.

This RAP is based upon future use of the property for industrial purposes.

Participant: Sparrows Point Terminal, LLC
1600 Sparrows Point Blvd.
Sparrows Point, MD 21219

Contact: Aaron Tomarchio
atomarchio@sparrowspoint.com

Eligible Property: Sparrows Point Parcel A1
1430 Sparrows Pt. Blvd.
Sparrows Point, MD 21219

Public Informational Meeting: May 11, 2015 6:30-8 PM
North Point Public Library
1716 Merritt Blvd.
Dundalk, MD 21222

Any person wishing to request further information or make comments regarding the proposed RAP must do so in writing. Comments or requests should be submitted to the attention of the Voluntary Cleanup Program project manager, Ms. Barbara Brown, at the Maryland Department of the Environment, 1800 Washington Blvd., Suite 625, Baltimore, Maryland 21230; telephone 410-537-3493.

All comments and requests must be received by the Department in writing no later than May 30, 2015.

de 4/30 2517100


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LEARN HOW

MDE to present partial Sparrows Point cleanup plan

By NICOLE RODMAN nrodman@chespub.com May 6, 2015


TRAVEL
WISCONSIN
.COM
MAKE YOUR
SUMMER
LUMBER-
JACK-TASTIC!
FUN IS FOUND HERE

The Maryland Department of the Environment (MDE) will unveil cleanup plans for a portion of the former Sparrows Point steel mill site during a public meeting to be held at the North Point Public Library on Monday, May 11, at 6 p.m.

During the meeting, MDE officials will unveil the proposed cleanup plan for parcel A-1, a 48.5 acre site near the former Rod and Wire Mill (and potential site of a proposed FedEx building, according to MDE spokesman Jay Apperson.)

Thank you for reading!
Please log in, or sign up for a new account and purchase a subscription to continue reading.

Sign Up (https://dundalkeagle-dot-com.bloxcms.com/users/profile/nrodman)

http://www.dundalkeagle.com/news/local/mde-to-present-partial-sparrows-point-cleanup-plan/art... 6/10/2015

April 23, 2015
Revised July 6, 2015

PHASE II ENVIRONMENTAL SITE ASSESSMENT REPORT/RESPONSE ACTION PLAN

PARCEL A1
SPARROWS POINT TERMINAL, MARYLAND

PREPARED FOR:

SCANNELL PROPERTIES

PREPARED BY

Weaver Consultants Group

EXECUTIVE SUMMARY

On behalf of Scannell Properties (who represents the potential future lessee), Weaver Consultants Group North Central, LLC (WCG) has prepared this Phase II Environmental Site Assessment (ESA) Report/Response Action Plan (RAP) for the property identified as Parcel A1 located on the northern portion of the Sparrows Point Terminal property located in in Sparrows Point, Maryland (the Site). The Site is part of an approximately 3,100-acre former steel mill located on the Sparrows Point Peninsula (Property).

The entire Property was accepted into the Maryland Department of the Environment (MDE) Voluntary Cleanup Program (VCP) on September 11, 2014. Subsequently, a VCP application for an area of the Property designated as Area A, which includes the Site, was submitted to the MDE. Parcels located in Area A are designated for investigation and remediation on a priority basis through the Maryland VCP process.

The Site consists of approximately 48.5 acres of land and is currently vacant. Beginning in the 1940s, the Site historically operated as a pipe production facility (Pipe Mill) associated with the former Bethlehem Steel Corporation steel mill. In 1998, the Pipe Mill was demolished. The proposed redevelopment use of the Property, including the Site, is Tier 3B, Restricted Industrial Use. Currently, it is anticipated that the Site will be redeveloped as a Federal Express Ground facility.

As part of the environmental due diligence activities implemented for Bryan Cave LLC, WCG previously performed a Phase I ESA of the entire Property and prepared a report dated May 19, 2014 (May 2014 Phase I ESA). Six Findings were identified related to the Site and these six Findings were grouped into one recognized environmental condition (REC) identified as REC-6: Rod and Wire and Pipe Mill Area. In addition to the May 2014 Phase I ESA, WCG performed a Phase I ESA specifically for the Site and prepared a report dated February 18, 2015. Based on the above Phase I ESA, four RECs were identified in connection with the Site related to historical operations on the Site and adjoining properties.

To assess potential environmental site conditions associated with the identified RECs, a Phase II ESA was implemented at the Site in November 2014. During the Phase II ESA, twenty-six soil borings/soil probes were advanced and groundwater samples were collected from five of the soil borings. In general, results of the Phase II ESA indicated the presence of select metals, one polychlorinated biphenyl (PCB), and total petroleum hydrocarbons-diesel range organics (TPH-DRO) in soil at concentrations exceeding the applicable MDE Non-Residential Cleanup Standards (NRCS) and/or the United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs). In addition, various dissolved metals were detected in groundwater at concentrations exceeding the MDE Groundwater Standards for Type I and Type II Aquifers and/or USEPA Maximum Contaminant Levels (MCLs) or Tap Water RSLs.

Additional investigation was conducted in February 2015 to further assess the impacts identified during the Phase II ESA. Twenty soil probes were advanced for soil sample collection and analysis. In general, the results indicated the presence of select metals, TPH-DRO, one PCB, and select polynuclear aromatic hydrocarbons (PAHs) in soil at concentrations exceeding the applicable MDE NRCS and/or the USEPA RSLs.

The RAP included herein proposes a remedy for impacted soil and groundwater in conjunction with the planned Site redevelopment. The selected technologies to address the soil and groundwater impacts include engineering and institutional controls, as well as health and safety protocols for construction workers. The engineering and institutional controls will control the exposure pathways (incidental ingestion, dermal contact, and inhalation of soil particles) from the media of concern (soil and groundwater) to the potential receptors (future adult workers and visitors). Additionally, the health and safety protocols developed for future construction of capped areas and redevelopment construction activities shall be designed to protect construction workers from unacceptable risk.

The engineering controls will consist of capping technologies, including concrete covered areas (future building slab and concrete paving), asphalt-paved areas, and capped landscaped areas with a geotextile fabric. Following implementation of the containment remedies (capping), institutional controls, including a groundwater use deed restriction, industrial land use restriction, and cap maintenance requirements will be recorded for the Site in order to maintain the integrity of the containment remedies and mitigate potential exposure. This RAP was prepared for submittal to the MDE so that ultimately a No Further Action Letter and a Certificate of Completion may be obtained following completion of the proposed RAP activities.

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1 INTRODUCTION

On behalf of Scannell Properties (who represents the potential future lessee), Weaver Consultants Group North Central, LLC (WCG) has prepared this Phase II Environmental Site Assessment (ESA) Report/Response Action Plan (RAP) for the site identified as Parcel A1 located on the northern portion of the Sparrows Point Terminal in Baltimore, Maryland (the Site). The location of the Site is shown on **Figure 1 – Site Location Map**.

The Site is part of an approximately 3,100-acre former steel mill located on the Sparrows Point Peninsula (Property). On June 26, 2014, the current owner of the Property, Sparrows Point Terminal, LLC (SPT), submitted an application to place the entire Property into the Maryland Department of the Environment (MDE) Voluntary Cleanup Program (VCP). On September 11, 2014, MDE determined that SPT was eligible for participation in the VCP. On September 12, 2014, SPT and MDE entered into an Administrative Consent Order (ACO) that allows for designation of certain areas of the Property for investigation and remediation on a priority basis through the VCP process. A VCP application for the priority areas (designated as Area A), including the Site, was submitted to the MDE on September 12, 2014.

The Site consists of approximately 48.5 acres of land and is currently vacant. Beginning in the 1940s, the Site historically operated as a pipe production facility (Pipe Mill) associated with the former Bethlehem Steel Corporation steel mill. In May 1984, the Pipe Mill was closed under a Closure Plan approved by the MDE on December 12, 1983. Closure activities occurred on the Site and surrounding area through the 1980s and 1990s. In 1998, the Pipe Mill was demolished.

The proposed redevelopment use of the Property, including the Site, is Tier 3B, Restricted Industrial Use. The VCP application for Area A specifies that the intended future use is Tier 3 (Industrial) with land use controls anticipated as part of the future use (designated by B [Restricted]). Currently, it is anticipated that the Site will be redeveloped as a Federal Express Ground facility, which is consistent with the intended future use designation on the Area A VCP application.

As part of the environmental due diligence activities implemented for Bryan Cave LLP (environmental counsel for SPT), WCG previously performed a Phase I ESA of the entire Property and prepared the *Phase I Environmental Site Assessment Report, Former RG Steel Facility, 1430 Sparrows Point Boulevard and 5111 North Point Boulevard, Sparrows Point, Maryland* dated May 19, 2014 (May 2014 Phase I ESA). The Phase I ESA Report was previously submitted to the MDE and therefore, is not included as an attachment to this report. Six Findings were identified related to the Site that is the subject of this report. These six Findings were grouped into one recognized environmental condition (REC) identified as REC-6: Rod and Wire and Pipe Mill Area (Findings 131 to 133, 153, 160, and 162). Findings 153 and 162 are specific to the former Pipe Mill and are associated with the Site; the other Findings are associated with the former Rod and Wire Mill located directly west of the Site. In addition to

the May 2014 Phase I ESA, WCG performed a Phase I ESA specifically for the Site and prepared a report dated February 18, 2015. Based on the February 2015 Phase I ESA, WCG identified four RECs in connection with the Site related to historical operations on the Site and adjoining properties. Details of the RECs are discussed within this report.

To assess potential environmental site conditions associated with the RECs identified during the above referenced Phase I ESAs, WCG and our sub consultant KCI Technologies (KCI) implemented a Phase II ESA (Phase II ESA) at the Site on November 10 through 13, 2014 and November 24, 2014. The scope of work for the Phase II ESA generally included the advancement of soil borings/probes and the installation of temporary monitoring wells for soil and groundwater sample collection. A total of twenty-six soil borings/soil probes were advanced and groundwater samples were collected from five of the soil borings.

In general, results of the Phase II ESA indicated the presence of metals (arsenic, cadmium, zinc, iron, manganese, or vanadium), or total petroleum hydrocarbons-diesel range organics (TPH-DRO) in soil at concentrations exceeding the applicable MDE Non-Residential Cleanup Standards (NRCS) and/or the United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs). Various dissolved metals (aluminum, cadmium, iron, manganese, vanadium, and zinc) were also detected in groundwater at concentrations exceeding the MDE Groundwater Standards for Type I and Type II Aquifers and/or USEPA Maximum Contaminant Levels (MCLs)/Tapwater screening levels.

Additional investigation was conducted in February 2015 to further assess the soil impacts identified during the Phase II ESA. The scope of work for the additional investigation was implemented pursuant to a MDE approved workplan and included the advancement of twenty soil probes for soil sample collection and analysis of select samples. In general, the results indicated the presence of select metals, TPH-DRO, PCBs, and polynuclear aromatic hydrocarbons (PAHs) in various soil samples at concentrations exceeding the applicable MDE NRCS and/or the USEPA RSLs.

1.1 Purpose and Scope

The purpose of this Phase II ESA Report/RAP is to:

- Provide results for the Phase II and supplemental site investigation activities;
- Evaluate the potential exposure pathways and potentially exposed populations for each media and contaminant of concern at the Site under the present and future land use scenarios;
- Based on the exposure evaluation, provide the details of the proposed response actions including engineering controls and institutional controls to mitigate potential risks to human health and the environment. The proposed response actions include

containment remedies (engineering controls) and deed restrictions (institutional controls) prohibiting potable groundwater use, and restricting land use.

The responsible party implementing this RAP will comply with local, state, and federal laws and regulations by obtaining necessary approvals and permits to conduct the activities pursuant to an approved RAP. If during implementation of the RAP, any previously undiscovered contamination or citation from regulatory entities related to health and safety practices is identified, the MDE VCP will be verbally notified within one business day. Written notification will be submitted within ten business days.

A description of the Site and summary of the Site history are provided in **Section 2.0**. The Phase II ESA investigation activities and results are summarized in **Section 3.0** and the additional investigation activities are discussed in **Section 4.0**. The RAP exposure assessment is provided in **Section 5.0** and the clean-up criteria are provided in **Section 6.0**. Details of the RAP including the selected technologies including engineering and institutional controls are provided in **Section 7.0.** RAP implementation details are outlined in **Sections 8.0** through **10.0** and references are provided in **Section 11.0**.

2 SITE DESCRIPTION AND HISTORY

2.1 Site Description

The Site is identified as Parcel A1, located on the northern portion of the Sparrows Point Peninsula in Sparrows Point, Maryland. The Site consists of approximately 48.5 acres of land with approximately 700 feet of frontage along Bethlehem Boulevard/Riverside Drive/Route 158 and 850 feet of frontage along Patapsco Back Rivers (PBR) Railroad Road. The Site is described as one lot on the Sparrows Point Peninsula in Baltimore County, Maryland (see **Figure 1 – Site Location Map**).

The Site is currently vacant, but contains building foundations and concrete slabs from former structures (see **Figure 2 – Site Layout Map**). The Site historically operated as a pipe production facility (Pipe Mill) from the 1940s to 1984 when operations ceased. The southern and eastern edges of the Site are improved with a chain-link fence. One access road is present through the center and along the western portion of the Site

2.2 Site Setting

The Site generally lies east and south of Riverside Drive/Bethlehem Boulevard/Route 158, north of PBR Railroad Road, and west of Wharf Road/Route 151. The following table is a listing of the current adjoining properties including the applicable property name, address, operation, and direction from the Site:

CURRENT ADJOINING PROPERTIES			
Property Name/Occupant	**Address**	**Operation/Use**	**Direction from the Site**
Greys Landfill	Along Interstate-695 Sparrows Point, Maryland	Landfill	North across I-695
Electrical Substation	Along US Route 138 Sparrows Point, Maryland	Electrical Substation	Northwest
New Cold Mill Complex	Along PBR Railroad Road Sparrows Point, Maryland	Vacant Building - Part of Former New Cold Mill	East
Former Billet Building	Along Cold Mill Road Sparrows Point, Maryland	Vacant/Former Industrial	South across railroad tracks
Humphrey's Impoundment	Along PBR Railroad Road Sparrows Point, Maryland	Impoundment	South across railroad tracks

CURRENT ADJOINING PROPERTIES			
Property Name/Occupant	**Address**	**Operation/Use**	**Direction from the Site**
Vacant Land	Along PBR Railroad Road Sparrows Point, Maryland	Vacant/Former Rod and Wire Mill	West

The Site is part of an approximately 3,100-acre former steel mill located on the Sparrows Point Peninsula. The surrounding area generally consists of properties formerly used for heavy industry associated with the former steel mill. The Sparrows Point Peninsula consists largely of the former steel mill plant, which was owned and operated primarily by the former Bethlehem Steel Company, and subsequently by RG Steel.

The following utility services are provided to the Sparrows Point Peninsula Property generally; specific availability is not verified herein:

- Electric service – provided by Baltimore Gas and Electric (BGE);
- Natural gas service – None (formerly BGE);
- Potable water – provided by Baltimore County; and
- Sanitary service – provided by City of Baltimore.

Storm water at the Site and in the surrounding area largely sheet flows; however, some storm water is also managed via an internal storm sewer system which discharges to various outfalls.

2.3 Site History

Based on historical information reviewed for the prior Phase I ESA performed for the Site, the central and western portions of the Site were improved by at least 1938 with six industrial buildings and access roads that were associated with the western adjoining property. The western adjoining property was improved with a large industrial building housing the former Rod and Wire Mill. The southern portion of the Site, which was previously part of Humphrey Creek, was filled in and developed with railroad tracks while the northern portion was farmland.

The Site was identified as the Pipe Mill and began operating as a pipe production facility in the 1940s. In May 1984, the Pipe Mill was closed under a Closure Plan approved by the MDE on December 12, 1983. Closure activities occurred on the Site and surrounding area through the

1980s and 1990s. In 1998, the Pipe Mill was demolished. The Site is currently vacant, but contains building foundations and concrete slabs from former structures.

As mentioned previously, the Site was part of a former steel mill that operated for over one hundred years. Pennsylvania Steel built the first furnace at the Sparrows Point facility in 1887 and the first iron was cast in 1889. In 1916, Bethlehem Steel Corporation (BSC) purchased the Sparrows Point facility and enlarged it with the addition of mills to produce hot rolled sheet, cold rolled sheet, galvanized sheet, tin mill products, and steel plate. Following the bankruptcy of BSC in 2001, the Property was owned by a succession of owners operating under different names. Steelmaking operations at the facility ceased in 2012. Throughout 2013 to the present day, a demolition contractor has been demolishing the majority of the above-grade structures on the Property.

On February 25, 1997, the United States Environmental Protection Agency (USEPA) filed a complaint under the Resource Conservation and Recovery Act (RCRA) against BSC claiming that BSC operated a hazardous waste treatment, storage, or disposal facility and that a release of hazardous constituents had occurred. On October 8, 1997, BSC, the USEPA, and the MDE entered into a Consent Decree to address releases from historical and on-going operations at the facility. As required by the Consent Decree, BSC submitted a Description of Current Conditions (DCC) Report on January 20, 1998 describing prior investigations and identifying potential sources of contaminants. Subsequently, numerous other major reports focusing primarily on designated Special Study Areas have been submitted to the USEPA and MDE.

Based on the May 2014 Phase I ESA, the Site is part of the Rod and Wire Mill Special Study Area. The former Rod and Wire Mill was located on the western adjoining property. According to the DCC Report, activities at the former Rod and Wire Mill associated with leaching of zinc ore and a subsequent treatment process to remove cadmium impurities resulted in impacted soil and groundwater. In 1986, BSC initiated a groundwater remediation program under MDE Complaint and Order C-0-85-179 dated February 25, 1985. The remediation activities included in-situ leaching of contaminated soil and treatment of groundwater pumped from a network of extraction wells. As part of the Interim Measures (IM) associated with the 1997 Consent Decree, BSC was required to continue to operate the remediation system (soil leaching system and groundwater pump and treat system). The groundwater pump and treat system is currently operational in the former Rod and Wire Mill Area for treatment of cadmium and zinc-impacted groundwater. The pumping system conveys groundwater to the existing Humphrey Creek Waste Water Treatment Plant. Based on the DCC Report, the former Pipe Mill Area associated with the Site was located in the eastern part of the Rod and Wire Mill & Pipe Mills Facility Area. Two solid waste management units (SWMUs) were identified in the Pipe Mill Area: the Zinc Ammonium Chloride Sludge Storage Tanks (SWMU 48) and the Pipe Mill Trenches/Sump (SWMU 49). At the time the DCC Report was prepared, the Zinc Ammonium Chloride Sludge Storage Tanks were inactive and formerly used for the management of zinc ammonium chloride sludge. There was one reported release in the sludge storage area resulting in contaminated soil, which was subsequently excavated and stored in this area. The

unit was located on the northern end of the Pipe Mill and consisted of an area where 55-gallon drums containing waste zinc ammonium chloride were temporarily stored on pallets. This unit was closed in 1984 under a Closure Plan approved by MDE on December 12, 1983. The Pipe Mill Trenches/Sumps were identified as a unit consisting of piping designed to transport process wastewater from the Pipe Mill to the Tin Mill Canal (TMC) Discharge Pipes and ultimately to the TMC. This unit began operations in the 1950s and was dismantled in 1983.

Three Areas of Concern (AOC) were also identified on the Site: the Hydraulic Oil Storage Area (AOC O), the Pipe Mill Selenium Testing Area (AOC Y), and the Pipe Mill Acid Tanks (AOC Z). The Hydraulic Oil Storage Area consisted of approximately 20 drums stored outside on soil and gravel on the east side of the Pipe Mill. Non-hazardous, water-based hydraulic oil was managed in this area until the Pipe Mill ceased operations in the 1980s. During a 1997 site inspection, the area contained no drums and was overgrown with vegetation. Additionally, no staining was observed in the area of AOC O. The Pipe Mill Selenium Testing Area consisted of a portion of the mill containing slag contaminated with selenium. The selenium-bearing slag was removed and replaced with new slag. The Pipe Mill Acid Tanks included four steel tanks that were observed to be rusted and contained visible holes during a 1991 site visit. The tanks were believed to be used to store sulfuric acid. There were no reported releases from the tanks and they were reportedly out of use before 1980. The tanks were not present at the time of the DCC Report.

A portion of the former East Pond associated with the former Rod and Wire Mill was investigated as part of the Phase II ESA. Results from samples collected in this area suggested the presence of possible conditions associated with the former East Pond. As a result of the investigation, the boundary of former East Pond was delineated and the configuration of the Site was subsequently modified to exclude the area of the former East Pond. Results from samples collected from the excluded former East Pond area are included for completeness, however the analytical results for these samples are tabulated separately.

On September 12, 2014, SPT and MDE entered into an Agreed Consent Order (ACO), which provides the framework for investigations and remedial measures to address contaminants of concern on the entire 3,100-acre Property under MDE's VCP. Additionally, SPT and USEPA entered into a Prospective Purchaser Agreement (PPA), which was effective as of November 25, 2014. The PPA is a Settlement Agreement and Covenant Not to Sue and outlines SPT's obligations and work to be performed associated with the existing contamination on the Sparrows Point Property. The PPA was subsequently amended during the first quarter of 2015 and is now considered a Settlement Agreement.

2.4 Environmental Setting

2.4.1 Topography

A review of the 1974 Sparrows Point, Maryland, 7.5-minute quadrangle topographic map published by the United States Geological Survey (USGS) indicates that the Site is at an elevation of approximately 10 feet above mean sea level (msl) and slopes in a general southwest direction.

2.4.2 Regional Geology/Hydrogeology

Based on information provided in historical reports reviewed for the May 2014 Phase I ESA, the Sparrows Point facility is located within the Coastal Plain Physiographic Province, which is the relatively low-lying portion of the Atlantic Slope. The unconsolidated sediments beneath Sparrows Point rest on a surface of Precambrian and Early Paleozoic crystalline bedrock that slopes downward to the southeast. The unconsolidated sediments include (from youngest to oldest) recent fill deposits consisting primarily of iron- and steel-making slag; the Pleistocene Talbot Formation (predominantly clays, organic clays, silts, and muds) approximately five to 100 ft. thick; the Upper Cretaceous Patapsco Formation (predominantly sand and gravel interbedded with lenses of sandy clay) approximately 145 to 255 ft. thick; the Upper Cretaceous Arundel Formation (predominantly dense, plastic clays with nodules of iron oxide and a few discontinuous lenses of sand) approximately 20 to 180 ft. thick with an average thickness of 100 ft.; and the Lower Cretaceous Patuxent Formation (interbedded and lenticular beds of gravel, sand, sandy clay, and clay) approximately 50 to 250 ft. thick. The Cretaceous formations comprise the Potomac Group.

Based on information provided in historical reports, unconfined groundwater exists within a shallow aquifer composed of the slag fill material, and intermediate and deep aquifers exist within the Talbot and Patapsco Formations, respectively. The aquifers are hydraulically interconnected, but are partially separated in areas by discontinuous lenses of silt and clay. Radial flow on the western side of the peninsula is toward Bear Creek and the Patapsco River to the west. Flow on the south side of the peninsula is south toward the southern shoreline and turning basin. Flow on the east side of the peninsula is toward Old Road Bay to the east. Groundwater flow direction within the intermediate aquifer along the western portion of the peninsula is northwest, apparently influenced by historical pumping activities in the area near the shipyard to the west of the peninsula. Groundwater flow direction within the intermediate aquifer along the eastern portion of the peninsula is south-southwest in the apparent direction of the natural gradient. Groundwater flow direction within the deep aquifer is unidirectional to the east-northeast.

2.4.3 Site Geology/Hydrogeology

The following interpretation of the subsurface conditions is based upon the soil borings/soil probes advanced at the Site in November 2014 and February 2015 (additional details provided

in **Sections 3.0 and 4.0,** respectively). Eleven (11) of the soil borings were advanced as part of a geotechnical investigation conducted by KCI on November 10 to 13, 2014. These borings were advanced to depths ranging from approximately 16 feet to 75 feet below ground surface (bgs). In addition, fifteen (15) soil probes were advanced on November 24, 2014 to depths ranging from seven to 16 feet bgs. Twenty (20) additional soil probes were advanced on February 5, 2015 to depths ranging from four to 12 feet bgs. Logs describing the soils and conditions encountered are provided in **Appendix A – Soil Boring/Soil Probe Logs**.

The following units were generally observed within the subsurface:

- A surficial layer of primarily granular fill material was encountered at most locations, with a thickness generally varying from approximately 0.5 to 8 feet. The granular fill material consisted of silty/clayey sand or gravel, a mixture of sand and gravel, gravelly asphalt-like material, slag-like material, slag with ash, and poorly or well-graded sand. A greater thickness of fill was encountered at SP-9, SP-19, SP-24, SP-26, SP-29, and SP-35 to the termination depth of 12 to 16 feet bgs. The fill material in these borings varied from a loose slag-like material or material identified as slag, well-graded sand to silty sand, and silty/clayey gravel.;

- In general, a moist layer of sandy or silty clay was found beneath the above fill layer. The majority of the borings/probes were advanced to a depth of approximately 12 to 16 feet bgs and the clay layer generally extended to the bottom of these borings. Within the above silty or sandy clay layer, a wet silty sand layer was encountered at various depths at several locations. The thickness of this layer varied from approximately 1 to 5 feet;

- In borings completed to depths greater than 16 feet bgs for geotechnical purposes, a sandy, silty clay with sand or silt layers was generally encountered below 16 feet to the maximum depth explored at 75 feet bgs. In general, the thickness of the sand or silt layers within the clay varied from 3.5 feet to 10.5 feet. In several borings completed to greater depths, silty sand layers up to 30 feet thick were encountered.

Groundwater was generally encountered during drilling/probing at depths of 2 to 6 feet bgs. The groundwater is believed to be perched on top of the underlying silty clayey layer. A separate groundwater unit was occasionally encountered in the deeper silty sand units.

Temporary wells were installed in soil borings SWM-2, SWM-4, SWM-5, B-5, and B-11 for groundwater sample collection and analysis. Additional detail regarding the installation and sampling of the temporary monitoring wells can be found in **Section 3.1.2.2**. The depth to groundwater in the temporary wells was found to vary from less than 1 foot to approximately 3.5 feet bgs. Deeper groundwater depths were observed at the western and southern portions of the site, which suggests that groundwater flow includes a western and southern component.

This is generally consistent with the groundwater flow direction on the adjoining Rod and Wire Mill property.

2.5 Areas of Concern

As part of the environmental due diligence activities implemented for Bryan Cave LLP, WCG previously performed a Phase I ESA of the entire Property and prepared a report dated May 2014. In addition, WCG performed a Phase I ESA specifically for the subject Site and prepared a report dated February 18, 2015 for Scannell Properties. To assess potential subsurface environmental site conditions associated with the RECs identified during the Phase I ESAs, a Phase II ESA was conducted on the Site in November 2014. Further investigation was conducted in February 2015 to assess further impacts identified during the Phase II ESA. The work was done pursuant to MDE approved workplans, as discussed further below in **Section 2.5.3** and **2.5.4**.

The RECs identified during each Phase I ESA are summarized in the sections below. The Phase II ESA activities are discussed in **Sections 2.5.3** and **Section 3.0**. Additional investigation activities are discussed in **Sections 2.5.4** and **Section 4.0**.

2.5.1 May 2014 Phase I ESA

During the May 2014 Phase I ESA, six Findings were identified related to the Site that is the subject of this report. These six Findings were grouped into one recognized REC identified as REC-6: Rod and Wire and Pipe Mill Area (Findings 131 to 133, 153, 160, and 162). The Findings were as follows:

- Finding 153: The Pipe Mill Trenches/Sumps, a piping system designed to transport process wastewater which may have resulted in a release to the environment.
- Finding 162: The Pipe Mill Acid Tanks, which potentially contained hazardous substances that may have resulted in a release to the environment.
- Finding 131: The Rod Mill Remediation Area, where continuing interim measures (IM) are in place for cadmium and zinc-impacted groundwater.
- Finding 132: The filled Northwest Pond area.
- Finding 133: The filled East Pond area (subsequently excluded from the Site).
- Finding 160: The unknown aboveground tank, which potentially contained hazardous substances and/or petroleum products which may have resulted in a release to the environment.

Findings 153 and 162 are specific to the former Pipe Mill and are associated with the Site. The other findings are associated with the former Rod and Wire Mill located directly west of the Site.

2.5.2 November 2014 Phase I ESA

In November 2014, WCG initiated a Phase I ESA of the Site for Scannell Properties to meet the environmental due diligence requirements of FedEx Ground. Based on the conclusions of the February 2015 Phase I ESA Report, WCG identified the following RECs in connection with the Site:

- The potential presence of surface and subsurface impacts associated with the historical presence of a Pipe Mill on the Property.
- The potential presence of surface and subsurface impacts associated with potentially PCB-containing transformers located on the Site and adjoining properties.
- The potential presence of surface and subsurface impacts associated with slag fill material on the Site and adjoining properties.
- The potential presence of surface and subsurface impacts associated with the historical operations of the adjoining properties as part of a former steel mill, including a landfill, a decanter cell, rod mill, cold mill, part of a wastewater treatment plant, and impoundment area.

To assess potential subsurface environmental site conditions associated with the RECs identified above, a Phase II ESA was implemented at the Site as discussed below.

2.5.3 Phase II ESA

A Phase II ESA was conducted at the Site in November 2014. The scope of work for the Phase II ESA generally included the advancement of soil borings/probes and the installation of temporary monitoring wells for soil and groundwater sample collection at the Site. A total of 26 soil borings/probes were advanced and groundwater samples were collected from five of the soil borings. Prior to implementing the Phase II ESA activities, a work plan outlining the Scope of Work was submitted via email to MDE on November 7, 2014. The MDE acknowledged receipt of the work plan and offered various comments regarding the scope in an email dated November 9, 2014. Details of the Phase II ESA investigation activities and results are provided in **Section 3.0** of this report.

2.5.4 Additional Investigation

Additional investigation was conducted at the Site in February 2015 to assess further impacts identified during the Phase II ESA. During the additional investigation, twenty (20) soil probes

were advanced for soil sample collection and analysis. The work was performed in accordance with a work plan transmitted to MDE via email on January 27, 2015 and approved by MDE on February 2, 2015. Details of the additional investigation activities and results are provided in **Section 4.0**.

2.6 Proposed Development and Future Use

Present plans call for the Site to be redeveloped as a Federal Express Ground facility consisting of an approximate 338,000 square foot, single-story distribution center/warehouse and associated parking lots. The latest available Schematic Design Documents for the Federal Express facility are included as **Appendix B**.

The proposed redevelopment use of the Site is Tier 3B, Restricted Industrial Use. The VCP application for Area A specifies that the intended future use is Tier 3 (Industrial) with land use controls anticipated as part of the future use (designated by B [Restricted]). Redevelopment of the Site as a Federal Express facility is consistent with the intended future use designation on the Area A VCP application. The term restricted industrial refers to the planned use of the property that allows exposure and access by workers over the age of 18, including adult workers and construction workers, and other potential expected users. Tier 3 properties typically include manufacturing facilities, maritime facilities, metal working shops, oil refineries, chemical plants, and other material plants.

Restricted industrial also indicates that one or more land use controls are imposed on the property as a condition for the future use of the Site. It is anticipated that a potable groundwater use restriction, an industrial land use restriction, and a requirement for maintenance of the designated capped areas will be placed on the property deed prior to issuance of the No Further Action determination.

Although final site plans are still being refined, the future building foundation will be either conventional concrete spread footings and slab-on-grade construction or structural concrete on deep foundations. Open areas surrounding the future building are anticipated to consist of surface-level paved parking areas, concrete walkways, and landscaped areas. Site redevelopment will also include a series of storm water management structures.

The Site will be serviced by municipal water and sanitary sewer (Baltimore County) and below grade storm water drains and storm water management structures, natural gas, and electric. Groundwater will not be used as a potable water supply. To ensure groundwater is not used, a groundwater use restriction will be placed on the Site prior to occupancy.

2.7 Proposed Response Actions

The future building will serve as an engineered barrier to address potential exposure to impacted media in the building area. In addition, designated portions of the future landscaped areas and paved areas (asphalt or concrete) are subject to the remedy proposed within this

RAP. The RAP will be implemented by constructing a containment remedy (cap) in select future landscaped or concrete/asphalt-paved areas. The containment remedy will consist of clean fill/soil overlying a geotextile fabric or asphalt/concrete cover materials placed in appropriately designated areas. Following implementation of the containment remedy, institutional controls (potable groundwater use deed restriction, industrial land use restriction, and cap maintenance) will be recorded for the Site in order to maintain the integrity of the containment remedy and mitigate potential exposure.

3 PHASE II ENVIRONMENTAL SITE ASSESSMENT

To assess potential environmental site conditions associated with the identified RECs, a Phase II ESA has been implemented at the Site as discussed in the sections below. Prior to implementing the Phase II ESA activities, a work plan outlining the Scope of Work was submitted via email to MDE on November 7, 2014. The MDE acknowledged receipt of the work plan and offered various comments regarding the scope in an email dated November 9, 2014.

3.1 Field Activities

Field activities conducted at the Site included the advancement of soil borings/probes and the installation of temporary monitoring wells for soil and groundwater sample collection to assess surface and subsurface conditions. The following includes a summary of these activities.

3.1.1 Areas of Exploration

The soil boring/probe locations were based upon the RECs identified during the prior Phase I ESAs performed for the Site. Additionally, to minimize duplication of efforts, select borings installed as part of a geotechnical investigation were also advanced for environmental sampling purposes. Eleven (11) soil borings (B-2 to B-7, B-11, SWM-1, SWM-2, SWM-4, and SWM-5) were advanced by Free State Drilling (FSD) of Frederick, Maryland for both geotechnical and environmental testing. Subsequently, an additional fifteen (15) soil probes (SP-1 to SP-15) were advanced by Tidewater, Inc. (Tidewater) of Elkridge, Maryland. Prior to beginning subsurface work, KCI contacted Miss Utility to clear public utilities. In addition, KCI's Utility Service group provided onsite utility location services to clear the proposed boring/probe locations prior to drilling. To assess the potential presence of surface and subsurface impacts, the soil borings/probes were advanced within the following general areas (see **Figure 3 – Approximate Boring Location Plan**):

- Soil borings/probes B-3, B-4, B-5, B-6, B-7, B-11, SP-4, SP-5, SP-8, and SP-9 were advanced to assess potential impacts associated with the historical operation of a Pipe Mill on the Site within the area of the proposed Federal Express distribution center/warehouse building;

- Soil probe SP-3 was advanced in the vicinity of the former Pipe Mill Trenches/Sump (SWMU 49), the Hydraulic Oil Storage Area (AOC O), and a pole-mounted electrical transformer;

- Soil probe SP-6 was advanced in the vicinity of the former Pipe Mill Selenium Testing Area (AOC Y);

- Soil probe SP-11 was advanced in the vicinity of the former Zinc Ammonium Chloride Sludge Storage Tanks (SWMU 48);

- Soil probe SP-13 was advanced in the vicinity of the former Pipe Mill Acid Tanks (AOC Z);

- Soil borings/probes SWM-1 and SP-1 were advanced to assess the potential impacts associated with historical operations on the northern adjoining property;

- Soil borings/probes SWM-2, SP-12, SP-14, and SP-15 were advanced to assess the potential impacts associated with historical operations on the western adjoining property, including the former Rod and Wire Mill and the former East Pond (northwest of the Site);

- Soil borings/probes SWM-4, SP-7, SP-10, and SP-15 were advanced to assess the potential impacts associated with historical operations on the southern adjoining property, including part of a wastewater treatment plant and an impoundment area; and

- Soil boring/probes SWM-4, SWM-5, B-2, SP-1, and SP-2 were advanced to assess the potential impacts associated with historical operations on the eastern adjoining property, including the former Cold Mill.

3.1.2 Methodology of Field Activities

3.1.2.1 Soil Sampling Activities

On November 10 to 13, 2014, FSD advanced eleven (11) soil borings using 3.25-inch inner diameter hollow stem augers. The borings were advanced for field screening, documentation of the soil profile, and soil sample collection for laboratory analysis. Four of the soil borings were advanced to a depth of approximately 16 feet bgs while the remaining soil borings were advanced to depths ranging from 45 to 75 feet bgs. Select soil borings were advanced to depths greater than 16 feet bgs for purposes of the geotechnical investigation. Drilling tools and down-hole equipment were steam cleaned between borings.

Soil samples were collected continuously using a two-inch diameter, two-foot long split-spoon sampler to at least 16 feet bgs in soil borings SWM-1, SWM-2, SWM-4, SWM-5, B-5, and B-11. Soil samples were collected at 2.5-foot intervals to 10 feet and then at 5-foot intervals to at least 16 feet bgs using a two-inch diameter, 1.5-foot long split-spoon sampler in soil borings B-2, B-3, B-4, B-6, and B-7. Split-spoon samplers were decontaminated between collection of each sample using a Liquinox and distilled water solution followed by a potable water rinse.

On November 24, 2014, Tidewater advanced fifteen (15) soil probes under the direction of KCI using a track-mounted Geoprobe® rig. The soil probes were advanced to depths of approximately 7 to 16 feet bgs for soil sample collection and analysis. Each soil probe was intended to be advanced to 16 feet bgs; however, refusal was encountered at 8 feet bgs and 7 feet bgs at soil probes SP-14 and SP-15, respectively. Soil samples were obtained by driving four-foot long, two-inch diameter probe rods into the undisturbed subsurface. Soil samples

were collected continuously via individual four-foot long, two-inch diameter acrylic liners. Tidewater decontaminated the sampling equipment before each sample was collected. The cleaning process consisted of an initial wash with a Liquinox and potable water solution, followed by a potable water rinse.

Upon retrieval, soil samples were described and logged. The field representative noted color, soil type, moisture content, and other applicable characteristics. This information was subsequently used to construct boring logs of the subsurface conditions encountered. The soil boring/probe logs are provided in **Appendix A**. Upon completion of each boring/probe, bentonite pellets were placed into each borehole. The samples collected were discrete samples and not composited over the designated sampling intervals (two-foot, 2.5-foot, or four-foot intervals).

Additionally, the soils were evaluated for the presence of volatile organic compounds (VOCs) in the field using a photoionization detector (PID) equipped with a 10.6 eV lamp. The PID provides a qualitative field measurement of VOCs contained in the sample. The field screening process involved placing a portion of the soil sample in a zip-lock plastic bag. The headspace was then sampled and soil gas VOC concentrations were measured and recorded. In addition to PID screening, visual and olfactory observations were used to assess soil conditions during the field activities. Field screening results were used to assess the presence of impacted soil and select the appropriate sample interval for laboratory analysis.

Generally, the sample from a particular interval exhibiting the greatest likelihood of possible impacts was submitted for laboratory analysis. Significant PID measurements were not observed in the field. The PID measurements are included on the soil boring/probe logs in **Appendix A**. In addition, a number of soil samples were also collected from deeper intervals underlying select shallow soil samples in an effort to characterize the vertical extent of impacts, if necessary.

Soil cuttings generated during the soil boring/probe activities were placed in a roll-off container and stored for later off-site disposal.

3.1.2.2 Groundwater Sampling Activities

Five temporary wells were installed in select soil borings (SWM-2, SWM-4, SWM-5, B-5, and B-11) to assess the subsurface groundwater conditions. Each temporary monitoring well was constructed of a one-inch diameter, schedule 40 polyvinyl chloride (PVC) riser and 10-foot long, 0.010-inch slot PVC well screen. The screen and PVC riser were lowered into a soil boring hole following completion of soil boring activities. The screen was installed with a sand pack and positioned from approximately six feet bgs to sixteen (16) feet bgs.

The wells were allowed to equilibrate for approximately twenty-four hours before groundwater levels were measured with a water-level meter. Groundwater samples were then collected using the methodology described in **Section 3.1.2.4**. Following groundwater sample collection,

the temporary monitoring wells were removed. Boreholes were subsequently backfilled to ground surface with bentonite pellets.

3.1.2.3 Soil Sample Collection and Analysis

Select soil samples from each boring/probe were placed into pre-cleaned, laboratory-supplied sample containers preserved as necessary for subsequent laboratory analysis. The sample containers were tightly capped, labeled, placed in a cooler, and surrounded with ice in order to maintain their temperature near 4° Celsius (^{o}C). Each sample was logged onto a chain-of-custody form, which is used to track the samples from the point of collection to receipt by the laboratory. The chain-of-custody forms are included with the laboratory reports in **Appendix C**.

A total of 30 soil samples were submitted for laboratory analysis, including four soil samples collected from deeper intervals in select soil borings. Samples were submitted to Microbac Laboratories, Inc. (Microbac) in Baltimore, Maryland and Merrillville, Indiana, which is certified under the National Environmental Laboratory Accreditation Program (NELAP). Sampling and laboratory analysis were performed in general accordance with approved techniques and methods as outlined in USEPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition, and other published sources.

Select soil samples were analyzed for the following:

- VOCs using USEPA Methods 5035/8260B (nine soil samples from soil borings SWM-1, SWM-2, SWM-4, SWM-5, B-4, B-5, B-6, and B-11);
- Semi-volatile Organic Compounds (SVOCs) using Method 8270C (seven soil samples from soil borings/probes SWM-2, B-11, SP-3, SP-4, SP-6, SP-11, and SP-13);
- Pesticides using USEPA Method 8081A (seven soil samples from soil borings/probes SWM-2, B-11, SP-3, SP-4, SP-6, SP-11, and SP-13) ;
- Herbicides using USEPA Method 8151A (seven soil samples from soil borings/probes SWM-2, B-11, SP-3, SP-4, SP-6, SP-11, and SP-13);
- Polychlorinated Biphenyls (PCBs) using USEPA Method 8082 (seven soil samples from soil borings/probes SWM-2, B-11, SP-3, SP-4, SP-6, SP-11, and SP-13);
- Metals listed in the MDE Table 1, Generic Numeric Cleanup Standards for Groundwater and Soil by USEPA Methods 6020/6010B/7196A/7471A (twenty-nine soil samples from all soil borings/probes);
- Cyanide using USEPA Method 9014 (twenty-six soil samples from soil borings/probes SWM-1, SWM-2, SWM-4, SWM-5, B-4, B-5, B-7, B-11, and SP-1 to SP-15);

- Total Petroleum Hydrocarbons (TPH) as Gasoline Range Organics (GRO) using USEPA Methods 5035/8260 Modified and Diesel Range Organics (DRO) using USEPA Method 8015B (seven soil samples from soil borings/probes SWM-2, B-11, SP-3, SP-4, SP-6, SP-11, and SP-13); and

- pH using USEPA Method 9045C (twenty-nine soil samples from all soil borings/probes).

The laboratory analytical reports, including an extended QA/QC data package and the chain-of-custody forms, are provided in **Appendix C**. **Table 1** provides a summary of the soil analytical results, with comparisons to the MDE Non-Residential Cleanup Standards (NRCS) listed in *MDE Cleanup Standards for Soil and Groundwater, Interim Final Guidance (*Update No. 2.1) dated June 2008. The soil results were also compared to USEPA RSLs for Industrial Soil obtained from the *Regional Screening Levels for Chemical Contaminants at Superfund Sites* screening level/preliminary remediation goal website (RSL Summary Table, November 2014). Additionally, the soil analytical results for metals were compared to Anticipated Typical Concentrations (ATCs) for the Eastern Maryland Province included in Appendix 2, Attachment 2 of the above referenced MDE document. The ATCs were used for screening instead of the NRCS if the ATCs were greater than the MDE NRCS. Data validation documentation has previously been forwarded to the MDE and USEPA under separate cover. The data validation was performed following the USEPA CLP National Functional Guidelines.

3.1.2.4 Groundwater Sample Collection and Analysis

Groundwater samples were collected into laboratory-provided sample containers from temporary monitoring wells installed in soil borings SWM-2, SWM-4, SWM-5, B-5, and B-11 for laboratory analysis. The groundwater samples were collected using a low-flow peristaltic pump and disposable polyethylene tubing installed at the middle of the water column. The pump was adjusted to a low-flow pumping rate (i.e., less than 100 mL/minute) to minimize sediment disturbance. The sample containers for metals analysis were filled first followed by VOCs and other organics. Samples collected for dissolved metals analysis were field-filtered using a 0.45-micron disposable filter. A table documenting groundwater sample collection and field parameters measured during groundwater sampling is included in **Appendix D – Groundwater Sampling Field Data**. Samples were then placed on ice to maintain their temperature near 4° C. Each sample was logged onto a chain-of-custody form, which is used to track the samples from the point of collection to receipt by the laboratory. An extended QA/QC package and chain-of-custody form is included with the laboratory analysis report in **Appendix C**.

A total of five groundwater samples were submitted for laboratory analysis. Samples were submitted to Microbac in Baltimore, Maryland and Merrillville, Indiana.

Select samples were analyzed for the following:

- VOCs using USEPA Method 8260B (four groundwater samples from SWM-2, SWM-4, B-5, and B-11);

- SVOCs using USEPA Method 8270C (four groundwater samples from SWM-2, SWM-4, B-5, and B-11);

- Pesticides using USEPA Method 8081A (two groundwater samples from SWM-2 and SWM-4);

- Herbicides using USEPA Method 8151A (two groundwater samples from SWM-2 and SWM-4);

- PCBs using USEPA Method 8082 (two groundwater samples from SWM-2 and SWM-4);

- Total and dissolved metals listed in MDE Table 1 (Generic Numeric Cleanup Standards for Groundwater and Soil) by USEPA Methods 245.1/ 200.7/200.8/6020 (five groundwater samples from SWM-2, SWM-4, SWM-5, B-5, and B-11);

- Cyanide using USEPA Method 335.4 (five groundwater samples from SWM-2, SWM-4, SWM-5, B-5, and B-11); and

- TPH as GRO using USEPA Methods 8260 Modified and DRO using USEPA Method 8015B (two groundwater samples from SWM-2 and SWM-4).

Table 2 provides a summary of the groundwater analytical results with comparisons to MDE Groundwater Cleanup Standards (GWS) as listed in *MDE Cleanup Standards for Soil and Groundwater, Interim Final Guidance (*Update No. 2.1) dated June 2008. Groundwater results were also compared to USEPA Maximum Contaminant Levels (MCLs) from the *Regional Screening Levels for Chemical Contaminants at Superfund Sites* screening level/preliminary remediation goal website (RSL Summary Table June 2015). Data validation documentation was previously forwarded to MDE and USEPA under separate cover.

3.2 Soil Analytical Results

As summarized in **Table 1**, the following soil analytical results were compared to MDE NRCS, USEPA RSLs for Industrial Soil, and ATCs for metals (when greater than MDE NRCS). Note that the sample locations that ultimately were excluded from the Site are also shown on **Table 1** for completeness, but are identified separately. **Figure 4** shows soil analytical results exceeding the applicable soil standards. A preliminary summary of the soil and groundwater analytical results was provided to the MDE and USEPA via email on December 29, 2014. In comments on the data provided by MDE and USEPA within an email dated January 14, 2015, the MDE indicated that Protection of Groundwater Soil Standards are not relevant since groundwater data was collected at the Site. Also, as mentioned above, groundwater is being addressed with an

ongoing interim measure consisting of a groundwater extraction and treatment system at the adjacent Rod and Wire Mill Area.

3.2.1 VOCs

Nine soil samples were submitted for VOC analysis. Results were below laboratory reporting limits or MDE soil standards and USEPA RSLs.

3.2.2 SVOCs

Seven soil samples were submitted for SVOC analysis. Results were below laboratory reporting limits or applicable MDE soil standards and USEPA RSLs.

3.2.3 Pesticides

Seven soil samples were submitted for pesticide analysis. Results were below laboratory reporting limits or applicable MDE soil standards and USEPA RSLs.

3.2.4 Herbicides

Seven soil samples were submitted for herbicide analysis. Results for each of the submitted samples were below laboratory reporting limits.

3.2.5 PCBs

Seven soil samples were submitted for PCB analysis. Aroclor 1260 was detected in soil sample SP-6 / 1-1.5' (2.1 mg/kg) in excess of the MDE NRCS (1.4 mg/kg) and the USEPA RSL (1.0 mg/kg). The remaining results were below laboratory reporting limits or MDE soil standards and USEPA RSLs.

3.2.6 Metals

Twenty-nine soil samples were submitted for MDE Table 1 metals analysis. This includes some samples from areas that were ultimately excluded from the Site (and therefore not specifically mentioned below). Results were below laboratory reporting limits or MDE soil standards (utilized ATCs if greater than MDE standards) and USEPA RSLs with the exception of the following:

- Arsenic was detected in soil samples SWM-1 / 0-2' (5.7 mg/kg), SWM-4 / 2-4' (12 mg/kg), SWM-5 / 0-1.5' (7.3 mg/kg), B-3 / 1-2.5' (4.1 mg/kg), B-7 / 1-2.5' (8.9 mg/kg), SP-10 / 1-1.5' (9.5 mg/kg), and SP-12 / 1-1.5' (15 mg/kg) in excess of the ATC (3.6 mg/kg) and the USEPA RSL for Industrial Soil (3.0 mg/kg).

- Total chromium was detected in several soil samples in excess of the MDE NRCS (310 mg/kg). A USEPA RSL for Industrial Soil is not provided for total chromium. However,

based on chromium speciation analysis, hexavalent chromium was not detected above the laboratory detection limits. Therefore, total chromium concentrations are comprised of trivalent chromium. Concentrations of trivalent chromium were below laboratory reporting limits and/or applicable MDE soil standards and the USEPA RSL for Industrial Soil.

- Iron was detected in soil samples SWM-4 / 2-4' (160,000 mg/kg), SP-6 / 1-1.5' (120,000 mg/kg), SP-9 / 1-1.5' (91,000 mg/kg), and SP-12 / 1-1.5' (160,000 mg/kg) in excess of the MDE NRCS (72,000 mg/kg). However, iron was not detected above the USEPA RSL for Industrial Soil.

- Manganese was detected in soil samples SWM-4 / 2-4' (13,000 mg/kg), B-2 / 1-2.5' (5,000 mg/kg), B-4 / 1-2.5' (2,600 mg/kg), SP-4 / 1-1.5' (9,300 mg/kg), SP-6 / 1-1.5' (2,300 mg/kg), SP-8 / 1-1.5' (2,400 mg/kg), SP-9 / 1-1.5' (10,000 mg/kg), SP-12 / 1-1.5' (3,900 mg/kg), SP-13 / 1-1.5' (3,600 mg/kg), and SP-14 / 1-1.5' (6,100 mg/kg) in excess of the MDE NRCS (2,000 mg/kg). However, manganese was not detected above the USEPA RSL for Industrial Soil.

- Vanadium was detected in soil samples SWM-4 / 2-4' (3,500 mg/kg), B-2 / 1-2.5' (120 mg/kg), SP-4 / 1-1.5' (2,200 mg/kg), SP-9 / 1-1.5' (430 mg/kg), SP-12 / 1-1.5' (400 mg/kg), SP-14 / 1-1.5' (120 mg/kg), and SP-15 / 1-1.5' (110 mg/kg) in excess of the MDE NRCS (100 mg/kg). However, vanadium was not detected above the USEPA RSL for Industrial Soil.

3.2.7 Cyanide

Twenty-six soil samples were submitted for cyanide analysis. Results for each of the submitted samples were below laboratory reporting limits or MDE soil standards and USEPA RSLs.

3.2.8 TPH (GRO and DRO)

Seven soil samples were submitted for TPH (GRO and DRO) analysis. DRO was detected in soil samples B-11 / 0-1.5' (6,800 mg/kg), SP-4 / 1-1.5' (26,000 mg/kg), and SP-6 / 1-1.5' (630 mg/kg) in excess of the MDE NRCS (620 mg/kg) and the USEPA RSL (440 mg/kg). The remaining results were below laboratory reporting limits or MDE soil standards and USEPA RSLs.

3.2.9 pH

Twenty-nine soil samples were submitted for pH analysis. The soils exhibited a range of pH from 4.66 to 11.8 standard units.

3.3 Groundwater Analytical Results

As summarized in **Table 2**, the following analytical results were compared to MDE GWS for Type I and II Aquifers, USEPA MCLs, and the Office of Solid Waste and Emergency Response (OSWER) generic screening levels for evaluating the vapor intrusion pathway. In cases where MCLs were not available, results were compared to USEPA Tapwater RSLs. Note that the sample locations that ultimately were excluded from the Site are also shown on **Table 2** for completeness, but are identified separately. Laboratory analytical reports are included in **Appendix C**.

3.3.1 VOCs

Four groundwater samples were submitted to the laboratory for VOC analysis. Results were below laboratory reporting limits or MDE GWS, USEPA MCLs, and OSWER screening levels. However, 1,1-dichloroethane was detected in groundwater sample B-11 (0.0077 milligrams/per liter [mg/L]) in excess of the USEPA Tapwater RSL (0.0027 mg/L).

3.3.2 SVOCs

Four groundwater samples were submitted to the laboratory for SVOC analysis. Results were below laboratory reporting limits or MDE GWS and USEPA Tapwater RSLs.

3.3.3 Pesticides

Two groundwater samples were submitted to the laboratory for pesticide analysis (including one from an area ultimately excluded from the Site). Pesticides were not detected at the Site above the laboratory reporting limit or MDE GWS and USEPA MCLs/Tapwater RSLs.

3.3.4 Herbicides

Two groundwater samples were submitted to the laboratory for herbicide analysis. Results were below laboratory reporting limits.

3.3.5 PCBs

Two groundwater samples were submitted to the laboratory for PCB analysis. Results were below laboratory reporting limits.

3.3.6 Dissolved Metals

Five groundwater samples were submitted for laboratory analysis of dissolved metals (MDE Table 1 metals). This includes one groundwater sample from SWM-2, which was ultimately excluded from the Site. Analytical results for dissolved metals were below laboratory reporting limits or MDE GWS and USEPA MCLs/Tapwater RSLs with the exception of the following:

- Dissolved aluminum was detected in groundwater sample SWM-4 (0.11 mg/L) in excess of the MDE GWS (0.05 mg/L), however this result is below the USEPA Tapwater RSL.

- Dissolved iron was detected in the three of the five groundwater samples at concentrations in excess of the MDE GWS (0.3 mg/L). In addition, concentrations in two of the five samples exceeded the USEPA Tapwater RSL (14 mg/L). Concentrations in groundwater ranged from 0.73 mg/L to 46 mg/L.

- Dissolved manganese was detected in five groundwater samples at concentrations in excess of the MDE GWS (0.05 mg/L) and in three groundwater samples exceeding the USEPA Tapwater RSL. Concentrations in groundwater ranged from 0.13 to 6.1 mg/L.

- Dissolved vanadium was detected in groundwater sample SWM-5 (0.013 mg/L) in excess of the MDE GWS (0.0037 mg/L). However, vanadium was not detected in excess of the USEPA Tapwater RSL (0.086 mg/L).

3.3.7 Cyanide

Five groundwater samples were submitted to the laboratory for total cyanide analysis. Results were below laboratory reporting limits or the MDE GWS and USEPA MCL.

3.3.8 TPH (DRO and GRO)

Two groundwater samples were submitted to the laboratory for TPH (GRO and DRO) analysis (including a groundwater sample from SWM-2, which was ultimately excluded from the Site). Although GRO was detected in excess of the MDE GWS in SWM-4 (0.075 mg/L), the concentrations are flagged in the laboratory report as estimated values detected between the laboratory reporting limit and the method detection limit.

TPH DRO was also detected in excess of the MDE GWS (0.047 mg/L) and USEPA Tapwater RSL (0.1 mg/L) in groundwater sample SWM-4 (0.41 mg/L).

4 ADDITIONAL INVESTIGATION INFORMATION

Additional investigation was conducted at the Site in February 2015 to further assess impacts observed during the November 2014 Phase II ESA. The supplemental field work was performed in accordance with a work plan transmitted to MDE via email on January 27, 2015 and approved by MDE on February 2, 2015.

4.1 Field Activities

During the additional investigation, twenty (20) soil probes were advanced for soil sample collection and analysis. Note that a number of soil probes were advanced near boring location SWM-2, which is located near the Former East Pond (see **Figure 3**). As shown on **Figure 3**, most of these soil samples were ultimately considered off-site because the Site boundaries were adjusted to exclude these areas. Details of the additional investigation activities and results are provided in the sections below.

4.1.1 Areas of Exploration

The locations of the soil probes were based upon soil impacts identified during the Phase II ESA. Additional soil probes were completed in the vicinity of SWM-2, SP-4, SP-6, and B-11 to further assess soil impacts in these areas. The locations of the additional soil probes (SP-16 to SP-35) are shown on **Figure 3 - Approximate Boring Location Plan**.

4.1.2 Methodology of Field Activities

4.1.2.1 Soil Sampling Activities

On February 5, 2015, Tidewater advanced twenty (20) soil probes using a track-mounted Geoprobe® rig. The soil probes were advanced to depths of approximately 4 to 12 feet bgs for soil sample collection and analysis. The soil probe sampling methodologies described above in *Section 3.1.2.1* were used for the additional investigation activities.

The subsurface conditions encountered are described on the soil probe logs provided in **Appendix A**. Results of the PID field screening are provided on the boring logs. Based on the field screening, VOCs were not detected by the PID.

Surface soil samples were collected from each probe for laboratory analysis. In addition, subsurface soil samples were collected from select soil probes (SP-16, SP-17, SP-22 to SP-27, and SP-29) for laboratory analysis. Based on visual observations such as texture and/or staining, the subsurface interval most likely to be impacted was selected for laboratory analysis.

Soil cuttings generated during the soil probe activities were placed in a roll-off container for later off-site disposal.

4.1.2.2 Soil Sample Collection and Analysis

The soil sample collection methodology described above in *Section 3.1.2.3* was used for soil sample collection during the additional investigation. A total of 23 soil samples were submitted for laboratory analysis, including nine soil samples collected from deeper intervals in select soil borings. Samples were submitted to Microbac in Merrillville, Indiana. Sampling and laboratory analysis were performed in general accordance with approved techniques and methods as outlined in USEPA SW-846, Test Methods For Evaluating Solid Waste, Third Edition, and other published sources.

Select soil samples were analyzed for the following:

- SVOCs or polynuclear aromatic hydrocarbons (PAHs) using Method 8270C (seven soil samples from soil probes SP-16, SP-17, SP-18, SP-26, and SP-29);
- Pesticides using USEPA Method 8081A (three soil samples from soil probes SP-17, SP-26, and SP-29);
- PCBs using USEPA Method 8082 (three soil samples from soil probes SP-30, SP-31, and SP-32);
- Metals listed in the MDE Table 1, Generic Numeric Cleanup Standards for Groundwater and Soil by USEPA Methods 6020/6010B/7196A/7471A (four soil samples from soil probes SP-25 and SP-26);
- Select metals including cadmium, cobalt, and zinc by USEPA Method 6020A (six soil samples from soil probes SP-22 to SP-24);
- TPH as GRO using USEPA Methods 5035/8260 Modified (three soil samples from soil probes SP-17, SP-26, and SP-29); and
- TPH as DRO using USEPA Method 8015B (eleven soil samples from soil probes SP-16 to SP-18 and SP-26 to SP-29).

The laboratory analytical reports, including the extended QA/QC data package and chain-of-custody forms, are provided in **Appendix C**. **Table 3** summarizes the soil analytical results with comparisons to the MDE NRCS and USEPA RSLs for Industrial Soil. All of the sample results obtained are shown on **Table 3** for completeness, but the sample locations that were ultimately excluded from the Site are identified separately. Additionally, the soil analytical results for metals were compared to ATCs for the Eastern Maryland Province. The ATCs were used for screening if they were greater than the MDE soil standards. **Figure 4** shows the soil analytical results exceeding the applicable soil standards. Data validation documentation was previously forwarded to MDE and USEPA under separate cover. The data validation was performed following the USEPA CLP National Functional Guidelines.

4.2 Soil Analytical Results

The soil analytical results are presented in the following sections. The sample data collected at locations ultimately excluded from the Site are not mentioned in subsequent discussion highlighting concentrations found to exceed applicable screening levels.

4.2.1 SVOCs/PAHs

Seven soil samples were submitted for SVOC or PAH analysis. Benzo(a)pyrene was detected in the surface soil sample from SP-17 (1.9 mg/kg) in excess of the MDE NRCS (0.39 mg/kg) and the USEPA RSL (0.29 mg/kg). In addition, dibenzo(a,h)anthracene was detected in SP-17 at the surface (0.36 mg/kg) in excess of the USEPA RSL (0.29 mg/kg). The remaining results were below laboratory reporting limits or applicable MDE soil standards and USEPA RSLs.

4.2.2 Pesticides

Three soil samples were submitted for pesticide analysis. Results were below laboratory reporting limits or applicable MDE soil standards and USEPA RSLs.

4.2.3 PCBs

Three soil samples were submitted for PCB analysis. Aroclor 1260 was detected in soil sample SP-32 at the surface at a concentration of 4.1 mg/kg, which is greater than the MDE NRCS (1.4 mg/kg) and the USEPA RSL (1.0 mg/kg).

4.2.4 Metals

Four soil samples were submitted for MDE Table 1 metals analysis and six soil samples were submitted for analysis of select metals (cadmium, cobalt, and zinc). Results were below laboratory reporting limits or applicable MDE soil standards (utilized ATCs if greater than MDE standards) and USEPA RSLs with the exception of the following:

- Arsenic was detected in soil sample SP-26 / 6-8' (21 mg/kg) in excess of the ATC (3.6 mg/kg) and the USEPA RSL for Industrial Soil (3.0 mg/kg).
- Manganese was detected in soil sample SP-26 at the surface (4,600 mg/kg) in excess of the MDE NRCS (2,000 mg/kg), however the concentration was below the USEPA RSL.
- Vanadium was detected in soil sample SP-26 at the surface (140 mg/kg) in excess of the MDE NRCS (100 mg/kg), however the concentration was below the USEPA RSL.

4.2.5 TPH (GRO and DRO)

Three soil samples were submitted for TPH-GRO analysis and eleven soil samples were submitted for TPH-DRO analysis. TPH-GRO results were below laboratory reporting limits or

applicable MDE soil standards and USEPA RSLs. TPH-DRO was detected in soil samples SP-17 at the surface (2,500 mg/kg), SP-27 / 6-8' (1,000 mg/kg), and SP-28 at the surface (14,000 mg/kg) in excess of the MDE NRCS (620 mg/kg) and the USEPA RSL (440 mg/kg). The remaining results were below laboratory reporting limits or MDE soil standards and USEPA RSLs.

5 EXPOSURE ASSESSMENT

Based on the intended restricted industrial land use (Tier 3B) presented in the September 2014 VCP Application, the media of concern, the potentially exposed populations, and the potential and complete exposure pathways, the following sections present an Exposure Assessment. In addition, the chemicals of potential concern are identified in **Section 5.3** below. This exposure assessment does not include ecological exposures since the Site will be a developed area that would not represent potential terrestrial habitat.

5.1 Media of Concern

5.1.1 Soil

Concentrations of certain metals, Aroclor 1260, select PAHs, and TPH (DRO) exceeding the MDE NRCS, USEPA RSLS, and/or ATCs were detected primarily in the fill material located near the surface. Therefore, soil is considered a potential media of concern. Future adult workers and visitors could potentially contact surface soil in proposed open landscaped areas of the Site. Future construction workers may contact impacted surface soil during earth movement activities associated with future construction activities.

The proposed containment remedy and institutional controls as discussed in **Section 7.0** will mitigate future adult workers and visitors from contacting impacted soil at the Site. The proposed health and safety controls outlined in **Section 9.1** and the site-specific Health and Safety Plan (HASP) will also mitigate the potential risk to construction workers from contacting impacted soil at the Site.

5.1.2 Groundwater and Soil to Groundwater

Concentrations of metals, DRO, and 1,1-dichloroethane exceeding the applicable MDE GWS and/or USEPA RSLs were detected in groundwater at the Site. However, groundwater is not considered a media of concern for this specific Site. Fate and transport of impacted groundwater is being considered over the entire 3,100-acre Property, with a focus on potentially complete exposure pathways such as groundwater to surface water interactions. This specific Site does not include features with naturally occurring groundwater discharging to surface water. Further discussion is provided in this RAP concerning control and management of potentially impacted groundwater that may need to be discharged during future construction activities. Additionally, a potable groundwater use restriction will be included as an institutional control in the No Further Action (NFA) Letter and Certificate of Completion (COC) issued by the MDE and a deed restriction prohibiting the potable use of groundwater will be filed.

Groundwater is considered a potential media of concern for construction workers. A deed restriction governing groundwater encountered during excavation activities will provide

protection for construction workers associated with future excavations at the Site. The proposed health and safety controls outlined in Section 9.1 and the site-specific Health and Safety Plan (HASP) will also mitigate the potential risk to construction workers from contacting impacted groundwater at the Site.

5.1.3 Surface Water and Sediment

Surface water and sediment are not present at the Site. Therefore, these media are not considered media of concern.

5.1.4 Soil Gas

Volatile organic compounds were detected at concentrations below the OSWER screening levels for evaluating the vapor intrusion pathway from groundwater (see **Table 2**). Therefore, soil gas is not considered a potential media of concern. Further, as discussed in Section 5.3 below, the TPH concentrations identified in soils are also not believed to be a concern with regard to soil gas and vapor intrusion.

5.2 Potential Exposure Pathways and Receptors of Concern

Under the proposed future use (Tier 3B), potential human receptors include future construction workers (construction workers for redevelopment activities and cap installation), future adult workers, and visitors. Potential exposure pathways associated with impacted soil at the Site include incidental ingestion, dermal contact, and inhalation of particulates entrained as dust. Potential exposure pathways associated with impacted groundwater include dermal contact and incidental ingestion for the construction worker.

Future adult workers and visitors may potentially contact impacted surface soils in open landscaped areas unless the exposure pathway is eliminated through the use of a containment remedy or another technology. Construction workers are likely to contact impacted surface and subsurface soil during earth movement activities associated with future construction activities. For purposes of this report, we have identified surface soil as being within 0 to 3 feet below ground surface and subsurface soil as the soil below 3 feet from the ground surface. Although the thickness of fill material at the surface varies, fill materials (when present) are generally at least 3 feet thick in over half of the soil borings.

The following potential human exposure pathways were identified for evaluation:

Media	Potential Exposure Pathway	Potentially Exposed Populations
Surface Soil	Incidental ingestion	Future construction worker, adult worker, visitor
	Dermal contact	Future construction worker, adult worker, visitor
Surface Soil	Inhalation of soil particles	Future construction worker, adult worker, visitor
Subsurface Soil	Incidental ingestion	Future construction worker
	Dermal contact	Future construction worker
	Inhalation of soil particles	Future construction worker
Groundwater	Incidental ingestion	Future Construction worker
	Dermal contact	Future Construction worker

5.3 Risk-Based Screening and Selection of Chemicals of Potential Concern

Risk-based screening was conducted by comparing the maximum detected chemical concentrations for each media to the MDE NRCS, ATC, or GWS as referenced in the *MDE Cleanup Standards for Soil and Groundwater, Interim Final Guidance* (Update No. 2.1) dated June 2008. In addition, maximum detected concentrations were compared to the USEPA RSLs for Industrial Soil or MCL/Tap Water RSLs obtained from the *Regional Screening Levels for Chemical Contaminants at Superfund Sites*, June 2015. Given the future use of the Site, analytes in any medium for which the maximum measured concentration exceeded the applicable MDE Cleanup Standard or USEPA RSLs were considered a Chemical of Potential Concern (COPC). Analytes detected above the applicable MDE Cleanup Standards and/or USEPA RSLs are listed below.

Based upon draft comments from MDE received on June 3, 2015 concerning the April 23, 2015 RAP, the USEPA RSLs are considered to be the primary standard for future decisions relative to appropriate responses/remediation.

- Surface Soil - Metals (arsenic, cadmium, iron, manganese, vanadium, and zinc), Aroclor 1260, PAHs (benzo(a)pyrene and dibenzo(a,h)anthracene), and TPH (DRO);
- Subsurface Soil – Arsenic, manganese, and TPH (DRO); and

- Groundwater – Metals (aluminum, iron, manganese, vanadium, and 1,1-dichloroethane).

The metals listed above for groundwater are based on concentrations for dissolved metals, since dissolved concentrations are more representative of mobile groundwater impacts.

The COPCs for each identified media of concern are listed below:

- Surface Soil - Metals (arsenic, iron, manganese, and vanadium), Aroclor 1260, PAHs (benzo(a)pyrene and dibenzo(a,h)anthracene), and TPH (DRO); and

- Subsurface Soil – Arsenic and TPH (DRO); and

- Groundwater – Metals (aluminum, iron, manganese, and vanadium), TPH (DRO and GRO), and 1,1-dichloroethane.

Elevated concentrations of TPH (DRO) were detected in surface soil samples collected from SP-4 (26,000 mg/kg), SP-28 (14,000 mg/kg), and B-11 (6,800 mg/kg). Filling and grading is planned in these areas. Although TPH (DRO) was detected at elevated concentrations in these locations, concentrations of VOCs in B-11 and SVOCs in both B-11 and SP-4 were below laboratory detection limits or detected at concentrations between the detection limit and the laboratory reporting limit. Therefore, it is not expected that vapor from volatile chemicals will be a concern if the soil in these areas is disturbed during grading. However, as an added precaution, soils at SP-4 (located at the edge of the proposed building) will be relocated during regrading activities so that they are beneath the paved parking area.

Arsenic was detected in one subsurface soil sample (SP-26 /6 – 8' at 21 mg/kg) above the MDE standard (3.6 mg/kg) and USEPA RSL (3.0 mg/kg). In addition, TPH (DRO) was detected in SP-27 / 6-8' (1,000 mg/kg) in excess of the MDE NRCS (620 mg/kg) and the USEPA RSL (440 mg/kg). The remaining results for subsurface soil were below laboratory reporting limits or applicable MDE soil standards and USEPA RSLs. These results suggest impacts for certain naturally occurring metals in surface soils. It should be noted that the soil sample collected from SWM-4 at 2 to 4 feet bgs was considered to be surface soil since it consists primarily of fill material. Therefore, data from this boring was not included in the above discussion of subsurface soil.

5.4 Complete Exposure Pathways

The following complete exposure pathways have been identified for the Site:

- Future Construction Worker – Possible incidental ingestion of surface and subsurface soil and groundwater, dermal contact with surface and subsurface soil and groundwater, and possible inhalation of surface and subsurface soil particles.

- Future Adult Worker: Possible incidental ingestion of surface soil, dermal contact with surface soil, and inhalation of soil particles.

- Future Visitor: Possible incidental ingestion of surface soil, dermal contact with surface soil, and inhalation of soil particles.

Engineering and institutional controls consisting of a containment remedy (asphalt or concrete cap, clean fill cap, and concrete slab barrier) and deed restrictions (prohibiting potable groundwater use and restricting land use) are proposed to mitigate potential risks to human health and the environment at the Site (refer to **Section 7.0**). The proposed health and safety controls as discussed in **Section 9.1** and the site-specific HASP will mitigate the potential risk to future construction workers associated with contacting impacted media at the Site.

6 CLEANUP CRITERIA

The selected cleanup criteria for soil at the Site are the USEPA RSLs for Industrial Soil with the exception of the cleanup criteria for TPH - DRO. The MDE NRCS, as referenced in the *MDE Cleanup Standards for Soil and Groundwater: Interim Final Guidance* (Update No. 2.1) dated June 2008, is the selected cleanup criteria for TPH - DRO. The MDE GWS and USEPA MCLs or Tap Water RSLs (if MCLs are not available) are the selected cleanup criteria for groundwater at the Site. Based on the future Site use (Tier 3B), the following cleanup standards are proposed for the Site:

COPC	USEPA Cleanup Criteria**
Soil (mg/kg)	
Arsenic	3.0
Iron	820,000
Manganese	26,000
Vanadium	5,800
Aroclor 1260	1.0
TPH - DRO	620*
Benzo(a)pyrene	0.29
Dibenzo(a,h) anthracene	0.29
Groundwater (mg/L)	
Aluminum	20
Iron	14
Manganese	0.43
Vanadium	0.086
1,1-dichloroethane	0.0027
TPH – GRO	1.3
TPH - DRO	0.1

*THP is MDE Cleanup Standard

** - From "Regional Screening Levels for Chemical Contaminants at Superfund Sites", June 2015.

Potential risks to future adult workers and visitors associated with impacts to soil and groundwater exceeding the above criteria will be addressed through a presumptive remedy consisting of engineering controls (capping of designated areas) and institutional controls (deed restrictions) as outlined in **Section 7.0**.

7 SELECTED TECHNOLOGIES AND LAND USE CONTROLS

Currently, the plans are to redevelop the Site as a Federal Express Ground facility with associated parking lots and landscaped areas primarily around the perimeter of the Site. (see Schematic Design Documents in **Appendix B**). Certain aspects of the proposed redevelopment including the concrete building slab and asphalt/concrete paved areas have been incorporated into the proposed response actions.

The selected technologies to address the soil and groundwater impacts at the Site include engineering and institutional controls, as well as health and safety protocols for construction workers. The engineering and institutional controls will address the exposure pathways (incidental ingestion, dermal contact, and inhalation of soil particles) from the media of concern (surface soil and groundwater) to the potential receptors (future adult workers and visitors). Additionally, the health and safety protocols developed for future construction of capped areas in conjunction with redevelopment construction activities will ensure construction workers are not exposed to an unacceptable risk.

The engineering controls will consist of capping techniques, including concrete covered areas (future building slab/foundation and concrete paving) and asphalt-paved areas. Additionally, designated landscaped areas located within impacted soils will consist of a two-foot thick combination of clean fill and/or top soil overlying an MDE-approved geotextile fabric marker barrier.

The proposed institutional controls will provide an effective means of mitigating potential exposure to impacted media. Specifically, a restriction will be placed on the deed requiring maintenance of the designated capped areas. Groundwater will not be used for potable purposes since the Site will be serviced by municipal water. To maintain this protocol, a restriction will be placed on the deed to prevent the potable use of groundwater.

In addition, the property owner or tenant will submit written notification to the MDE at least 30 days prior to any planned future excavation involving impacted soil or intrusive landscaping activities that will penetrate the geotextile conducted after completion of the RAP. In the event of an unplanned emergency excavation on the Site, the property owner or tenant will verbally or electronically notify the MDE within 24 hours following initiation of the emergency excavation activities. Within ten days following completion of an unplanned emergency excavation, the property owner or tenant will file a detailed written report with the MDE. All excavated soil from the property will be analyzed before disposal and the analytical results will be the basis for appropriate disposition of the material in accordance with applicable local, state, and federal laws and regulations.

Lastly, a site-specific HASP will specify the methods to protect construction workers engaged in intrusive activities at the Site. During construction in designated impacted areas, on-site personnel and visitors will be notified of the HASP. A copy of the HASP and associated

signature log will be present on site for MDE inspection, if requested, during RAP and redevelopment construction activities.

It is believed that the above proposed remedies for the soil and groundwater impacts are protective for the intended use of the Site as restricted industrial, provided the capped areas are properly maintained. Further details regarding the selected technologies are provided in the sections below.

7.1 Paved and Concrete Areas

During redevelopment, the Site will be re-graded and certain areas will be paved with newly placed asphalt or concrete as shown in Drawing No. C-4 (Site Plan) of the Schematic Design Documents (**Appendix B**). Proposed asphalt and concrete paved areas are also shown on **Figure 3** of this report. The grading plans are specified in Drawing No. C-5 (Grading Plan). The asphalt paved areas will consist of a 9 or 12-inch thick combination of road base and newly placed asphalt. The concrete paved areas will consist of six inches of concrete with four inches of base course. The concrete and asphalt paving details are shown in Drawing No. C-7 (Site Details) of the Schematic Design Documents.

Soil analytical results exceeding the identified cleanup criteria are shown in **Figure 4**. Soil exhibiting exceedances of the applicable criteria in borings/probes B-3, B-4, B-7, SP-4, SP-6, SP-17, and SP-32 will be capped by the concrete floor slab of the building. Additionally, impacted surface soil in the vicinity of borings SP-8, SP-9, SP-27, SP-28, SP-32, and B-11 will be capped by either concrete or asphalt paving as shown in **Figure 4**.

A deed restriction requiring maintenance of the concrete/asphalt paved areas is proposed as part of the institutional controls (see **Section 7.5**). The building slab and paved areas subject to the maintenance requirements are shown in **Figure 5**.

As discussed above in Section 5.3, existing surficial soils in the vicinity of SP-4 exhibiting elevated concentrations of TPH-DRO will be relocated during site grading activities so that they are beneath the paved parking area to the north or east of the building. As SP-4 is located near the edge of the building footprint and the soils only need to be moved a short distance, the soils will be moved with a dozer or grader. After the surficial soils are relocated, a confirmation soil sample will be collected at the location of SP-4 and analyzed for TPH-DRO. If concentrations of TPH-DRO exceed the cleanup criteria listed above in Section 6, additional soils will be relocated and another confirmation sample collected. This process will continue until remaining soils exhibit TPH-DRO concentrations below the above cleanup criteria.

7.2 Landscaped Areas

The redevelopment plans include landscaped areas primarily around the perimeter of the Site as shown on Drawing No. C-4 of the Schematic Design Documents (**Appendix B**). Landscaped areas will be re-graded as shown on Drawing No. C-5. In select landscaped areas with impacted surface soil, capping will include an MDE-approved geotextile fabric followed by placement of a

two-foot thick clean fill and/or top soil layer. A TenCate™ Mirafi 140N Nonwoven Geotextile (or equivalent) will be utilized. The specification sheet for this product is submitted with the June 19, 2015 letter to MDE providing a response to Draft Comments on the April 23, 2015 RAP. The landscaped areas that are subject to capping are shown in **Figure 5**. Proposed capped areas include surface soils at the Site.

A deed restriction requiring maintenance of the capped landscaped areas is proposed as part of the institutional controls (see **Section 7.5**).

Landscape plants in the designated areas will be limited to those with root systems that do not penetrate the geotextile marker barrier. If landscape plants have root systems that extend deeper than two feet or trees are planted, the thickness of the clean fill cap will be adjusted accordingly.

The remaining impacted soil borings (SP-2, SP-12, and SWM-4) associated with the landscaped areas are located in areas where grading plans indicate surface fill material will be removed for installation of the storm water facilities as shown on **Figure 5**. The storm water facilities are designed as submerged gravel wetlands and will be lined. Assuming that the soils are geotechnically suitable, soil removed from these areas during grading will be placed beneath the building area or paved areas and re-graded. Unsuitable soils will be transported to a properly permitted off-site disposal facility.

7.3 Future Excavation/Utility Trenching

Both shallow and deeper utilities may be installed at the Site. For purposes of this discussion, shallow utilities are considered to be at or above the frost line (2-3 feet bgs), while deeper utilities are beneath the frost line. It is expected that shallow utilities may include electric, natural gas, and communication lines and deeper utilities may include water and sewer/stormwater.

Both shallow and deeper utilities will be installed with either traditional trenching methods or horizontal bore. Impacted soil excavated during trenching for utilities will be re-graded beneath the capped areas of the Site. The utility trenches for shallow utilities will be backfilled with clean fill imported to the site in accordance with the approved Soil Management Plan.

It is possible that deeper utilities may be installed within impacted soils. If deeper utilities installed in impacted soils need to be excavated in the future for maintenance, the excavation activities will be covered under a future soil management plan (SMP) that will be reviewed and approved by MDE. The SMP will describe the excavation methods and the means for managing the excavated soils.

If shallow utilities need to be installed entirely in unimpacted clean fill that is imported onto the site, then no restrictions will be associated with possible excavation for future maintenance.

If shallow utilities need to be installed immediately above impacted soils, then the geotextile will be installed at the appropriate depth. Depending upon the depth of the utility piping, the geotextile may need to be installed slightly deeper than the 2 feet standard depth. In order to limit exposure to impacted media of future workers installing or repairing utilities, shallow utility trenches installed in impacted soils will be over excavated approximately one foot wider than the width/depth required to install a utility.

For installation of both shallow and deeper utilities, appropriate health and safety protocols will be followed as outlined in the Health and Safety Plan (HASP) (see **Section 9.1**) and dust monitoring will be conducted during trenching activities (see **Section 9.2**).

7.4 Site Access and Control

The main facility gate where access is granted through a security officer presently limits access to the Sparrows Point Property as a whole, including the Site. A gate security officer will need to be notified in advance in order to allow access to the Property.

The responsible party will also comply with local, state, and federal laws and regulations by obtaining necessary approvals and permits to conduct the activities pursuant to an approved RAP.

As previously discussed in **Section 5.2**, the potential exists for exposure to COPCs by construction workers during redevelopment activities through incidental ingestion of soil and/or groundwater, dermal contact with soil and/or groundwater, and inhalation of soil particles. Therefore, future construction contractors must comply with requirements of the site-specific HASP and the health and safety protocols described herein. The primary actions to be taken to mitigate potential exposure by future construction workers will be dust control measures, worker hygiene, and the appropriate use of personal protective equipment (PPE) during construction activities.

7.5 Institutional Controls (Future Land Use Controls)

Long-term conditions related to future use of the Site will be placed on the RAP approval, NFA Letter, and COC. These conditions are anticipated to include the following:

- A restriction prohibiting potable use of groundwater at the Site;
- Implementation of inspection procedures and maintenance of the containment remedies as outlined in **Section 7.6** below.

The responsible party will file the above deed restrictions as defined by the MDE VCP in the NFA Letter and COC. Designated areas of the Site as shown in **Figure 5** are subject to the proposed response action containment remedy and the maintenance requirement. The Site will be subject to the potable groundwater use restriction.

7.6 Post Remediation Requirements

Post remediation requirements will include compliance with the conditions specified in the NFA Letter, COC, and the deed restrictions recorded for the Site. Deed restrictions will be recorded within 30 days after receipt of the final NFA Letter.

Maintenance requirements will include maintenance of the capped areas to minimize degradation of the cap and exposure to the underlying soil as discussed in **Section 9.4**. An Operations and Maintenance Plan (O&M Plan) for the capped areas is included in **Appendix E**. The O&M Plan includes the inspection protocols and a maintenance schedule.

The responsible party will perform cap maintenance inspections, perform maintenance of the cap, and retain cap inspection records. Areas of the pavement cap that have degraded to a Pavement Condition Index (PCI) of 4.0 will be repaired within 30 days of discovery. MDE shall be notified within ten business days of any repairs that are the result of a PCI of 4.0 or greater or if damage to the landscaped capped area(s) exceeds one foot in diameter and/or two feet in depth. The notification will include documentation of the conditions being repaired and the location of the repair.

In addition, the property owner or tenant will submit written notification to the MDE at least 30 days prior to any planned future excavation involving impacted soil or intrusive landscaping activities that will penetrate the geotextile on the Site. In the event of an unplanned emergency excavation on the Site, the property owner or tenant will verbally or electronically notify the MDE within 24 hours following initiation of the emergency excavation activities. Within ten days following completion of an unplanned emergency excavation, the property owner or tenant will file a detailed written report with the MDE. All excavated soil from the property will be analyzed before disposal and the analytical results will be the basis for appropriate disposition of the material in accordance with applicable local, state, and federal laws and regulations.

8 EVALUATION CRITERIA FOR SELECTED TECHNOLOGIES

8.1 Criteria for Certificate of Completion

The criteria to be met for issuance by the MDE of a No Further Action (NFA) Letter to be followed by a Certificate of Completion (COC) per the requirements of the ACO include the following:

- Written notification to the MDE at least ten business days prior to beginning RAP implementation activities in the field;
- Implementation of the health and safety protocols outlined in the site-specific HASP;
- Submittal to MDE of documentation related to monitoring implementation of health and safety measures and oversight of RAP construction activities to ensure accurate construction of the containment remedies;
- Submittal of quarterly progress reports to MDE documenting progress of the RAP implementation activities;
- Upon completion of the RAP activities, submittal of a Response Action Completion Report to the MDE. The Response Action Completion Report will include field visit documentation, photo documentation, documentation of implementation of health and safety measures during RAP implementation activities, and as-built Site plans illustrating paved areas, open landscaped areas, building footprint(s), and final elevations of the Site. The appropriate RAP Clean fill documentation will also be included in the report.
- Submittal of a copy of the recorded deed restrictions to MDE within 30 days of receipt of the COC from the MDE VCP.

8.2 Criteria for Contingency Measures

If previously undiscovered contamination is encountered during implementation of the RAP, the remediation schedule is revised, or a written citation related to health and safety practices is received from a regulatory entity, the MDE will be verbally notified within 24 hours. Written notifications will be provided to the VCP at the following address:

Maryland Department of the Environment
Remedial Project Manager
Land Management Administration
Attention: Barbara Brown
1800 Washington Boulevard
Baltimore, Maryland 21230

(410) 537-3212

In addition to verbal notifications, the MDE VCP will be provided with documentation and/or laboratory analytical reports generated as a result of newly identified conditions.

9 PROPOSED RESPONSE ACTION IMPLEMENTATION

The sections below include protocols for implementation of the proposed RAP, including:

- General health and safety procedures;
- Reporting requirements;
- Maintenance requirements;
- Excavation protocols;
- Specifications for clean fill characterization; and
- Companies and individuals expected to be responsible for RAP implementation.

9.1 General Health and Safety Protocols

During cap installation and redevelopment activities, the potential exists for exposure to COPCs through incidental ingestion of soil and/or groundwater, dermal contact of soil and/or groundwater, and inhalation of soil particles by construction workers. Therefore, future construction contractors are required to comply with the RAP health and safety protocols, the Occupational Safety and Health Administration (OSHA) guidelines for managing contaminated materials, and the site-specific HASP. A site-specific HASP is included as **Appendix F**.

The primary actions proposed to manage potential exposures to future construction workers will be dust control as described in **Section 9.2** and the use of appropriate personal protective equipment (PPE) during construction activities.

A copy of the site-specific HASP will be present on Site during RAP activities. In addition, all construction personnel will be advised of the requirements of the HASP prior to working on the Site.

9.2 Dust Control Requirements

General construction operations, including removal of existing foundations or utilities, soil excavation and transport, soil grading, trenching for utilities, and cap construction activities will be performed at the Site. These activities are anticipated to be performed in areas of soil impacted with select metals, Aroclor 1260, select PAHs, and/or TPH (DRO). To limit worker exposure to contaminants borne on dust and windblown particulates, dust control measures will be implemented, if warranted when the above activities are performed in areas with impacted soil.

The action level proposed for the purpose of determining the need for dust suppression techniques (e.g. watering and/or misting) and/or continuous monitoring during future construction activities on Site will be 3.0 mg/m³. The lowest of the site-specific dust action levels, OSHA PELs, and ACGIH TLV was selected as the proposed action level.

If visible dust is generated in the breathing zone, air monitoring will be implemented as follows:

- At the start of intrusive activities;
- Periodically during intrusive activities (15-minute intervals);
- When contaminants other than those previously identified are being handled;
- When a different type of operation is initiated or conditions change;
- If personnel are working in areas with obvious particulate contamination; and
- If a sufficient reasonable interval has passed so that exposures may have significantly changed.

Air monitoring will be performed using a ThermoElectron Corporation Personal Data RAM 1000AN dust monitor or equivalent real-time air monitoring device. If the action level (3 mg/m³) is exceeded as a result of conditions occurring at the Site, operations will be stopped and dust suppression implemented. The background dust concentration will be utilized to evaluate whether Site activities are the source of the action level exceedance. Background concentrations will be based on measurements over a minimum of a one hour period at the upwind Site boundary. This upwind data will be used to calculate a time weighted average background dust concentration. The background dust concentration may need to be recalculated periodically during the work day, based on changed upwind conditions. Operations may be resumed once monitoring indicates that dust concentrations are below the action level.

As applicable, air monitoring will be conducted during RAP implementation activities in the immediate work zones and surrounding areas to assess levels of exposure to Site workers, establish that the work zone designations are valid, and verify that respiratory protection being worn by personnel, if needed, is adequate. Concurrent with the work zone air monitoring, perimeter air monitoring will also be performed to ensure contaminants are not migrating off-site. Perimeter monitoring will include monitoring along the perimeter of the Site, including both the downwind and upwind portions of the Site. The concentration measured in the downwind portion of the Site shall not exceed the concentration in the upwind portion. If exceedances attributable to Site conditions are identified downwind for more than five minutes, dust control measures and additional monitoring will be implemented. The dust suppression measures may include wetting or misting through use of a hose connected to an available water supply or a water truck stationed on Site.

Dust control measures will be implemented as described above to address dust generated as a result of construction and RAP activities conducted on Site. However, based on the nature of

the area and/or on-going activities surrounding the Site, it is possible that windblown particulates may come from surrounding areas. As discussed above, the dust concentration in the upwind portion of the Site will be considered when monitoring dust levels in the work zone.

9.3 Reporting Requirements

Reporting required during the implementation of the RAP will consist of RAP addendums (as applicable) including final development plans, the initial written notification prior to beginning RAP field activities, the final proposed construction schedule, quarterly progress reporting, and submission of the Response Action Completion Report following completion of the RAP activities. The RAP implementation schedule and final development plans will be forwarded to the MDE prior to beginning RAP field activities. A preliminary schedule is presented below.

The Response Action Completion Report will include field visit documentation including implementation of health and safety measures, photo documentation, as-built Site plans illustrating paved areas, open landscaped areas, building footprint(s), and final elevations of the Site, and copies of applicable clean fill documentation.

9.4 Maintenance Requirements

Maintenance requirements will include maintenance of the capped areas to control degradation of the cap and exposure to the underlying soil. An Operations and Maintenance Plan (O&M Plan) for the capped areas is included in **Appendix E**. The O&M Plan includes the inspection protocols and a maintenance schedule.

The responsible party will inspect the cap, perform maintenance of the cap, and retain cap inspection/maintenance records. Areas of the pavement cap that have degraded to a Pavement Condition Index (PCI) of 4.0 will be repaired within 30 days of discovery. MDE shall be notified within ten business days of any repairs that are the result of a PCI of 4.0 or greater or if damage to the landscaped capped area(s) exceeds one foot in diameter and/or two feet in depth. The notification will include documentation of the conditions being repaired and the location of the repair.

9.5 Soil Excavation, Staging, Sampling, and Disposal

Impacted soil excavated during redevelopment of the Site is anticipated to be placed under the capped areas, assuming it is suitable from a geotechnical standpoint. Otherwise, such materials will be properly managed in accordance with applicable requirements. Based on the currently available grading plan, on a site-wide basis, excess soils are not anticipated during redevelopment and RAP implementation activities. Details regarding management of excavated soil, including the cut/fill excavation plan and soil storage locations and procedures, are provided in the SMP included as **Appendix G**.

9.6 Clean Fill

In general, the RAP proposes containment remedies to mitigate exposure to impacted soil. In order to implement this remedy, clean fill materials from a designated location(s) will be utilized for construction of the cap in selected landscaped areas. MDE approval will be obtained for use of clean fill materials from Parcel A1, including recycled building materials, prior to transport and/or use at the Site. Additionally, based on the grading plan, clean fill will be imported for re-grading of the Site. Requirements and procedures for selection of clean fill imported for capping and redevelopment activities are discussed in **Section 3.0** of the SMP included as **Appendix G**.

9.7 Asbestos, Lead, and Oil

RAP activities are not expected to include the removal of asbestos or lead-based paint from the Site. If an underground storage tank(s) is discovered during intrusive activities or a release of petroleum occurs at the Site, the MDE Oil Control Program and VCP will be notified.

9.8 Groundwater

It is anticipated that shallow groundwater may be encountered during intrusive construction activities and dewatering of the excavation area(s) and/or utility trenches may be necessary. If groundwater is removed from excavation areas and/or utility trenches, it will be routed to the storm water sewer system on the south side of the new Cold Mill, which flows into the Humphrey Creek Waste Water Treatment Plant (WWTP) on the Sparrows Point Property.

Prior to discharge of groundwater, the applicable permit requirements associated with the Humphrey Creek WWTP will be satisfied. Additional sampling will be performed, if the applicable WWTP permit conditions require additional sampling. If groundwater concentrations or potential constituents exceed the WWTP limits or treatment capability, groundwater will be disposed offsite in accordance with applicable federal, state, and local regulations.

9.9 RAP Implementation Team

As the lead developer, Scannell Properties is expected to oversee the redevelopment of Parcel A1 and therefore the implementation of the RAP. Scannell will contract with various subcontractors and subconsultants to assist with the implementation of the RAP. The primary construction contractor will be Zirkelbach. The Zirkelbach team will be led by Wayne Russom. Robert White with 4D Engineering will serve as the lead Engineer. Third party oversight of environmental aspects of RAP implementation activities will be coordinated by Weaver Consultants Group. Doug Dorgan and Mike Maxwell will serve as lead project managers for this effort.

If changes to the above RAP Implementation Team are made in the future, the appropriate notice will be provided to MDE prior to implementation of the change.

10 PERMITS, NOTIFICATIONS, AND CONTINGENCIES

10.1 Preliminary Implementation Schedule

A final construction schedule has not been developed as of the date of this submittal. However, future RAP milestones are anticipated to begin and be completed according to the schedule below.

RAP Milestones	Start Date	Completion Date
Final Construction Document / Development Plan Submissions	July 15, 2015	August 15, 2015
Pre-RAP Activities Health and Safety Meeting	July 15, 2015	August 15, 2015
Site Grading Activities (including cap placement)	August 15, 2015	November 1, 2015
Utility Excavations and Installation	September 1, 2015	February 1, 2016
Final Environmental Cap Construction/Placement	April 1, 2016	June 1, 2016
Quarterly Progress Reporting	August 15, 2015	June 1, 2006
Response Action Completion Report Submittal	August 1, 2016	August 1, 2016

An updated implementation schedule will be provided to the MDE prior to initiating RAP field activities.

10.2 Administrative Requirements

A copy of the VCP written agreement and certified zoning statement are provided in **Appendix H**. The written agreement was prepared in accordance with Section 7-512 of the Environmental Article, Annotated Code of Maryland, and states that the Participant will comply with the provisions of this RAP. Further, the Participant acknowledges that there are significant penalties for falsifying any information required by MDE under Title 7, Subtitle 5 of the Environmental Article, Annotated Code of Maryland, and that the certified zoning statement is required to be included in the RAP for the VCP pursuant to Title 7, Subtitle 5 of the Environmental Article, Annotated Code of Maryland. The VCP requirement for a bond or other security has been addressed by the ACO.

As part of the RAP approval process, a public meeting notice was published on May 8 and April 30, 2015 in the Baltimore Sun, a local daily paper. The public meeting was subsequently held on May 11, 2015.

11 REFERENCES

1. Maryland Department of the Environment *Voluntary Cleanup Program Guidance Document,* March 2006.
2. State of Maryland Department of the Environment *Cleanup Standards for Soil and Groundwater Interim Final Guidance, Update No. 2.1*, June 2008.
3. United States Environmental Protection Agency *Regional Screening Level Summary Table (Revised June 2015),* http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/
4. Weaver Boos Consultants *Phase I Environmental Site Assessment Report, Former RG Steel Facility, 1430 Sparrows Point Boulevard and 5111 North Point Boulevard, Sparrows Point, Maryland*, May 2014.
5. Weaver Boos Consultants *Phase I Environmental Site Assessment, Parcel A1, Sparrows Point Maryland*, February 2015.

Tables

Table 1
Soil Analytical Summary
Parcel A1
Sparrows Point, Maryland

Parameter	Units	MDE Soil Standards[a]	U.S. EPA Regional Screening Levels[b]	Anticipated Typical Concentrations/ Reference Levels[c]	Phase II Environmental Site Assessment November 10 to November 13, 2014														
		Non-Residential Clean-up Standard	Industrial Soil		SWM-1 0-2'	SWM-1 6-8'	SWM-2 0-1.5'	SWM-4 2-4'	SWM-4 8-10'	SWM-5 0-1.5	B-2 1-2.5'	B-3 1-2.5'	B-4 1-2.5'	B-4 3.5-5'	B-5 0-1.5'	B-6 1-2.5'	B-6 8.5-10'	B-7 1-2.5'	B-11 0-1.5'
Volatile Organic Compounds (VOCs)[d]																			
Acetone	mg/kg	92,000	670,000	--	NA	0.035*	0.021*	0.026*	0.013*	0.025*	NA	NA	NA	0.048*	0.014*	NA	0.03*	NA	0.024*
Benzene	mg/kg	52	5.1	--	NA	<0.0044	<0.0027	0.00058*	<0.0022	<0.0044	NA	NA	NA	<0.0039	0.00060*	NA	<0.0041	NA	<0.0027
2-Butanone	mg/kg	61,000	190,000	--	NA	0.0039*	0.0025*	0.0038*	0.0027*	0.0048*	NA	NA	NA	0.0076*	0.0019*	NA	<0.0082	NA	0.0037*
Carbon Disulfide	mg/kg	10,000	3,500	--	NA	<0.0088	<0.0054	0.00098*	0.00082*	0.026	NA	NA	NA	0.0062*	0.018	NA	<0.0082	NA	0.0051*
Ethylbenzene	mg/kg	10,000	25	--	NA	<0.0044	<0.0027	<0.0026	<0.0022	<0.0044	NA	NA	NA	0.00092*	<0.0024	NA	<0.0041	NA	<0.0027
Toluene	mg/kg	8,200	47,000	--	NA	0.0009*	0.00063*	0.00085*	<0.0022	0.011	NA	NA	NA	0.0019*	0.00093*	NA	0.0013*	NA	<0.0027
m,p-Xylene	mg/kg	--	--	--	NA	<0.0044	<0.0027	<0.0026	<0.0022	<0.0044	NA	NA	NA	0.0020*	<0.0024	NA	<0.0041	NA	<0.0027
o-Xylene	mg/kg	--	2,800	--	NA	<0.0044	<0.0027	<0.0026	<0.0022	<0.0044	NA	NA	NA	0.00095*	<0.0024	NA	<0.0041	NA	<0.0027
Total Xylenes	mg/kg	20,000	2,800	--	NA	<0.0044	<0.0027	<0.0026	<0.0022	<0.0044	NA	NA	NA	0.0030*	<0.0024	NA	<0.0041	NA	<0.0027
Semivolatile Organic Compounds (SVOCs)[d]																			
Acenaphthylene	mg/kg	6,100	45,000	--	NA	NA	0.018*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.051*
Anthracene	mg/kg	31,000	230,000	--	NA	NA	0.024*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.13*
Benzo(a)anthracene	mg/kg	3.9	2.9	--	NA	NA	0.088*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.16*
Benzo(a)pyrene	mg/kg	0.39	0.29	--	NA	NA	0.096*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.660
Benzo(b)fluoranthene	mg/kg	3.9	2.9	--	NA	NA	0.13*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.660
Benzo(g,h,i)perylene	mg/kg	3,100	--	--	NA	NA	0.05*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.100*
Benzo(k)fluoranthene	mg/kg	39	29	--	NA	NA	0.046*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.660
Bis(2-ethylhexyl)phthalate	mg/kg	200	160	--	NA	NA	<0.330	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.660
Chrysene	mg/kg	390	290	--	NA	NA	0.092*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.160*
Dibenzo(a,h)anthracene	mg/kg	0.39	0.29	--	NA	NA	<0.330	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.660
Dibenzofuran	mg/kg	100	1,000	--	NA	NA	<0.330	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.660
Fluoranthene	mg/kg	4,100	30,000	--	NA	NA	0.19*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.320*
Indeno(1,2,3-cd)pyrene	mg/kg	3.9	2.9	--	NA	NA	0.053*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.099*
Naphthalene	mg/kg	2,000	17	--	NA	NA	<0.330	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.660
Phenanthrene	mg/kg	31,000	--	--	NA	NA	0.077*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.130*
Pyrene	mg/kg	3,100	23,000	--	NA	NA	0.14*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.280*
Pesticides[d]/Herbicides/PCBs[d]																			
4,4'-DDD	mg/kg	12	9.6	--	NA	NA	<0.330	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.330
4,4'-DDE	mg/kg	8.4	9.6	--	NA	NA	0.0067*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.330
4,4'-DDT	mg/kg	8.4	8.5	--	NA	NA	<0.330	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.330
Aldrin	mg/kg	0.17	0.18	--	NA	NA	<0.330	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.330
beta-BHC	mg/kg	1.6	1.3	--	NA	NA	0.020*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.013*
Endosulfan Sulfate	mg/kg	610	7,000	--	NA	NA	<0.330	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.330
Total Herbicides	mg/kg	--	--	--	NA	NA	<0.0427	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0417
Aroclor 1260	mg/kg	1.4	0.99	--	NA	NA	<0.033	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.033
Aroclor 1268	mg/kg	--	--	--	NA	NA	<0.033	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.064
Inorganics																			
Aluminum	mg/kg	100,000	1,100,000.0	11,000	5,500	12,000	3,800	11,000	8,500	17,000	13,000	14,000	18,000	16,000	17,000	16,000	NA	14,000	8,500
Antimony	mg/kg	41	470	6.0	<5.1	<5.7	<5.3	<4.5	<5.3	<5.6	0.11*	0.15*	<5.9	0.16*	<5.3	0.11*	NA	<5.6	<4.8
Arsenic	mg/kg	1.9	3.0	3.6	5.7	<5.7	12	12	<5.3	7.3	0.61	4.1	<5.9	1.1	<5.3	0.44*	NA	8.9	<4.8
Barium	mg/kg	20,000	220,000	73	66	28	72	120	42	86	210	20	290	230	93	80	NA	73	35
Beryllium	mg/kg	200	2,300	0.66	<1.0	<1.1	<1.1	<0.90	<1.1	<1.1	1.3*	0.62*	2.2	1.6	<1.1	0.56*	NA	1.3	<0.95
Cadmium	mg/kg	51	980**	0.73	<1.0	<1.1	3,200	<0.90	<1.1	<1.1	1.5	0.23	<1.2	0.7	<1.1	0.19*	NA	<1.1	<0.95
Chromium, Total	mg/kg	310	--	28	9.0	17	6.5	830	9.9	28	150	22	21	17	29	21	NA	25	18
Chromium, Trivalent	mg/kg	150,000	1,800,000	--	9.0*	17*	<20	830	<20	28	150	22	21	17*	29	21	NA	25	<20
Chromium, Hexavalent	mg/kg	310	6.3	--	<20	<20	<20	<20	<19	<19	<19	<20	<19	<20	<19	<19	NA	<20	<19
Copper	mg/kg	4,100	47,000	12	14	3.1	780	110	9.1	23	12	9.3	10	18	13	11	NA	17	9.2
Iron	mg/kg	72,000	820,000	15,000	7,700	16,000	28,000	160,000	9,800	29,000	29,000	18,000	11,000	13,000	22,000	6,900	NA	21,000	12,000
Lead	mg/kg	1,000	800	45	62	22	690	150	8.4	34	55	10	68	31	27	9.2	NA	11	33
Manganese	mg/kg	2,000	26,000	480	64	13	1,700	13,000	82	600	5,000	43	2,600	1,800	630	41	NA	54	280
Mercury	mg/kg	31	350***	0.51	0.19	0.029	0.56	0.055	<0.029	0.037	0.035*	0.0011*	<0.029	0.024	0.042	0.0073*	NA	<0.029	0.090
Nickel	mg/kg	2,000	22,000	13	6.5	5.3	21	95	18	11	5.9	15	7.2	8.0	10	13	NA	13	6.8
Selenium	mg/kg	510	5,800	2.2	<5.1	<5.7	<5.3	<4.5	<5.3	<5.6	0.97	0.36	<5.9	0.96	<5.3	0.13*	NA	<5.6	<4.8
Silver	mg/kg	510	5,800	0.94	<1.0	<1.1	21	<0.90	<1.1	<1.1	0.091*	0.042*	<1.2	0.083*	<1.1	0.044*	NA	<1.1	<0.95
Thallium	mg/kg	7.2	12	3.9	<1.0	<1.1	<1.1	1.1	<1.1	1.1	0.081*	0.23	<1.2	0.12*	<1.1	0.21	NA	<1.1	<0.95
Tin	mg/kg	61,000	700,000	--	7.9	<5.7	110	13	<5.3	<5.6	1.7	0.77*	8.9	1.6	<5.3	0.79*	NA	<5.6	<4.8
Vanadium	mg/kg	100	5,800	30	<20	41	<21	3,500	24	61	120	29	34	34	55	17	NA	53	29
Zinc	mg/kg	31,000	350,000	63	52	17	290,000	690	58	150	280	35	50	130	150	32	NA	38	120
General Chemistry																			
Cyanide, Total	mg/kg	2,000	12	--	<0.28	0.30	0.29	3.8	<0.31	0.58	NA	NA	2.1	0.16*	<0.30	NA	NA	<0.29	<0.28
pH	s.u.	--	--	--	9.10	8.46	6.20	9.41	8.57	8.80	11.7	4.74	11.4	11.0	9.03	4.66	NA	7.75	8.44
Total Petroleum Hydrocarbon (TPH)																			
Gasoline Range Organics (GRO)	mg/kg	620	2,200****	--	NA	NA	<500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.500
Diesel Range Organics (DRO)	mg/kg	620	440****	--	NA	NA	11*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6,800

[a] Soil Standards obtained from State of Maryland Department of the Environment (MDE) , Cleanup Standards for Soil an Groundwater, June 2008, Interim Final Guidance (Update No. 2.1), Tables 1 and 2

[b] U.S. EPA Regional Screening Levels obtained from "Regional Screening Levels for Chemical Contaminants at Superfund Sites" screening level/preliminary remediation goal website (RSL Summary Table, Target Cancer Risk = 1E-6, Target Hazard Quotient = 1, June 2015).

[c] Anticipated Typical Concentrations (ATCs)/Reference Levels for metals obtained from Appendix 2 - Attachment 2 for the Eastern Maryland Region of MDE Cleanup Standards for Soil and Groundwater, June 2008 (utilized if greater than MDE Soil Standards).

[d] Sample results for VOCs, SVOCs, pesticides, and PCBs that are below laboratory detection limits are not listed in the tabl

-- Not listed in Table 1 or 2 of MDE Cleanup Standards for Soil and Groundwater, June 2008.

<0.330 Concentration below laboratory reporting limit.

Concentration exceeds U.S. EPA industrial soil screening level.

Concentration exceeds MDE non-residential soil cleanup standard.

Concentration exceeds ATC (utilized if greater than MDE standards)

Sample location is outside of the revised Parcel A1 property boundary.

mg/kg Milligrams per kilogram

NA Not analyzed

* Analyte concentration detected between reporting limit and method detection limit.

** Screening level for Cadmium (Diet).

*** Screening level for Mercuric Chloride (and other Mercury salts).

****TPH (Aliphatic Low) screening level used for GRO.

****TPH (Aliphatic Medium) screening level used for DRO.

Table 1
Soil Analytical Summary
Parcel A1
Sparrows Point, Maryland

Parameter	Units	MDE Soil Standards[a]	U.S. EPA Regional Screening Levels[b]	Anticipated Typical Concentrations/ Reference Levels[c]	Phase II Environmental Site Assessment November 24, 2014														
		Non-Residential Clean-up Standard	Industrial Soil		SP-1 1-1.5'	SP-2 1-1.5'	SP-3 1-1.5'	SP-4 1-1.5'	SP-5 1-1.5'	SP-6 1-1.5'	SP-7 1-1.5'	SP-8 1-1.5'	SP-9 1-1.5'	SP-10 1-1.5'	SP-11 1-1.5'	SP-12 1-1.5'	SP-13 1-1.5'	SP-14 1-1.5'	SP-15 1-1.5'
Volatile Organic Compounds (VOCs)[d]																			
Acetone	mg/kg	92,000	670,000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	mg/kg	52	5.1	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	mg/kg	61,000	190,000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	mg/kg	10,000	3,500	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	mg/kg	10,000	25	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	mg/kg	8,200	47,000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	mg/kg	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	mg/kg	--	2,800	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	mg/kg	20,000	2,800	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (SVOCs)[d]																			
Acenaphthylene	mg/kg	6,100	45,000	--	NA	NA	<0.320	0.070*	NA	<0.660	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Anthracene	mg/kg	31,000	230,000	--	NA	NA	<0.320	0.055*	NA	<0.660	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Benzo(a)anthracene	mg/kg	3.9	2.9	--	NA	NA	<0.320	0.200*	NA	0.060*	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Benzo(a)pyrene	mg/kg	0.39	0.29	--	NA	NA	<0.320	0.250*	NA	<0.660	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Benzo(b)fluoranthene	mg/kg	3.9	2.9	--	NA	NA	<0.320	0.390	NA	<0.660	NA	NA	NA	NA	0.024*	NA	<1.300	NA	NA
Benzo(g,h,i)perylene	mg/kg	3,100	--	--	NA	NA	<0.320	0.190*	NA	<0.660	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Benzo(k)fluoranthene	mg/kg	39	29	--	NA	NA	<0.320	0.140*	NA	<0.660	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Bis(2-ethylhexyl)phthalate	mg/kg	200	160	--	NA	NA	<0.320	<0.320	NA	0.052*	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Chrysene	mg/kg	390	290	--	NA	NA	<0.320	0.2*	NA	0.087*	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Dibenzo(a,h)anthracene	mg/kg	0.39	0.29	--	NA	NA	<0.320	0.049*	NA	<0.660	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Dibenzofuran	mg/kg	100	1,000	--	NA	NA	<0.320	0.019*	NA	<0.660	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Fluoranthene	mg/kg	4,100	30,000	--	NA	NA	<0.320	0.310*	NA	0.084*	NA	NA	NA	NA	0.026*	NA	<1.300	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	3.9	2.9	--	NA	NA	<0.320	0.170*	NA	<0.660	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Naphthalene	mg/kg	2,000	17	--	NA	NA	<0.320	0.034*	NA	<0.660	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Phenanthrene	mg/kg	31,000	--	--	NA	NA	<0.320	0.140*	NA	<0.660	NA	NA	NA	NA	<0.320	NA	<1.300	NA	NA
Pyrene	mg/kg	3,100	23,000	--	NA	NA	0.018*	0.260*	NA	0.094*	NA	NA	NA	NA	0.024*	NA	<1.300	NA	NA
Pesticides[d]/Herbicides/PCBs[d]																			
4,4'-DDD	mg/kg	12	9.6	--	NA	NA	<0.330	0.0099*	NA	<0.330	NA	NA	NA	NA	<0.330	NA	<1.600	NA	NA
4,4'-DDE	mg/kg	8.4	9.6	--	NA	NA	<0.330	<0.330	NA	0.013*	NA	NA	NA	NA	<0.330	NA	<1.600	NA	NA
4,4'-DDT	mg/kg	8.4	8.5	--	NA	NA	<0.330	0.0066*	NA	<0.330	NA	NA	NA	NA	<0.330	NA	<1.600	NA	NA
Aldrin	mg/kg	0.17	0.18	--	NA	NA	<0.330	<0.330	NA	0.0067*	NA	NA	NA	NA	<0.330	NA	<1.600	NA	NA
beta-BHC	mg/kg	1.6	1.3	--	NA	NA	<0.170	<0.170	NA	<0.170	NA	NA	NA	NA	<0.170	NA	<0.840	NA	NA
Endosulfan Sulfate	mg/kg	610	7,000	--	NA	NA	<0.330	<0.330	NA	0.120*	NA	NA	NA	NA	<0.330	NA	<1.600	NA	NA
Total Herbicides	mg/kg	--	--	--	NA	NA	<0.0432	<0.0430	NA	<0.0672	NA	NA	NA	NA	<0.0410	NA	<21.6	NA	NA
Aroclor 1260	mg/kg	1.4	0.99	--	NA	NA	<0.033	<0.033	NA	2.1	NA	NA	NA	NA	<0.033	NA	<0.033	NA	NA
Aroclor 1268	mg/kg	--	--	--	NA	NA	<0.033	<0.033	NA	<0.330	NA	NA	NA	NA	<0.033	NA	0.170	NA	NA
Inorganics																			
Aluminum	mg/kg	100,000	1,100,000.0	11,000	6,100	7,600	9,700	30,000	8,400	12,000	24,000	22,000	14,000	9,600	18,000	10,000	23,000	10,000	6,800
Antimony	mg/kg	41	470	6.0	0.25	6.0	0.086*	0.21	0.057*	0.095*	0.36	0.072*	0.55	0.38*	0.053*	1.1	0.050*	0.62	0.31
Arsenic	mg/kg	1.9	3.0	3.6	1.8	3.4	2.4	<0.50	1.1	1.1	0.53	2.1*	1.6	9.5	3.0	15*	<0.50	2.6	2.5
Barium	mg/kg	20,000	220,000	73	72	66	42	310	34	85	300	300	250	140	180	290	200	130	110
Beryllium	mg/kg	200	2,300	0.66	0.44*	0.69*	0.50*	4.0*	0.68*	0.86*	2.0*	2.1	3.7*	0.67*	2.5*	1.3*	4.0*	0.84*	0.4*
Cadmium	mg/kg	51	980**	0.73	0.23	0.27	0.15*	5.2	1.2	1.2	0.97	0.99	2.1	1	0.36*	1.1	0.81	0.91	0.51
Chromium, Total	mg/kg	310	--	28	10	14	16	270	19	350	24	16	360	20	16	130	33	200	34
Chromium, Trivalent	mg/kg	150,000	1,800,000	--	<20	<20	<20	270	<20	350	24	<20	360	20	<20	130	33	200	34
Chromium, Hexavalent	mg/kg	310	6.3	--	<20	<20	<19	<20	<19	<20	<20	<20	<20	<20	<20	<20	<19	<19	<20
Copper	mg/kg	4,100	47,000	12	20	17	7.2	45	11	11	32	18	38	39	7.9	160	27	18	57
Iron	mg/kg	72,000	820,000	15,000	8,200	11,000	14,000	31,000	15,000	120,000	29,000	26,000	91,000	29,000	21,000	160,000	16,000	38,000	41,000
Lead	mg/kg	1,000	800	45	63	58	13	210	34	77	130	11	480	130	22	210	210	160	140
Manganese	mg/kg	2,000	26,000	480	160	290	140	9,300	240	2,300	1,800	2,400	10,000	330	1,900	3,300	3,600	6,100	710
Mercury	mg/kg	31	350***	0.51	0.22	0.53	0.13	0.020	0.077	0.093	0.084	0.0078	0.21	0.11	0.030*	0.19	0.039	0.078	0.090
Nickel	mg/kg	2,000	22,000	13	5.1	7.7	7.8	5.3	14	7.5	7.5	9.6	12	14	6.3	46	6.2	13	16
Selenium	mg/kg	510	5,800	2.2	0.61	0.49	0.33*	2.4	0.37*	0.46	3.3	1.0	0.19*	0.82*	1.8*	4.3*	1.4	0.27*	0.38*
Silver	mg/kg	510	5,800	0.94	0.13*	0.15*	0.057*	0.77	0.077*	0.15*	0.14*	0.11*	0.39*	0.16*	0.057*	0.28*	0.11*	0.14*	0.14*
Thallium	mg/kg	7.2	12	3.9	0.16*	0.12*	0.11*	0.061*	0.12*	0.046*	0.051*	0.045*	0.085*	0.093*	0.076*	0.090*	0.024*	0.052*	0.033*
Tin	mg/kg	61,000	700,000	--	6.1	39	1.1	9.1	1.9	2.2	3.0	1.0	10	5.1	0.86*	16	6.8	8.7	5.7
Vanadium	mg/kg	100	5,800	30	13	18	20	2,200	18	79	94	66	430	33	28	400	69	120	110
Zinc	mg/kg	31,000	350,000	63	77	92	27	650	650	2,200	230	400	490	320	51	590	150	97	67
General Chemistry																			
Cyanide, Total	mg/kg	2,000	12	--	<0.25	<0.23	<0.24	0.31	<0.24	<0.25	0.39	0.65	3.8	0.77	0.15*	1.6	<0.24	0.26	0.16
pH	s.u.	--	--	--	7.53	8.00	7.54	9.66	7.23	11.8	10.4	9.78	11.8	8.60	10.4	10.8	9.64	11.7	8.44
Total Petroleum Hydrocarbon (TPH)																			
Gasoline Range Organics (GRO)	mg/kg	620	2,200****	--	NA	NA	<0.480	<0.500	NA	<0.470	NA	NA	NA	NA	<0.470	NA	1.2	NA	NA
Diesel Range Organics (DRO)	mg/kg	620	440****	--	NA	NA	12*	26,000	NA	630	NA	NA	NA	NA	20*	NA	520	NA	NA

[a] Soil Standards obtained from State of Maryland Department of the Environment (MDE) , Cleanup Standards for Soil an Groundwater, June 2008, Interim Final Guidance (Update No. 2.1), Tables 1 and 2

[b] U.S. EPA Regional Screening Levels obtained from "Regional Screening Levels for Chemical Contaminants at Superfund Sites" screening level/preliminary remediation goal website (RSL Summary Table, Target Cancer Risk = 1E-6, Target Hazard Quotient = 1, June 2015).

[c] Anticipated Typical Concentrations (ATCs)/Reference Levels for metals obtained from Appendix 2 - Attachment 2 for the Eastern Maryland Region of MDE Cleanup Standards for Soil and Groundwater, June 2008 (utilized if greater than MDE Soil Standards).

[d] Sample results for VOCs, SVOCs, pesticides, and PCBs that are below laboratory detection limits are not listed in the tabl

-- Not listed in Table 1 or 2 of MDE Cleanup Standards for Soil and Groundwater, June 2008.

<0.330 Concentration below laboratory reporting limit.

Concentration exceeds U.S. EPA industrial soil screening level.

Concentration exceeds MDE non-residential soil cleanup standard.

Concentration exceeds ATC (utilized if greater than MDE standards) .

mg/kg Milligrams per kilogram

NA Not analyzed

* Analyte concentration detected between reporting limit and method detection limit.

** Screening level for Cadmium (Diet).

*** Screening level for Mercuric Chloride (and other Mercury salts).

****TPH (Aliphatic Low) screening level used for GRO.

****TPH (Aliphatic Medium) screening level used for DRO.

Table 2
Groundwater Analytical Summary
Parcel A1
Sparrows Point, Maryland

Parameter	Units	MDE Groundwater Standards[a]	U.S. EPA Regional Screening Levels[b]	OSWER Generic Screening Levels[c]	Limited Phase II Environmental Site Assessment November 11, 2014				
		Type I and II Aquifers	MCL/*Tapwater*	Table 2c	SWM-2	SWM-4	SWM-5	B-5	B-11
Volatile Organic Compounds (VOCs)[d]									
Acetone	mg/L	0.55	*14.0*	220	0.0013*	<0.050	NA	0.0043*	0.0088*
Benzene	mg/L	0.005	0.005	0.005	<0.005	<0.005	NA	<0.005	0.00053*
2-Butanone	mg/L	0.7	*5.6*	440	<0.010	<0.010	NA	<0.010	0.0013*
Carbon Disulfide	mg/L	0.1	*0.81*	0.56	<0.010	0.00026*	NA	<0.010	<0.010
1,1-Dichloroethane	mg/L	0.09	*0.0027*	2.2	<0.005	<0.005	NA	<0.005	0.0077
1,1-Dichloroethene	mg/L	0.007	0.007	0.19	<0.005	<0.005	NA	<0.005	0.0029*
Trichloroethene	mg/L	0.005	0.005	0.005	0.00032*	<0.005	NA	<0.005	0.0014*
Semivolatile Organic Compounds (SVOCs)[d]									
Benzoic acid	mg/L	--	*75*	--	0.00063*	<0.051	NA	0.00094*	0.00062*
Butyl benzyl phthalate	mg/L	--	*0.016*	--	0.0012*	<0.010	NA	0.004*	<0.010
Diethyl phthalate	mg/L	2.9	*15.0*	--	0.00085*	<0.010	NA	0.0011*	0.0015*
Di-n-butyl phthalate	mg/L	0.37	*0.9*	--	0.0018*	<0.010	NA	0.00094*	<0.010
Pesticides[d]/Herbicides/PCBs									
4,4'-DDD	mg/L	0.00028	*0.000031*	--	0.00003*	0.00003*	NA	NA	NA
alpha-BHC	mg/L	0.000011	*0.0000071*	0.0031	0.00003*	<0.000050	NA	NA	NA
beta-BHC	mg/L	0.000037	*0.000025*	--	0.00001*	<0.00020	NA	NA	NA
Endrin	mg/L	0.002	0.002	--	<0.001	0.00003*	NA	NA	NA
Heptachlor	mg/L	0.0004	0.0004	0.0004	0.00006*	0.00005*	NA	NA	NA
Heptachlor epoxide	mg/L	0.0002	0.0002	--	0.00002*	<0.00010	NA	NA	NA
Methoxychlor	mg/L	0.040	0.040	--	0.00039*	<0.001	NA	NA	NA
Total Herbicides	mg/L	--	--	--	<0.00200	<0.00200	NA	NA	NA
Total PCBs	mg/L	--	--	--	<0.0005	<0.0005	NA	NA	NA
Inorganics, Total									
Aluminum	mg/L	0.05	*20*	--	20	3.0	9.3	3.1	1.8
Antimony	mg/L	0.006	0.006	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Arsenic	mg/L	0.01	0.01	--	0.026	0.0036	0.0057	0.0059	0.0022
Barium	mg/L	2.0	2.0	--	0.10	0.044	0.051	0.048	0.069
Beryllium	mg/L	0.004	0.004	--	0.0022	<0.0010	<0.0010	<0.0010	<0.0010
Cadmium	mg/L	0.005	0.005	--	2.0	<0.00050	<0.00050	0.0014	0.00051
Chromium, Total	mg/L	0.1	0.1	--	0.025	0.0040	0.013	0.0045	0.0023
Chromium, Trivalent	mg/L	0.1	*22*	--	0.025	<0.0050	<0.0050	<0.0050	<0.0050
Chromium, Hexavalent	mg/L	0.1	*0.000035*	--	<0.0050	0.023	0.0090	0.0070	0.020
Copper	mg/L	1.3	1.3	--	0.039	0.0033	0.017	0.0065	0.019
Iron	mg/L	0.3	*14*	--	110	4.4	11	26	4.2
Lead	mg/L	0.015	0.015	--	0.039	0.0068	0.017	0.0044	0.0023
Manganese	mg/L	0.05	*0.43*	--	6.6	0.22	1.1	2.2	0.36
Mercury	mg/L	0.002	0.002	0.00068	0.00036	<0.00020	<0.00020	<0.00020	<0.00020
Nickel	mg/L	0.073	*0.39*	--	0.072	<0.0050	0.052	0.029	0.044
Selenium	mg/L	0.05	0.05	--	<0.0050	<0.0050	0.012	<0.0050	<0.0050
Silver	mg/L	0.1	*0.094*	--	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Thallium	mg/L	0.002	0.002	--	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tin	mg/L	2.2	*12*	--	0.20	<0.20	<0.20	<0.20	<0.040
Vanadium	mg/L	0.0037	*0.086*	--	0.046	0.012	0.040	0.010	<0.0050
Zinc	mg/L	5.0	*6.0*	--	290	0.030	0.079	0.16	0.14

Table 2
Groundwater Analytical Summary
Parcel A1
Sparrows Point, Maryland

Parameter	Units	MDE Groundwater Standards[a]	U.S. EPA Regional Screening Levels[b]	OSWER Generic Screening Levels[c]	Limited Phase II Environmental Site Assessment November 11, 2014				
		Type I and II Aquifers	MCL/*Tapwater*	Table 2c	SWM-2	SWM-4	SWM-5	B-5	B-11
Inorganics, Dissolved									
Aluminum	mg/L	0.05	*20*	--	0.074	0.11	<0.010	<0.010	0.026
Antimony	mg/L	0.006	0.006	--	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Arsenic	mg/L	0.01	0.01	--	0.0047	0.0032	<0.0020	0.0043	<0.0020
Barium	mg/L	2.0	2.0	--	0.028	0.028	0.027	0.037	0.053
Beryllium	mg/L	0.004	0.004	--	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cadmium	mg/L	0.005	0.005	--	2.0	<0.00050	<0.00050	<0.00050	<0.00050
Chromium, Total	mg/L	0.1	0.1	--	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Chromium, Trivalent	mg/L	0.1	*22*	--	NA	NA	NA	NA	NA
Chromium, Hexavalent	mg/L	0.1	*0.000035*	--	NA	NA	NA	NA	NA
Copper	mg/L	1.3	1.3	--	0.012	<0.0010	0.0023	0.0016	0.0020
Iron	mg/L	0.3	*14*	--	46	<0.025	<0.025	18	0.73
Lead	mg/L	0.015	0.015	--	0.0015	<0.0010	<0.0010	<0.0010	<0.0010
Manganese	mg/L	0.05	*0.43*	--	6.1	0.13	0.98	2.1	0.24
Mercury	mg/L	0.002	0.002	0.00068	NA	NA	NA	NA	NA
Nickel	mg/L	0.073	*0.39*	--	0.056	<0.0050	0.033	0.024	0.032
Selenium	mg/L	0.05	0.05	--	<0.0050	<0.0050	0.013	<0.0050	<0.0050
Silver	mg/L	0.1	*0.094*	--	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Thallium	mg/L	0.002	0.002	--	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tin	mg/L	2.2	*12*	--	0.14	<0.040	<0.040	<0.040	<0.040
Vanadium	mg/L	0.0037	*0.086*	--	<0.0050	<0.0050	0.013	<0.0050	<0.0050
Zinc	mg/L	5.0	*6.0*	--	280	0.0056	0.014	0.057	0.058
General Chemistry									
Cyanide, Total	mg/L	0.2	0.2	--	<0.0050	<0.0050	<0.0050	<0.0050	0.012
Total Petroleum Hydrocarbon									
Gasoline Range Organics (GRO)	mg/L	0.047[e]	*1.3*	--	0.066*	0.075*	NA	NA	NA
Diesel Range Organics (DRO)	mg/L	0.047[e]	*0.1*	--	0.83	0.41	NA	NA	NA

[a] Groundwater Standards obtained from State of Maryland Department of the Environment (MDE) , Cleanup Standards for Soil and Groundwater, June 2008, Interim Final Guidance (Update No. 2.1), Tables 1 and 2.

[b] U.S EPA Maximum Contaminant Levels (MCLs) or Tapwater RSL (if MCL is not available) from "Regional Screening Levels for Chemical Contaminants at Superfund Sites" screening level/preliminary remediation goal website (RSL Summary Table, June 2015). Tapwater RSLs are shown in italics.

[c] Screening Levels from the Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Table 2c, November 2002

[d] Sample results for VOCs, SVOCs, and pesticides that are below laboratory detection limits are not listed in the table.

[e] Residential Cleanup Standard; non-residential standards for GRO and DRO are not listed in Table 2.

-- Not listed in Table 1 of MDE Cleanup Standards for Soil and Groundwater, June 2008.

<0.330 Concentration below laboratory reporting limit.

NA Not analyzed

Concentration exceeds groundwater standard for Type I and II Aquifers.

Concentration exceeds U.S. EPA Maximum Contaminant Level or Tapwater RSL (if MCL is not available).

Sample location is outside of the revised Parcel A1 property boundary.

mg/L Milligrams per liter

* Analyte concentration detected between reporting limit and method detection limit.

Table 3
Soil Analytical Summary
Parcel A1
Sparrows Point, Maryland

Parameter	Units	MDE Soil Standards[a]	U.S. EPA Regional Screening Levels[b]	Anticipated Typical Concentrations/ Reference Levels[c]	Supplemental Phase II Environmental Site Assessment																				
					February 5, 2015																				
					SP-16		SP-17		SP-18	SP-22		SP-23		SP-24		SP-25		SP-26		SP-27		SP-28	SP-29		SP-30	SP-31	SP-32
		Non-Residential Clean-up Standard	Industrial Soil		Surface	6-8'	Surface	6-8'	Surface	Surface	6-8'	Surface	6-8'	Surface	6-8'	Surface	10-12'	Surface	6-8'	Surface	6-8'	Surface	Surface	6-8'	Surface	Surface	Surface
Semivolatile Organic Compounds (SVOCs)[d]																											
Acenaphthene	mg/kg	6,100	45,000	--	<0.050	<0.050	0.18	<0.050	<0.050	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Acenaphthylene	mg/kg	6,100	--	--	0.30	<0.050	0.96	<0.050	0.095	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Anthracene	mg/kg	31,000	230,000	--	0.16	<0.050	1.4	<0.050	0.062	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Benzo(a)anthracene	mg/kg	3.9	2.9	--	0.10	<0.050	1.7	<0.050	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Benzo(a)pyrene	mg/kg	0.39	0.29	--	0.16	<0.050	1.9	<0.050	0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	4	2.9	--	0.30	<0.050	3.0	<0.050	0.51	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Benzo(g,h,i)perylene	mg/kg	3,100	--	--	0.41	<0.050	1.8	<0.050	0.21	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	39	29	--	0.093	<0.050	1.1	<0.050	0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Chrysene	mg/kg	390	290	--	0.097	<0.050	1.9	<0.050	0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Dibenzo(a,h)anthracene	mg/kg	0.39	0.29	--	0.074	<0.050	0.36	<0.050	0.032	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Fluoranthene	mg/kg	4,100	30,000	--	0.094	<0.050	3.4	<0.050	0.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Fluorene	mg/kg	4,100	30,000	--	<0.050	<0.050	0.19	<0.050	<0.050	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	3.9	2.9	--	0.27	<0.050	1.4	<0.050	0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Naphthalene	mg/kg	2,000	17	--	<0.050	<0.050	0.21	<0.050	<0.050	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Phenanthrene	mg/kg	31,000	--	--	0.17	<0.050	1.3	<0.050	0.045	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Pyrene	mg/kg	3,100	23,000	--	0.11	<0.050	3.5	<0.050	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.050	NA	NA	NA	NA	<0.050	NA	NA	NA
Pesticides[d]/Herbicides/PCBs[d]																											
4,4'-DDD	mg/kg	12	9.6	--	NA	NA	NA	0.0017	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0017	NA	NA	NA	NA	0.0021	NA	NA	NA
beta-BHC	mg/kg	1.6	1.3	--	NA	NA	NA	0.00086	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0013	NA	NA	NA	NA	<0.017	NA	NA	NA
Endrin ketone	mg/kg	31.0	--	--	NA	NA	NA	0.0091	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.012	NA	NA	NA	NA	0.016	NA	NA	NA
Aroclor 1260	mg/kg	1.4	0.99	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.022	<0.033	4.1
Inorganics																											
Aluminum	mg/kg	100,000	1,100,000.00	11,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	49,000	31,000	25,000	14,000	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	mg/kg	41	470	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.20	0.084	0.061	0.098	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	mg/kg	1.9	3	3.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.50	1.8	1.5	21	NA	NA	NA	NA	NA	NA	NA	NA
Barium	mg/kg	20,000	220,000	73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380	280	470	35	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	mg/kg	200	2,300	0.66	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.1	2.6	2.8	0.63	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	mg/kg	51	980**	0.73	NA	NA	NA	NA	NA	7.2	23	240	8.0	2.1	0.22	3.6	4.3	7.5	1.7	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Total	mg/kg	310	--	28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.6	13	49	28	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Trivalent	mg/kg	150,000	1,800,000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.6	13	49	28	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Hexavalent	mg/kg	310	6.3	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4.75	<50.0	<52.8	<12.4	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	mg/kg	--	350	--	NA	NA	NA	NA	NA	12	0.29	6.3	3.3	1.9	1.8	1.0	2.6	3.1	4.1	NA	NA	NA	NA	NA	NA	NA	NA
Copper	mg/kg	4,100	47,000	12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.0	75	22	13	NA	NA	NA	NA	NA	NA	NA	NA
Iron	mg/kg	72,000	820,000	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8,800	16,000	27,000	34,000	NA	NA	NA	NA	NA	NA	NA	NA
Lead	mg/kg	1,000	800	45	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.3	39	23	15	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	mg/kg	2,000	26,000	480	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5,600	3,700	4,600	79	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	mg/kg	2,000	22,000	13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9	4.9	6.6	10	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	mg/kg	510	5,800	2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.7	2.4	2.5	0.42	NA	NA	NA	NA	NA	NA	NA	NA
Silver	mg/kg	510	5,800	0.94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.20	0.16	0.32	0.085	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	mg/kg	7.2	12	3.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.020	0.045	0.096	0.13	NA	NA	NA	NA	NA	NA	NA	NA
Tin	mg/kg	61,000	700,000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.73	3.4	1.9	1.2	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	mg/kg	100	5,800	30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14	29	140	49	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	mg/kg	31,000	350,000	63	NA	NA	NA	NA	NA	280	1,400	33,000	1,200	280	19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Petroleum Hydrocarbon (TPH)																											
Gasoline Range Organics (GRO)	mg/kg	620	2,200****	--	NA	NA	NA	<0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.50	NA	NA	NA	NA	0.17	NA	NA	NA
Diesel Range Organics (DRO)	mg/kg	620	440****	--	350	24	2,500	19	55	NA	NA	NA	NA	NA	NA	NA	NA	NA	33	29	1,000	14,000	71	260	NA	NA	NA

[a] Soil Standards obtained from State of Maryland Department of the Environment (MDE) , Cleanup Standards for Soil and Groundwater, June 2008, Interim Final Guidance (Update No. 2.1), Tables 1 and 2

[b] U.S. EPA Regional Screening Levels obtained from "Regional Screening Levels for Chemical Contaminants at Superfund Sites" screening level/preliminary remediation goal website (RSL Summary Table, Target Cancer Risk = 1E-6, Target

[c] Anticipated Typical Concentrations (ATCs)/Reference Levels for metals obtained from Appendix 2 - Attachment 2 for the Eastern Maryland Region of MDE Cleanup Standards for Soil and Groundwater, June 2008 (utilized if greater than MDE

[d] Sample results for SVOCs,pesticides, and PCBs that are below laboratory detection limits are not listed in the table.

-- Not listed in Table 1 or 2 of MDE Cleanup Standards for Soil and Groundwater, June 2008.

<0.330 Concentration below laboratory reporting limit.

Concentration exceeds U.S. EPA industrial soil screening level.

Concentration exceeds MDE non-residential soil cleanup standard.

Concentration exceeds ATC (utilized if greater than MDE standards) .

Sample location is outside of the revised Parcel A1 property boundary.

mg/kg Milligrams per kilogram

NA Not analyzed

* Analyte concentration detected between reporting limit and method detection limit.

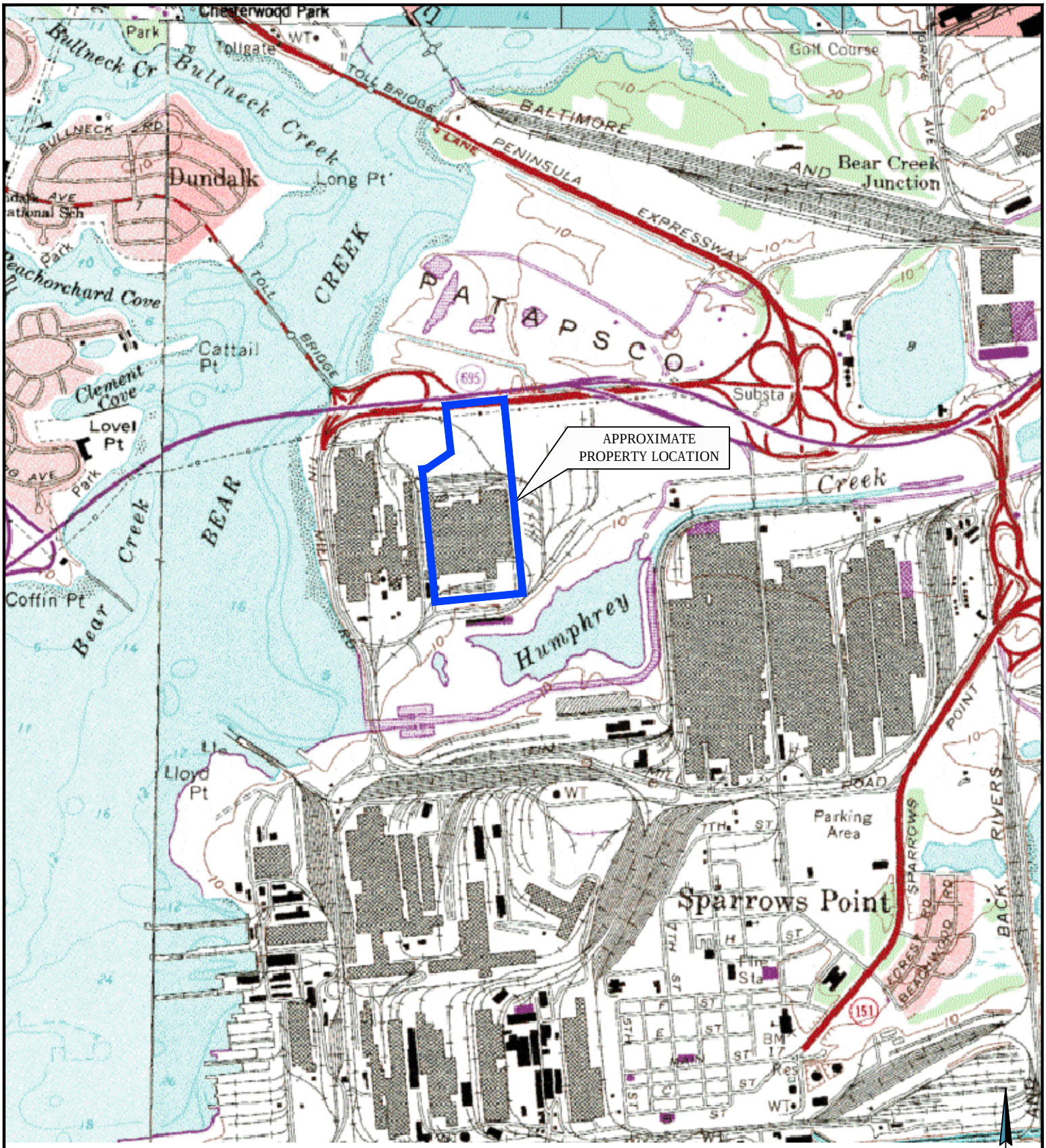
** Screening level for Cadmium (Diet).

*** Screening level for Mercuric Chloride (and other Mercury salts).

****TPH (Aliphatic Low) screening level used for GRO.

****TPH (Aliphatic Medium) screening level used for DRO.

Figures



APPROXIMATE GRAPHIC SCALE

1500 0 750 1500 3000

1 inch = 1500 ft.

SOURCE: IMAGE ADAPTED FROM MAPCARD SPARROWS POINT, MD DATED 1974.

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SITE LOCATION MAP

PARCEL A1
FORMER SPARROWS POINT STEEL MILL
SPARROWS POINT, MD

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FIGURE 1



APPROXIMATE GRAPHIC SCALE

400 0 200 400 800

1 inch = 400 ft.

SOURCE: IMAGE ADAPTED FROM GOOGLE EARTH IMAGERY DATED AUGUST 2010.

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SITE LAYOUT MAP

PARCEL A1
FORMER SPARROWS POINT STEEL MILL
SPARROWS POINT, MD

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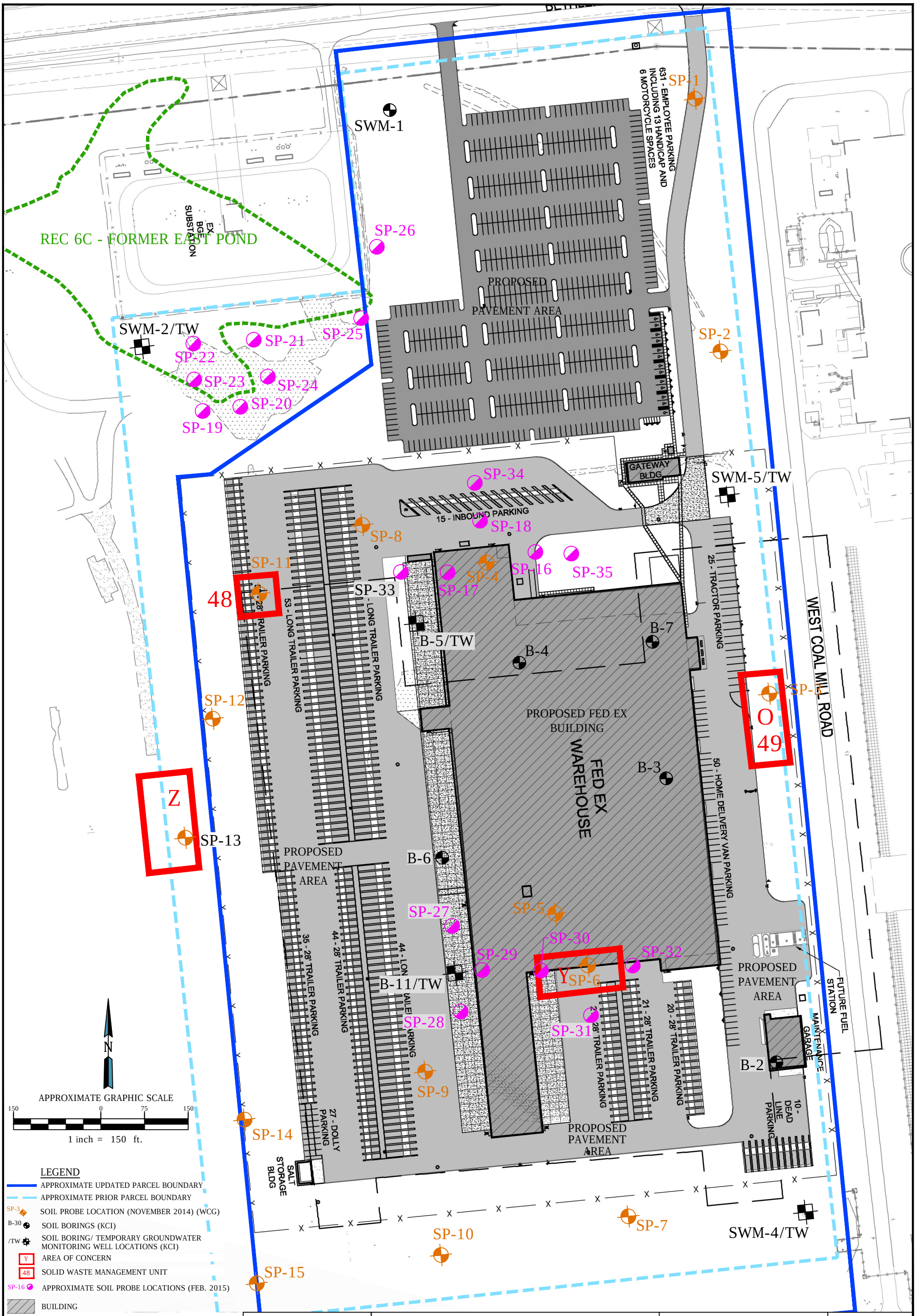
DRAWN BY: RMD
REVIEWED BY: MM
DATE: 2/19/2015
FILE: 3751-300-01
CAD: BASE MAP.dwg

FIGURE 2



SOURCE: BASE IMAGE ADAPTED FROM KCI TECHNOLOGIES SITE MAP AND SOIL BORING PLAN DATED JANUARY 9, 2015.

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PREPARED FOR:

SCANNELL PROPERTIES

APPROXIMATE BORING LOCATION PLAN

PARCEL A1
FORMER SPARROWS POINT STEEL MILL
SPARROWS POINT, MD

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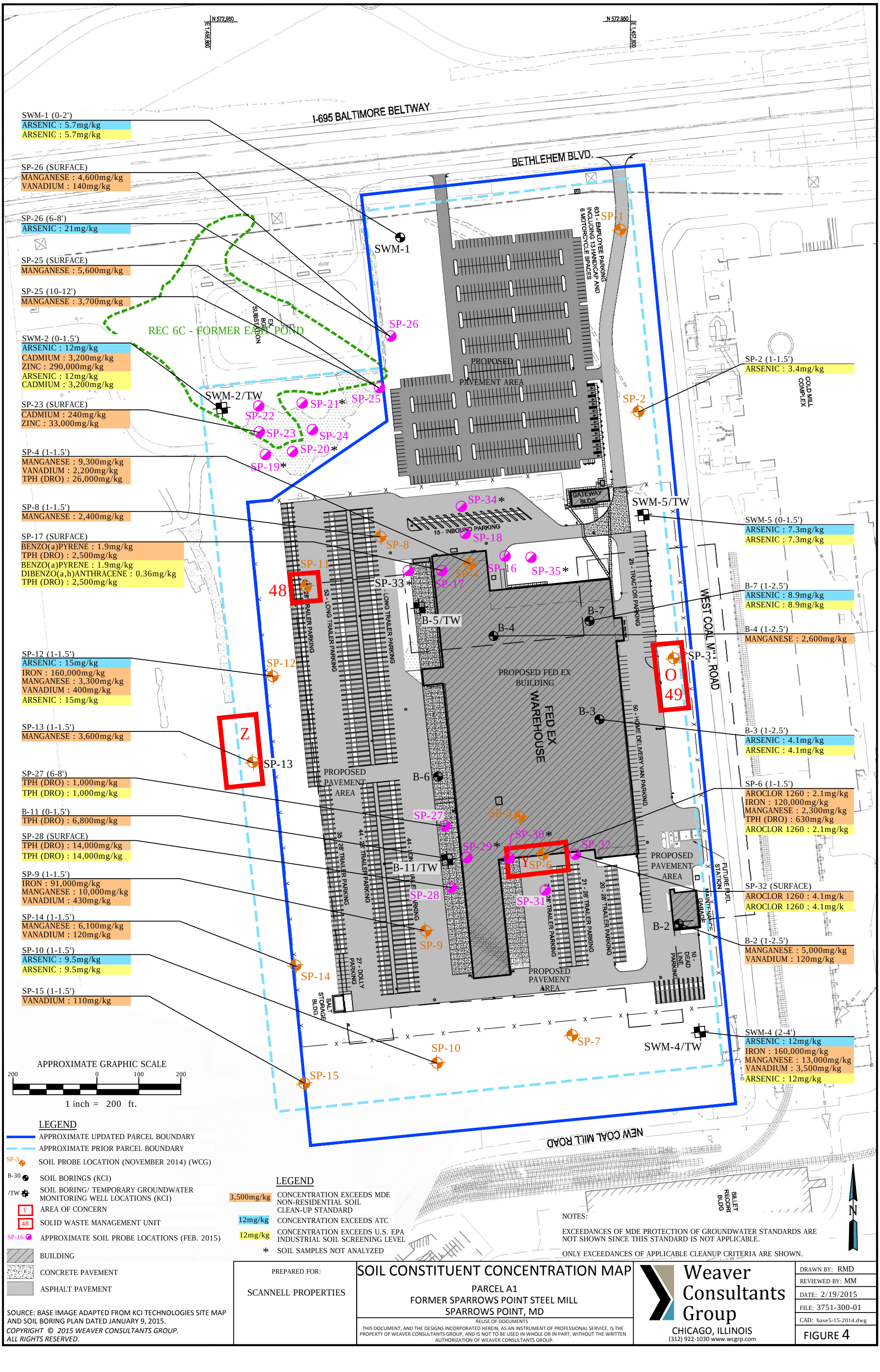
DRAWN BY: RMD
REVIEWED BY: MM
DATE: 2/19/2015
FILE: 3751-300-01
CAD: base5-15-2014.dwg

FIGURE 3



APPROXIMATE GRAPHIC SCALE

200 0 100 200

1 inch = 200 ft.

LEGEND

- APPROXIMATE UPDATED PARCEL BOUNDARY
- APPROXIMATE PRIOR PARCEL BOUNDARY
- SP-3 SOIL PROBE LOCATION (NOVEMBER 2014) (WCG)
- B-30 SOIL BORINGS (KCI)
- /TW SOIL BORING/ TEMPORARY GROUNDWATER MONITORING WELL LOCATIONS (KCI)
- Y AREA OF CONCERN
- 48 SOLID WASTE MANAGEMENT UNIT
- SP-16 APPROXIMATE SOIL PROBE LOCATIONS (FEB. 2015)
- BUILDING
- CONCRETE PAVEMENT
- ASPHALT PAVEMENT

LEGEND

- 3,500mg/kg CONCENTRATION EXCEEDS MDE NON-RESIDENTIAL SOIL CLEAN-UP STANDARD
- 12mg/kg CONCENTRATION EXCEEDS ATC
- 12mg/kg CONCENTRATION EXCEEDS U.S. EPA INDUSTRIAL SOIL SCREENING LEVEL
- * SOIL SAMPLES NOT ANALYZED

NOTES:

EXCEEDANCES OF MDE PROTECTION OF GROUNDWATER STANDARDS ARE NOT SHOWN SINCE THIS STANDARD IS NOT APPLICABLE.

ONLY EXCEEDANCES OF APPLICABLE CLEANUP CRITERIA ARE SHOWN.

N

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PREPARED FOR:

SCANNELL PROPERTIES

SOIL CONSTITUENT CONCENTRATION MAP

PARCEL A1
FORMER SPARROWS POINT STEEL MILL
SPARROWS POINT, MD

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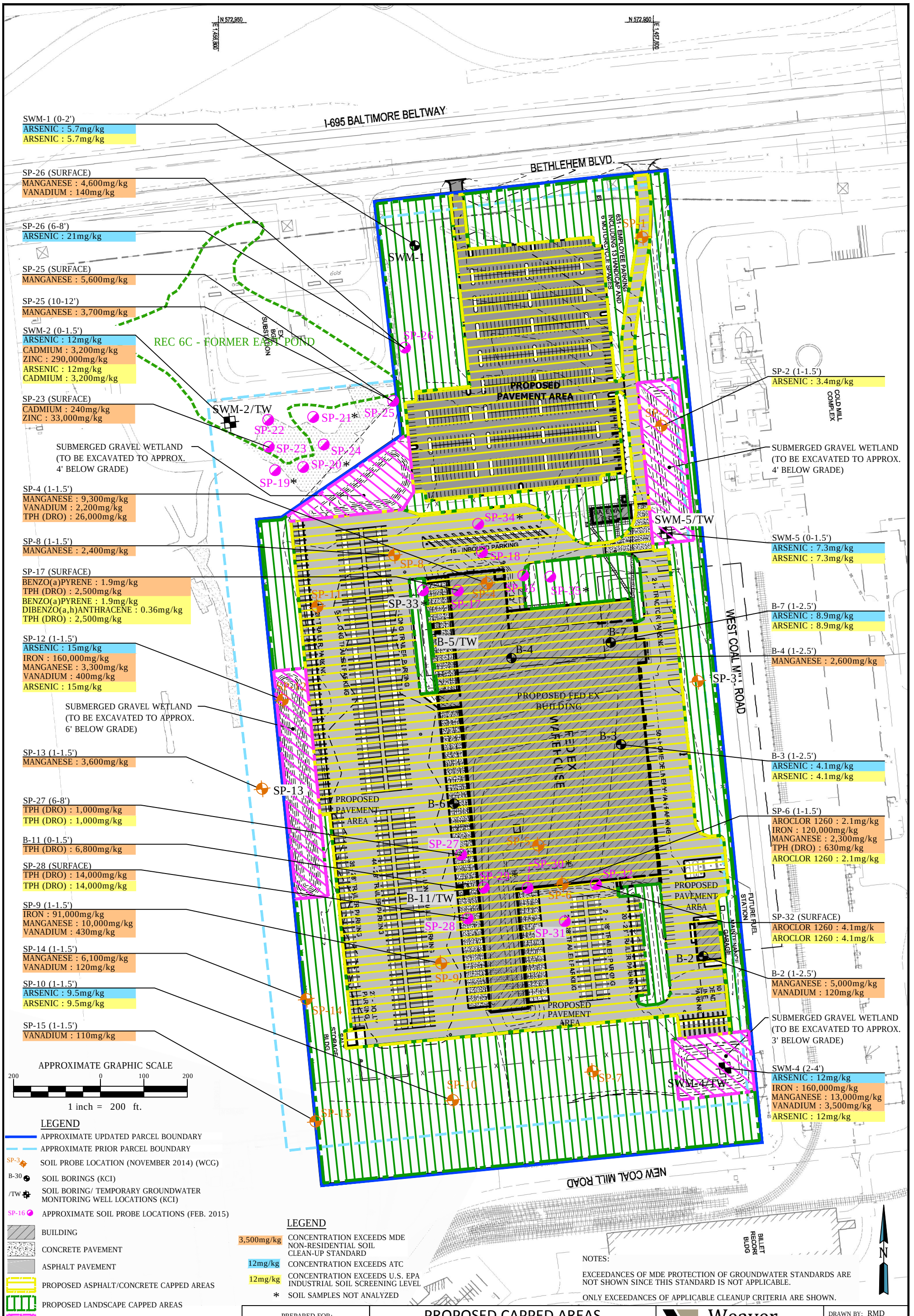
DRAWN BY: RMD
REVIEWED BY: MM
DATE: 2/19/2015
FILE: 3751-300-01
CAD: base5-15-2014.dwg

FIGURE 4



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PREPARED FOR:

SCANNELL PROPERTIES

PROPOSED CAPPED AREAS

PARCEL A1
SPARROWS POINT TERMINAL
BALTIMORE, MD

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DRAWN BY: RMD
REVIEWED BY: MM
DATE: 6/12/2015
FILE: 3751-300-01
CAD: base6-12-2015.dwg

FIGURE 5

Appendix A

Soil Boring/Soil Probe Logs

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **11.36 (ft)**

TEST BORING LOG
B-02

SHEET 1 OF 2

Driller:	Method:	Casing Length:	Date Begun:
Nelson / FSD	**HSA**	**43.5 ft**	**11/13/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/13/2014**

Groundwater Levels (feet)

0 hour: 2 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6" / REC RQD
	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.						
▽	6" GRAVEL FILL Sampled As: Moist, black and brown, very dense, Sandy GRAVEL and rock fragments(GP)		10	S-1		0	50/5" REC=5"
5	FILL Sampled As: Wet, dark green and gray, loose, Clayey Silty SAND and Gravel (SC-SM)		5	S-2		0	4-3-2 N = 5 REC=12"
				S-3		0	2-2-2 N = 4 REC=8"
10	Moist, dark green, very soft, Clayey SILT, trace mica (CL-ML)		0	S-4		0	WOH-WOH-1 N = 1 REC=16"
15	Moist, dark gray, very soft, Sandy SILT, little organics (ML)		-5	S-5		0	WOH-WOH-1 N = 1 REC=18"
20	Moist, gray and brown, soft, Sandy, Silty CLAY (CL-ML)		-10	S-6			WOH-1-2 N = 3 REC=18"
25	Wet, brown to dark brown, medium dense, Silty SAND (SM)		-15	S-7			31-11-19 N = 30 REC=12"
30	Wet, dark gray to greenish gray, very soft to medium stiff, Silty CLAY (CL-ML)		-20	S-8			WOH/18" REC=12"
35			-25	S-9			2-2-2 N = 4 REC=18"

PLASTIC M.C. LIQUID

□FINES (%)

●SPT (bpf)

20 40 60 80 100

KCI-KOA PLOG.W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **11.36 (ft)**

TEST BORING LOG
B-02

SHEET 2 OF 2

Driller:	Method:	Casing Length:	Date Begun:	Groundwater Levels (feet)
Nelson / FSD	**HSA**	**43.5 ft**	**11/13/2014**	0 hour: 2
KCI Representative: **LSG**	Hammer Type: **Automatic**	Casing Diameter: **3.25"**	Date Completed: **11/13/2014**	24 hours:

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" / REC RQD	PLASTIC M.C. LIQUID / FINES (%) / SPT (bpf)
	Wet, dark gray to greenish gray, very soft to medium stiff, Silty CLAY (CL-ML)			S-10			WOH-3-2 N = 5 REC=18"	
40			-30					
				S-11			S3-2-3 N = 5 REC=18"	
45	Boring terminated at 45 ft. bgs		-35					
50			-40					
55			-45					
60			-50					
65			-55					
70			-60					
75								

Notes:
1) Hard drilling to 3.5 feet bgs.
2) We encountered groundwater at 2 feet bgs during drilling.
3) Borehole grouted upon completion.

KCI-KOA PLOG W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.55 (ft)**

TEST BORING LOG
B-03

SHEET 1 OF 2

Driller:	Method:	Casing Length:	Date Begun:
West/FSD	**HSA**	**48.5 ft**	**11/12/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/12/2014**

Groundwater Levels (feet)

0 hour: 8 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	IDNET	TYPE	PID (ppm)	N-COUNT (1st 6" / 2nd 6" / 3rd 6" / 4th 6") REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.							20 40 60 80 100
0	6" TOPSOIL		10					
	Moist, orange and tan, stiff, micaceous, Sandy SILT (ML)			S-1		0	3-4-6 N = 10 REC=16"	
	S-2: And Clayey SAND			S-2		0	3-3-3 N = 6 REC=16"	
5			5					5
	Wet, orange, soft, Sandy Silty CLAY (CL-ML)			S-3		0.1	2-2-2 N = 4 REC=18"	
▽				S-4		0	1-1-2 N = 3 REC=18"	
10			0					10
	Wet, orange, gray, loose, Silty Clayey SAND (SC-SM)			S-5		0	2-2-3 N = 5 REC=18"	
15	Wet, orange, gray, medium stiff, Silty CLAY (CL-ML)		-5					15
	Wet, dark gray, very soft, Sandy SILT (ML)			S-6			WOH-WOH-2 N = 2 REC=18"	
20			-10					20
	Moist, dark gray, soft to very soft, Silty CLAY, little SAND (CL-ML)			S-7			3-2-2 N = 4 REC=18"	
25			-15					25
	S-8: Micaceous			S-8			2-1-3 N = 4 REC=16"	
30			-20					30
				S-9			WOH-WOH-1 N = 1 REC=18"	
35			-25					35

KCI-KOA PLOG W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.55 (ft)**

TEST BORING LOG
B-03

SHEET **2** OF **2**

Driller:	Method:	Casing Length:	Date Begun:
West/FSD	**HSA**	**48.5 ft**	**11/12/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/12/2014**

Groundwater Levels (feet)

0 hour: 8 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
40	Wet, tan, brown and gray, loose to medium dense, Silty SAND (SM)		-30	S-10			3-3-2 N = 5 REC=18"		
45			-35	S-11			4-6-6 N = 12 REC=16"		
50	S-12: Orangish brown, trace Gravel		-40	S-12			3-6-8 N = 14 REC=16"		
	Boring terminated at 50 ft. bgs								

Notes:
1) We encountered groundwater at approximately 8 feet bgs during drilling.
2) Borehole grouted upon completion.

KCI-KOA PLOG W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.78 (ft)**

TEST BORING LOG
B-04

SHEET 1 OF 2

Driller:	Method:	Casing Length:	Date Begun:
Nelson / FSD	**HSA**	**48.5 ft**	**11/12/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/12/2014**

Groundwater Levels (feet)

0 hour: 1 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6" — REC RQD
▽	FILL Sampled As: Wet, dark gray and black,very dense, Silty GRAVEL, brick fragments, debris (GM)		10	S-1		0	50/1" — REC=1"
5	FILL Sampled As: Wet, dark gray and black, very dense, Silty Clayey GRAVEL, brick fragments, debris (GM-GC)		5	S-2		0.2	4-4-5 — N = 9 — REC=8"
	Moist to wet, gray to gray and brown, soft, Silty CLAY, trace Sand (CL-ML)			S-3		0	2-2-2 — N = 4 — REC=16"
10			0	S-4		0	3-1-2 — N = 3 — REC=16"
15	Wet, gray and orange, very loose, Silty SAND (SM)		-5	S-5			WOH/18" — REC=12"
20	Wet, gray, soft, Sandy Lean CLAY (CL)		-10	S-6			1-2-2 — N = 4 — REC=18
25	Wet, gray very soft to medium stiff, Silty CLAY (CL-ML)		-15	S-7			WOH-WOH-1 — N = 1 — REC=18"
30			-20	S-8			1-1-1 — N = 2 — REC=18"
35			-25	S-9			3-2-3 — N = 5 — REC=12"

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

SAMPLES

PLASTIC M.C. LIQUID

□FINES (%)

●SPT (bpf)

20 40 60 80 100

KCI-KOA PLOG W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.78 (ft)**

TEST BORING LOG
B-04

SHEET 2 OF 2

Driller:	Method:	Casing Length:	Date Begun:
Nelson / FSD	**HSA**	**48.5 ft**	**11/12/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/12/2014**

Groundwater Levels (feet)

0 hour: 1 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	SAMPLES TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID / FINES (%) / SPT (bpf)
40	Wet, gray, loose, Silty SAND, little Silty Clay (SM)		-30	S-10			3-2-3	N = 5 REC=18"	
45	Wet, dark gray, soft to stiff, Silty CLAY, trace rock fragments (CL-ML)		-35	S-11			3-3-1	N = 4 REC=12"	
	S-11: Some Sand			S-12			4-5-4	N = 9 REC=12"	
50	Wet, light gray, loose, Silty SAND (SM)		-40						
	Boring terminated at 50 ft. bgs								
55	Notes: 1) We encountered groundwater at approximately 1 foot bgs. 2) Borehole grouted upon completion.		-45						
60			-50						
65			-55						
70			-60						
75			-65						

PLASTIC M.C. LIQUID

☐ FINES (%)

● SPT (bpf)

20 40 60 80 100

KCI-KOA PLOG.W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.25 (ft)**

TEST BORING LOG
B-05

SHEET 1 OF 2

Driller:	Method:	Casing Length:	Date Begun:
Jay / FSD	**HSA**	**48.5 ft**	**11/10/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/11/2014**

Groundwater Levels (feet)

0 hour: 2 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	IDNET	TYPE	PID (ppm)	SAMPLES N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6" REC RQD
	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.						
0	6" GRAVEL		10				
▽	FILL Sampled As: Moist to wet, black, dark gray, and brown, medium dense, Silty SAND, trace to little Clay (SM)			S-1		0	4-5-8-10 N = 13 REC=16"
				S-2		0	2-3-3-4 N = 6 REC=16"
5	Wet, gray to light gray, orange, medium stiff, Silty CLAY, trace Sand, trace wood fragments below 8 feet (CL-ML)		5	S-3		0	4-3-3-4 N = 6 REC=19"
				S-4		0	3-2-3-4 N = 5 REC=24"
	S-5: No Recovery			S-5		0	4-4-3-3 N = 7 REC=0
10			0	S-6			3-4-3-3 N = 7 REC=24"
	S-7: Micaceous			S-7			2-2-3-3 N = 5 REC=24"
15			-5	S-8			1-1-1-8 N = 2 REC=24"
	Wet, gray, loose, Silty SAND (SM)						
	Wet, dark gray, very soft, Sandy Silty CLAY (CL-ML)			S-9			1-1-1 N = 2 REC=14"
20	Wet, dark gray to greenish gray, very soft to medium stiff, Silty CLAY (CL-ML)		-10				
				S-10			WOH/18" REC=14"
25			-15				
				S-11			3-3-2 N = 5 REC=14"
30			-20				
				S-12			3-2-2 N = 4 REC=16"
35			-25				

PLASTIC M.C. LIQUID

☐FINES (%)

●SPT (bpf)

20 40 60 80 100

KCI-KOA PLOG.W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.25 (ft)**

TEST BORING LOG
B-05

SHEET **2** OF **2**

Driller:	Method:	Casing Length:	Date Begun:
Jay / FSD	**HSA**	**48.5 ft**	**11/10/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/11/2014**

Groundwater Levels (feet)

0 hour: 2 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
40	Wet dark gray, stiff, Sandy Lean CLAY (CL)		-30	S-13			3-6-7 N = 13 REC=16"		
45	Wet, gray, medium dense, Silty SAND (SM)		-35	S-14			3-9-8 N = 17 REC=12"		
50	Moist, dark gray, micaceous, Sandy SILT (ML)		-40	S-15			3-5-5 N = 10 REC=16"		
	Boring terminated at 50 ft. bgs								
	Notes: 1) We encountered groundwater at approximately 2 feet bgs during drilling. 2) Environmental well stand pipe installed at 16 feet bgs. 3) Borehole grouted upon completion.								

20 40 60 80 100

40 45 50 55 60 65 70 75

-30 -35 -40 -45 -50 -55 -60 -65

KCI-KOA PLOG W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.54 (ft)**

TEST BORING LOG
B-06

SHEET 1 OF 2

Driller:	Method:	Casing Length:	Date Begun:
Nelson / FSD	**HSA**	**38.5 ft**	**11/12/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Manual**	**3.25"**	**11/12/2014**

Groundwater Levels (feet)

0 hour: 19 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" / REC RQD
	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.						
0	5" TOPSOIL Moist, dark gray, stiff, CLAY (CL)		10	S-1		0	4-5-7 N = 12 REC=16"
5	Moist, gray and dark orange, soft to medium stiff, Silty CLAY (CL-ML)		5	S-2		1	2-3-4 N = 7 REC=18"
				S-3		0.2	2-2-2 N = 4 REC=13"
10	S-4: Little Sand		0	S-4		0.2	WOH/18" REC=7"
15	Moist, dark gray, very soft, micaceous, Silty CLAY (CL-ML)		-5	S-5		0.7	WOH/18" REC=18"
20 ▽	Wet, gray, very loose, Silty SAND (SM)		-10	S-6			1-2-2 N = 4 REC=18"
25	Moist, dark gray, very soft, Silty CLAY (CL-ML)		-15	S-7			WOH/18" REC=18"
30	Wet, gray, very loose, Silty SAND (SM)		-20	S-8			WOH/18" REC=18"
35	Wet, gray, medium stiff, Silty CLAY, 2" Sand seam at 39 feet bgs (CL-ML)		-25	S-9			2-3-3 N = 6 REC=18"

PLASTIC M.C. LIQUID

☐FINES (%)

●SPT (bpf)

20 40 60 80 100

KCI-KOA PLOG.W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.54 (ft)**

TEST BORING LOG
B-06

SHEET **2** OF **2**

Driller:	Method:	Casing Length:	Date Begun:
Nelson / FSD	**HSA**	**38.5 ft**	**11/12/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Manual**	**3.25"**	**11/12/2014**

Groundwater Levels (feet)

0 hour: 19 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	SAMPLES TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
40	Wet, gray, medium stiff, Silty CLAY, 2" Sand seam at 39 feet bgs (CL-ML)		-30	S-10			3-3-4 N = 7 REC=18"		
	Boring terminated at 40 ft. bgs								
	Notes: 1) We encountered groundwater at approximately 19 feet bgs during drilling. 2) Borehole grouted upon completion.								

PLASTIC M.C. LIQUID — FINES (%) — SPT (bpf)

20 40 60 80 100

40 45 50 55 60 65 70 75

-30 -35 -40 -45 -50 -55 -60 -65

KCI-KOA PLOG W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.78 (ft)**

TEST BORING LOG
B-07

SHEET 1 OF 3

Driller:	Method:	Casing Length:	Date Begun:
West/FSD	**HSA**	**73.5 ft**	**11/12/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/12/2014**

Groundwater Levels (feet)

0 hour: 9 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" / REC RQD
	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.						
0	Moist, gray and orange, stiff, CLAY and SILT, trace Sand (CL-ML)		10	S-1		1	6-7-7 N = 14 REC=14"
5			5	S-2		2.1	4-6-7 N = 13 REC=16"
	Moist, gray and orange, medium stiff, Silty CLAY (CL-ML)			S-3		1.7	2-3-3 N = 6 REC=16"
▽ 10			0	S-4		2.7	3-2-3 N = 5 REC=18"
15			-5	S-5		1.7	WOH-WOH-2 N = 2 REC=18"
20	Wet dark gray, very loose, Silty SAND, trace mica (SM)		-10	S-6			WOH-2-2 N = 4 REC=18"
25	Moist, dark gray to dark greenish gray, very soft to medium stiff, Silty CLAY, trace Sand below 28.5 feet bgs (CL-ML)		-15	S-7			WOH-WOH-2 N = 2 REC=18"
30			-20	S-8			2-2-2 N = 4 REC=18"
35			-25	S-9			1-3-2 N = 5 REC=18"

PLASTIC M.C. LIQUID

□FINES (%)

●SPT (bpf)

20 40 60 80 100

KCI-KOA PLOG W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.78 (ft)**

TEST BORING LOG
B-07

SHEET **2** OF **3**

Driller:	Method:	Casing Length:	Date Begun:
West/FSD	**HSA**	**73.5 ft**	**11/12/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/12/2014**

Groundwater Levels (feet)

0 hour: 9 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6" REC RQD	PLASTIC M.C. LIQUID ☐FINES (%) ●SPT (bpf)
40	Moist, gray, medium stiff, micaceous, Sandy SILT (ML)		-30	S-10			4-3-4 N = 7 REC=18"	
45	Wet, tan to brown, loose to medium dense, Silty SAND (SM)		-35	S-12			1-4-4 N = 8 REC=18"	
50			-40	S-13			5-11-11 N = 22 REC=14"	
55			-45	S-14			1-7-8 N = 15 REC=12"	
60			-50	S-15			5-7-9 N = 16 REC=14"	
65			-55	S-16			3-5-7 N = 12 REC=8"	
70			-60					
75	Moist, gray and brown, medium dense, Sandy GRAVEL (GP)		-65					

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

20 40 60 80 100

KCI-KOA PLOG.W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.78 (ft)**

TEST BORING LOG
B-07

SHEET 3 OF 3

Driller:	Method:	Casing Length:	Date Begun:
West/FSD	**HSA**	**73.5 ft**	**11/12/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/12/2014**

Groundwater Levels (feet)

0 hour: 9 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	SAMPLES TYPE	SAMPLES PID (ppm)	SAMPLES N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	SAMPLES REC RQD	PLASTIC M.C. LIQUID ☐FINES (%) ●SPT (bpf)
80	Boring terminated at 75 ft. bgs		10						20 40 60 80 100
85	Notes: 1) We encountered groundwater at approximately 9 feet bgs during drilling. 2) Borehole grouted upon completion.		-70						
90			-75						
95			-80						
100			-85						
105			-90						
110			-95						
			-100						

KCI-KOA PLOG W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **11.06 (ft)**

TEST BORING LOG
B-11

SHEET 1 OF 3

Driller:	Method:	Casing Length:	Date Begun:
West/FSD	**HSA**	**73.5 ft**	**11/10/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/11/2014**

Groundwater Levels (feet)

0 hour: 8 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6" — REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
0	Moist, gray and brown, very stiff, Sandy SILT (ML)		10	S-1		0	12-14-9-7 N = 23 REC=15"	
	Moist, orange and gray, very stiff to stiff, Sandy Silty CLAY (CL-ML) And rock fragments below 4 feet			S-2		0	8-6-9-9 N = 15 REC=24"	
5				S-3			2-4-6-6 N = 10 REC=8"	
	Moist, gray, very stiff to soft, Silty CLAY, trace to some Sand (CL-ML)		5	S-4			6-7-8-8 N = 15 REC=19"	
▽				S-5		0	3-2-3-4 N = 5 REC=24"	
10			0	S-6			4-4-4-5 N = 8 REC=24"	
				S-7		0	WOH-1-2-2 N = 3 REC=24"	
15			-5	S-8			WOH-1-2-2 N = 3 REC=24"	
	Wet, gray, loose, Silty SAND (SM)			S-9			2-4-4 N = 8 REC=12"	
20			-10					
	Moist, dark gray very soft to soft, Silty CLAY, trace to little Sand (CL-ML)			S-10			WOH/18" REC=18"	
25			-15					
				S-11			WOH/18" REC=18"	
30			-20					
				S-12			WOH-2-1 N = 3 REC=10"	
35			-25					

KCI-KOA PLOG W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **11.06 (ft)**

TEST BORING LOG
B-11

SHEET **2** OF **3**

Driller:	Method:	Casing Length:	Date Begun:
West/FSD	**HSA**	**73.5 ft**	**11/10/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/11/2014**

Groundwater Levels (feet)

0 hour: 8 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6" REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
40	Moist, dark gray very soft to soft, Silty CLAY, trace to little Sand (CL-ML)		-30	S-13			2-2-2 N = 4 REC=16"	
45			-35	S-14			WOH-2-2 N = 4 REC=18"	
50	Moist, dark gray, stiff, micaceous, Sandy SILT (ML)		-40	S-15			3-4-8 N = 12 REC=18"	
55	Moist, tan, very soft, micaceous, Sandy Silty CLAY (CL-ML)		-45	S-16			WOH-WOH-1 N = 1 REC=18"	
60	Wet, light gray to light orange, loose to medium dense, Silty SAND, trace Clay (SM)		-50	S-17			3-3-6 N = 9 REC=18"	
65			-55	S-18			6-7-7 N = 14 REC=8"	
70			-60	S-19			4-6-9 N = 15 REC=12"	
75	Moist, gray, medium stiff, Sandy Silty CLAY (CL-ML)			S-20			8-3-4 N = 7 REC=12"	

PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)

20 40 60 80 100

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

KCI-KOA PLOG.W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **11.06 (ft)**

TEST BORING LOG
B-11

SHEET 3 OF 3

Driller:	Method:	Casing Length:	Date Begun:
West/FSD	**HSA**	**73.5 ft**	**11/10/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/11/2014**

Groundwater Levels (feet)

0 hour: 8 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	SAMPLES TYPE	SAMPLES PID (ppm)	SAMPLES N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	SAMPLES REC RQD	PLASTIC M.C. LIQUID ☐FINES (%) ●SPT (bpf) 20 40 60 80 100
80	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.		-70						
85	Boring terminated at 75 ft. bgs Notes: 1) We encountered groundwater at 8 feet bgs during drilling. 2) Environmental stand pipe installed at 16 feet bgs in borehole offset approximately 6 feet. 3) Borehole grouted upon completion.		-75						
90			-80						
95			-85						
100			-90						
105			-95						
110			-100						

KCI-KOA PLOG W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **13.00 (ft)**

TEST BORING LOG
SWM-1

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun:
West/FSD	**HSA**	**14 ft**	**11/13/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/13/2014**

Groundwater Levels (feet)

0 hour: 14 ▽

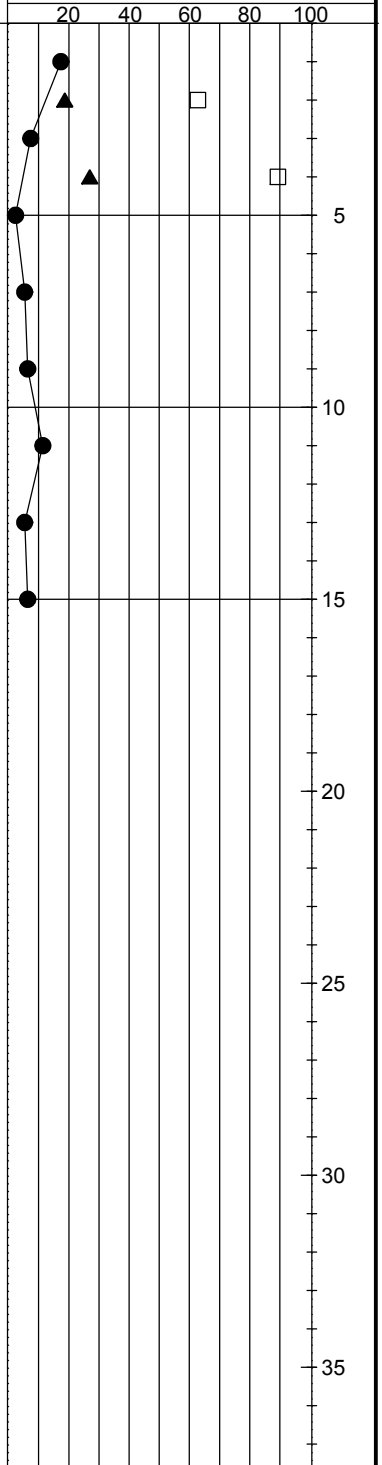
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" / REC RQD
	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.						
0	FILL Sampled As: Moist, brown black, medium dense, SAND and SILT (SM)		10	S-1		0	6-12-6-5 N = 18 REC=14"
	Moist, orange, medium stiff, Sandy SILT (ML)			S-2		0	4-4-4-4 N = 8 REC=18"
5	Moist, orange, gray, soft to medium stiff, Silty Sandy CLAY (CL)		5	S-3		0	1-1-2-2 N = 3 REC=16"
				S-4		0	2-3-3-3 N = 6 REC=20"
	Moist, orange, stiff, Silty CLAY, trace Sand (CL-ML)			S-5		0	3-3-4-5 N = 7 REC=20"
10	Moist, orange, stiff, Sandy Clayey SILT (CL-ML)		0	S-6		0	5-6-6-7 N = 12 REC=20"
	Moist, orange to dark gray, medium stiff, Silty CLAY (CL-ML)			S-7		0	2-2-4-3 N = 6 REC=20"
▽ 15				S-7		0	3-4-3-3 N = 7 REC=20"
	Boring terminated at 16 ft. bgs		-5				
20	Notes: 1) We encountered groundwater at 7 feet bgs. 2) Environmental screen well stand pipe set at 9 feet bgs. 3) Borehole caved in at 11 feet bgs. 4) Borehole grouted upon completion.		-10				
25			-15				
30			-20				
35							

PLASTIC M.C. LIQUID

□FINES (%)

●SPT (bpf)



KCI-KOA PLOG.W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.76 (ft)**

TEST BORING LOG
SWM-2

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/10/2014
Jay / FSD	**HSA**	**14 ft**	
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/10/2014**
LSG	**Automatic**	**3.25"**	

Groundwater Levels (feet)

0 hour: 6 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6" REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
0	Moist, very dark brown, loose, Silty SAND (SM)		10	S-1		0	1-3-3-3 N = 6 REC=20"	
	Moist to wet, orange, loose, Clayey SAND (SC)			S-2		0	4-3-3-4 N = 6 REC=16"	
5 ▽	Wet, brown and gray , stiff, Sandy SILT (ML)		5	S-3		0	1-2-2-10 N = 4 REC=24"	
	Wet, gray and brown, loose, Silty SAND (SM)			S-4		0	6-2-2-2 N = 4 REC=24"	
	Wet, gray and brown, soft, Sandy Silty CLAY (CL-ML)			S-5		0	2-3-4-4 N = 7 REC=20"	
10	Wet, gray and brown, medium stiff, Silty CLAY (CL-ML)		0	S-6		0	4-5-8-12 N = 13 REC=16"	
	Wet, gray and brown, loose, Silty SAND (SM)			S-7		0	3-4-6-8 N = 10 REC=24"	
	Moist, gray and tan, very stiff, micaceous, Clayey SILT (ML)							
	Wet, tan, medium dense, SAND (SP)			S-8		0	1-5-8-7 N = 13 REC=24"	
15	Wet, orange, medium dense, Silty SAND (SM)		-5					
	Boring terminated at 16 ft. bgs							
20			-10					
25			-15					
30			-20					
35			-25					

Notes:
1) We encountered groundwater at approximately 6 feet bgs during drilling.
2) Environmental screen well stand pipe set at 16 feet bgs
3) Borehole caved-in at 3 feet bgs.
4) Borehole grouted upon completion.

KCI-KOA PLOG.W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.29 (ft)**

TEST BORING LOG
SWM-4

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun:
West/FSD	**HSA**	**14 ft**	**11/10/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/10/2014**

Groundwater Levels (feet)

0 hour: 8 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6" — REC RQD
	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.						
0	FILL Sampled As: Moist, black, very dense, SAND and GRAVEL (SP)		10	S-1			16-50/0" N = 100 REC=6"
	FILL Sampled As: Moist, black, very dense, SAND, GRAVEL and brick fragments (SP)			S-2		22	11-17-6-4 N = 23 REC=17"
5	Moist, orange and tan to light gray and brown, stiff, SILT, trace to little Sand (ML)		5	S-3		3	3-4-6-6 N = 10 REC=21"
▽	Moist to wet, light gray and brown, dark gray, medium stiff to soft, Silty CLAY, trace Sand (CL-ML)			S-4			6-5-4-4 N = 9 REC=14"
	Wet, dark gray, very loose, Clayey SAND and Silty SAND (SC-SM)			S-5		0	WOH-1-2-2 N = 3 REC=16"
10	Wet, dark gray, very loose, Clayey SAND and Sandy CLAY (SC)		0	S-6		0	1-1-2-2 N = 3 REC=20"
	Wet, dark gray, very loose Silty Clayey SAND and Rock fragments (SC-SM)			S-7			1-1-2-2 N = 3 REC=6"
15	Moist, gray and brown, stiff CLAY, trace Sand (CL)		-5	S-8			WOH-2-5-5 N = 7 REC=24"
	Boring terminated at 16 ft. bgs						
20	Notes: 1) We encountered groundwater at approximately 8 feet bgs during drilling. 2) Environmental screen well stand pipe set at 16 feet bgs. 3) Borehole grouted upon completion.		-10				
25			-15				
30			-20				
35			-25				

PLASTIC — M.C. — LIQUID

☐ FINES (%)

● SPT (bpf)

20 40 60 80 100

KCI-KOA PLOG W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **FedEx Facility**

PROJECT NO. **13146740**

Surface Elevation **10.40 (ft)**

TEST BORING LOG
SWM-5

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun:
West/FSD	**HSA**	**14 ft**	**11/10/2014**
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed:
LSG	**Automatic**	**3.25"**	**11/10/2014**

Groundwater Levels (feet)

0 hour: 1.5 ▽

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LITHOLOGY	ELEV (ft)	IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6" / REC RQD
▽	FILL Sampled As: Moist, black, dense, Sandy Silty GRAVEL (GM)		10	S-1		0.3	1-2-8-22 N = 10 REC=20"
	FILL Sampled As: Moist, tan and brown, dense Clayey Silty SAND, little organics and wood fragments (SM)			S-2		0.7	26-16-8-6 N = 24 REC=12"
5	FILL Sampled As: Moist, yellowish, tan, medium dense, Silty Gravelly SAND, trace brick fragments (SM)		5	S-3		0	2-2-2-3 N = 4 REC=19"
	Moist to wet Gray medium stiff, micaceous, Silty CLAY, trace Sand, trace wood fragments (CL-ML)			S-4			2-2-2-3 N = 4 REC=9"
	Moist to wet, brown and gray, medium stiff, micaceous, Sandy Silty CLAY, trace wood fragments (CL-ML)			S-5			1-3-2-3 N = 5 REC=18"
10			0	S-6			4-4-3-4 N = 7 REC=24"
	Wet, dark gray, very soft to soft , micaceous, Clayey SILT (CL-ML)			S-7			WOH-WOH-WOH N = 0 REC=24"
15			-5	S-8			1-1-2-2 N = 3 REC=24"
	Boring terminated at 16 ft. bgs						
20	Notes: 1) We encountered groundwater at approximately 1.5 feet bgs. 2) Environmental screen well stand pipe set at 16 feet bgs 3) Borehole grouted upon completion.		-10				
25			-15				
30			-20				
35			-25				

PLASTIC M.C. LIQUID

☐FINES (%)

●SPT (bpf)

20 40 60 80 100

KCI-KOA PLOG.W PID BORING LOGS.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-1

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: Dry
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
	Topsoil, Brown / Dark Brown, Moist, Soft								
	SM, Silty Sand, Brown / Gray, Moist, Stiff								
	CL-ML, Silty Clay, Light Gray / Tan, Moist, Stiff					0		REC=100	
	SP, Sand, Light Gray / Tan / White, Moist, Soft								
	SP, Sand, White / Light Gray, Dry, Stiff								
5	SM, Silty Sand, Light Brown, Moisture, Soft					0		REC=100	5
	CL, Clay, Dark Brown / Gray. Moist (Much more moist closer to 11'), Soft								
10						0		REC=100	10
	CL, Clay, Light Gray / Gray, Moist, Soft								
15						0		REC=100	15
	Boring terminated at 16 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-10

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: 8 ▽
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
	Topsoil, Brown, Moist, Loose Geoprobe FILL, Gravely Crushed Asphalt like material, Black, Moist, Loose SM, Sandy Silt, Brown, Moist, Soft CL-ML, Silty Clay, Blue / Greenish Gray, Moist, Stiff					0.1		REC=80	
5	CL-ML, Silty Clay, Blue / Greenish Gray, Moist, More Stiff than above								5
	CL, Clay, Reddish Brown / Gray, Moist, Hard					0		REC=100	
▽	CL-ML, Silty Clay, Bluish Gray, Soft, Wet								
10	CL-ML, Silty Clay, Bluish Gray, Stiff, Moist					0		REC=95	10
	CL-ML, Silty Clay, Bluish Gray, Soft, Wet								
15						0		REC=25	15
	Boring terminated at 16 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-11

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: 10 ▽
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
	Topsoil, Brown, Moist, Soft								
	FILL, Gravely / Sand, Gray / Brown, Dry, Stiff								
	CL-ML, Silty Clay, Light Gray / Reddish Brown, Moist, Stiff					0		REC=100	
5	CL-ML, Silty Clay, Light Gray / Reddish Brown, Moist, Stiff					0		REC=100	
▽10	CL-ML, Silty Clay, Light Gray / Reddish Brown, Wet, Softer					0		REC=100	
	CL-ML, Silty Clay, Light Gray / Reddish Brown, Moist, Stiff					0		REC=100	
15	CL-ML, Silty Clay, Bluish Gray, Moist, Stiff								
	Boring terminated at 16 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-12

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: 5 ▽
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
	FILL-Topsoil / Gravely / Sandy Material, Brown, Slightly Moist, Soft								
	FILL, Sandy Gravels, Brown / Gray, Slightly Moist, Stiffer than above					0		REC=85	
	CL-ML, Silty Clay, Light Gray / Reddish-Brown Streaks, Slight Moisture but mostly Dry, Slightly Stiff								
	CL-ML, Silty Clay / Some Gravels, Brown / Tan, Very moist, Soft								
▽5	CL-ML, Silty Clay / Some Gravels, Brown / Tan, Very moist, Stiffer than above								
	CL-ML, Silty Clay / Some Gravels, Brown / Tan, Slightly moist, Stiff					0		REC=100	
	CL-ML, Silty Clay / Some Gravels, Light Gray, Slightly moist, Stiff								
10						0		REC=100	
	CL-ML, Silty Clay / Some Gravels, Brown / Tan, Wet, Softer than above								
						0		REC=20	
15									
	Boring terminated at 16 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-13

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: 11/24/2014
RWS			

Groundwater Levels (feet)
0 hour: 4.5 ▽
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
	FILL-Topsoil / Gravely Material, Brown, Moist, Soft								
	FILL, Gravely Asphlat-like material, Black, Dry, Loose								
	SC, Sandy Clay, Gray / Tan, Moist, Stiff								
	CL-ML, Silty Clay, Gray / Tan / Light Brown, Moist, Hard					0		REC=80	
▽	SP, Sand Gravels / Silty, Gray / Tan, Wet, Loose								
5	CL, Clay, Red-Brown / Light Gray, Slightly Moist, Stiff					0		REC=90	
	CL, Clay, Red-Brown / Light Gray / More Gray 11'-12', Wet @ 8.5', Stiff					0		REC=100	
10									
	CL-ML, Silty Clay, Light Gray, Moist, Stiff					0		REC=100	
15									
	Boring terminated at 16 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-14

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: Dry
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6" / REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf)
	FILL-Topsoil / Gravels. Brown, Dry, Loose							
	FILL, Gravels, Brown / Black, Moist, Loose							
	SC, Sandy Clay, Gray, Dry, Stiff					0	REC=95	
	SC, Sandy Clay, Dark Gray, Slightly Moist, Stiff							
5	SC, Sandy Clay, Dark Gray, Moist, Stiff, REFUSAL 2 8' after attempting 3 different locations nearby					0	REC=100	
10								
15	Boring terminated at 16 ft. bgs							

20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-15

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: 6.5 ▽
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
	FILL-Topsoil / Gravels, Brown, Moist, Soft								
	FILL, Sandy Gravels (CR6-like material), Gray, Dry, Loose								
	FILL, Sandy Gravels (CR6-like material), Tan / Gray, Dry, Loose					0		REC=45	
5	SP, Sand, Red / Brown, Wet, Stiff, Refusal @ 7' after attempting 3 nearby locations					0		REC=35	
▽									
10									
15	Boring terminated at 16 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-2

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: Dry
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf) 20 40 60 80 100
	FILL-Topsoil / Rocky Fill Material, Brown, Moist, Loose w/ Gravels								
	SC, Sandy Clay, Light Brown / Tan, Moist, Stiff					0		REC=100	
	CL-ML, Silty Clay, Grayish-Brown, Moist, Softer								
5	CL, Clay, Grayish-Brown / Red Specks, Moist, Stiff					0		REC=80	
	CL, Clay, Light Gray / Reddish Brown Streaks, Moist, Stiff					0		REC=85	
10	CL-ML, Silty Clay, Light Brown / Gray, Wet, Soft								
	CL, Clay, Light Gray, Moist, Stiff					0		REC=95	
15	Boring terminated at 16 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-3

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: 6 ▽
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
	Topsoil, Brown, Moist, Loose								
	FILL, Sandy / Gravelly CR6-type Material, Dark Bluish-Gray, Dry, Loose								
	SC, Sandy Clay, Reddish / Light Brown, Moist, Stiff					0		REC=70	
	SC, Sandy Clay, Light Gray, Moist, Stiff								
5	CL-ML, Sandy Silty Clay, Light Brown / Gray / Red-Brown, Wet, Soft								
▽	CL-ML, Silty Clay, Light Brown / Gray / Red-Brown, Moist, Stiff					0		REC=100	
	CL-ML, Silty Clay, Light Reddish-Brown / Tan, Moist, Stiff, becomes Soft and Wet @ 10.5'-12'								
10						0		REC=65	
15						0		REC=70	
	Boring terminated at 16 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-4

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: 11/24/2014
RWS			

Groundwater Levels (feet)
0 hour: 5 ▽
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
	Topsoil / Rocky Material, Brown, Moist, Loose FILL, Rocky Slag-Like Material, Brown / Bluish Dark Gray, Wet, Stiff					0.1		REC=65	
▽5	FILL, Rocky Slag-Like Material, Dark Gray, Wet , Loose								
	CL, Clay, Light Gray / Light Brown w/ Oranges, Moist, Stiff					0		REC=100	
10	CL, Clay, Light Gray / Light Brown w/ Oranges, Moist, Stiff					0		REC=40	
15	CL, Clay, Light Gray / Light Brown w/ Oranges, Moist, Stiff					0		REC=10	
	Boring terminated at 16 ft. bgs 0'-4' Oily Looking Materials, Petrolium Type Odor, 0.1 PID hit								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-5

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: 5 ▽
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
	Topsoil, Light Brown, Very Moist, Loose								
	CL, Clay, Light Brown, Tan, Gray, Moist, Stiff					0		REC=95	
▽5	CL-ML, Silty Clay, Grayish Brown, Wet, Soft								
	CL, Clay, Light Gray / Brown, Moist, Stiff					0		REC=100	
10	CL, Clay, Light Gray / Brown, Moist, Stiff					0		REC=80	
15	CL, Clay, Light Gray / Brown, Moist, Stiff					0		REC=80	
	Boring terminated at 16 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-6

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: 4.5 ▽
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf)
	Topsoil / Gravely Material, Brown, Moist, Loose								
	FILL, CR6-like Material / Gravely / Sandy, Dry, Loose					0		REC=90	
	SC, Sandy Clay, Brown, Moist, Stiff								
	CL-ML, Silty Clay, Gray-Brown, Moist, Stiff								
▽ 5	CL-ML, Silty Clay, Gray-Brown, Moist, Stiff, Becomes more Red-Brown / Gray @ 6'					0		REC=50	
	SP, Sand w/ Gravels, Dark Gray, Wet, Soft								
10	CL, Clay, Reddish-Brown / Gray, Moist, Hard					0		REC=100	
	CL, Clay, Reddish-Brown / Gray, Moist, Hard, Wet 12'-12.5'					0		REC=100	
15	Boring terminated at 16 ft. bgs								

PLASTIC M.C. LIQUID
□FINES (%)
●SPT (bpf)
20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-7

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: 4.5 ▽
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf)
0	Topsoil / Gravels, Brown, Moist, Soft FILL, Gravely / Sandy / Asphalt-like Material, Dark Brown / Black, Moist, Loose FILL, Mixed Sandy Material (similar to above layer), Gray, Tan, Black, Brown, Moist, Stiff CL-ML, Silty Clay, Gray / Brown, Moist, Soft					0		REC=90	
▽ 5	CL-ML, Silty Clay, Gray / Brown, Moist, Soft, More moist @ 5'					0		REC=100	
	CL-ML, Silty Clay, Greenish Gray / Tan, Moist, Stiff								
10	SC, Sandy Clay, Black / Tan / Gray, Wet, Soft CL-ML, Silty Clay, Greenish Gray / Tan, Moist, Stiff					0		REC=100	
	CL-ML, Silty Clay, Greenish Gray / Tan, Moist, Stiff					0		REC=100	
15	Boring terminated at 16 ft. bgs								

PLASTIC M.C. LIQUID
□FINES (%)
●SPT (bpf)
20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-8

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **11/24/2014**
RWS			

Groundwater Levels (feet)
0 hour: Dry
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
	Topsoil, Brown, Slightly Moist, Loose								
	FILL, Slag-like, Gravely Material, Bluish Gray / Black, Moist, Stiff								
	SP, Sandy / Gravely, Gray / Bluish Gray, Moist, Stiff					0		REC=60	
5	CL, Clay, Light Gray / Reddish Brown, Moist, Stiff					0		REC=100	
10						0		REC=50	
15						0		REC=70	
	Boring terminated at 16 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-9

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 11/24/2014
Alfredo / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: 11/24/2014
RWS			

Groundwater Levels (feet)
0 hour: 4 ▽
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
0	Topsoil / Rocky Gravels, Brown, Dry, Loose FILL, Gravel / Sand (CR6-type Material), Gray, Dry, Loose					0		REC=75	
▽ 5	FILL, Slag-like Material / Gravels, Brown / Black, Wet, Loose					0		REC=30	
10	FILL, Slag-like Material / Larger Gravels, Brown / Black, Wet, Loose					0		REC=25	
15	FILL, Slag-like Material / Larger Gravels, Brown / Black, Wet, Loose					0		REC=20	
	Boring terminated at 16 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 12/18/14

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-16

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
0	Topsoil, Brown, Moist, Soft SP, Gray / Brown, Moist, Loose								
	SP, Gray, Moist, Loose							REC=70	
5	SP, Gray / Brown, Moist, Loose							REC=70	
10	SC, Gray / Tan, Moist, Medium Soft							REC=70	
	Boring terminated at 12 ft. bgs								
15									

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-17

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES: IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf)
0	Topsoil, Brown, Moist, Soft SC, FILL, Brown / Black, Moist, Firm SC, FILL, Brown / Gray, Moist, Firm					0		REC=80	
5	SC, Brown, Moist, Loose, Some Shells					0		REC=75	
	CL-ML, Tan / Reddish Orange / Gray, Moist, Firm								
10	CL-ML, Tan / Reddish Orange / Gray, Wet, Firm					0		REC=30	
	Boring terminated at 12 ft. bgs								
15									

20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-18

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
0	Topsoil, Brown, Moist, Soft SC, FILL, Brown / Gray, Moist, Firm					0		REC=75	
5	CL-ML, Tan / Reddish Orange / Gray, Moist, Firm					0		REC=75	
10	CL-ML, Tan / Reddish Orange / Gray, Wet, Firm					0		REC=30	
15	Boring terminated at 12 ft. bgs								

20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-19

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES: IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf) 20 40 60 80 100
0	SC, Fill, Gray, Moist, Loose, Rocks / Gravels								
	SW-SM, Brown / Gray, Moist, Loose					0		REC=75	
	GWS, Brown, Moist, Loose								
5	SW-SM, Tan, Wet, Loose					0		REC=90	
10						0		REC=100	
	Boring terminated at 12 ft. bgs								
15									

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-20

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
0	Topsoil, Brown, Moist SW-SC, Brown, Moist, Firm					0		REC=90	
5	OH, Brown / Black, Moist, Medium Firm, Shells								
	SM-SC, Tan, Wet, Medium Firm					0		REC=100	
	SC, Gray / Tan, Moist, Firm								
10	SC, Gray / Tan, Wet, Loose					0		REC=100	
	Boring terminated at 12 ft. bgs								
15									

20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-21

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf) 20 40 60 80 100
0	Topsoil, Brown, Moist								
	SM, Fill (Crush like Material), Gray / Brown, Moist, Loose					0		REC=50	
	SM-SC, Tan, Moist, Loose								
5	SC, Tan / Gray, Moist, Loose					0		REC=100	
10						0		REC=100	
	Boring terminated at 12 ft. bgs								
15									

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-22

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
0	Topsoil, Brown, Moist								
	SW-SM, Fill, Brown, Moist, Loose					0		REC=90	
5	SW-SM, Fill, Black, Oily / Moist, Petro Odor					0		REC=30	
	NO RECOVERY					0		REC=0	
10	Boring terminated at 12 ft. bgs								
15									

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-23

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
0	Topsoil, Brown, Moist SW-SM, Brown, Moist, Loose					0		REC=60	
5	SC, Brown, Moist, Soft								
	SC, Tan, Moist, Soft					0		REC=100	
10	SC, Tan, Wet, Soft					0		REC=100	
15	Boring terminated at 12 ft. bgs								

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-24

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
0	Topsoil, Brown, Moist, Soft								
	SW-SM, Gray / Brown, Moist, Loose								
	SW-SM, Brown, Moist, Loose					0		REC=70	
	SC, Tan / Reddish Brown, Soft								
5	SW-SM, Reddish Orange, Moist, Loose					0		REC=100	
	SW-SM, Tan, Wet, Loose								
10						0		REC=100	
	Boring terminated at 12 ft. bgs								
15									

20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**

PROJECT NO.

Surface Elevation

TEST BORING LOG
SP-25

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)

0 hour: XX

24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
	Topsoil, Brown, Moist Fill, ASH / Slag Material, Black / Gray, Moist, Loose					0		REC=75	
5	Fill, ASH / Slag / Sandy Material, Black, Wet, Loose					0		REC=75	5
10	SM, Gray, Wet, Loose					0		REC=75	10
	Boring terminated at 12 ft. bgs								
15									15

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-26

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; ☐FINES (%); ●SPT (bpf) 20 40 60 80 100
0	Topsoil, Brown, Moist, Soft								
	SW-SM, Brown, Moist, Soft / Loose					0		REC=75	
5	SW-SC, Brownish Black / Tan, Moist, Loose					0		REC=90	
10						0		REC=90	
	Boring terminated at 12 ft. bgs								
15									

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-27

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
0	Topsoil, Brown, Moist SM, Tan, Dry, Loose					0		REC=90	
5	SC, Tan / Reddish / Gray, Moist, Dense					0		REC=90	
10						0		REC=90	
12	Boring terminated at 12 ft. bgs								
15									

PLASTIC M.C. LIQUID
FINES (%)
SPT (bpf)
20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-28

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
0	Fill / Rocky Gravels, Gray, Dry, Loose								
	Fill / Blacktop Material, Black, Dry								
	SC, Gray, Dry, Stiff					0		REC=80	
5	CL, Reddish Gray, Moist, Stiff					0		REC=100	
10						0		REC=100	
12	Boring terminated at 12 ft. bgs								
15									

20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-29

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; □FINES (%); ●SPT (bpf) 20 40 60 80 100
0	Topsoil, Brown, Dry, Rocky GM-GC, Fill / Gravel / Crush, Brown, Dry, Stiff					0		REC=80	
	SM, Tan / Light Brown, Dry, Dense								
5	SM, Tan / Gray, Dry, Dense					0		REC=100	
10						0		REC=100	
12	Boring terminated at 12 ft. bgs								
15									

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-30

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES: IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; ☐FINES (%); ●SPT (bpf)
0	Topsoil, Brown, Moist								
	SW-SM, Gray, Moist, Dense								
	SC, Brown / Greenish Gray, Moist, Firm					0		REC=50	
5	Boring terminated at 4 ft. bgs								
10									
15									

PLASTIC M.C. LIQUID
20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-31

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES: IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf) 20 40 60 80 100
	Topsoil, Brown, Moist GM-GC, Fill / Blacktop Material, Moist, Dense SM, Brown, Moist, Dense					0		REC=50	
5	Boring terminated at 4 ft. bgs								
10									
15									

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-32

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; ☐FINES (%); ●SPT (bpf)
	Topsoil, Brown, Moist								
	SANDGR / Crushed Quartzlike Material, Pink / Yellow / White, Dry, Loose								
	SC, Brown / Greenish Gray, Moist, Firm					0		REC=50	
5	Boring terminated at 4 ft. bgs								
10									
15									

20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-33

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf) 20 40 60 80 100
0	Topsoil, Brown, Moist								
	SC-SM, FILL, Brown / Black, Moist, Firm, Odd Odor not sure if Petroleum								
	SP-SM, Gray, Moist, Loose					0		REC=75	
5	SC, Reddish Orange / Tan / Gray, Moist, Firm					0		REC=100	
	SC, Tan, Wet, Firm					0		REC=90	
10	Boring terminated at 12 ft. bgs								
15									

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-34

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater	**Geoprobe**		
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: **2/5/2015**
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS (SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.)	LITHOLOGY	ELEV (ft)	SAMPLES IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf)
0	Topsoil, Brown, Moist								
	SM, Gray, Moist, Loose								
	SC, Reddish Brown, Moist, Medium Firm					0		REC=80	
5	SM, Reddish Brown / Tan, Moist, Soft					0		REC=100	
	SC, Tan / Gray / Brown, Moist, Firm					0		REC=100	
10	Boring terminated at 12 ft. bgs								
15									

20 40 60 80 100

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

KCI TECHNOLOGIES

PROJECT **Sparrows Point Rod & Wire Mill**
PROJECT NO.

TEST BORING LOG
SP-35

Surface Elevation

SHEET 1 OF 1

Driller:	Method:	Casing Length:	Date Begun: 2/5/2015
Devon / Tidewater			
KCI Representative:	Hammer Type:	Casing Diameter:	Date Completed: 2/5/2015
RWS			

Groundwater Levels (feet)
0 hour: XX
24 hours: _____

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LITHOLOGY	ELEV (ft)	SAMPLES: IDNET	TYPE	PID (ppm)	N-COUNT 1st 6" / 2nd 6" / 3rd 6" / 4th 6"	REC RQD	PLASTIC M.C. LIQUID; FINES (%); SPT (bpf) 20 40 60 80 100
0	Topsoil, Brown, Moist, Soft								
	GM-GC, FILL, Gray "Crush" material, Moist, Loose								
	GM-GC, FILL, Sandy Gravel, Black, Oil-like sheen, Wet								
	GM-GC, FILL, Bluish Gray "Crush" Material, Dry, Firm					15		REC=90	
5	ASH, Black "Slag" Material, Wet, Firm								
	SW-SC, Reddish Tan / Light Gray, Moist, Firm					0		REC=90	
	SW-SC, Gray, Moist, Medium Soft								
10						0		REC=90	
	Boring terminated at 12 ft. bgs								
15									

KCI-KOA PLOG W PID SP SERIES LOGS - FINAL.GPJ MD SHA REVISED TEMPLATE.GDT 02/16/15

Appendix B

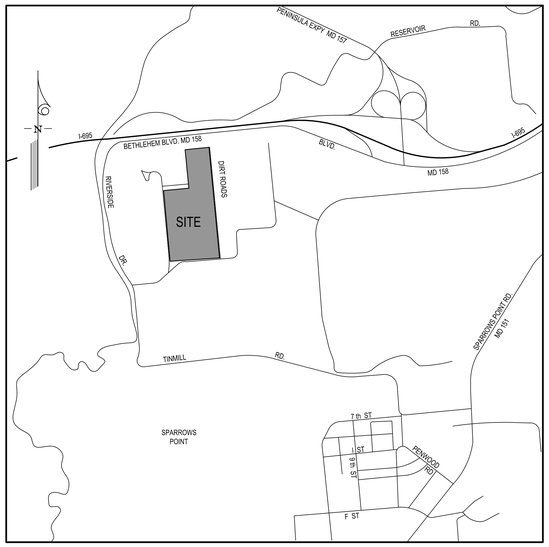
Schematic Design Documents, Federal Express Facility

(Provided separately due to size of documents)

SCHEMATIC DESIGN DOCUMENTS

FOR

FED EX WAREHOUSE BUILDING
SPARROWS POINT, MARYLAND



VICINITY MAP

SCALE: 1" = 1000'

SITE DATA

1. SITE ADDRESS: 2001 WHARF ROAD
   BALTIMORE, MD 21219
2. ELECTION DISTRICT: 15
3. COUNCILMANIC DISTRICT: 7
4. CENSUS TRACT: 452200
5. DEED REF: 32617/00144
6. TAX MAP: 111 GRID: 14 PARCEL: 318
7. PROPERTY TAX ACCOUNT NO. 1502024000
8. PROPERTY OWNER: HRE SPARROWS POINT LLC
   1650 DES PERES RD
   SUITE 303
   ST. LOUIS, MO 63131
9. TOTAL SITE (LEASE) AREA: 2,102,845 SQ. FT OR 48.47 AC.± LOT 1
10. SITE IS LOCATED WITHIN THE BALTIMORE HARBOR WATERSHED DRAINAGE AREA.
11. ZONING: MH/M (MANUFACTURING HEAVY/INDUSTIRAL MAJOR) 2-5 N/A
12. PARKING:
    TOTAL PARKING REQUIRED:
    1 PARKING SPACE PER EMPLOYEE ON LARGEST SHIFT

    TOTAL PARKING PROVIDED:

    EMPLOYEE PARKING:

EMPLOYEE SPACES:	631 (INCLUDING 13 HANDICAP SPACES)
MOTORCYCLE PARKING:	6

    FEDEX VEHICLE PARKING:

TRACTOR PARKING:	25
HOME DELIVERY VANS:	50
DEADLINE SPACES:	10
28' TRAILER PARKING:	200
LONG TRAILER PARKING	162
INBOUND PARKING:	15

13. SET BACKS: FRONT = 50'
    SIDE = 30'
    REAR = 30'
14. BUILDING HEIGHT: NO RESTRICTIONS
15. THIS SITE IS SERVED BY PRIVATELY OWNED SEWER AND PUBLIC WATER SYTEMS

LEGEND

EXISTING

- EX. INDEX CONTOUR
- EX. INTERMEDIATE CONTOUR
- PROPERTY LINE
- EX. BUILDING OUTLINE
- EX. EDGE OF ROAD
- OHU — EX. OVERHEAD ELECTRIC
- EX. RAILROAD TRACKS
- 100-YEAR FLOOD PLAIN
- EX. SIDEWALK LINE
- EX. EASEMENT LINE
- EX. WATER PIPE
- EX. STORM DRAIN
- S — S — EX. SANITARY SEWER
- EX. TREE LINE
- X — X — EX. FENCE
- EX. LIGHT POLE
- EX. SIGN
- EX. NATURAL GAS PIPE
- EX. UNDERGROUND ELECTRIC
- EX. OVERHEAD PIPE W/ TOWER SUPPORTS
- EX. UTILITY POLE
- APPROXIMATE LIMITS OF EX. PAVING, SIDEWALK, AND CONCRETE TO BE REMOVED
- EX. OVERHEAD UTILITY TO BE REMOVED
- EX. RAILROAD TRACKS TO BE REMOVED
- APPROXIMATE LIMITS OF EX. TREE LINE TO BE REMOVED
- EX. FENCE LINE TO BE REMOVED

PROPOSED

- PROP. BUILDING
- PROP. ASPHALT PAVING TYPE I
- PROP. ASPHALT PAVING TYPE II
- PROP. ASPHALT PAVING TYPE I W/ SEALCOAT
- CONCRETE PAD
- PROP. LEASE LINE
- X — PROP. SECURITY FENCE
- PROP. BUILDING LINE
- PROP. EDGE OF ROAD
- PROP. CONCRETE CURB
- PROP. SIDEWALK
- PROP. SIGN
- PROP. PARKING COUNT
- PROP. FIRE HYDRANT
- PROP. WATER LINE
- PROP. STORM DRAIN
- G — PROP. GAS LINE
- E — PROP. ELECTRIC LINE
- WET LANDS AREA

PREPARED FOR:

SCANNELL PROPERTIES

800 EAST 96TH STREET
INDIANAPOLIS, INDIANA 46240

SHEET INDEX

C-1	COVER SHEET
C-2	OVERALL SITE PLAN
C-3	EX. CONDITIONS / DEMOLITION PLAN
C-4	SITE PLAN
C-5	GRADING PLAN
C-6	UTILITY PLAN
C-7	SITE DETAILS
C-8	SITE DETAILS
C-9	EROSION AND SEDIMENT CONTROL PLAN
C-10	EROSION AND SEDIMENT CONTROL NOTES
C-11	EROSION AND SEDIMENT CONTROL DETAILS
C-12	CONCEPT STORMWATER MANAGEMENT PLAN

NOTE: THESE PLANS ARE FOR SCHEMATIC PURPOSES ONLY AND ARE NOT INTENDED FOR CONSTRUCTION

DESIGN AND DRAWING BASED ON MARYLAND COORDINATE SYSTEM NAD 83/91 HORIZONTAL AND NAVD 1988 VERTICAL DATUM.

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 31089 EXPIRATION DATE: 11/2115.

KCI TECHNOLOGIES
ENGINEERS
PLANNERS
SURVEYORS
CONSTRUCTION MANAGERS
936 RIDGEBROOK ROAD
SPARKS, MARYLAND 21152
TELEPHONE: (410) 316-7800
FAX: (410) 316-7818

REVISIONS			
NO.	DATE	DESCRIPTION	BY

DATE 01/09/2015
SCALE 1"=50'
DESIGNED BY JD/MS/FW
DRAWN BY FW

COVER SHEET
FED EX
WAREHOUSE BUILDING
SCHEMATIC DESIGN DOCUMENTS
SPARROWS POINT, MARYLAND
15th ELECTION DISTRICT 7th COUNCILMANIC DISTRICT

DRAWING NO. C-1
SHEET 1 OF 12
KCI JOB NUMBER 13146740

Monday, February 09, 2015 9:10:42 AM
JUSTIN DUNN
M:\2013\13146740\DRAWINGS\CIVIL\C-01 COVERSHEET.DWG

MD STATE GRID / NAD 83

COLD MILL COMPLEX

WEST COAL MILL ROAD

FUTURE FUEL STATION

MAINTENANCE GARAGE

10 - DEAD LINE PARKING

BILLET RECORD BLDG

NEW COAL MILL ROAD

BETHLEHEM BLVD.

631 - EMPLOYEE PARKING INCLUDING 13 HANDICAP AND 6 MOTORCYCLE SPACES

GATEWAY ROAD

25 - TRACTOR PARKING

50 - HOME DELIVERY VAN PARKING

FED EX WAREHOUSE

20 - 28' TRAILER PARKING

21 - 28' TRAILER PARKING

21 - 28' TRAILER PARKING

15 - INBOUND PARKING

53 - LONG TRAILER PARKING

44 - LONG TRAILER PARKING

53 - LONG TRAILER PARKING

44 - 28' TRAILER PARKING

27 - DOLLY PARKING

59 - 28' TRAILER PARKING

35 - 28' TRAILER PARKING

SALT STORAGE BLDG

I-695 BALTIMORE BELTWAY

EX. BGE SUBSTATION

N 572,880
E 1,457,800

N 572,880
E 1,456,800

N 570,480
E 1,456,800

RIVERSIDE DRIVE

LEGEND

- PROPERTY LINE
- EX. BUILDING OUTLINE
- EX. EDGE OF ROAD
- OHU — EX. OVERHEAD ELECTRIC
- EX. RAILROAD TRACKS
- 100-YEAR FLOOD PLAIN
- EX. SIDEWALK LINE
- EX. EASEMENT LINE
- EX. TREE LINE
- EX. FENCE
- EX. LIGHT POLE
- EX. SIGN
- EX. OVERHEAD PIPE W/ TOWER SUPPORTS
- EX. UTILITY POLE
- EX. METAL ELECTRIC TOWER

OVERALL SITE PLAN

SCALE: 1" = 100'

Monday, February 09, 2015 9:12:43 AM
J:\SITE\FED EX WAREHOUSE\DRAWINGS\CIVIL\C-02 OVERALL SITE PLAN.DWG
M. VASVARI (MAP) (US) (BENTLEY)

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KCI TECHNOLOGIES

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CONSTRUCTION MANAGERS

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REVISIONS			
NO.	DATE	DESCRIPTION	BY

DATE: 01/09/2015
SCALE: 1" = 100'
DESIGNED BY: JD/MS/FW
DRAWN BY: FW

OVERALL SITE PLAN

FED EX WAREHOUSE BUILDING

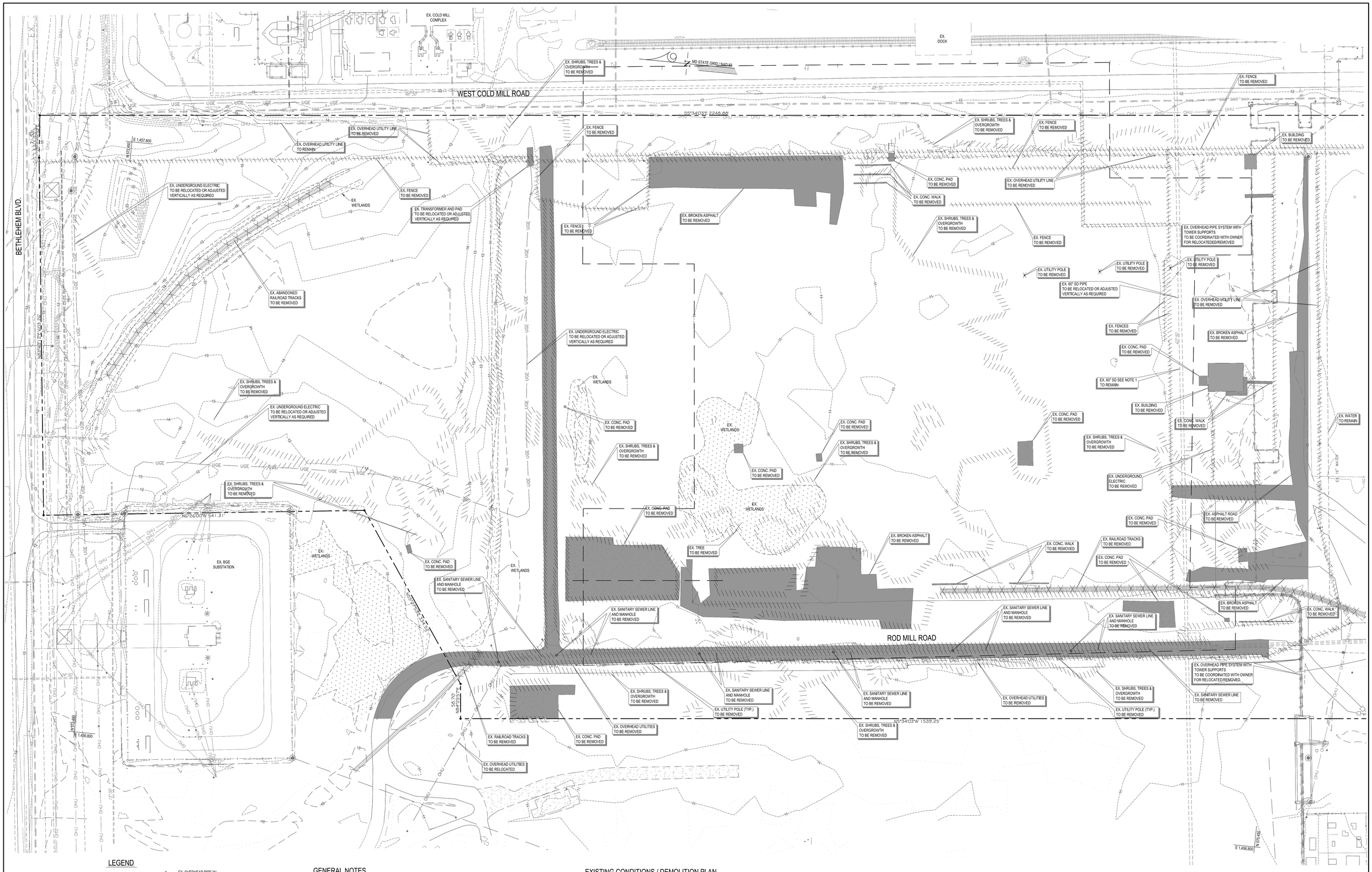
SCHEMATIC DESIGN DOCUMENTS
SPARROWS POINT, MARYLAND

15th ELECTION DISTRICT — 7th COUNCILMANIC DISTRICT

DRAWING NO. C-2

SHEET 2 OF 12

KCI JOB NUMBER 13146740



LEGEND

- EX. INDEX CONTOUR
- EX. INTERMEDIATE CONTOUR
- PROPERTY LINE
- EX. BUILDING OUTLINE
- EX. EDGE OF ROAD
- EX. OVERHEAD ELECTRIC
- EX. RAILROAD TRACKS
- 100-YEAR FLOOD PLAIN
- EX. SIDEWALK LINE
- EX. EASEMENT LINE
- EX. WATER PIPE
- EX. STORM DRAIN
- EX. SANITARY SEWER
- EX. TREE LINE
- EX. FENCE
- EX. LIGHT POLE
- EX. SIGN
- EX. NATURAL GAS PIPE
- EX. UNDERGROUND ELECTRIC
- EX. OVERHEAD PIPE W/ TOWER SUPPORTS
- EX. UTILITY POLE
- APPROXIMATE LIMITS OF EX. PAVING, SIDEWALK, AND CONCRETE TO BE REMOVED
- EX. OVERHEAD UTILITY TO BE REMOVED
- EX. RAILROAD TRACKS TO BE REMOVED
- APPROXIMATE LIMITS OF EX. TREE LINE TO BE REMOVED
- EX. FENCE LINE TO BE REMOVED
- EX. WETLANDS

GENERAL NOTES

1. TOPOGRAPHIC, BOUNDARY AND UTILITY INFORMATION SHOWN HEREON IS BASED ON A FIELD SURVEY PERFORMED BY ASM DURING SEPTEMBER 2014 AND DRAWINGS PROVIDED BY BALTIMORE COUNTY, MARYLAND, UNLESS OTHERWISE NOTED ON PLANS. THE SURVEYOR DOES NOT CERTIFY OR WARRANT THAT ALL UTILITIES ARE SHOWN, BUT DOES STATE THAT THE UTILITIES ARE SHOWN TO THE BEST OF HIS KNOWLEDGE FROM INFORMATION SUPPLIED TO HIM AT THE TIME OF THE SURVEY.
2. OBSTRUCTIONS SHOWN ON THIS DRAWING ARE FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. KCI TECHNOLOGIES, INC. DOES NOT WARRANT OR GUARANTEE THE CORRECTNESS OR THE COMPLETENESS OF THE INFORMATION GIVEN. THE CONTRACTOR MUST VERIFY ALL SUCH INFORMATION TO HIS OWN SATISFACTION. IN THE EVENT THAT INFORMATION IS IN CONFLICT WITH INFORMATION OUTLINED, THE CONTRACTOR SHALL IMMEDIATELY BRING IT TO THE ATTENTION OF THE ENGINEER PRIOR TO STARTING ANY WORK.
3. ALL OVERHEAD AND UNDERGROUND UTILITIES WILL REQUIRE COORDINATION WITH SPARROWS POINT TERMINALS, LLC. AND THE UTILITY COMPANY PRIOR TO FINAL DESIGN AND CONSTRUCTION.

UTILITY NOTES

1. EXISTING 60" STORM DRAIN SEE DRAWING No. 5594 OF THE SPARROWS POINT PLANT POWER AND UTILITIES PLANT UTILITY MAPS STORM SEWER PLAN.

EXISTING CONDITIONS / DEMOLITION PLAN

SCALE: 1"=50'

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REVISIONS			
NO.	DATE	DESCRIPTION	BY

DATE: 01/09/2015
SCALE: 1"=50'
DESIGNED BY: JD/MS/FW
DRAWN BY: FW

EX. CONDITIONS / DEMOLITION PLAN

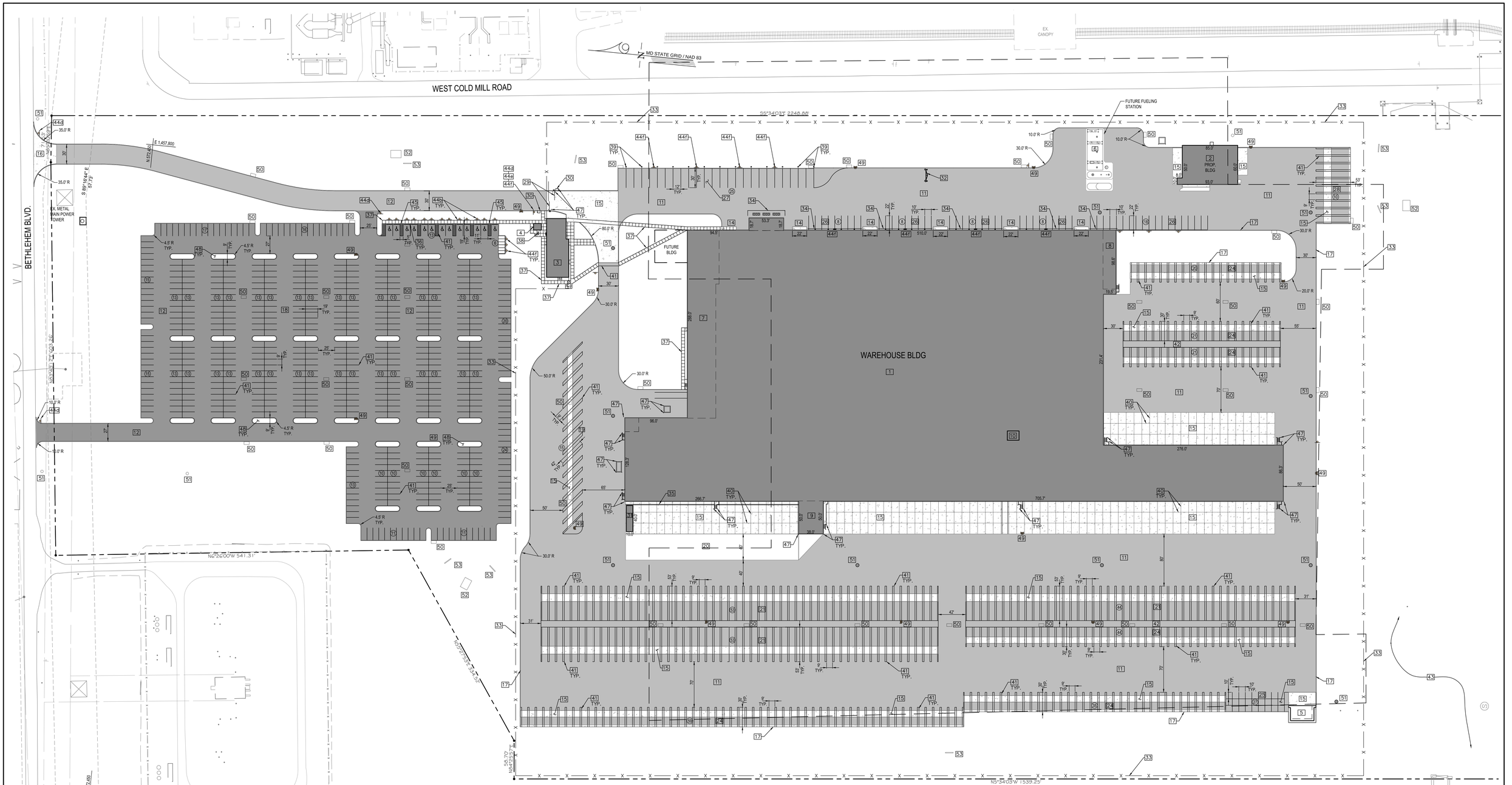
FED EX WAREHOUSE BUILDING

SCHEMATIC DESIGN DOCUMENTS
SPARROWS POINT, MARYLAND

15th ELECTION DISTRICT — 7th COUNCILMANIC DISTRICT

DRAWING NO. C-3
SHEET 3 OF 12
KCI JOB NUMBER 13146740

Monday, February 09, 2015, 9:27:52 AM
JUSTIN DUNN
K:\2014\13146740\DRAWINGS\SDD\13146740-SDD-EX COND PLAN.DWG



SITE PLAN

SCALE: 1" = 50'

LEGEND

- PROP. BUILDING
- PROP. ASPHALT PAVING TYPE I
- PROP. ASPHALT PAVING TYPE II
- PROP. ASPHALT PAVING TYPE I W/ SEALCOAT
- CONCRETE PAD
- PROP. LEASE LINE
- PROP. SECURITY FENCE
- PROP. BUILDING LINE
- PROP. EDGE OF ROAD
- PROP. CONCRETE CURB
- PROP. SIDEWALK
- PROP. SIGN
- PROP. PARKING COUNT

DRAWING INDEX

1 BUILDING (WAREHOUSE AREA)
2 VEHICLE MAINTENANCE GARAGE
3 GATEWAY BUILDING
4 LOCKER SHELTER
5 SALT STORAGE BUILDING (30' X 20')
6 FUEL ISLAND WITH CANOPY

7 ADMIN OFFICE
8 REMOTE OFFICE
9 L / H OFFICE
10 REMOTE TOILET ROOM

11 ASPHALT PAVEMENT TYPE I (01 / C-07)
12 ASPHALT PAVEMENT TYPE II (05 / C-07)
13 ASPHALT PAVEMENT TYPE I (W/ SEALCOAT) (08 / C-07)
14 CONCRETE PAD (06 / C-07)
15 CONCRETE PAVING (02 / C-07)
16 CONCRETE APRON (XX / C-XX)
17 CONCRETE CURB (09 / C-07)

18 AUTOMOBILE PARKING
19 INBOUND DROP AREA
20 TRANSITION AREA
21 LONG TRAILER PARKING
22 TRIPLES PARKING
23 DOUBLES PARKING
24 28' TRAILER PARKING
25 DOLLY PARKING (69 SPACES)
26 HD VAN PARKING
27 TRACTOR PARKING
28 DEAD PARKING

29 MOTORIZED OVERHEAD TRUSS GATE
30 GATE ACCESS PEDISTAL
31 TRASH COMPACTOR
32 SNOW SCRAPER
33 8' CHAIN LINK FENCE (07 / C-07)
34 HIGHWAY GUARDRAIL (04 / C-07)
35 TRENCH DRAIN
36 WHEEL STOP (03 / C-07)
37 CONCRETE SIDEWALK (11 / C-07)
38 BIKE RACK
39 BLOCK HEATER

40 EXPANSION / CONSTRUCTION JOINT
41 4" WIDE PAINT STRIPING (13 / C-07)
42 CLEAR AREA (NOTHING PERMITTED IN CLEAR AREA)
43 SNOW STORAGE AREA

44a SPEED LIMIT 10 MPH SIGN (24"x18")
44b HANDICAP PARKING SIGN (XX / C-XX)
44c MOTORCYCLE PARKING ONLY SIGN (18"x12")
44d STOP SIGN (24"x24")
44e NOTICE – NO ADMITTANCE UNATHORIZED (24"x36") "UNATHORIZED PERSONS OR PRIVARE VEHICLES NOT ALLOWED BEYOND THIS POINT. VIOLATORS WILL BE PROSECUTED"
44f NO ENGINE IDLING SIGN (20"x24")

45 DEPRESSED CURB (15 / C-08)
46 HANDICAP RAMP (14 / C-08)
47 CONCRETE PIPE BOLLARD (12 / C-XX)
48 LANDSCAPE ISLAND
49 FIRE HYDRANT

50 INLET
51 MANHOLE
52 STORM WATER MANAGEMENT STRUCTURE
53 END WALL

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 31089 EXPIRATION DATE: 11/21/15.

DESIGN AND DRAWING BASED ON MARYLAND COORDINATE SYSTEM NAD 83/91 HORIZONTAL AND NAVD 1988 VERTICAL DATUM.

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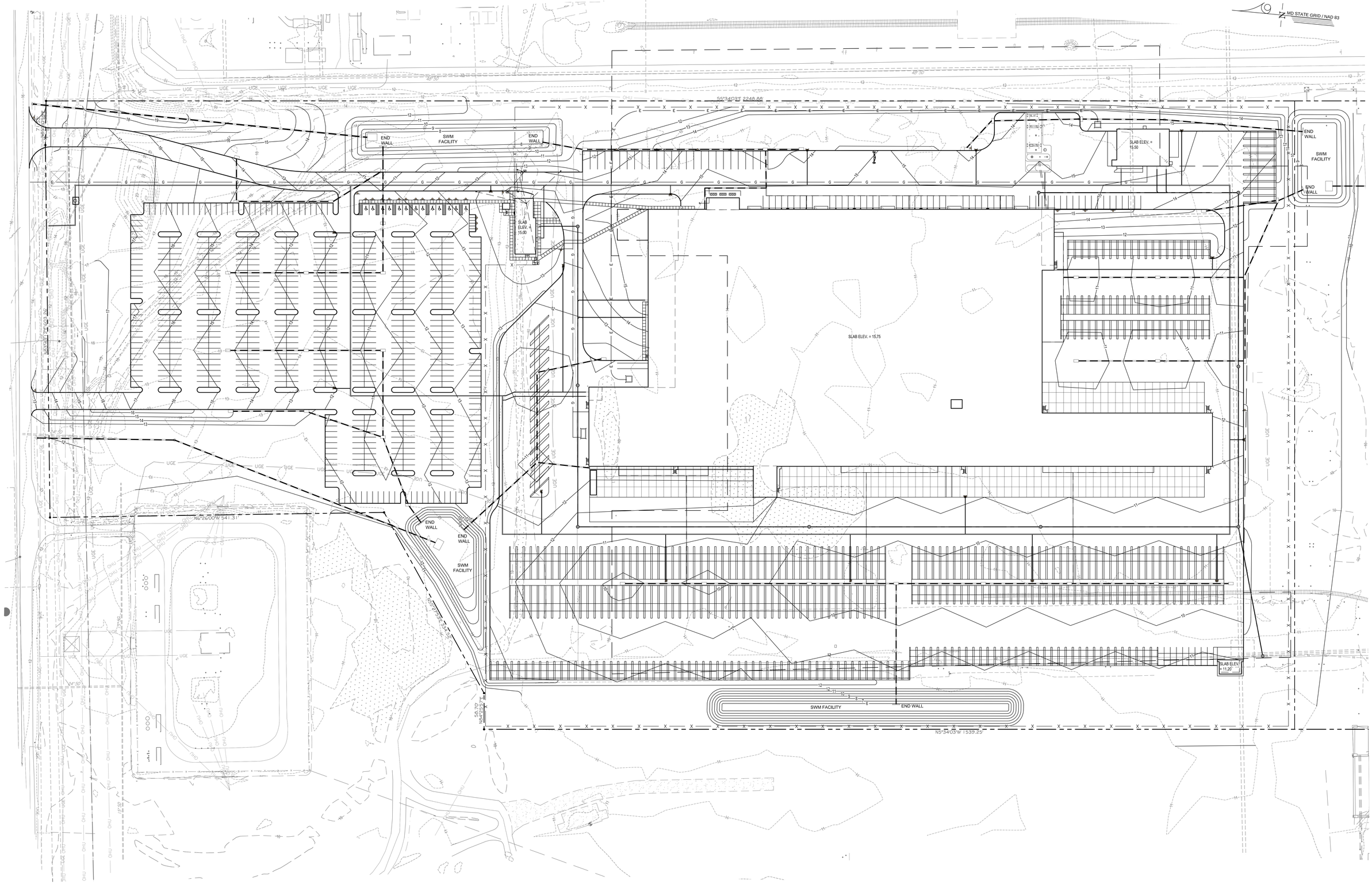
REVISIONS			
NO.	DATE	DESCRIPTION	BY

DATE 01/09/2015
SCALE
DESIGNED BY JD/MS/FW
DRAWN BY FW

SITE PLAN
FED EX WAREHOUSE BUILDING
SCHEMATIC DESIGN DOCUMENTS
SPARROWS POINT, MARYLAND
15th ELECTION DISTRICT
7th COUNCILMANIC DISTRICT

DRAWING NO. C-4
SHEET 4 OF 12
KCI JOB NUMBER 13146740

Monday, February 09, 2015 9:30:45 AM
JUSTIN DUNN
M:\2014\13146740\DRAWINGS\DWG\C-04 SITE PLAN.DWG



LEGEND

——12—— PROP. CONTOUR

GRADING PLAN

SCALE: 1" = 50'

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SPARKS, MARYLAND 21152
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REVISIONS			
NO.	DATE	DESCRIPTION	BY

DATE: 01/09/2015
SCALE: 1"=50'
DESIGNED BY: JD/MS/FW
DRAWN BY: FW

GRADING PLAN
FED EX
WAREHOUSE BUILDING
SCHEMATIC DESIGN DOCUMENTS
SPARROWS POINT, MARYLAND
15th ELECTION DISTRICT — 7th COUNCILMANIC DISTRICT

DRAWING NO. C-5
SHEET 5 OF 12
KCI JOB NUMBER 13146740

Monday, February 09, 2015 8:50:22 AM
JUSTIN DAVIS
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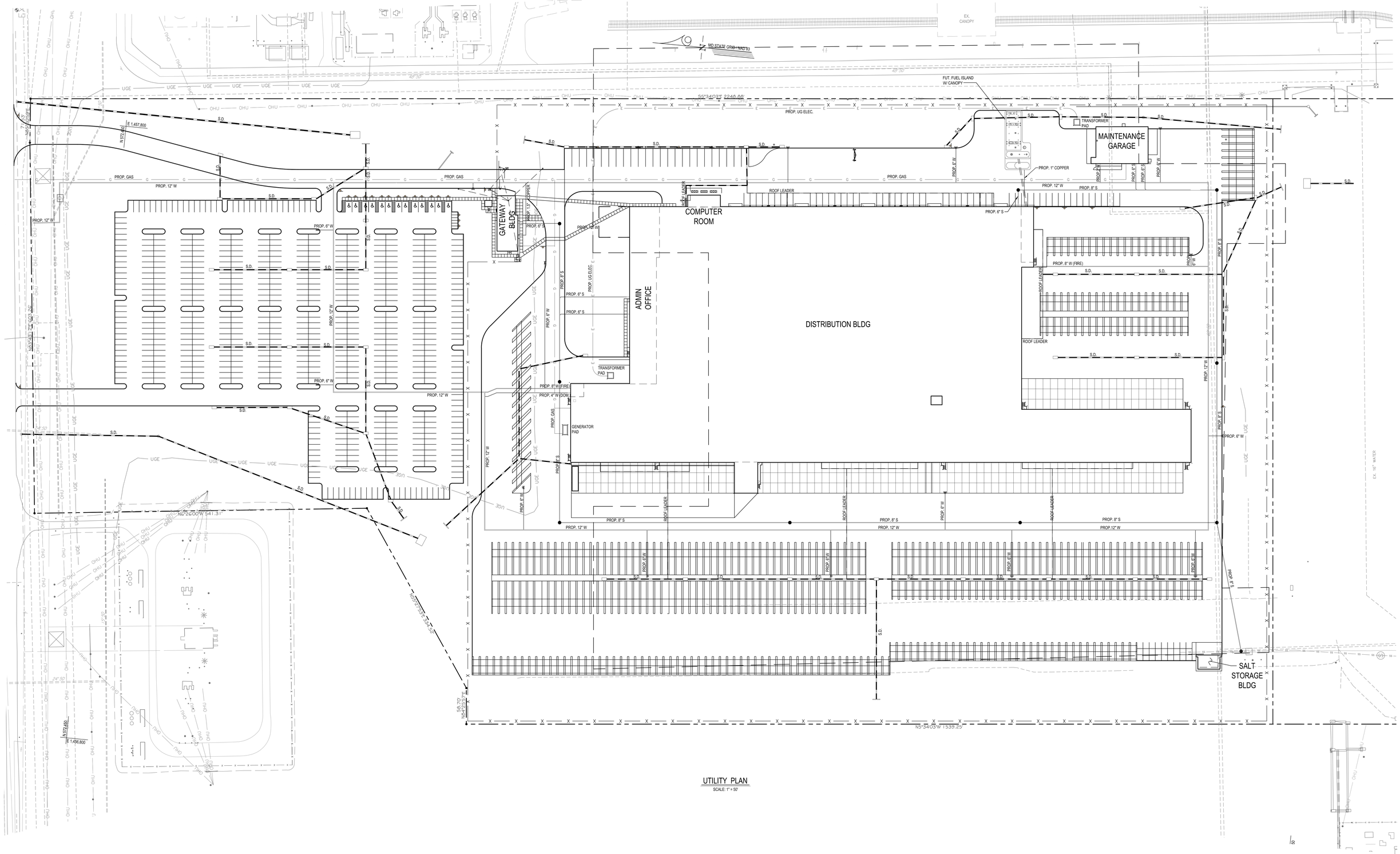

UTILITY PLAN

SCALE: 1" = 50'

LEGEND

- PROP. STORMDRAIN
- PROP. WATER LINE
- PROP. SANITARY SEWER
- UGE — PROP. UNDERGROUND ELECTRIC
- G — PROP. GAS LINE
- PROP. MANHOLE
- PROP. INLET
- PROP. END WALL
- PROP. FIRE HYDRANT

DESIGN AND DRAWING BASED ON MARYLAND COORDINATE SYSTEM NAD 83/91 HORIZONTAL AND NAVD 1988 VERTICAL DATUM.

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REVISIONS			
NO.	DATE	DESCRIPTION	BY

DATE 01/09/2015
SCALE 1"=50'
DESIGNED BY JD/MS/FW
DRAWN BY FW

UTILITY PLAN
FED EX
WAREHOUSE BUILDING
SCHEMATIC DESIGN DOCUMENTS
SPARROWS POINT, MARYLAND
15th ELECTION DISTRICT
7th COUNCILMANIC DISTRICT

DRAWING NO. C-6
SHEET 6 OF 12
KCI JOB NUMBER 13146740

Monday, February 09, 2015 10:19:44 AM
JUSTIN DUNN
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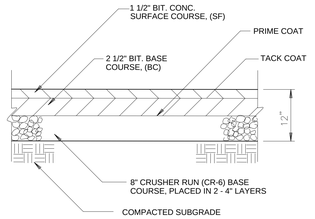
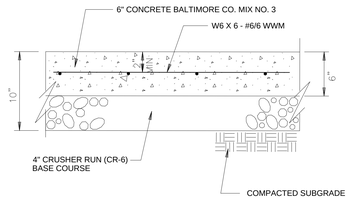
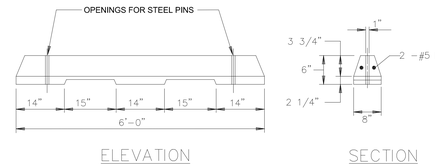


1 TYPE I PAVING DETAIL SCALE: N.T.S.



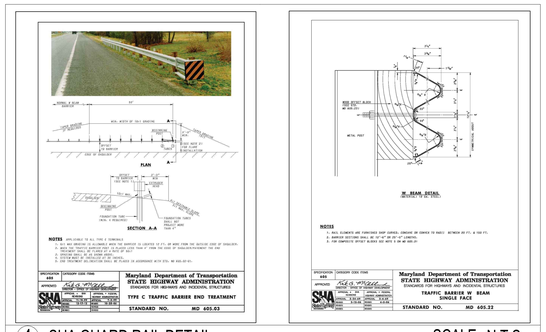
NOTE: 1. EXPANSION JOINTS SHALL BE AT THE LOCATIONS SHOWN ON THE PLANS AND SHALL BE IN ACCORDANCE WITH MARYLAND STATE HIGHWAY ADMINISTRATION STANDARD DETAIL NO. MD 572.92.

2 CONCRETE PAVING DETAIL SCALE: N.T.S.

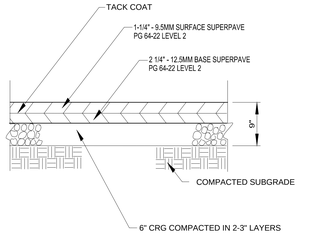


NOTE:
CONTRACTOR TO PROVIDE TWO (2) NO.8 REBARS, 16" LONG FOR EACH WHEEL STOP.

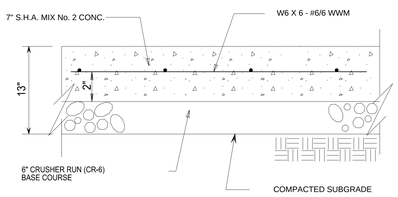
3 PRECAST CONCRETE WHEEL STOP SCALE: N.T.S.



4 SHA GUARD RAIL DETAIL SCALE: N.T.S.

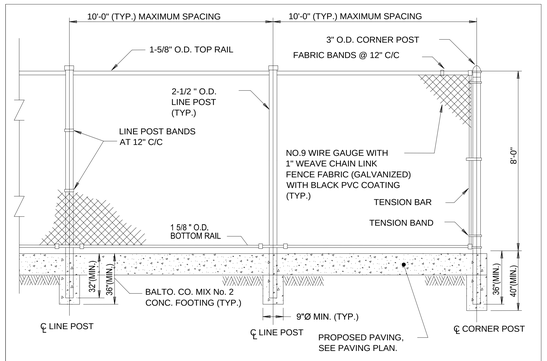


5 TYPE II PAVING DETAIL SCALE: N.T.S.



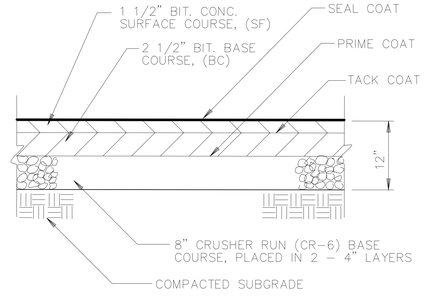
NOTES:
1. EXPANSION JOINTS SHALL BE AT THE LOCATIONS SHOWN ON THE PLANS.
2. MINIMUM 28 DAY COMPRESSION STRENGTH 4000psi.

6 REINFORCED CONCRETE PAD DETAIL SCALE: N.T.S.

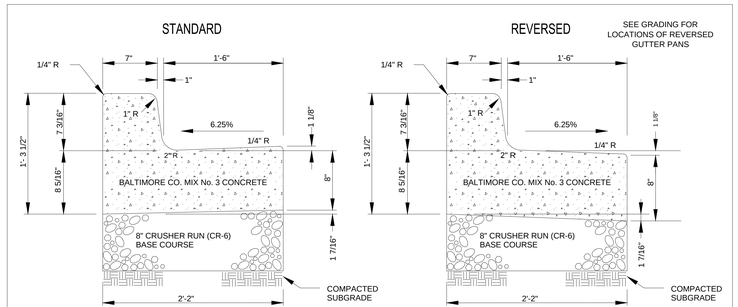


NOTES:
1. ALL PIPING SHALL BE SCHEDULE 40.
2. CONTRACTOR SHALL EXERCISE EXTREME CARE WHEN INSTALLING FENCE SO AS NOT TO DAMAGE UNDERGROUND UTILITIES.
3. FENCE FABRIC SHALL BE SECURED TO THE RAILS AND POSTS WITH ALUMINUM SELF LOCKING BANDS.

7 8' HIGH CHAIN LINK FENCE DETAIL SCALE: N.T.S.

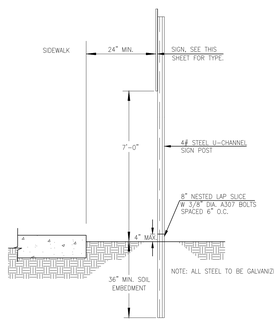


8 TYPE I PAVING W/ SEALCOAT DETAIL SCALE: N.T.S.

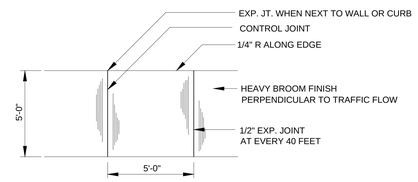


NOTES:
1. PROVIDE EXPANSION JOINTS EVERY 20' (MAX.).
2. PROVIDE CONTROL JOINTS EVERY 10' (MAX.). JOINTS ARE TO ALIGN WITH THE PROPOSED SIDEWALK JOINTS (TYPICAL).
3. SEE CONCRETE SIDEWALK DETAIL THIS SHEET REGARDING SCORING OF SIDEWALK.
4. SEE BALTIMORE COUNTY STANDARD DETAIL R-21 FOR ADDITIONAL INFORMATION.

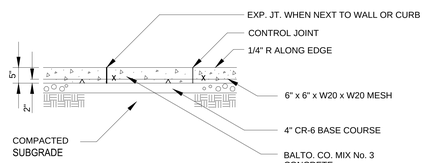
9 COMBINATION CURB AND GUTTER SCALE: N.T.S.



10 TYPICAL SIGN INSTALLATION DETAIL SCALE: N.T.S.



PROFILE

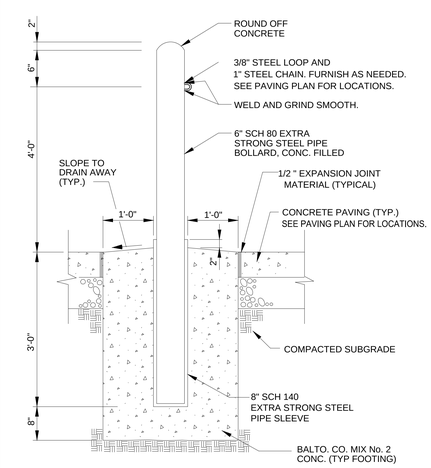


NOTE: PROVIDE 2% CROSS-SLOPE FOR POSITIVE DRAINAGE AS REQUIRED

SECTION

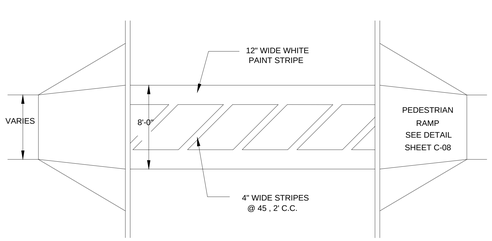
1. PROVIDE EXPANSION JOINTS 40' C.C. MAX. AND SCORE JOINTS 5' C.C. (UNLESS OTHERWISE NOTED). EXPANSION JOINTS SHALL BE 1/2" PREMOLDED BITUMINOUS JOINT MATERIAL IN ACCORDANCE WITH BALTIMORE COUNTY SPECIFICATION.
2. WHEN SIDEWALK ABUTS CURB, SIDEWALK SHALL BE 1/4" ABOVE CURB WITH 1/2" PREMOLDED BITUMINOUS JOINT MATERIAL.
3. SEE BALTIMORE COUNTY STANDARD DETAIL R-19 FOR ADDITIONAL INFORMATION.

11 CONCRETE SIDEWALK SCALE: N.T.S.



NOTE:
1. PIPE BOLLARDS TO BE PRIMED AND PAINTED WITH EXTERIOR ENAMEL PAINT IN ACCORDANCE WITH BALTIMORE COUNTY STANDARD DETAIL G-10. COLOR TO BE PER ARCHITECT.

12 PIPE BOLLARD SCALE: N.T.S.



13 CROSSWALK PAINT STRIPING SCALE: N.T.S.

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 3 I 089 EXPIRATION DATE: 1 1/21/15.

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PLANNERS
SCIENTISTS
CONSTRUCTION MANAGERS
936 RIDGEBROOK ROAD
SPARKS, MARYLAND 21152
TELEPHONE: (410) 316-7800
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REVISIONS			
NO.	DATE	DESCRIPTION	BY

DATE 01/09/2015
SCALE 1"=50'
DESIGNED BY JD/MS/FW
DRAWN BY FW

SITE DETAILS
FED EX
WAREHOUSE BUILDING
SCHEMATIC DESIGN DOCUMENTS
SPARROWS POINT, MARYLAND
15th ELECTION DISTRICT 7th COUNCILMANIC DISTRICT

DRAWING NO. C-7
SHEET 7 OF 12
KCI JOB NUMBER 13146740

DESIGN AND DRAWING BASED ON MARYLAND COORDINATE SYSTEM NAD 83/91 HORIZONTAL AND NAVD 1988 VERTICAL DATUM.

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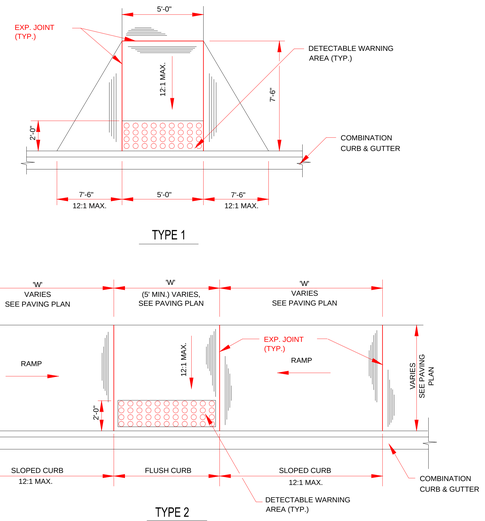


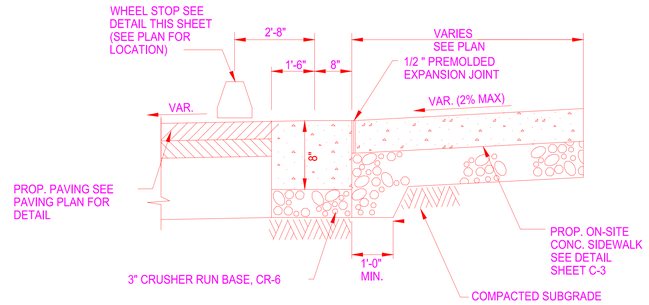
TYPE 1

TYPE 2

NOTES:

1. SURFACE TEXTURE OF RAMPS SHALL BE COARSE BROOMING OR NON SKID SURFACE.
2. SEE BALTIMORE COUNTY STANDARD DETAIL R-36A FOR ADDITIONAL INFORMATION.
3. DETECTABLE WARNING AREAS SHALL BE SQUARE PATTERN RED MASONRY UNITS. PARALLEL ALIGNMENT. SEE BALTIMORE COUNTY STANDARD DETAIL R-36C FOR ADDITIONAL INFORMATION.
4. SEE DEPRESSED CURB AND GUTTER AT PEDESTRIAN RAMP DETAIL, SHEET C-4.

14 PEDESTRIAN RAMP SCALE: N.T.S.



15 DEPRESSED CURB & GUTTER AT PEDESTRIAN RAMP SCALE: N.T.S.

DESIGN AND DRAWING BASED ON MARYLAND COORDINATE SYSTEM NAD 83/91 HORIZONTAL AND NAVD 1988 VERTICAL DATUM.

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DATE 01/09/2015
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SITE DETAILS
FED EX WAREHOUSE BUILDING
SCHEMATIC DESIGN DOCUMENTS
SPARROWS POINT, MARYLAND
15th ELECTION DISTRICT 7th COUNCILMANIC DISTRICT

DRAWING NO. C-8
SHEET 8 OF 12
KCI JOB NUMBER 13146740

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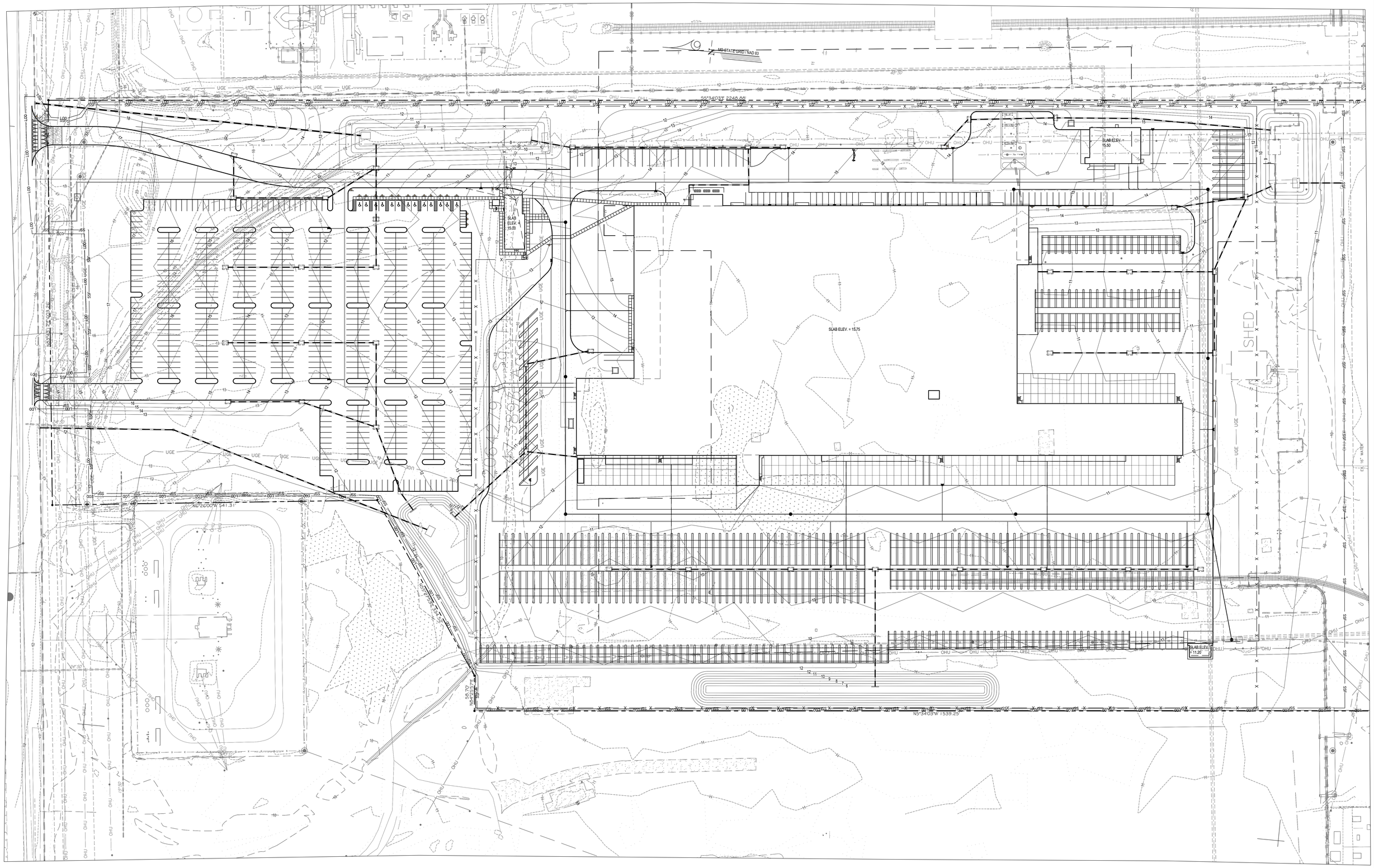
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B-4-2 STANDARDS AND SPECIFICATIONS FOR SOIL PREPERATION, TOPSOILING, AND SOIL AMENDMENTS

DEFINITION

THE PROCESS OF PREPARING THE SOILS TO SUSTAIN ADEQUATE VEGETATIVE STABILIZATION.

PURPOSE

TO PROVIDE A SUITABLE SOIL MEDIUM FOR VEGETATIVE GROWTH.

CONDITIONS WHERE PRACTICE APPLIES

WHERE VEGETATIVE STABILIZATION IS TO BE ESTABLISHED.

CRITERIA

A. SOIL PREPARATION

1. TEMPORARY STABILIZATION
   - A. SEEDBED PREPARATION CONSISTS OF LOOSENING SOIL TO A DEPTH OF 3 TO 5 INCHES BY MEANS OF SUITABLE AGRICULTURAL OR CONSTRUCTION EQUIPMENT, SUCH AS DI SC HARROWS OR CHISEL PLOWS OR RIPPERS MOUNTED ON CONSTRUCTION EQUIPMENT. AFTER THE SOIL IS LOOSENED, IT MUST NOT BE ROLLED OR DRAGGED SMOOTH BUT LEFT IN THE ROUGHENED CONDITION. SLOPES 3:1 OR FLATTER ARE TO BE TRACKED WITH RIDGES RUNNING PARALLEL TO THE CONTOUR OF THE SLOPE.
   - B. APPLY FERTILIZER AND LIME AS PRESCRIBED ON THE PLANS.
   - C. INCORPORATE LIME AND FERTILIZER INTO THE TOP 3 TO 5 INCHES OF SOIL BY DISKING OR OTHER SUITABLE MEANS.
2. PERMANENT STABILIZATION
   - A. A SOIL TEST IS REQUIRED FOR ANY EARTH DISTURBANCE OF 5 ACRES OR MORE. THE MINIMUM SOIL CONDITIONS REQUIRED FOR PERMANENT VEGETATIVE ESTABLISHMENT ARE:
     - I. SOIL PH BETWEEN 6.0 AND 7.0.
     - II. SOLUBLE SALTS LESS THAN 500 PARTS PER MILLION (PPM).
     - III. SOIL CONTAINS LESS THAN 40 PERCENT CLAY BUT ENOUGH FINE GRAINED MATERIAL (GREATER THAN 30 PERCENT SILT PLUS CLAY) TO PROVIDE THE CAPACITY TO HOLD A MODERATE AMOUNT OF MOISTURE. AN EXCEPTION: IF LOVEGRASS WILL BE PLANTED, THEN A SANDY SOIL (LESS THAN 30 PERCENT SILT PLUS CLAY) WOULD BE ACCEPTABLE.
     - IV. SOIL CONTAINS 1.5 PERCENT MINIMUM ORGANIC MATTER BY WEIGHT.
     - V. SOIL CONTAINS SUFFICIENT PORE SPACE TO PERMIT ADEQUATE ROOT PENETRATION.
   - B. APPLICATION OF AMENDMENTS OR TOPSOIL IS RE QUIRED IF ON-SITE SOILS DO NOT MEET THE ABOVE CONDITIONS.
   - C. GRADED AREAS MUST BE MAINTAINED IN A TRUE AND EVEN GRADE AS SPECIFIED ON THE APPROVED PLAN, THEN SCARIFIED OR OTHERWISE LOOSENED TO A DEPTH OF 3 TO 5 INCHES.
   - D. APPLY SOIL AMENDMENTS AS SPECIFIED ON THE APPROVED PLAN OR AS INDICATED BY THE RESULTS OF A SOIL TEST.
   - E. MIX SOIL AMENDMENTS INTO THE TOP 3 TO 5 INCHES OF SOIL BY DISKING OR OTHER SUITABLE MEANS. RAKE LAWN AREAS TO SMOOTH THE SURFACE. REMOVE LARGE OBJECTS LIKE STONES AND BRANCHES, AND READY THE AREA FOR SEED APPLICATION. LOOSEN SURFACE SOIL BY DRAGGING WITH A HEAVY CHAIN OR OTHER EQUIPMENT TO ROUGHEN THE SURFACE WHERE SITE CONDITIONS WILL NOT PERMIT NORMAL SEEDBED PREPARATION. TRACK SLOPES 3:1 OR FLATTER WITH TRACKED EQUIPMENT LEAVING THE SOIL IN AN IRREGULAR CONDITION WITH RIDGES RUNNING PARALLEL TO THE CONTOUR OF THE SLOPE. LEAVE THE TOP 1 TO 3 INCHES OF SOIL LOOSE AND FRIABLE. SEEDBED LOOSENING MAY BE UNNECESSARY ON NEWLY DISTURBED AREAS.

B. TOPSOILING

1. TOPSOIL IS PLACED OVER PREPARED SUBSOIL PRIOR TO ESTABLISHMENT OF PERMANENT VEGETATION. THE PURPOSE IS TO PROVIDE A SUITABLE SOIL MEDIUM FOR VEGETATIVE GROWTH. SOILS OF CONCERN HAVE LOW MOISTURE CONTENT, LOW NUTRIENT LEVELS, LOW PH, MATERIALS TOXIC TO PLANTS, AND/OR UNACCEPTABLE SOIL GRADATION.
2. TOPSOIL SALVAGED FROM AN EXISTING SITE MAY BE USED PROVIDED IT MEETS THE STANDARDS AS SET FORTH IN THESE SPECIFICATIONS. TYPICALLY, THE DEPTH OF TOPSOIL TO BE SALVAGED FOR A GIVEN SOIL TYPE CAN BE FOUND IN THE REPRESENTATIVE SOIL PROFILE SECTION IN THE SOIL SURVEY PUBLISHED BY USDA-NRCS.
3. TOPSOILING IS LIMITED TO AREAS HAVING 2:1 OR FLATTER SLOPES WHERE:
   - A. THE TEXTURE OF THE EXPOSED SUBSOIL/PARENT MATERIAL IS NOT ADEQUATE TO PRODUCE VEGETATIVE GROWTH.
   - B. THE SOIL MATERIAL IS SO SHALLOW THAT THE ROOTING ZONE IS NOT DEEP ENOUGH TO SUPPORT PLANTS OR FURNISH CONTINUING SUPPLIES OF MOISTURE AND PLANT NUTRIENTS.
   - C. THE ORIGINAL SOIL TO BE VEGETATED CONTAINS MATERIAL TOXIC TO PLANT GROWTH.
   - D. THE SOIL IS SO ACIDIC THAT TREATMENT WITH LIMESTONE IS NOT FEASIBLE.
4. AREAS HAVING SLOPES STEEPER THAN 2:1 REQUIRE SPECIAL CONSIDERATION AND DESIGN.
5. TOPSOIL SPECIFICATIONS: SOIL TO BE USED AS TOPSOIL MUST MEET THE FOLLOWING CRITERIA:
   - A. TOPSOIL MUST BE A LOAM, SANDY LOAM, CLAY LOAM, SILT LOAM, SANDY CLAY LOAM, OR LOAMY SAND. OTHER SOILS MAY BE USED IF RECOMMENDED BY AN AGRONOMIST OR SOIL SCIENTIST AND APPROVED BY THE APPROPRIATE APPROVAL AUTHORITY. TOPSOIL MUST NOT BE A MIXTURE OF CONTRASTING TEXTURED SUBSOILS AND MUST CONTAIN LESS THAN 5 PERCENT BY VOLUME OF CINDERS, STONES, SLAG, COARSE FRAGMENTS, GRAVEL, STICKS, ROOTS, TRASH, OR OTHER MATERIALS LARGER THAN 1-1/2 INCHES IN DIAMETER.
   - B. TOPSOIL MUST BE FREE OF NOXIOUS PLANTS OR PLANT PARTS SUCH AS BERMUDA GRASS, QUACK GRASS, JOHNSON GRASS, NUT SEDGE, POISON IVY, THISTLE, OR OTHERS AS SPECIFIED.
   - C. TOPSOIL SUBSTITUTES OR AMENDMENTS, AS RECOMMENDED BY A QUALIFIED AGRONOMIST OR SOIL SCIENTIST AND APPROVED BY THE APPROPRIATE APPROVAL AUTHORITY, MAY BE USED IN LIEU OF NATURAL TOPSOIL.
6. TOPSOIL APPLICATION
   - A. EROSION AND SEDIMENT CONTROL PRACTICES MUST BE MAINTAINED WHEN APPLYING TOPSOIL.
   - B. UNIFORMLY DISTRIBUTE TOPSOIL IN A 5 TO 8 INCH LAYER AND LIGHTLY COMPACT TO A MINIMUM THICKNESS OF 4 INCHES. SPREADING IS TO BE PERFORMED IN SUCH A MANNER THAT SODDING OR SEEDING CAN PROCEED WITH A MINIMUM OF ADDITIONAL SOIL PREPARATION AND TILLAGE. ANY IRREGULARITIES IN THE SURFACE RESULTING FROM TOPSOILING OR OTHER OPERATIONS MUST BE CORRECTED IN ORDER TO PREVENT THE FORMATION OF DEPRESSIONS OR WATER POCKETS.
   - C. TOPSOIL MUST NOT BE PLACED IF THE TOPSOIL OR SUBSOIL IS IN A FROZEN OR MUDDY CONDITION, WHEN THE SUBSOIL IS EXCESSIVELY WET OR IN A CONDITION THAT MAY OTHERWISE BE DETRIMENTAL TO PROPER GRADING AND SEEDBED PREPARATION.

C. SOIL AMENDMENTS (FERTILIZER AND LIME SPECIFICATIONS)

1. SOIL TESTS MUST BE PERFORMED TO DETERMINE THE EXACT RATIOS AND APPLICATION RATES FOR BOTH LIME AND FERTILIZER ON SITES HAVING DISTURBED AREAS OF 5 ACRES OR MORE. SOIL ANALYSIS MAY BE PERFORMED BY A RECOGNIZED PRIVATE OR COMMERCIAL LABORATORY. SOIL SAMPLES TAKEN FOR ENGINEERING PURPOSES MAY ALSO BE USED FOR CHEMICAL ANALYSES.
2. FERTILIZERS MUST BE UNIFORM IN COMPOSITION, FREE FLOWING AND SUITABLE FOR ACCURATE APPLICATION BY APPROPRIATE EQUIPMENT. MANURE MAY BE SUBSTITUTED FOR FERTILIZER WITH PRIOR APPROVAL FROM THE APPROPRIATE APPROVAL AUTHORITY. FERTILIZERS MUST ALL BE DELIVERED TO THE SITE FULLY LABELED ACCORDING TO THE APPLICABLE LAWS AND MUST BEAR THE NAME, TRADE NAME OR TRADEMARK AND WARRANTY OF THE PRODUCER.
3. LIME MATERIALS MUST BE GROUND LIMESTONE (HYDRATED OR BURNT LIME MAY BE SUBSTITUTED EXCEPT WHEN HYDROSEEDING) WHICH CONTAINS AT LEAST 50 PERCENT TOTAL OXIDES (CALCIUM OXIDE PLUS MAGNESIUM OXIDE). LIMESTONE MUST BE GROUND TO SUCH FINENESS THAT AT LEAST 50 PERCENT WILL PASS THROUGH A #100 MESH SIEVE AND 98 TO 100 PERCENT WILL PASS THROUGH A #20 MESH SIEVE.
4. LIME AND FERTILIZER ARE TO BE EVENLY DISTRIBUTED AND INCORPORATED INTO THE TOP 3 TO 5 INCHES OF SOIL BY DISKING OR OTHER SUITABLE MEANS.
5. WHERE THE SUBSOIL IS EITHER HIGHLY ACIDIC OR COMPOSED OF HEAVY CLAYS, SPREAD GROUND LIMESTONE AT THE RATE OF 4 TO 8 TONS/ACRE (200-400 POUNDS PER 1,000 SQUARE FEET) PRIOR TO THE PLACEMENT OF TOPSOIL.

B-4-5 STANDARDS AND SPECIFICATIONS FOR PERMANENT STABILIZATION

DEFINITION

TO STABILIZE DISTURBED SOILS WITH PERMANENT VEGETATION.

PURPOSE

TO USE LONG-LIVED PERENNIAL GRASSES AND LEGUMES TO ESTABLISH PERMANENT GROUND COVER ON DISTURBED SOILS.

CONDITIONS WHERE PRACTICE APPLIES

EXPOSED SOILS WHERE GROUND COVER IS NEEDED FOR 6 MONTHS OR MORE.

CRITERIA

A. SEED MIXTURES

1. GENERAL USE
   - A. SELECT ONE OR MORE OF THE SPECIES OR MIXTURES LISTED IN TABLE B.3 FOR THE APPROPRIATE PLANT HARDINESS ZONE (FROM FIGURE B.3) AND BASED ON THE SITE CONDITION OR PURPOSE FOUND ON TABLE B.2. ENTER SELECTED MIXTURE(S), APPLICATION RATES, AND SEEDING DATES IN THE PERMANENT SEEDING SUMMARY. THE SUMMARY IS TO BE PLACED ON THE PLAN.
   - B. ADDITIONAL PLANTING SPECIFICATIONS FOR EXCEPTIONAL SITES SUCH AS SHORELINES, STREAM BANKS, OR DUNES OR FOR SPECIAL PURPOSES SUCH AS WILDLIFE OR AESTHETIC TREATMENT MAY BE FOUND IN USDA/NRCS TECHNICAL FIELD OFFICE GUIDE. SECTION 342 - CRITICAL AREA PLANTING.
   - C. FOR SITES HAVING DISTURBED AREA OVER 5 ACRES. USE AND SHOW THE RATES RECOMMENDED BY THE SOIL TESTING AGENCY.
   - D. FOR AREAS RECEIVING LOW MAINTENANCE. APPLY UREA FORM FERTILIZER (46-0-0) AT 3-1/2 POUNDS PER 1000 SQUARE FEET (150 POUNDS PER ACRE) AT THE TIME OF SEEDING IN ADDITION TO THE SOIL AMENDMENTS SHOWN IN THE PERMANENT SEEDING SUMMARY .
2. TURFGRASS MIXTURES
   - A. AREAS WHERE TURFGRASS MAY BE DESIRED INCLUDE LAWNS, PARKS, PLAYGROUNDS. AND COMMERCIAL SITES WHICH WILL RECEIVE A MEDIUM TO HIGH LEVEL OF MAINTENANCE.
   - B. SELECT ONE OR MORE OF THE SPECIES OR MIXTURES LISTED BELOW BASED ON THE SITE CONDITIONS OR PURPOSE. ENTER SELECTED MIXTURE(S), APPLICATION RATES, AND SEEDING DATES IN THE PERMANENT SEEDING SUMMARY. THE SUMMARY IS TO BE PLACED ON THE PLAN.
     - I. KENTUCKY BLUEGRASS: FULL SUN MIXTURE: FOR USE IN AREAS THAT RECEIVE INTENSIVE MANAGEMENT, IRRIGATION REQUIRED IN THE AREAS OF CENTRAL MARYLAND AND EASTERN SHORE. RECOMMENDED CERTIFIED KENTUCKY BLUEGRASS CULTIVARS SEEDING RATE: 1.5 TO 2.0 POUNDS PER 1000 SQUARE FEET, CHOOSE A MINIMUM OF THREE KENTUCKY BLUEGRASS CULTIVARS WITH EACH RANGING FROM 10 TO 35 PERCENT OF THE TOTAL MIXTURE BY WEIGHT.
     - II. KENTUCKY BLUEGRASS/PERENNIAL RYE: FULL SUN MIXTURE: FOR USE IN FULL SUN AREAS WHERE RAPID ESTABLISHMENT IS NECESSARY AND WHEN TURF WILL RECEIVE MEDIUM TO INTENSIVE MANAGEMENT. CERTIFIED PERENNIAL RYEGRASS CULTIVARS/CERTIFIED KENTUCKY BLUEGRASS SEEDING RATE: 2 POUNDS MIXTURE PER 1000 SQUARE FEET, CHOOSE A MINIMUM OF THREE KENTUCKY BLUEGRASS CULTIVARS WITH EACH RANGING FROM 10 TO 35 PERCENT. TRACK SLOPES 3:1 OR FLATTER WITH TRACKED EQUIPMENT LEAVING THE SOIL IN AN IRREGULAR CONDITION WITH RIDGES RUNNING PARALLEL TO THE CONTOUR OF THE SLOPE. LEAVE THE TOP 1 TO 3 INCHES OF SOIL LOOSE AND FRIABLE. SEEDBED LOOSENING MAY BE UNNECESSARY ON NEWLY DISTURBED AREAS.
     - III. TALL FESCUE/KENTUCKY BLUEGRASS: FULL SUN MIXTURE: FOR USE IN DROUGHT PRONE AREAS AND/OR FOR AREAS RECEIVING LOW TO MEDIUM MANAGEMENT IN FULL SUN TO MEDIUM SHADE. RECOMMENDED MIXTURE INCLUDES: CERTIFIED TALL FESCUE CULTIVARS 95 TO 100 PERCENT. CERTIFIED KENTUCKY BLUEGRASS CULTIVARS 0 TO 5 PERCENT. SEEDING RATE: 5 TO 8 POUNDS PER 1000 SQUARE FEET. ONE OR MORE CULTIVARS MAY BE BLENDED.
     - IV. KENTUCKY BLUEGRASS/FINE FESCUE: SHADE MIXTURE: FOR USE IN AREAS WITH SHADE IN BLUEGRASS LAWNS. FOR ESTABLISHMENT IN HIGH QUALITY, INTENSIVELY MANAGED TURF AREAS. MIXTURE INCLUDES: CERTIFIED KENTUCKY BLUEGRASS CULTIVARS 30 TO 40 PERCENT AND CERTIFIED FINE FESCUE AND 60 TO 70 PERCENT. SEEDING RATE: 1-1/2 TO 3 POUNDS PER 1000 SQUARE FEET.

     NOTES:

     SELECT TURFGRASS VARIETIES FROM THOSE LISTED IN THE MOST CURRENT UNIVERSITY OF MARYLAND PUBLICATION, AGRONOMY MEMO #77, "TURFGRASS CULTIVAR RECOMMENDATIONS FOR MARYLAND"

     CHOOSE CERTIFIED MATERIAL. CERTIFIED MATERIAL IS THE BEST GUARANTEE OF CULTIVAR PURITY. THE CERTIFICATION PROGRAM OF THE MARYLAND DEPARTMENT OF AGRICULTURE, TURF AND SEED SECTION, PROVIDES A RELIABLE MEANS OF CONSUMER PROTECTION AND ASSURES A PURE GENETIC LINE.
   - C. IDEAL TIMES OF SEEDING FOR TURF GRASS MIXTURES

     WESTERN MD: MARCH 15 TO JUNE 1, AUGUST 1 TO OCTOBER 1 (HARDINESS ZONES: 6B, 6A)
     CENTRAL MD: MARCH 1 TO MAY 15, AUGUST 15 TO OCTOBER 15 (HARDINESS ZONE: 6B)
     SOUTHERN MD, EASTERN SHORE: MARCH 1 TO MAY 15, AUGUST 15 TO OCTOBER 15 (HARDINESS ZONES: 7A, 7B)
   - D. TILL AREAS TO RECEIVE SEED BY DISKING OR OTHER APPROVED METHODS TO A DEPTH OF 2 TO 4 INCHES. LEVEL AND RAKE THE AREAS TO PREPARE A PROPER SEEDBED. REMOVE STONES AND DEBRIS OVER 1½ INCHES IN DIAMETER. THE RESULTING SEEDBED MUST BE IN SUCH CONDITION THAT FUTURE MOWING OF GRASSES WILL POSE NO DIFFICULTY.
   - E. IF SOIL MOISTURE IS DEFICIENT, SUPPLY NEW SEEDINGS WITH ADEQUATE WATER FOR PLANT GROWTH (1/2 TO 1 INCH EVERY 3 TO 4 DAYS DEPENDING ON SOIL TEXTURE) UNTIL THEY ARE FIRMLY ESTABLISHED. THIS IS ESPECIALLY TRUE WHEN SEEDINGS ARE MADE LATE IN THE PLANTING SEASON, IN ABNORMALLY DRY OR HOT SEASONS, OR ON ADVERSE SITES.

INLET INSPECTION NOTES

THE CONTRACTOR IS REQUIRED TO INSTALL INLET PROTECTION IN ALL STORM DRAIN INLETS WITH THE EXCEPTION OF THE FOLLOWING:

*1) ANY INLET OUTFALLING DIRECTLY INTO A SEDIMENT TRAPPING DEVICE.

2) INLETS ON PRIVATE OR PUBLIC PAVED ROADWAYS OPEN TO THE PUBLIC.

ALL INLET PROTECTION WILL BE INSTALLED AS DIRECTED BY THE INSPECTOR IN ACCORDANCE WITH THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL, PAGE E.23 (OR AS MAY BE AMENDED). THE REMOVAL OF ANY INLET PROTECTION DEVICES WILL REQUIRE APPROVAL FROM THE INSPECTOR.

* STORM DRAINS TO BE FLUSHED PRIOR TO TRAPPING DEVICE REMOVAL.

MAINTENANCE NOTE

CONTRACTOR SHALL INSPECT AND MAINTAIN ALL SEDIMENT CONTROL MEASURES AND DEVICES AFTER EVERY STORM EVENT. MAINTENANCE SHALL INCLUDE, BUT NOT BE LIMITED TO THE REMOVAL OF ALL ACCUMULATED SEDIMENT. GEOTEXTILE FABRIC SHALL BE REPLACED AS NEEDED TO ENSURE PROPER FUNCTION.

SUPER SILT FENCE MAINTENANCE NOTE

CONTRACTOR SHALL INSPECT THE SUPER SILT FENCE (SSF) AFTER EACH STORM EVENT AND PREFORM MAINTENANCE. MAINTENANCE SHALL CONSIST OF, BUT NOT BE LIMITED TO, REMOVAL OF ANY ACCUMULATED SEDIMENT ALONG AND/OR ABOVE THE FENCE LOCATION WHICH WILL RESTRICT ITS FUNCTION. IN ADDITION, ANY PORTION OF SSF DAMAGED SHALL BE REPAIRED AND/OR REPLACED IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS. IN THE EVENT THAT THE SSF IS TEMPORARILY REMOVED FOR CONTRACTOR TO CONDUCT WORK; SUCH AS, FOR RETAINING WALL CONSTRUCTION, THE SSF SHALL BE REPAIRED AND/OR REPLACED BY THE END OF THAT WORK DAY OR PRIOR TO A STORM EVENT, WHICHEVER COMES FIRST.

STANDARD STABILIZATION NOTE

FOLLOWING INITIAL SOIL DISTURBANCE OR RE-DISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION MUST BE COMPLETED WITHIN:

A. THREE (3) CALENDAR DAYS AS TO THE SURFACE OF ALL PERIMETER DIKES, SWALES, DITCHES, PERIMETER SLOPES, AND ALL SLOPES STEEPER THAN 3 HORIZONTAL TO 1 VERTICAL (3:1); AND

B. SEVEN (7) CALENDAR DAYS AS TO ALL OTHER DISTURBED OR GRADED AREAS ON PROJECT SITE NOT UNDER ACTIVE GRADING.

EROSION AND SEDIMENT CONTROL NOTES

1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN CONTINUOUS COMPLIANCE WITH THE LATEST VERSION OF THE MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL.

2. ALL UTILITIES, SUCH AS: STORM DRAIN, PUBLIC WATER, SANITAR SEWER, ELECTRIC POWER, TELEPHONE, CABLE AND GAS LINES, THAT ARE NOT IN PAVED AREAS AND ARE NOT UNDERGOING ACTIVE GRADING SHALL BE TEMPORARILY OR PERMANENTLY STABILIZED WITHIN 3 DAYS OF INITIAL DISTURBANCE.

3. THE OWNER/DEVELOPER OR THEIR DESIGNATE IS RESPONSIBLE FOR CONDUCTING ROUTINE INSPECTIONS AND REQUIRED MAINTENANCE. THE SITE AND CONTROLS SHOULD BE INSPECTED WEEKLY AND THE NEXT DAY AFTER EACH RAIN*. ANY ACCUMULATED SEDIMENT SHALL BE REMOVED AND DISPOSED OF IN A SUITABLE AREA AND SHALL BE TEMPORARILY OR PERMANENTLY STABILIZED.

**ANY PROJECT THAT HAS A STATE ISSUED N.O.I. PERMIT MUST DOCUMENT EACH INSPECTION AND MAINTAIN AN INSPECTION LOB (PLEASE SEE THE N.O.I. FOR DETAILS.)

STOCKPILE NOTES

1. NO STOCKPILING ALLOWED ON ASPHALT.

2. ALL STOCKPILES LEFT AT THE END OF THE DAY NEED TO BE STABILIZED UNTIL THE NEXT REDISTURBANCE.

FOR UTILITY WORK ONLY OR FOR OFF-SITE UTILITY WORK

1. DISTURBANCE OUTSIDE OF LODA CANNOT EXCEED 5000 SQUARE FEET.

2. PLACE ALL EXCAVATED MATERIAL ON HIGH SIDE OF TRENCH

3. ONLY DO AS MUCH WORK AS CAN BE DONE IN ONE DAY SO BACKFILLING, FINAL GRADING, SEEDING AND MULCHING CAN OCCUR.

4. ANY SEDIMENT CONTROL MEASURES DISURBED BY CONSTRUCTION WILL BE REPAIRED THE SAME DAY.

PERMANENT SEEDING SUMMARY

HARDINESS ZONE (from figure B.3): 7a
SEED MIXTURE (from table B.1):

NO.	SPECIES	APPLICATION RATE (lb/ac)	SEEDING DATES	SEEDING DEPTHS	FERTILIZER RATE (10-20-20) N	P_2O	K_2O	LIME RATE
6	TALL FESCUE PERENNIAL RYEGRASS SHITE CLOVER	40 25 5	3/1 - 5/15 8/1 - 10/15	1/2"	45 POUNDS PER ACRE (1.0 lb/ 1000 sf)	90 lb/ac (2 lb/ 1000 sf)	90 lb/ac (2 lb/ 1000 sf)	2 tons/ac (90 lb/1000 sf)
8	TURF-TYPE TALL FESCUE 100%	100	3/1 - 5/15 AND 8/1 - 10/15	1/4 - 1/2 in.				

NOTE: REFER TO TEMPORARY SEEDING SUMMARY TABLE NOTE #2 ADD NURSE CROP (5lbs. PER ACRE OF FOXTAIL MILLET FOR SEED MIXTURE NO. 8) AND (3.5 lbs. PER ACRE OF FOXTAIL MILLET FOR MIXTURE NO. 6) DURING SEEDING DATES 5/16 - 7/31 .

SEED MIX 6 IS SPECIFIED FOR USE IN BASIN NO. 1

B. SOD: TO PROVIDE QUICK COVER ON DISTURBED AREAS (2:1 GRADE OR FLATTER).

1. GENERAL SPECIFICATIONS
   - A. CLASS OF TURFGRASS SOD MUST BE MARYLAND STATE CERTIFIED. SOD LABELS MUST BE MADE AVAILABLE TO THE JOB FOREMAN AND INSPECTOR.
   - B. SOD MUST BE MACHINE CUT AT A UNIFORM SOIL THICKNESS OF 3/4 INCH, PLUS OR MINUS 1/4 INCH, AT THE TIME OF CUTTING. MEASUREMENT FOR THICKNESS MUST EXCLUDE TOP GROWTH AND THATCH. BROKEN PADS AND TORN OR UNEVEN ENDS WILL NOT BE ACCEPTABLE.
   - C. STANDARD SIZE SECTIONS OF SOD MUST BE STRONG ENOUGH TO SUPPORT THEIR OWN WEIGHT AND RETAIN THEIR SIZE AND SHAPE WHEN SUSPENDED VERTICALLY WITH A FIRM GRASP ON THE UPPER 10 PERCENT OF THE SECTION.
   - D. SOD MUST NOT BE HARVESTED OR TRANSPLANTED WHEN MOISTURE CONTENT (EXCESSIVELY DRY OR WET) MAY ADVERSELY AFFECT ITS SURVIVAL.
   - E. SOD MUST BE HARVESTED, DELIVERED, AND INSTALLED WITHIN A PERIOD OF 36 HOURS. SOD NOT TRANSPLANTED WITHIN THIS PERIOD MUST BE APPROVED BY AN AGRONOMIST OR SOIL SCIENTIST PRIOR TO ITS INSTALLATION.
2. SOD INSTALLATION
   - A. DURING PERIODS OF EXCESSIVELY HIGH TEMPERATURE OR IN AREAS HAVING DRY SUBSOIL, LIGHTLY IRRIGATE THE SUBSOIL IMMEDIATELY PRIOR TO LAYING THE SOD.
   - B. LAY THE FIRST ROW OF SOD IN A STRAIGHT LINE WITH SUBSEQUENT ROWS PLACED PARALLEL TO IT AND TIGHTLY WEDGED AGAINST EACH OTHER. STAGGER LATERAL JOINTS TO PROMOTE MORE UNIFORM GROWTH AND STRENGTH. ENSURE THAT SOD IS NOT STRETCHED OR OVERLAPPED AND THAT LONG JOINTS ARE BUTTED TIGHT IN ORDER TO PREVENT VOIDS WHICH WOULD CAUSE AIR DRYING OF THE ROOTS.
   - C. WHEREVER POSSIBLE, LAY SOD WITH THE LONG EDGES PARALLEL TO THE CONTOUR AND WITH STAGGERING JOINTS. ROLL AND TAMP. PEG OR OTHERWISE SECURE THE SOD TO PREVENT SLIPPAGE ON SLOPES. ENSURE SOLID CONTACT EXISTS BETWEEN SOD ROOTS AND THE UNDERLYING SOIL SURFACE.
   - D. WATER THE SOD IMMEDIATELY FOLLOWING ROLLING AND TAMPING UNTIL THE UNDERSIDE OF THE NEW SOD PAD AND SOIL SURFACE BELOW THE SOD ARE THOROUGHLY WET. COMPLETE THE OPERATIONS OF LAYING, TAMPING AND IRRIGATING FOR ANY PIECE OF SOD WITHIN EIGHT HOURS.
3. SOD MAINTENANCE
   - A. IN THE ABSENCE OF ADEQUATE RAINFALL, WATER DAILY DURING THE FIRST WEEK OR AS OFTEN AND SUFFICIENTLY AS NECESSARY TO MAINTAIN MOIST SOIL TO A DEPTH OF 4 INCHES. WATER SOD DURING THE HEAT OF THE DAY TO PREVENT WILTING.
   - B. AFTER THE FIRST WEEK, WATER AS OFTEN AS NECESSARY TO MAINTAIN ADEQUATE MOISTURE CONTENT.
   - C. DO NOT MOW UNTIL THE SOD IS FIRMLY ROOTED. NO MORE THAN 1/3 OF THE GRASS LEAF MUST BE REMOVED BY THE INITIAL CUTTING OR SUBSEQUENT CUTTINGS. MAINTAIN A GRASS HEIGHT OF AT LEAST 3 INCHES UNLESS OTHERWISE SPECIFIED.

B-4-4 STANDARDS AND SPECIFICATIONS FOR TEMPORARY STABILIZATION

DEFINITION

TO STABILIZE DISTURBED SOILS WITH VEGETATION FOR UP TO 6 MONTHS.

PURPOSE

TO USE FAST GROWING VEGETATION THAT PROVIDES COVER ON DISTURBED SOILS.

CONDITIONS WHERE PRACTICE APPLIES

EXPOSED SOILS WHERE GROUND COVER IS NEEDED FOR A PERIOD OF 6 MONTHS OR LESS. FOR LONGER DURATION OF TIME, PERMANENT STABILIZATION PRACTICES ARE REQUIRED.

CRITERIA

1. SELECT ONE OR MORE OF THE SPECIES OR SEED MIXTURES LISTED IN TABLE B.1 FOR THE APPROPRIATE PLANT HARDINESS ZONE (FROM FIGURE B.3), AND ENTER THEM IN THE TEMPORARY SEEDING SUMMARY BELOW ALONG WITH APPLICATION RATES, SEEDING DATES AND SEEDING DEPTHS. IF THIS SUMMARY IS NOT PUT ON THE PLAN AND COMPLETED, THEN TABLE B.1 PLUS FERTILIZER AND LIME RATES MUST BE PUT ON THE PLAN.
2. FOR SITES HAVING SOIL TESTS PERFORMED, USE AND SHOW THE RECOMMENDED RATES BY THE TESTING AGENCY. SOIL TESTS ARE NOT REQUIRED FOR TEMPORARY SEEDING.
3. WHEN STABILIZATION IS REQUIRED OUTSIDE OF A SEEDING SEASON, APPLY SEED AND MULCH OR STRAW MULCH ALONE AS PRESCRIBED IN SECTION B-4-3.A.1.B AND MAINTAIN UNTIL THE NEXT SEEDING SEASON.

TEMPORARY SEEDING SUMMARY

HARDINESS ZONE (from figure B.3): 7a
SEED MIXTURE (from table B.1):

NO.	SPECIES	APPLICATION RATE (lb/ac)	SEEDING DATES	SEEDING DEPTHS	FERTILIZER RATE (10-20-20)	LIME RATE
	FOXTAIL MILLET (Setaria italica)	30	5/16 - 7/31	1/2"	436 lb/ac (10 lb/1000 sf)	2 tons/ac (90 lb/1000 sf)
	ANNUAL RYEGRASS (Lolium perenne ssp, multiflorum)	40	3/1 - 5/15 AND 8/1 - 10/15	1/2"		

NOTE:

1. SEEDING RATES FOR THE WARM-SEASON GRASSES ARE IN POUNDS OF PURE LIVE SEED (PLS). ACTUAL PLANTING RATES SHALL BE ADJUSTED TO REFLECT PERCENT SEED GERMINATION AND PURITY, AS TESTED. ADJUSTMENTS ARE USUALLY NOT NEEDED FOR THE COOL-SEASON GRASSES.

2. SEEDING RATES LISTED ABOVE ARE FOR TEMPORARY SEEDINGS. WHEN PLANTED ALONE. WHEN PLANTED AS A NURSE CROP WITH PERMANENT SEED MIXES DO NOT EXCEED MORE THAN 5% (BY WEIGHT) OF THE OVERALL PERMANENT SEEDING MIX.

OWNER/DEVELOPER

I CERTIFY THAT THIS PLAN OF SEDIMENT CONTROL WILL BE IMPLEMENTED TO THE FULLEST EXTEND, AND ALL STRUCTURES WILL BE INSTALLED TO THE DESIGN AND SPECIFICATIONS AS SPELLED OUT IN THIS PLAN AND THAT ANY RESPONSIBLE PERSONNEL INVOLVED IN THE CONSTRUCTION PROJECT WILL HAVE A CERTIFICATION OF ATTENDANCE AT A DEPARTMENT OF ENVIORMENT APPROVED TRAINING PROGRAM FOR THE CONTROL OF SEDIMENT AND EROSION BEFORE BEGINNING THE PROJECT. I ALSO AUTHORIZE PERIODIC ON-SITE EVALUATION BY THE FREDERICK SOIL CONSERVATION DISTRICT PERSONNEL AND COOPERATING AGENCIES.

OWNER/DEVELOPER DATE

ENGINEER/ARCHITECT DESIGN CERTIFICATION

"I HEREBY CERTIFY THAT THE PLANS HAVE BEEN DESIGNED IN ACCORDANCE WITH LOCAL ORDINANCES, COMAR 26.17.01 AND 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL."

SIGNATURE REGISTRATION NUMBER DATE

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 3 1069 EXPIRATION DATE: 11/21/15.

B-4-3 STANDARDS AND SPECIFICATIONS FOR SEEDING AND MULCHING

DEFINITION

THE APPLICATION OF SEED AND MULCH TO ESTABLISH VEGETATIVE COVER.

PURPOSE

TO THE SURFACE OF ALL PERIMETER CONTROLS, SLOPES, AND ANY DISTURBED AREA NOT UNDER ACTIVE GRADING.

CONDITIONS WHERE PRACTICE APPLIES

TO PROTECT DISTURBED SOILS FROM EROSION DURING AND AT THE END OF CONSTRUCTION.

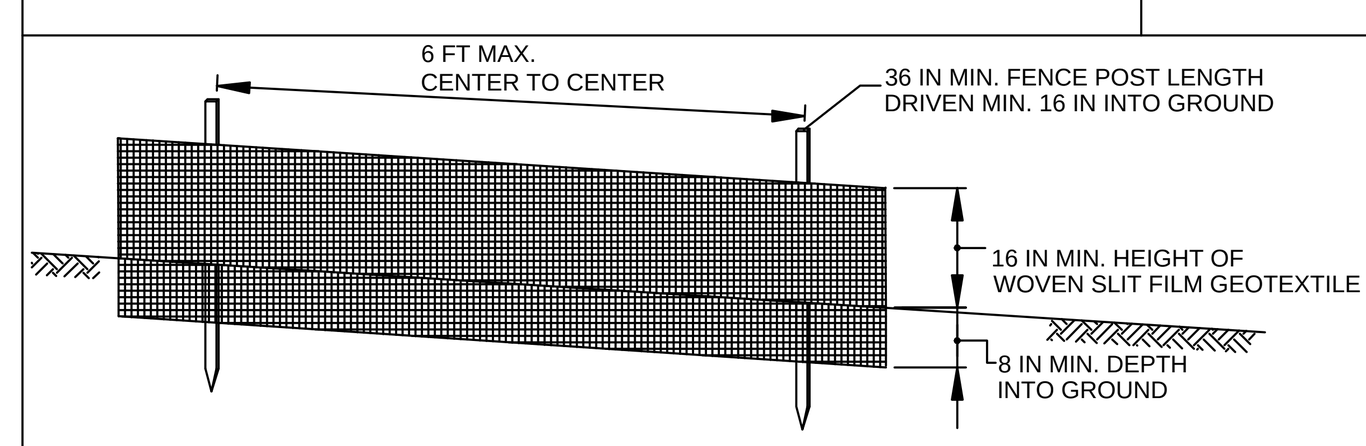
CRITERIA

A. SEEDING

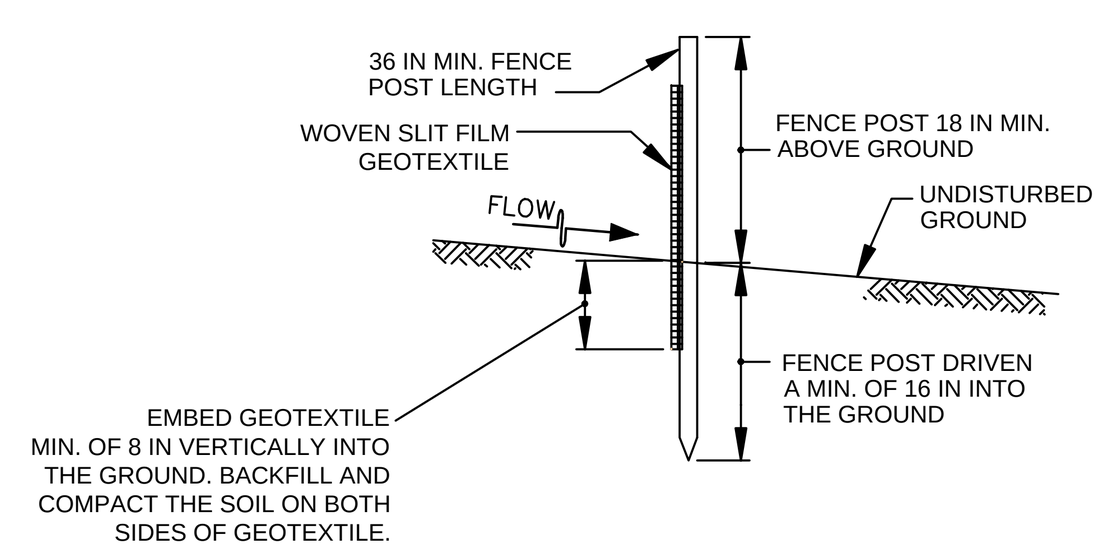
1. SPECIFICATIONS
   - A. ALL SEED MUST MEET THE REQUIREMENTS OF THE MARYLAND STATE SEED LAW. ALL SEED MUST BE SUBJECT TO RE-TESTING BY A RECOGNIZED SEED LABORATORY. ALL SEED USED MUST HAVE BEEN TESTED WITHIN THE 6 MONTHS IMMEDIATELY PRECEDING THE DATE OF SOWING SUCH MATERIAL ON ANY PROJECT. REFER TO TABLE B.4 REGARDING THE QUALITY OF SEED. SEED TAGS MUST BE AVAILABLE UPON REQUEST TO THE INSPECTOR TO VERIFY TYPE OF SEED AND SEEDING RATE.
   - B. MULCH ALONE MAY BE APPLIED BETWEEN THE FALL AND SPRING SEEDING DATES ONLY IF THE GROUND IS FROZEN. THE APPROPRIATE SEEDING MIXTURE MUST BE APPLIED WHEN THE GROUND THAWS.
   - C. INOCULANTS: THE INOCULANT FOR TREATING LEGUME SEED IN THE SEED MIXTURES MUST BE A PURE CULTURE OF NITROGEN FIXING BACTERIA PREPARED SPECIFICALLY FOR THE SPECIES. INOCULANTS MUST NOT BE USED LATER THAN THE DATE INDICATED ON THE CONTAINER. AD

DETAIL E-1 SILT FENCE

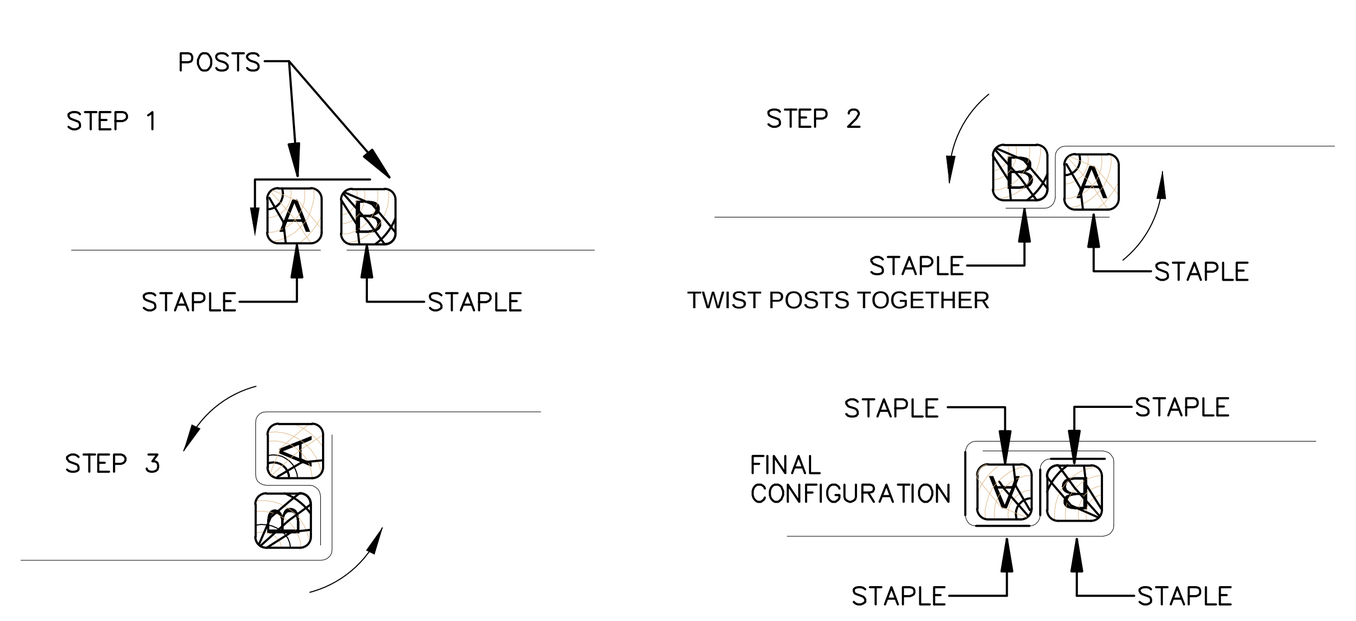
STANDARD SYMBOL: ├── SF ──┤



ELEVATION



CROSS SECTION



JOINING TWO ADJACENT SILT FENCE SECTIONS (TOP VIEW)

1 OF 2

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL
U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE | 2011 | MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL E-1 SILT FENCE

STANDARD SYMBOL: ├── SF ──┤

CONSTRUCTION SPECIFICATIONS

1. USE WOOD POSTS $1\frac{3}{4}$ X $1\frac{3}{4}$ ± $\frac{1}{16}$ INCH (MINIMUM) SQUARE CUT OF SOUND QUALITY HARDWOOD. AS AN ALTERNATIVE TO WOODEN POST USE STANDARD "T" OR "U" SECTION STEEL POSTS WEIGHING NOT LESS THAN 1 POUND PER LINEAR FOOT.

2. USE 36 INCH MINIMUM POSTS DRIVEN 16 INCH MINIMUM INTO GROUND NO MORE THAN 6 FEET APART.

3. USE WOVEN SLIT FILM GEOTEXTILE AS SPECIFIED IN SECTION H–1 MATERIALS AND FASTEN GEOTEXTILE SECURELY TO UPSLOPE SIDE OF FENCE POSTS WITH WIRE TIES OR STAPLES AT TOP AND MID–SECTION.

4. PROVIDE MANUFACTURER CERTIFICATION TO THE AUTHORIZED REPRESENTATIVE OF THE INSPECTION/ENFORCEMENT AUTHORITY SHOWING THAT THE GEOTEXTILE USED MEETS THE REQUIREMENTS IN SECTION H–1 MATERIALS.

5. EMBED GEOTEXTILE A MINIMUM OF 8 INCHES VERTICALLY INTO THE GROUND. BACKFILL AND COMPACT THE SOIL ON BOTH SIDES OF FABRIC.

6. WHERE TWO SECTIONS OF GEOTEXTILE ADJOIN: OVERLAP, TWIST, AND STAPLE TO POST IN ACCORDANCE WITH THIS DETAIL.

7. EXTEND BOTH ENDS OF THE SILT FENCE A MINIMUM OF FIVE HORIZONTAL FEET UPSLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT TO PREVENT RUNOFF FROM GOING AROUND THE ENDS OF THE SILT FENCE.

8. REMOVE ACCUMULATED SEDIMENT AND DEBRIS WHEN BULGES DEVELOP IN SILT FENCE OR WHEN SEDIMENT REACHES 25% OF FENCE HEIGHT. REPLACE GEOTEXTILE IF TORN. IF UNDERMINING OCCURS, REINSTALL FENCE.

2 OF 2

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL
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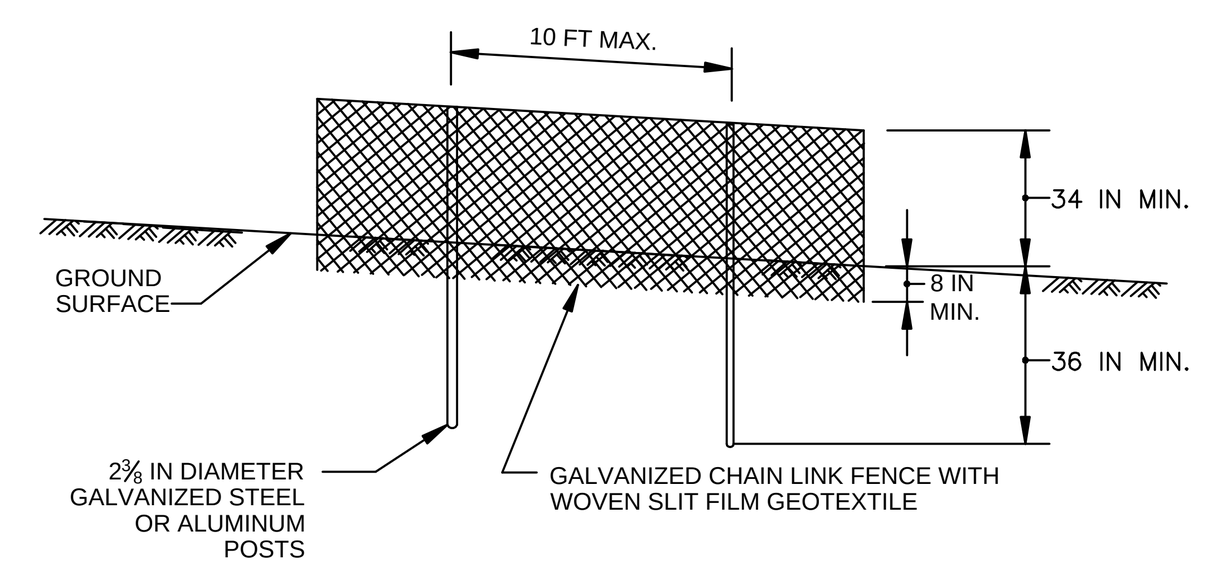
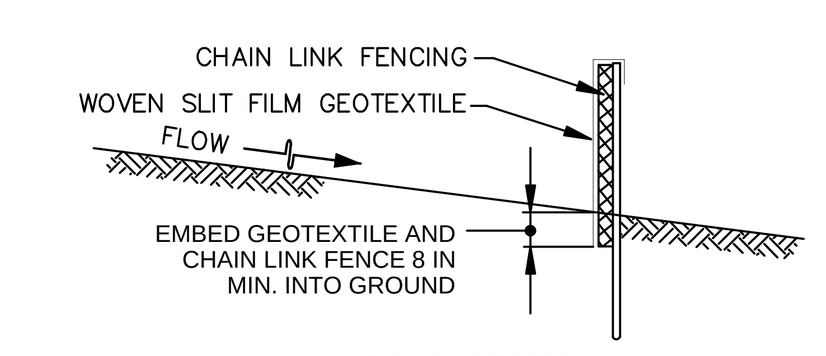
DETAIL E-3 SUPER SILT FENCE

STANDARD SYMBOL: ├── SSF ──┤



ELEVATION



CROSS SECTION

CONSTRUCTION SPECIFICATIONS

1. INSTALL $2\frac{3}{8}$ INCH DIAMETER GALVANIZED STEEL POSTS OF 0.095 INCH WALL THICKNESS AND SIX FOOT LENGTH SPACED NO FURTHER THAN 10 FEET APART. DRIVE THE POSTS A MINIMUM OF 36 INCHES INTO THE GROUND.

2. FASTEN 9 GAUGE OR HEAVIER GALVANIZED CHAIN LINK FENCE ($2\frac{3}{8}$ INCH MAXIMUM OPENING) 42 INCHES IN HEIGHT SECURELY TO THE FENCE POSTS WITH WIRE TIES OR HUG RINGS.

3. FASTEN WOVEN SLIT FILM GEOTEXTILE AS SPECIFIED IN SECTION H–1 MATERIALS, SECURELY TO THE UPSLOPE SIDE OF CHAIN LINK FENCE WITH TIES SPACED EVERY 24 INCHES AT THE TOP AND MID SECTION. EMBED GEOTEXTILE AND CHAIN LINK FENCE A MINIMUM OF 8 INCHES INTO THE GROUND.

4. WHERE ENDS OF THE GEOTEXTILE COME TOGETHER, THE ENDS SHALL BE OVERLAPPED BY 6 INCHES, FOLDED, AND STAPLED TO PREVENT SEDIMENT BY PASS.

5. EXTEND BOTH ENDS OF THE SUPER SILT FENCE A MINIMUM OF FIVE HORIZONTAL FEET UPSLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT TO PREVENT RUNOFF FROM GOING AROUND THE ENDS OF THE SUPER SILT FENCE.

6. PROVIDE MANUFACTURER CERTIFICATION TO THE INSPECTION/ENFORCEMENT AUTHORITY SHOWING THAT GEOTEXTILE USED MEETS THE REQUIREMENTS IN SECTION H–1 MATERIALS.

7. REMOVE ACCUMULATED SEDIMENT AND DEBRIS WHEN BULGES DEVELOP IN FENCE OR WHEN SEDIMENT REACHES 25% OF FENCE HEIGHT. REPLACE GEOTEXTILE IF TORN. IF UNDERMINING OCCURS, REINSTALL CHAIN LINK FENCING AND GEOTEXTILE.

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL
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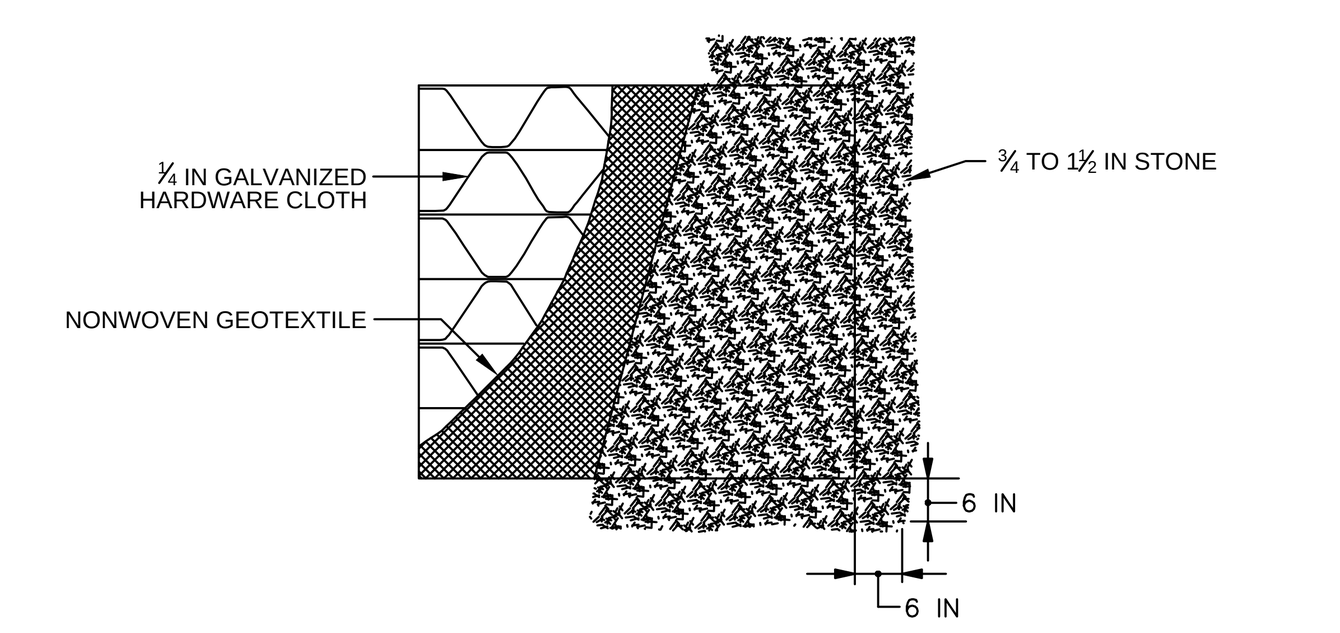
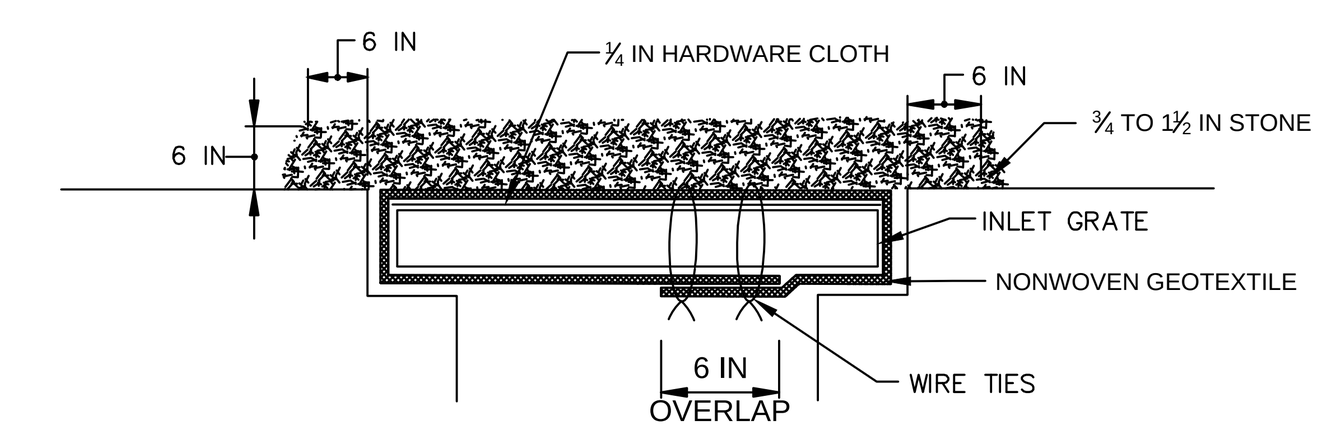
DETAIL E-9-2 AT-GRADE INLET PROTECTION

STANDARD SYMBOL: AGIP

MAXIMUM DRAINAGE AREA = 1 ACRE



PLAN / CUT AWAY VIEW



CROSS SECTION

CONSTRUCTION SPECIFICATIONS

1. USE NONWOVEN GEOTEXTILE AS SPECIFIED IN SECTION H–1 MATERIALS.

2. LIFT GRATE AND WRAP WITH NONWOVEN GEOTEXTILE TO COMPLETELY COVER ALL OPENINGS. SECURE WITH WIRE TIES AND SET GRATE BACK IN PLACE.

3. PLACE CLEAN $\frac{3}{4}$ TO $1\frac{1}{2}$ INCH STONE OR EQUIVALENT RECYCLED CONCRETE 6 INCHES THICK ON THE GRATE.

4. STORM DRAIN INLET PROTECTION REQUIRES FREQUENT MAINTENANCE. REMOVE ACCUMULATED SEDIMENT AFTER EACH RAIN EVENT TO MAINTAIN FUNCTION AND AVOID PREMATURE CLOGGING. IF INLET PROTECTION DOES NOT COMPLETELY DRAIN WITHIN 24 HOURS AFTER A STORM EVENT, IT IS CLOGGED. WHEN THIS OCCURS, REMOVE ACCUMULATED SEDIMENT AND CLEAN, OR REPLACE GEOTEXTILE AND STONE.

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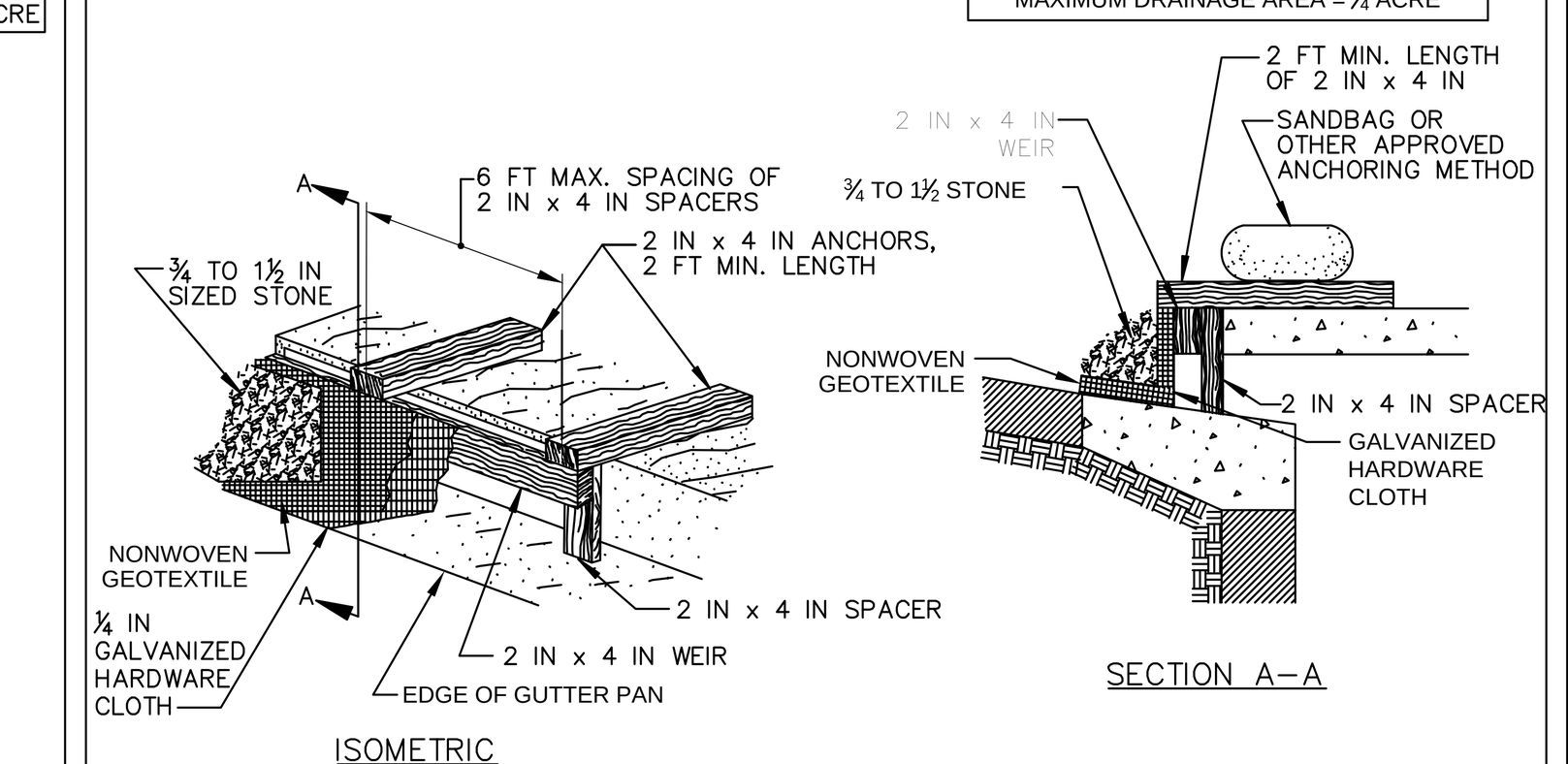
DETAIL E-9-3 CURB INLET PROTECTION

STANDARD SYMBOL: CIP

MAXIMUM DRAINAGE AREA = ¼ ACRE



CONSTRUCTION SPECIFICATIONS

1. USE NOMINAL 2 INCH x 4 INCH LUMBER

2. USE NONWOVEN GEOTEXTILE AS SPECIFIED IN SECTION H-1 MATERIALS.

3. NAIL THE 2x4 WEIR TO 9 INCH LONG VERTICAL SPACERS (MAXIMUM 6 FEET APART).

4. ATTACH A CONTINUOUS PIECE OF ¼ INCH GALVANIZED HARDWARE CLOTH, WITH A MINIMUM WIDTH OF 30 INCHES AND A MINIMUM LENGTH OF 4 FEET LONGER THAN THE THROAT OPENING, TO THE 2x4 WEIR, EXTENDING IT 2 FEET BEYOND THROAT ON EACH SIDE.

5. PLACE A CONTINUOUS PIECE OF NONWOVEN GEOTEXTILE OF THE SAME DIMENSIONS AS THE HARDWARE CLOTH OVER THE HARDWARE CLOTH AND SECURELY ATTACH TO THE 2x4 WEIR.

6. PLACE THE ASSEMBLY AGAINST THE INLET THROAT AND NAIL TO 2x4 ANCHORS (MINIMUM 2 FEET LENGTH). EXTEND THE ANCHORS ACROSS THE INLET TOP AND HOLD IN PLACE BY SANDBAGS OR OTHER APPROVED ANCHORING METHOD.

7. INSTALL END SPACERS A MINIMUM OF 1 FOOT BEYOND THE ENDS OF THE THROAT OPENING.

8. FORM THE HARDWARE CLOTH AND THE GEOTEXTILE TO THE CONCRETE GUTTER AND FACE OF CURB TO SPAN THE INLET OPENING. COVER THE HARDWARE CLOTH AND GEOTEXTILE WITH CLEAN ¾ TO 1½ INCH STONE OR EQUIVALENT RECYCLED CONCRETE.

9. AT NON-SUMP LOCATIONS, INSTALL A TEMPORARY SANDBAG OR ASPHALT BERM TO PREVENT INLET BYPASS.

10. STORM DRAIN INLET PROTECTION REQUIRES FREQUENT MAINTENANCE. REMOVE ACCUMULATED SEDIMENT AFTER EACH RAIN EVENT TO MAINTAIN FUNCTION AND AVOID PREMATURE CLOGGING. IF INLET PROTECTION DOES NOT COMPLETELY DRAIN WITHIN 24 HOURS AFTER A STORM EVENT, IT IS CLOGGED. WHEN THIS OCCURS, REMOVE ACCUMULATED SEDIMENT AND CLEAN, OR REPLACE GEOTEXTILE AND STONE.

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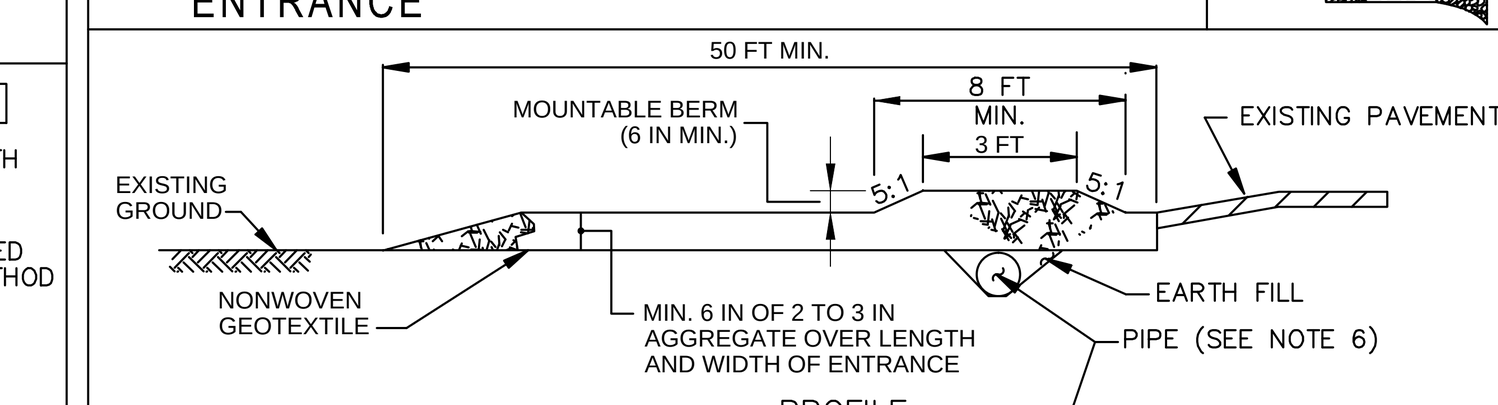
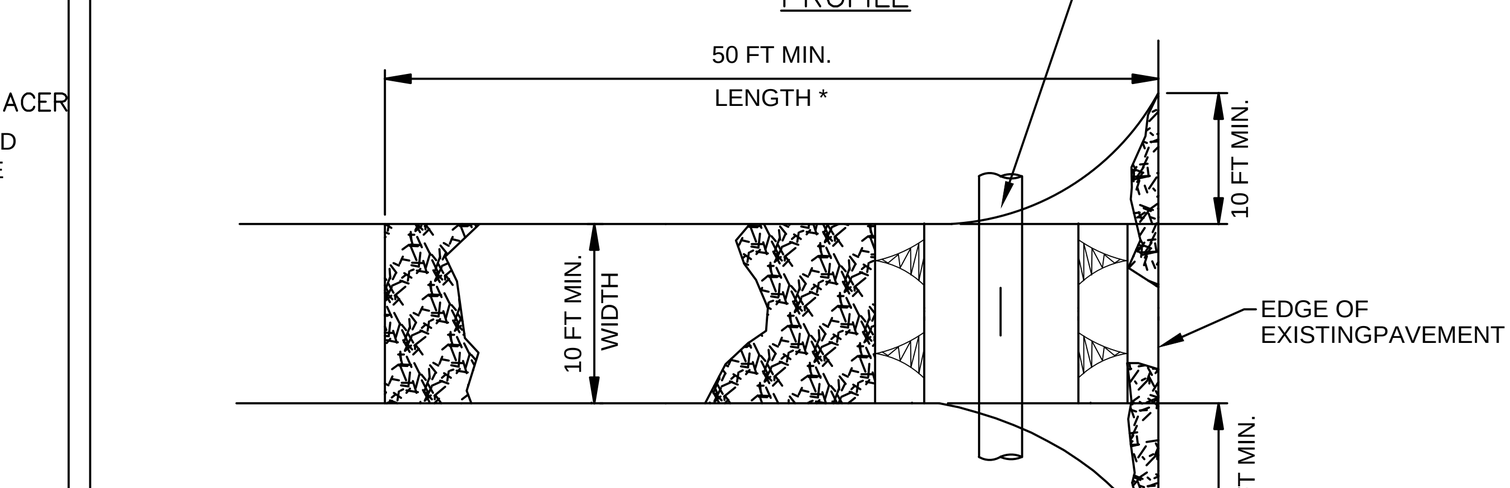
DETAIL B-1 STABILIZED CONSTRUCTION ENTRANCE

STANDARD SYMBOL: SCE



PROFILE



PLAN VIEW

CONSTRUCTION SPECIFICATIONS

1. PLACE STABILIZED CONSTRUCTION ENTRANCE IN ACCORDANCE WITH THE APPROVED PLAN. VEHICLES MUST TRAVEL OVER THE ENTIRE LENGTH OF THE SCE. USE MINIMUM LENGTH OF 50 FEET (*30 FEET FOR SINGLE RESIDENCE LOT). USE MINIMUM WIDTH OF 10 FEET. FLARE SCE 10 FEET MINIMUM AT THE EXISTING ROAD TO PROVIDE A TURNING RADIUS.

2. PIPE ALL SURFACE WATER FLOWING TO OR DIVERTED TOWARD THE SCE UNDER THE ENTRANCE, MAINTAINING POSITIVE DRAINAGE. PROTECT PIPE INSTALLED THROUGH THE SCE WITH A MOUNTABLE BERM WITH 5:1 SLOPES AND A MINIMUM OF 12 INCHES OF STONE OVER THE PIPE. PROVIDE PIPE AS SPECIFIED ON APPROVED PLAN. WHEN THE SCE IS LOCATED AT A HIGH SPOT AND HAS NO DRAINAGE TO CONVEY, A PIPE IS NOT NECESSARY. A MOUNTABLE BERM IS REQUIRED WHEN SCE IS NOT LOCATED AT A HIGH SPOT.

3. PREPARE SUBGRADE AND PLACE NONWOVEN GEOTEXTILE, AS SPECIFIED IN SECTION H–1 MATERIALS.

4. PLACE CRUSHED AGGREGATE (2 TO 3 INCHES IN SIZE) OR EQUIVALENT RECYCLED CONCRETE (WITHOUT REBAR) AT LEAST 6 INCHES DEEP OVER THE LENGTH AND WIDTH OF THE SCE.

5. MAINTAIN ENTRANCE IN A CONDITION THAT MINIMIZES TRACKING OF SEDIMENT. ADD STONE OR MAKE OTHER REPAIRS AS CONDITIONS DEMAND TO MAINTAIN CLEAN SURFACE, MOUNTABLE BERM, AND SPECIFIED DIMENSIONS. IMMEDIATELY REMOVE STONE AND/OR SEDIMENT SPILLED, DROPPED, OR TRACKED ONTO ADJACENT ROADWAY BY VACUUMING, SCRAPING, AND/OR SWEEPING. WASHING ROADWAY TO REMOVE MUD TRACKED ONTO PAVEMENT IS NOT ACCEPTABLE UNLESS WASH WATER IS DIRECTED TO AN APPROVED SEDIMENT CONTROL PRACTICE.

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL
U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE | 2011 | MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

Monday, February 09, 2015 10:36:20 AM
JUSTIN DUNN
M:\2014\13146740\DRAWINGS\CIVIL\C-11 EROSION & SEDIMENT CONTROL DETAILS.DWG

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 31089 EXPIRATION DATE: 11/21/15.

KCI TECHNOLOGIES
ENGINEERS
PLANNERS
SCIENTISTS
CONSTRUCTION MANAGERS
936 RIDGEBROOK ROAD
SPARKS, MARYLAND 21152
TELEPHONE: (410) 316-7800
FAX: (410) 316-7818

REVISIONS

NO.	DATE	DESCRIPTION	BY

DATE: 01/09/2015
SCALE: 1"=50'
DESIGNED BY: JD/MS/FW
DRAWN BY: FW

EROSION AND SEDIMENT CONTROL DETAILS
FED EX
WAREHOUSE BUILDING
SCHEMATIC DESIGN DOCUMENTS
SPARROWS POINT, MARYLAND
15th ELECTION DISTRICT — 7th COUNCILMANIC DISTRICT

DESIGN AND DRAWING BASED ON MARYLAND COORDINATE SYSTEM NAD 83/91 HORIZONTAL AND NAVD 1988 VERTICAL DATUM.

DRAWING NO. C-11
SHEET 11 OF 12
KCI JOB NUMBER 13146740

MD STATE GRID / NAD 83

E 1,457,800

N 572,450

S51°34'03"E 2248.68'

PROP. UG ELEC.

FUT. FUEL ISLAND W/ CANOPY

TRANSFORMER PAD

SLAB ELEV. =

MAINTENANCE GARAGE

SUBMERGED GRAVEL WETLAND

PROP. GAS

PROP. 12" W

PROP. 6" W

PROP. 8" S

ROOF LEADER

COMPUTER ROOM

GATEWAY BLDG

PROP. 12" S

PROP. 6" S

WAREHOUSE BLDG

ADMIN OFFICE

SLAB ELEV. = 15.75

PROP. 8" W (FIRE)

PROP. 4" W (DOM.)

GENERATOR PAD

N6°26'00"W 541.31'

SUBMERGED GRAVEL WETLAND

S5°27'57"E 97.52'

N5°34'03"W 1539.25'

SALT STORAGE BLDG

SLAB ELEV.= 11.29'

SUBMERGED GRAVEL WETLAND

N 572,450

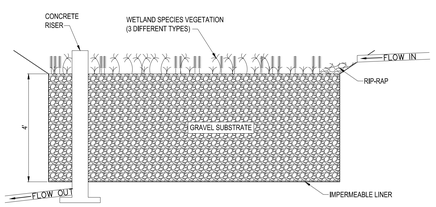
E 1,456,800

N 570,450

EX. 16" WATER

LEGEND

- PROP. STORMDRAIN
- PROP. WATER LINE
- PROP. SANITARY SEWER
- UGE — PROP. UNDERGROUND ELECTRIC
- G — PROP. GAS LINE
- PROP. MANHOLE
- PROP. INLET
- PROP. END WALL
- PROP. FIRE HYDRANT



SUBMERGED GRAVEL WETLAND
TYPICAL SECTION
SCALE: NTS

STORMWATER MANAGEMENT PLAN
SCALE: 1" = 50'

DESIGN AND DRAWING BASED ON MARYLAND COORDINATE SYSTEM NAD 83/91 HORIZONTAL AND NAVD 1988 VERTICAL DATUM.

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 31089 EXPIRATION DATE: 11/2/15.

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REVISIONS			
NO.	DATE	DESCRIPTION	BY

DATE: 01/09/2015
SCALE: 1"=50'
DESIGNED BY: JD/MS/FW
DRAWN BY: FW

STORMWATER MANAGEMENT PLAN
FED EX WAREHOUSE BUILDING
SCHEMATIC DESIGN DOCUMENTS
SPARROWS POINT, MARYLAND
15th ELECTION DISTRICT — 7th COUNCILMANIC DISTRICT

DRAWING NO. C-12
SHEET 12 OF 12
KCI JOB NUMBER 13146740

Monday, February 09, 2015 10:37:23 AM
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Appendix C

Laboratory Analytical Reports

(Included with April 2015 Submission, but not included with July 2015 Submission)

Appendix D

Groundwater Sampling Field Data

Table 1
Summary of Groundwater Sample Collection
Rod and Wire Mill Phase II
November 10-13, 2014

		SWM-2	B-5	SWM-5	SWM-4	B-11
Field Data	Date Sampled	11/11/2014	11/11/2014	11/11/2014	11/11/2014	11/11/2014
	DTW	1.48	0.50	1.10	3.35	0.33
	pH	5.1	6.3	6.7	7.8	5.3
	SpCond (mS/cm)	1.88	0.74	1.09	0.39	1.68
	°C	16.3	17.2	16.1	18.6	18.0
	ORP (mV)	111.5	11.5	53.0	-147.0	127.6
Analyses	Table I Metals	X	X	X	X	X
	Dissolved Metals	X	X	X	X	X
	Cr VI Total	X	X	X	X	X
	Cr VI Dissolved	X	X	X	X	X
	Cyanide	X	X	X	X	X
	VOCs	X	X		X	X
	SVOCs	X	X		X	X
	TPH	X			X	
	PCB/Pest./Herb.	X			X	

Notes:

DTW- Depth to water in feet below grade

Appendix E

Containment Remedy Operations and Maintenance Plan

CONTAINMENT REMEDY OPERATIONS AND MAINTENANCE PLAN PARCEL A1, FORMER SPARROWS POINT STEEL MILL

Containment Remedy Operations and Maintenance Overview

In accordance with the Response Action Plan (RAP) for the property identified as Parcel A1 located on the northern portion of the Sparrows Point Peninsula in Sparrows Point, Maryland (the Site), post remediation care requirements include compliance with the conditions placed on the No Further Action Letter, Certificate of Completion, and deed restrictions recorded for the Site. In addition, maintenance will be performed on the capped areas to control degradation and exposure to the underlying soil. Inspections of the capped areas will be conducted semi-annually. The responsible party will perform cap inspections, maintenance of the cap, and retain cap inspection records. Maintenance records will include the date of the inspection, name of the inspector, any noted issues, and subsequent resolution of the issues. Maintenance records will be maintained in a designated area at the Site for Maryland Department of the Environment (MDE) inspection and review, if requested.

The containment remedy (capping) will be constructed as described in the MDE-approved RAP. The following sections provide details of the Operations and Maintenance Plan (O&M Plan) procedures to be followed at the Site to assess when maintenance of the capped areas is necessary.

Designated Pavement Area Inspections

The asphalt-paved areas will consist of a 9 or 12-inch thick combination of road base and asphalt. The concrete-paved areas will consist of six inches of concrete with four inches of base course. The designated paved areas, as identified in the RAP, will be maintained to ensure the integrity of the cap.

Pavement area inspections will be conducted on a semi-annual basis to ensure that the capped areas are maintained as needed. During the inspection, the capped surfaces will be inspected to check for the following potential conditions:

- Differential settlement and significant surface-water ponding;
- Erosion or cracking of the cap materials; and
- Obstruction or blocking of drainage facilities.

When inspections indicate that cap repair is necessary, repairs will be completed as soon as practically possible in compliance with any recorded deed restrictions. The work will be documented on a form similar to the attached example Pavement Inspection Form. The inspection documentation will include the results of each inspection, recommended maintenance actions, and the actual maintenance/repair implemented. The responsible party will maintain inspection forms and any resulting repair records.

Pavement Inspection Protocol

A pavement management system (pavement condition index) will be implemented in the designated areas of the Site. The purpose of this system is to plan and prioritize future pavement maintenance needs. The system is based on a numerical rating of pavement distresses as published by the United States Army Corps of Engineers. The following chart will be used to provide an index of the pavement condition.

PAVEMENT CONDITION INDEX (PCI)		
PCI	**Characterization**	**Description**
1	New crack-free surface	Black in color, smooth texture
2	Oxidation has started	Short hairline cracks start to develop; dark gray color.
3	Oxidation in advanced state	Hairline cracks are longer and wider; gray in color
4	Oxidation complete	Cracked area 0.25 inch wide and crack lines have found base faults
5	Moisture penetrating through 0.25 inch cracks; loose material, stone and sand, evident	Texture of surface becoming rough; Preventative maintenance
6	Cracks widen and join	Cracks and shrinkage evident at curb and gutter lines
7	Potholes develop in low spots	Gatoring areas begin to break up; overall texture very rough.
8	Potholes developing	Pavement breaking up
9	Heaving due to excessive moisture in base	Distorts entire surface

PAVEMENT CONDITION INDEX (PCI)		
PCI	**Characterization**	**Description**
10	General breakup of surface	General breakup of surface

An inspection indicating a PCI of 4 or greater for designated areas of the Site will require maintenance. The intent is that repairs should be completed before the pavement degrades beyond a PCI of 4. MDE will be notified in a timely manner of any repairs that are the result of a PCI of 4 or greater. The notification will include documentation of the conditions being repaired and the location of the repair.

Designated Landscaped Area Inspections

The planned Site redevelopment includes landscaped areas primarily along the site perimeter. In designated landscaped areas, as identified in the RAP, capping will include an MDE-approved geotextile fabric beneath a minimum two-foot thick clean fill and/or top soil layer. The designated landscaped areas will be maintained to ensure the integrity of the cap.

Landscape Inspection Protocol

Inspections will be performed by traversing the designated landscaped areas and observing the surface conditions. Landscaped areas will be inspected to evaluate the condition of the plants, signs of animal burrows, erosion, or other features that may compromise the cap integrity. If plants need to be replaced, they will be replaced with shallow-rooted species whose root systems will not penetrate beyond the cap thickness. Alternatively, an excavation notification may be submitted to the MDE VCP for review and approval to extend the cap thickness in the area of the plants to allow for deeper-rooted species. The extended cap thickness will encompass the maximum anticipated root depth of the plant(s).

When inspections indicate that capped landscaped areas are in need of repair, repairs will be completed as soon as practically possible and in compliance with the MDE deed restriction. A form similar to the attached example Landscape Inspection Form will be used to document the results of each inspection, the recommended maintenance actions, and the actual maintenance/repair implemented. The responsible party will maintain inspection forms and any resulting repair records. MDE will be notified in a timely manner if damage to the capped landscaped area(s) exceeds one foot in diameter and/or two feet in depth.

PAVEMENT INSPECTION FORM	Parcel A1, Former Sparrows Point Steel Mill
Date:	Time:
Weather Conditions:	
General Pavement Conditions:	

	PCI	Characterization	Description
	1	New crack-free surface	Black in color, smooth texture
	2	Oxidation has started	Short hairline cracks start to develop; dark gray color
	3	Oxidation in advanced state	Hairline cracks are longer and wider; gray in color
RESPONSE REQUIRED	4	Oxidation complete	Crack area 0.25 inch wide and crack lines have found base faults
	5	Moisture penetrating through 0.25-inch cracks; loose material, stone and sand,evident	Texture of surface becoming rough; preventative maintenance
	6	Cracks widen and join	Cracks and shrinkage evident at curb and gutter lines
	7	Potholes develop in low spots	Gatoring areas begin to break up; overall texture very rough
	8	Potholes developing	Pavement breaking up
	9	Heaving due to excessive moisture in base	Distorts entire surface
	10	General breakup of surface	General breakup of surface

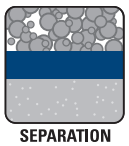
PAVEMENT INSPECTION FORM	Parcel A1, Former Sparrows Point Steel Mill
CURB CONDITION	☐ Exists ☐ Sound ☐ Cracked ☐ Root Intrusion ☐ Deteriorated Comments: _____
SIDEWALK CONDITION	Comments: _____
RESPONSE REQUIRED	
WORK COMPLETED	
PHOTOGRAPHS / FIGURES ATTACHED	
RESPONSE CONTRACTOR	Work Completed By: _____ Date: Signature:

LANDSCAPE INSPECTION FORM	Parcel A1, Former Sparrows Point Steel Mill
Date:	Time:
Weather Conditions:	
General Landscaping Description:	

GENERAL LANDSCAPE CONDITION	☐ Sound ☐ Erosion ☐ Root Intrusion ☐ Healthy Plant Condition ☐ Signs of Mortality ☐ Animal Burrows
GROUND COVER	☐ Dry ☐ Damp ☐ Wet Comments: _____
TREES	☐ Exists ☐ Healthy ☐ Poor Health ☐ Dead ☐ Fallen Comments: _____
SHRUBS	☐ Exists ☐ Healthy ☐ Poor Health ☐ Dead ☐ Fallen Comments: _____
EROSION	☐ Exists ☐ Slight ☐ Moderate ☐ Significant Comments: _____
HOLES	☐ Exists Depth of Holes: _____ Comments: _____

LANDSCAPE INSPECTION FORM	Parcel A1 Former Sparrows Point Steel Mill
RESPONSE REQUIRED	
WORK COMPLETED	
PHOTOGRAPHS / FIGURES ATTACHED	
RESPONSE CONTRACTOR	Work Completed By: _____ Date: Signature:

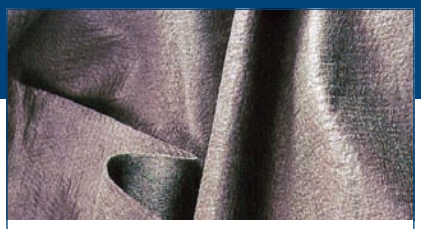
TENCATE Mirafi®


SEPARATION


DRAINAGE

Mirafi® N-Series Nonwoven Polypropylene Geotextiles

for Soil Separation and Drainage


Mirafi® N-Series Nonwoven Geotextiles

TenCate™ develops and produces materials that function to increase performance, reduce costs and deliver measurable results by working with our customers to provide advanced solutions.

The Difference Mirafi® N-Series Nonwoven Geotextiles Make:

- Construction. Mirafi® N-Series polypropylene nonwoven geotextiles easily conform to the ground or trench surface for trouble-free installation.
- Strength. Mirafi® N-Series geotextiles withstand installation stresses with high puncture and tear resistance.
- Drainage. High permittivity properties provide high water flow rates while providing excellent soil retention.
- Environmental. Mirafi® N-Series geotextiles are chemically stable in a wide range of aggressive environments.
- Cost Effective. Mirafi® N-Series geotextiles provide economical solutions to many civil engineering applications including a cost-effective alternative to graded-aggregate filters.

APPLICATIONS

Mirafi® N-Series nonwoven geotextiles are used in a wide variety of applications including soil separation and drainage applications. Lightweight nonwovens are predominantly used for subsurface drainage applications along highways, within embankments, under airfields, and athletic fields. For these drainage structures to be effective, they must have a properly designed protective filter.

Mirafi® N-Series nonwoven geotextiles eliminate the problems of determining the aggregate gradation required to match soil conditions, finding a convenient and economical source of a specific aggregate gradation, transporting and placing graded aggregate, and assuring that the in-place aggregate gradation provides effective filter performance.

Heavyweight nonwovens are used in critical subsurface drainage systems, soil separation, permanent erosion control, and geomembrane liner protection within landfills. These geotextiles provide the required strength and abrasion resistance to withstand installation and application stresses to create an effective, long-term drainage solution.

INSTALLATION GUIDELINES*

French and Trench Drains Geosynthetic Placement

Cut geosynthetic to proper width prior to placement. Width should be enough to conform to the trench perimeter with at least a 15cm (6in) top overlap. Place the geosynthetic roll over the trench, and unroll enough geosynthetic that the geosynthetic can be placed down into the trench. Anchor the edges of the geosynthetic with heavy objects to prevent the geosynthetic from falling into the trench. Where overlaps are necessary between rolls, allow for 1m (3ft) overlap from the upstream to the downstream roll.

* These guidelines serve as a general basis for installation. Detailed instructions are available from your TenCate™ representative.







TENCATE Mirafi®

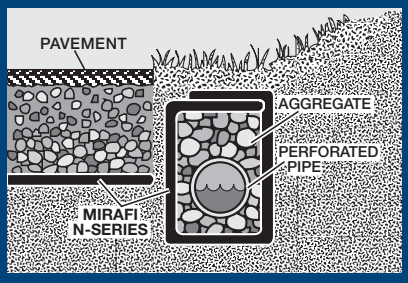
Mirafi® N-Series Nonwoven Polypropylene Geotextiles

for Soil Separation and Drainage

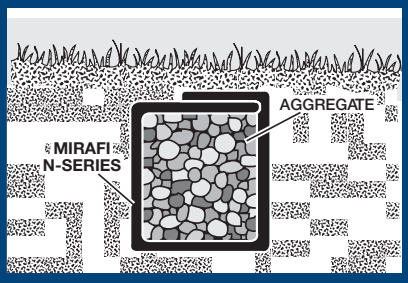
Property / Test Method	Units	140NL	140NC	140N	160N	170N	180N	1100N	1120N	1160N
MECHANICAL PROPERTIES										
Grab Tensile Strength										
ASTM D 4632										
Strength @ Ultimate	kN (lbs)	0.40 (90)	0.45 (100)	0.54 (120)	0.71 (160)	0.80 (180)	0.91 (205)	1.12 (250)	1.34 (300)	1.69 (380)
Elongation @ Ultimate	%	50	60	50	50	50	50	50	50	50
Trapezoidal Tear Strength	kN	0.18	0.20	0.22	0.27	0.33	0.36	0.45	0.52	0.62
ASTM D 4533	(lbs)	(40)	(45)	(50)	(60)	(75)	(80)	(100)	(115)	(140)
Puncture Strength	kN	0.25	0.29	0.29	0.42	0.47	0.49	0.69	0.78	1.05
ASTM D 4833	(lbs)	(55)	(65)	(65)	(95)	(105)	(110)	(155)	(175)	(235)
CBR Puncture Strength	kN	1.11	1.12	1.34	1.78	2.00	2.23	3.14	3.58	4.45
ASTM D 6241	(lbs)	(250)	(250)	(300)	(400)	(450)	(500)	(700)	(800)	(1000)
UV Resistance after 500 hrs.	% strength	70	70	70	70	70	70	70	70	70
ASTM D 4355										
HYDRAULIC PROPERTIES										
Apparent Opening Size (AOS)	US Sieve	60	70	70	70	100	80	100	100	100
ASTM D 4751	mm	0.25	0.212	0.212	0.212	0.15	0.180	0.149	0.149	0.150
Permittivity	sec^{-1}	2.0	1.9	1.8	1.4	1.2	1.1	1.0	0.8	0.54
ASTM D 4491										
Flow Rate	$l/min/m^2$	5907	5704	5500	4481	4278	3870	3056	2648	2037
ASTM D 4491	$(gal/min/ft^2)$	(145)	(140)	(135)	(110)	(105)	(95)	(75)	(65)	(50)
Packaging										
Roll Width	m (ft)	3.8 (12.5) 4.5 (15.0)	3.8 (12.5) 4.5 (15.0)	3.8 (12.5) 4.5 (15.0)	4.5 (15.0)	4.5 (15.0)	4.5 (15.0)	4.5 (15.0)	4.5 (15.0)	4.5 (15.0)
Roll Length	m (ft)	110 (360)	110 (360)	110 (360)	91 (300)	91 (300)	91 (300)	91 (300)	91 (300)	91 (300)
Est. Gross Weight	kg (lbs)	60 (133) 70 (160)	69 (152) 83(182)	74 (164) 89 (197)	99 (217)	110 (242)	113 (250)	154 (339)	175 (386)	205 (453)
Area	m^2 (yd^2)	418 (500) 502 (600)	418 (500) 502 (600)	418 (500) 502(600)	418 (500)	418 (500)	418 (500)	418 (500)	418 (500)	418 (500)

*NOTE: Mechanical Properties and Hydraulic Properties shown are Minimum Average Roll Values (MARV). Apparent Opening Size (AOS) properties shown are Maximum Average Roll Values. (Values and methods could change witout notice)

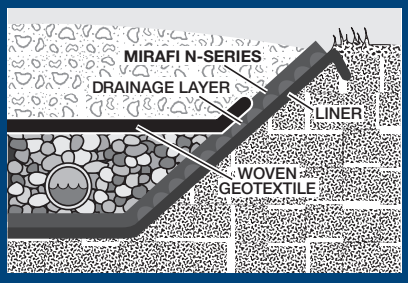
Mirafi® N-Series Nonwoven Geotextiles



Cut-off/Inceptor Drain Along a Roadway Or Another Critical Struction



French Drain Without Pipe



Liner Protection Within a Landfill

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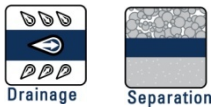

Mirafi® 140N

Mirafi® 140N is a nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. Mirafi® 140N is inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.

Mechanical Properties	Test Method	Unit	Typical Value	
			MD	CD
Tensile Strength (at ultimate)	ASTM D 4595	kN/m (lbs/in)	8.8 (50)	8.8 (50)
Grab Tensile Strength	ASTM D 4632	N (lbs)	627 (141)	627 (1410)
Grab Tensile Elongation	ASTM D 4632	%	80	80
Trapezoid Tear Strength	ASTM D 4533	N (lbs)	289 (65)	289 (65)
Mullen Burst Strength	ASTM D 3786	kPa (psi)	1777 (258)	
Puncture Strength[1]	ASTM D 4833	N (lbs)	329 (74)	
CBR Puncture Strength	ASTM D 6241	N (lbs)	1736 (390)	
Apparent Opening Size (AOS)[2]	ASTM D 4751	mm (U.S. Sieve)	0.18 (87)	
Permittivity	ASTM D 4491	sec^{-1}	2.2	
Flow Rate	ASTM D 4491	$l/min/m^2$ ($gal/min/ft^2$)	6722 (165)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70	

[1] ASTM D 4833 has been replaced with ASTM D 6241
[2] ASTM D 4751: AOS is a Maximum Opening Diameter Value

Physical Properties	Test Method	Unit	Typical Value	
Weight	ASTM D 5261	g/m^2 (oz/yd^2)	163 (4.8)	
Thickness	ASTM D 5199	mm (mils)	1.0 (40)	
Roll Dimensions (width x length)	--	m (ft)	3.8 x 110 (12.5 x 360)	4.5 x 110 (15 x 360)
Roll Area	--	m^2 (yd^2)	418 (500)	502 (600)
Estimated Roll Weight	--	kg (lb)	74 (164)	89 (197)

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Appendix F

Sample Health and Safety Plan

HEALTH AND **SAFETY PLAN**

SPARROWS POINT TERMINAL
SPARROWS POINT, MARYLAND

Prepared by:

EnviroAnalytics Group

Environmental Engineers

January 2015

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ATTACHMENTS

Attachment A – EAG Acknowledgment Form
Attachment B – MSDSs

1.0 INTRODUCTION

1.1 Background

The Sparrows Point Terminal site has historically been a steel making facility. It is located in Baltimore County, Maryland in the southeast corner of the Baltimore metropolitan area (approximately 9 miles from the downtown area), on the Sparrows Point Peninsula in the Chesapeake Bay watershed. The facility occupies the entire peninsula and is bounded to the west by Bear Creek; to the south by Patapsco River; and to the east by Jones Creek, Old Road Bay and residential areas of the City of Edgemere. The facility is bounded to the north by the Sparrows Point Country Club. The site is approximately 3,100 acres in size.

Pennsylvania Steel built the furnace at Sparrows Point in 1887 and the first iron was cast in 1889. Bethlehem Steel Corporation (BSC) purchased the facility in 1916 and enlarged it by building additional and plating facilities. BSC filed for bankruptcy in 2001. A series of entities has owned the site between then and now: the International Steel Group (ISG), Mittal Steel, ISG Sparrows Point, LLC, Severstal Sparrows Holding LLC, which was renamed to Severstal Sparrows Point, LLC, RG Steel Sparrows Point, LLC, and then a joint venture to Sparrows Point LLC (SP) and HRE Sparrows Point LLC. Most recently, in 2014, the property and assets were sold to Sparrows Point Terminal LLC (SPT). Environmental liability was retained by SP and work is currently being conducted by EnviroAnalytics Group, LLC (EAG) on behalf of SP.

- In addition to the current environmental investigation and remediation being conducted onsite by EAG and their consultants, there are other entities conducting work on the facility. Demolition of the remaining structures is currently ongoing at the site, and those contractors are being managed by SPT.
- The purpose of this document is to provide an overall health and safety plan (HASP) for EAG personnel and EAG directed contractors who are engaging in environmental investigation and remediation activities onsite. EAG directed contractors will also be expected to have their own Health and Safety Program, and they may opt to draft their own site specific HASP, provided it meets the requirements in this HASP.

1.2 Historic Operations

Steel manufacturing involves handling vast amounts of raw material including coke, iron ore, limestone and scrap steel, as well as recovering byproducts and managing waste materials. The operations listed below either were or are currently performed at the Sparrows Point Facility.

- Iron and steel production
- Coal chemical recovery system
- Other byproducts recovery systems
- Wastewater treatment systems
- Solid waste management
- Air pollution control

A number of site-specific environmental and hydrogeologic investigations have been prepared for the Sparrows Point facility. For the purposes of this HASP, information was obtained from the "Special Study Area Release Site Characterization" completed in 2001 by CH2MHill, as well as additional documents submitted since that time. There are five separate Special Study Areas as put forth in the Consent Decree:

- Humphrey Impoundment,
- Tin Mill Canal/Finishing Mills Areas,
- Coke Oven Area,
- Coke Point Landfill, and
- Greys Landfill.

Contaminated soils and groundwater may be present at the site. This plan was prepared based on an assessment of hazards expected to be present and a review of data from the previous site investigations and groundwater sampling events.

During the current investigations and remedial efforts, all related work will be performed in accordance with the requirements of this HASP and Occupational Safety and Health Administration (OSHA) regulations as defined in 29 Code of Federal Regulations (CFR) 1910.120 and 1926.65.

2.0 PURPOSE, SCOPE AND ORGANIZATION

This section describes the purpose, scope and organization of this HASP and the health and safety responsibilities of EAG, their employees, and their subcontractors involved in the field investigation and remediation activities at the Sparrows Point facility.

2.1 Scope

Field investigation and remediation activities for this project may include, but are not limited to:

- Groundwater sampling and monitoring,
- Groundwater and remediation well installation,
- Groundwater and remediation well repairs,
- Groundwater and remediation well closure and abandonment,
- Surface water sampling,
- Sediment sampling,
- Soil boring and subsurface soil sampling,
- Soil excavations for remedial purposes,
- Installation and operation of remediation systems for soil, soil vapor, and groundwater,
- Decommissioning and closure of remediation systems,
- Soil excavations for remedial purposes,
- Insitu soil mixing/soil stabilization,
- Exsitu soil mixing/soil stabilization,
- Dredging operations along Tin Mill Canal,
- Insitu chemical and/or biological injections, and
- Recovery of non-aqueous phase liquids (NAPL)

When EAG personnel are providing oversight of subcontractors, they will attend the safety and health briefings held by the contractor. EAG personnel will follow the requirements of this HASP, as well as any potentially more stringent requirements of the contractor's health and safety plan.

When EAG personnel are conducting tasks on their own, with or without subcontractors, they will follow the requirements of this HASP. EAG contractors, such as drillers, will also be required to follow the requirements of this HASP, as well as any more stringent requirements of the contractor's health and safety plan.

All EAG field personnel, including subcontractors to EAG, will be required to read and understand this HASP and agree to implement its provisions. All site personnel will sign the Acknowledgement Form included in **Attachment A** stating that they have read, understood, and agree to abide by the guidelines and requirements set forth in this plan.

2.2 Organization of Document

This HASP includes health and safety procedures for all generally anticipated project field activities. This plan also meets the OSHA requirements contained in the CFR, specifically 29 CFR 1910.120 and 29 CFR 1926, by including the following items:

- A description of staff organization, qualifications and responsibilities (Section 2.3),
- Hazard analysis (Section 3.0),
- Health hazard information (Section 4.0),
- Personal protective equipment (PPE), including available first aid, emergency, and safety equipment (Section 5.0),
- Employee and subcontractor training and standard safety procedures (section 6.0),
- Exposure monitoring plan (Section 7.0),
- Medical surveillance (Section 8.0),
- Site control measures and decontamination procedures for personnel and equipment (Section 9.0),
- Emergency response and contingency procedures (section 10.0), and
- Material Safety Data Sheets (MSDSs) for chemicals used on-site (**Attachment B**).

2.3 EAG Health and Safety Personnel

Personnel responsible for implementing this HASP include:

EAG Contacts for Sparrows Point Project Work	
VP Remediation, Russ Becker	(314) 686-5611
Senior Project Manager, James Calenda	(314) 620-3056
Senior Project Engineer, Elizabeth Schlaeger	(314) 307-1732
Josh Burke – Field Operations Manager	(314) 686-5623
Project Field Team Members, Jeff Wilson and Bill Trentzsch	(314) 620-3135, (314) 686-5598

3.0 HAZARD ANALYSIS

This section outlines the potential hazards related to the field activities listed in Section 2.1.

3.1 Hazard Analysis

The field activities planned for this project pose potential health and safety hazards for field team members. This section describes the hazards associated with the above-listed field activities. Detailed chemical, physical, and biological hazards information is provided in Section 4.0 (Health Hazard Information).

Hazards to which employees and subcontractors may be exposed to as a result of the above-listed activities include potential chemical exposures, lacerations, excessive noise, thermal stress, lifting of excessive weight or bulk, hand tools and heavy equipment, drilling and slips, trips and falls.

3.1.1 Chemical Hazards

Potential exposures to chemicals in the soil or groundwater include the possibility of dermal exposure (contact and/or absorption), inhalation of chemical contamination that may be encountered during sampling or during equipment decontamination activities, or ingestion of contaminants if good personal hygiene practices are not followed.

Benzene, naphthalene, and various metals are the major contaminants that have been identified in groundwater during previous investigations at the site In addition, light NAPL (LNAPL – benzene, in particular) and dense NAPL (DNAPL – naphthalene, in particular) have also been identified or are heavily suspected in various locations in the Coke Oven Area. Dissolved metals the chemicals of concern primarily located in the area of Tin Mill Canal and the Rod and Wire Mill Area. Treatment chemicals, such as sulfuric acid, are currently being used in remediation systems. All appropriate MSDS sheets will be reviewed that apply to the investigation or remedial tasks being conducted. MSDS sheets are located in **Attachment B**. It should be noted that this is a dynamic document: should any additional chemicals be introduced or discovered, the MSDS sheets will be added to **Attachment B**, as necessary.

3.1.2 Physical Hazards

The potential physical hazards associated with field activities include:

- Excessive lifting
- Slips, trips, and falls
- Working at heights
- Exposure to extreme outside temperatures and weather
- Equipment hazards
- Drilling Hazards
- Noise
- Dust and fumes
- Injury from tools, equipment, rotating parts
- Electrical hazards
- Buried and overhead hazards
- Work over water
- Driving to, from, and around the site (including working in trafficked areas)

Additional hazards may be encountered based on the various task at hand. It will be the responsibility of the site manager, with the help of field staff, to identify and address any additional hazards on a "per task or job" basis. A Job Safety Analyses (JSA) may need to be conducted prior to the start of various tasks. Safety meetings will be conducted with all staff in attendance, before the start of any new task or when any significant personnel or other changes (such as a swift change in weather, for example) occur. Updated information relating to physical hazards will be presented during these meetings in an effort to familiarize the crew with potential hazards, discuss new situations, and determine how the associated risks can be reduced. Further, good housekeeping practices will be enforced to preclude other risks resulting from clutter and inattention to detail. In addition, internal field audits will be randomly conducted to ensure adherence to all procedures are being followed.

3.1.3 Biological Hazards

Biological hazards that may be encountered when conducting field activities include the following:

- Poisonous snakes and spiders
- Ticks and tick-borne diseases
- Stinging insects such as chiggers, bees, wasps, etc.
- Various viruses and diseases spread via animal to human contact such as West Nile virus or rabies
- Various viruses and diseases spread via human to human contact such as colds or the flu
- Dermal contact with poison ivy, oak, and/or sumac
- Bloodborne pathogens when administering first aid

First aid kits will be available on-site. It is crucial to note that any site personnel who has significant allergies should communicate that information to the field team they are working with, along with the location of their auto-injector pen (such as an Epi-Pen) for use in case of going into anaphylactic shock from something that would cause such a reaction (like a bee sting, for example). Personnel who suffer from such allergies are responsible for providing their own auto-injector devices as those are typically prescription based as well as specific to their particular allergy.

4.0 HEALTH HAZARD INFORMATION

This section provides chemical hazard information for those potentially hazardous materials expected to be present at the facility. Potential physical and biological hazards are also discussed in this section.

4.1 Chemical Hazards

Exposure to chemicals through inhalation, ingestion, or skin contact may result in health hazards to field workers. Hazards associated with exposure will be evaluated using OSHA Permissible Exposure Limits (PELs) and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). Each of these values are 8-hour, time-weighted averaged (TWAs) above which an employee cannot be exposed. EAG may also use the National Institute of Occupational Safety and Health (NIOSH) Recommended Exposure Limits (RELs) where applicable. Although the OSHA PELs are the only exposure limits enforceable by law, the most stringent of exposure limits will be used as the EAG-enforced exposure criteria during field activities.

The following is a summary of the potential hazards created by the compounds that may be encountered during field activities. Data from sampling of groundwater wells was reviewed to identify potential contaminants at the site. Contaminants of concern may include benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), phenols, metals and water treatment chemicals. Table 4-1 contains chemical information and exposure limits for various chemicals that may be expected to be present in the investigation and remediation efforts. During the recovery of NAPL, the major contaminants of concern are benzene and naphthalene. It is possible that carbon monoxide may also be encountered from the use of various internal combustion engines (vehicular or otherwise); however, it is anticipated that since any such engine will be used outdoors, it is not expected that concentrations of concern will accumulate. With the use of any such engine, the engine should be positioned such that site personnel are upwind of the engine exhaust.

If any chemicals are brought on-site, MSDS must be made available and added to **Attachment B**. Personnel must be trained in the hazards and use of chemicals.

Table 4-1
Chemical Contaminants of Potential Concern

Chemical Name Synonyms (trade name)	Exposure Limits	Characteristics	Route of Exposure	Symptoms of Exposure
Benzene	PEL: 1PPM REL: 0.1 CA TLV: 0.5PPM STEL: 1PPM (NIOSH) Skin: YES	Colorless to light-yellow liquid with aromatic odor. LEL: 1.2% UEL: 7.8% VP: 75mm FI.P: 12°F	INH ABS ING CON	Irritation of eyes, skin, nose, respiratory system, giddiness, headache, nausea, fatigue, anorexia, dermatitis, bone marrow depression
Ethylbenzene	PEL: 100PPM REL: 100PPM TLV: 100PPM STEL: 125PPM IDLH: 800PPM Skin: NO	Colorless liquid with an aromatic odor. LEL: 0.85 UEL: 6.7% IP: 8.76EV VP: 7mm FI.P: 55°F	INH ING CON	Irritation of eyes, skin, mucous membranes; headache; dermatitis
1,1 dichloroethane	PEL: 100PPM REL: 100PPM TLV: 100PPM STEL: NA IDLH: 3000PPM Skin: NO	Colorless, oily liquid with a chloroform-like odor. LEL: 6.2% UEL: 16% IP: 11.05EV Vp: 64mm FI.P: 56°F	INH ING CON	Irritation of eyes, CNS depression, liver, kidney, lung damage
Phenol	PEL: 5PPM REL: 5PPM, 15.6PPM (C) TLV: 5PPM STEL: NA IDLH 250PPM Skin: YES	Colorless to light pink crystalline solid with a sweet, acrid odor. LEL: 1.8% UEL: 5.9% IP: 8.12EV Vp: 0.08mm FI.P: 175°F	INH ING CON ABS	Irritated eyes, nose, throat, anorexia, weakness, muscular ache, pain, dark urine, cyanosis, liver, kidney damage, skin burns, dermatitis, tremor, convulsions, twitch
Naphthalene	PEL: 10PPM REL: 10PPM TLV: 10PPM STEL: 15PPM IDLH: 250PPM Skin: YES	Colorless to brown solid with an odor of mothballs LEL: 0.9% UEL: 5.9% IP: 8.12EV Vp: 0.08mm FI.P: 174°F	INH ABS ING CON	Irritation of eyes, headache, confusion, excitement, malaise, nausea, vomiting, abdominal pain, irritated bladder, profuse sweating, jaundice, hematuria, renal shutdown, dermatitis, optical neuritis, corneal damage
Toluene	PEL: 200PPM, 300PPM (C) REL: 100PPM TLV: 20PPM STEL: 150PPM IDLH: 500PPM Skin: YES	Colorless liquid with a sweet, pungent benzene-like odor. LEL: 1.1% UEL: 7.1% IP: 8.82EV VP: 21MM FI.P: 40°F	INH ABS ING CON	Irritation of eyes, nose, fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, lacrimation, nervousness, muscle fatigue, insomnia, dermatitis, liver, kidney damage
Xylenes	PEL: 100PPM REL: 100PPM TLV: 100PPM STEL: 150PPM IDLH: 900PPM Skin: NO	Colorless liquid with an aromatic odor. LEL: 0.9% UEL: 6.7% IP: 8.40EV VP: 5MM FI.P: 88°F	INH ABS ING CON	Irritated eyes, nose, respiratory system, headache, fatigue, dizziness, confusion, malaise, drowsiness, incoherence, staggering gait, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermatitis

Chemical Name Synonyms (trade name)	Exposure Limits	Characteristics	Route of Exposure	Symptoms of Exposure
Styrene	PEL: 100PPM, 200PPM (C) REL: 50PPM TLV: 20PPM STEL: 40PPM IDLH: 700PPM Skin: NO	Colorless to yellow, oily liquid with a sweet, floral odor. LEL: 0.9% UEL: 6.8% IP: 8.40eV VP: 5MM FI.P: 88°F	INH ABS ING CON	Irritated eyes, nose, respiratory system, headache, fatigue, dizziness, confusion, malaise, drowsiness, weakness, narcosis, dermatitis
Chlorodiphenyl (54% chlorine) (11097-69-1)	PEL: 0.5mg/m³ REL: 0.001mg/m³ TLV: 0.5mg/m³ STEL: N/A IDLH: 5mg/m³(CA) Skin: YES	Colorless to pale yellow viscous liquid with a mild hydrocarbon odor. LEL: NA UEL: NA IP: UNKNOWN VP: 0.00006MM FI.P: NA	INH ABS ING CON	Irritated eyes, chloracne, liver damage, reproductive effects (carcinogen)
Polynuclear aromatic hydrocarbons (PAHs) (coal tar pitch volatiles) (65996-93-2)	PEL: 0.2mg/m³ REL: 0.1mg/m³ TLV: 0.2 mg/m³ STEL: N/A IDLH: 80mg/m³(CA) Skin: NO	The pitch of coal tar is black or dark brown amorphous residue that remains after the redistillation process. LEL: N/A UEL: N/A IP: VARIES VP: VARIES FI.P: VARIES	INH CON	Direct contact or exposure to vapors may be irritating to the eyes. Direct contact can be highly irritating to the skin and produce dermatitis. Exposure to vapors may cause nausea and vomiting. A potential human carcinogen.
Arsenic (inorganic)	PEL: 0.01mg/m³ REL: NONE TLV: 0.5 mg/m³ STEL: N/A IDLH: 5mg/m³ (CA) Skin: NO	Silver-gray or tin-white brittle odorless solid. Air odor threshold: N/D.	INH ABS CON ING	Symptoms include ulceration of nasal septum, gastrointestinal disturbances, respiratory irritation and peripheral neuropathy. Potential occupational carcinogen.
Barium	PEL: 0.5mg/m³ REL: 0.5mg/m³ TLV: 0.5mg/m³ STEL: N/A IDLH: 50mg/m³ Skin: NO	White, odorless solid. Air odor threshold: N/D.	INH ING CON	Irritated eyes, skin, upper respiratory system, skin burns, gastroenteritis, muscle spasm, slow pulse, cardiac arrhythmia
Cadmium (elemental)	PEL: 0.005mg/m³ REL: CA TLV: 0.01mg/m³ STEL: N/A IDLH: 9mg/m³ (CA) Skin: NO	Silver-white, blue-tinged lustrous, odorless solid. Air odor threshold: N/D.	INH ING	Symptoms include pulmonary edema, cough, tight chest, head pain, chills, muscle aches, vomiting and diarrhea. Potential occupational carcinogen.
Chromium (Metal)	PEL: 1.0mg/m³ REL: 0.5mg/m³ TLV: 0.5mg/m³ STEL: N/A IDLH: 250mg/m³ Skin: NO	Blue-white to steel-gray lustrous, brittle, hard odorless solid. Air odor threshold: N/D.	INH ING CON	Symptoms may include irritated eyes and skin, lung fibrosis.
Chromium (Chromium III inorganic compounds)	PEL: 0.5mg/m³ REL: 0.5mg/m³ TLV: 0.5mg/m³ STEL: N/A IDLH: 25mg/m³ Skin: NO	Varies depending on specific compound.	INH ING CON	Irritation of eyes, sensitivity dermatitis

Chemical Name Synonyms (trade name)	Exposure Limits	Characteristics	Route of Exposure	Symptoms of Exposure
Copper	PEL: 1mg/m³ REL: 1mg/m³ TLV: 1mg/m³ STEL: N/A IDLH: 100mg/m³ Skin: NO	Reddish, lustrous, malleable, odorless solid	INH ING CON	Irritation of eyes, nose, pharynx, nasal septum perforations, metallic taste, dermatitis
Lead (Elemental & Inorganic as Pb)	PEL: 0.05mg/m³ REL0.1mg/m³ TLV: 0.05mg/m³ STEL: N/A IDLH: 100mg/m³ Skin: NO	A heavy, ductile soft gray solid. Air odor threshold: N/D.	INH ING CON	Accumulative poison may cause weakness, insomnia, facial pallor, anorexia, malnutrition, constipation, abdominal pain, anemia, gingival lead line, paralysis of wrists and ankles, hypertension and kidney disease.
Nickel	PEL: 1mg/m³ REL: 0.015mg/m³ (Ca) TLV: 0.1mg/m³ STEL: N/A IDLH: 10mg/m³ Skin: NO	Lustrous, silvery, odorless solid. Air odor threshold: N/A VP: 0mm	INH CON ING	Sensitivity dermatitis, allergic asthma, pneumonitis
Vanadium pentoxide dust	PEL: 0.5mg/m³ (C) REL: 0.05mg/m³ (C) TLV: 0.05mg/m³ STEL: N/A IDLH: 35mg/m³ Skin: NO	Yellow-orange powder or dark gray, odorless flakes dispersed in air. VP: 0mm	INH ING CON	Irritated eyes, skin, throat, green tongue, metallic taste, eczema, cough, fine rales, wheezing, bronchitis
Zinc oxide	PEL: 5mg/m³ REL: 5mg/m³ TLV: 2mg/m³ STEL: 10mg/m³ IDLH: 500mg/m³ Skin: NO	White, lustrous solid	INH	Metal fume fever, chills, muscular ache, nausea, fever, dry throat, cough, weakness, metallic taste, headache, blurred vision, low back pain, vomiting, fatigue, malaise
Sulfuric Acid (water treatment chemical)	PEL: 1mg/m³ TLV: 0.2mg/m³ Skin: YES	Oily, colorless to slightly yellow, clear to turbid liquid	IHN ABS ING CON	Can cause irritation or corrosive burns to the upper respiratory system, lung irritation, pulmonary edema, burns to mouth throat and stomach, erode teeth, skin lesions
Antiscale (water treatment chemical)	PEL: 1mg/m³ TLV: 0.2mg/m³ Skin: YES	Liquid, colorless, clear	IHN ABS ING CON	May cause severe skin burns and eye damage, can cause cancer, fatal if inhaled, may damage organs through prolonged exposure
Antifoam (water treatment chemical)	N/E	Liquid emulsion, white, opaque	IHN ABS ING CON	May be harmful to skin, if inhaled and if swallowed
Gases				
Carbon Monoxide	PEL: 50PPM REL: 35PPM TLV: 25PPM STEL: 200PPM (C) IDLH: 1200PPM Skin: NO	Colorless, odorless gas LEL: 12.5% UEL: 74% IP: 14.01eV VP: >35atm FI.P: N/A	INH	Headache, rapid breathing, nausea, tiredness, dizziness, confusion

NOTES:

OSHA PEL	Occupational Safety and Health administration Final Rule Limits, Permissible Exposure Limit for an eight=hour, time-weighted average
ACGIH TLV	American Conference of Governmental Industrial Hygienists, Threshold Limit Value for eight-hour, time-weighted average
STEL	Short-term Exposure Limit for a 15-minute, time-weighted average
NIOSH IDLH	National Institute for Occupational Safety and Health, Immediately Dangerous to Life or Health concentration
PPM	Part of vapor or gas per millions parts of air by volume at 25°Celsius and 760mm Hg mg/m³ (milligram of substance per cubic meter of air)
CA	NIOSH has identified numerous chemicals that it recommends to be treated as potential or confirmed human carcinogens.
(C)	The (ceiling) concentration that should not be exceed during any part of the working exposure.
Skin	Refers to the potential contribution to the overall exposure by the cutaneous (absorption) route, including mucous membranes and eye, either by airborne or more particularly by direct contact with the substance.
UEL	Upper Explosive Limit – the highest concentration of a material in air that produces an explosion in fire or ignites when it contacts an ignition source.
LEL	Lower Explosive Limit – the lowest concentration of the material in air that can be detonated by spark, shock, fire, etc.
INH	Inhalation
ABS	Skin absorption
ING	Ingestion
CON	Skin and/or eye contact

4.2 Physical Hazards

Field employees and subcontractors may be exposed to a number of physical hazards during this project. Physical hazards that may be encountered include the following:

- Heat and cold stress
- Lifting hazards
- Slips, trips and falls
- Working around heavy equipment
- Drilling hazards
- Noise
- Use of hand and power tools
- Buried hazards
- Electrical hazards
- Underground and overhead utilities
- Working over water
- Travel to and from site

4.2.1 Heat Stress

Local weather conditions may produce an environment that will require restricted work schedules in order to protect employees from heat stress. The Project Manager or the Field Lead Team Member will observe workers for any potential symptoms of heat stress. Adaptation of work schedules and training on recognition of heat stress conditions should help prevent heat-related illnesses from occurring. Heat stress controls will be stated at 70°F for personnel in protective clothing and at 90°F for personnel in regular work clothing. Heat stress prevention controls include:

- Allow workers to become acclimatized to heat (three to six days)
- Provide rest breaks in a shaded or air-conditioned break area
- Provide sun screen to prevent sun burn
- Provide drinking water and electrolyte-replenishing fluids
- Keep ice readily available to rapidly cool field team members

The following Heat Stress Index should be used as a guide to evaluate heat stress situations. If the Heat Stress exceeds 105 degrees Fahrenheit, contact the project manager prior to conducting work for detailed guidance.

Heat Stress Index

Temp. °F	Relative Humidity								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
105	98	104	110	120	132				
102	97	101	108	117	125				
100	95	99	105	110	120	132			
98	93	97	101	106	110	125			
96	91	95	98	104	108	120	128		
94	89	93	95	100	105	111	122		
92	87	90	92	96	100	106	114	122	
90	85	88	90	92	96	100	106	114	122
88	82	86	87	89	93	95	100	106	115
86	80	84	85	87	90	92	96	100	109
84	78	81	83	85	86	89	91	95	99
82	77	79	80	81	84	86	89	91	95
80	75	77	78	79	81	83	85	86	89
78	72	75	77	78	79	80	81	83	85
76	70	72	75	76	77	77	77	78	79
74	68	70	73	74	75	75	75	76	77

NOTES: Add 10° F when protective clothing is being used; Add 10° F when in direct sunlight

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HSI Temp	Category	Injury Threat
Above 130° F	Extreme Danger	No work unless emergency exists. Contact Cardno ATC RSC and Corporate Risk Management Department prior to proceeding. Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
105° to 130° F	Danger	Contact RSC prior to proceeding. Requires strict adherence to ACGIH Heat Stress Guidelines, including use of on-site WBGT equipment. Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
90° to 105° F	Extreme Caution	Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
80° to 90° F	Caution	Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
Below 80° F	Normal Range	Typical conditions for time of year. Little or no danger under normal circumstances. As always, anticipate problems and work safely.

4.2.2 Cold Stress

Frostbite and hypothermia are two types of cold injury that personnel must be protected against during the performance of field duties. The objective is to prevent the deep body temperature from falling below 96.8° F and to prevent cold injury to body extremities. Two factors influence the development of a cold injury the ambient temperature, and wind velocity. Reduced body temperature will very likely result in reduced mental alertness, reduction in rational decision making, and/or loss of consciousness with the threat of death.

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Use appropriate cold weather clothing when temperatures are at or below 40° F as exposed skin surfaces must be protected. These protective items can include facemask, hand wear, and foot wear. Workers handling evaporative solvents during cold stress conditions will take special precautions to avoid soaking gloves and clothing because of the added danger of prolonged skin contact and evaporative cooling. Personnel will wear protective clothing appropriate for the level of cold and planned physical activity. The objective is to protect all parts of the body, with emphasis on the hands and feet. Eye protection against glare and ultraviolet light should be worn in snowy and icy conditions.

The work rate should not be so great as to cause heavy sweating that could result in wet clothing. If heavy work must be done, opportunities for rest breaks will be provided where workers have the opportunity to change into dry clothing. Conversely, plan work activities to minimize time spent sitting or standing still. Rest breaks should be taken in a warm, dry area. Windbreaks can also be used to shield the work area from the cooling effects of wind.

If extreme cold-related weather conditions occur, EAG field personnel and subcontractors will take the following precautions:

- Wear adequate insulated clothing when the air temperature drops below 40°F
- Reduce work periods in extreme conditions to allow adequate rest periods in a warm area
- Change clothes when work clothes become wet
- Avoid caffeine (which has diuretic and circulatory effects)

4.2.3 Lifting Hazards

Field personnel may be exposed to injury caused by lifting heavy objects and various pieces large or unwieldy pieces of equipment. All field team members will be trained in the proper methods for lifting heavy and/or large equipment and are cautioned against lifting objects that are too heavy or too big for one person. Proper lifting techniques include the following:

- Keep feet approximately shoulder width apart
- Bend at the knees
- Tighten abdominal muscles
- Lift with the legs
- Keep the load close to the body
- Keep the back upright
- Use the buddy system for larger or heavy pieces of equipment

All drums will be staged using an approved drum dolly or other appropriate equipment. Proper care will be taken in the use of this equipment. Healthy employees with no medical restrictions may lift and carry a maximum of 50 pounds using proper lifting and carrying techniques. This recommended weight limit may be reduced depending on physical and workplace factors.

4.2.4 Slips, Trips and Falls

The most common hazards that will be encountered during field activities will be slips, trips and falls. Field team members are trained to use common sense to avoid these hazards such as using work boots/safety shoes with nonskid soles. When working on slippery surfaces, tasks will be planned to decrease the risk of slipping via avoiding the slippery areas, if possible, or utilizing engineering controls. Engineering controls may involve the placement of supplemental material such as boards, gravel, or ice melt should be utilized to mitigate slippery conditions. Other engineering controls may involve the use of footgear traction control devices. Employees and subcontractors will avoid slippery surfaces, use engineering controls as appropriate, not hurry, and maintain good housekeeping.

4.2.5 Buried Hazards

Whenever the ground is penetrated, the potential for contacting buried hazards exists. During the planning/mobilization phase, prior to drilling or other excavation activities, EAG personnel and/or their contractors will establish the location of underground utility lines (gas, electrical, telephone, fiber optic cable, etc.) and/or substructures or other potential buried hazardous items. This may be conducted by review of historic utility and substructure maps, private utility locates, ground penetrating radar, or other technologies. If there is any evidence of utilities or subsurface objects/structures, drilling or excavation activities may be offset. If activities cannot be offset, measures will be taken to remove, disconnect, and/or protect the utilities and/or subsurface structures and/or objects. Every reasonable effort will be made to clear the area of intrusive work prior to fieldwork being started.

4.2.6 Electrical Hazards

It may be possible that overhead power lines will be in proximate locations during drilling or excavation activities. At least a 20 foot clearance must be maintained from overhead power lines. No equipment such as drill rigs or dump trucks can be moved while masts or buckets are in the upright position. Field personnel and subcontractors performing electrical work are required to be appropriately trained to work on the electrical systems in question prior to start of work. Authorization from project management personnel is required prior to any electrical work or work near overhead power lines. . When using extension cords, all field workers will ensure that they are in good working condition, are correctly rated for use, and do not contain abrasions such that bare wires could be exposed to the environment. Extension cords will not be used in wet areas without plugging the extension cord into a ground fault circuit interrupter (GFCI). GFCIs will detect a short circuit and cut power.

4.2.7 Heavy Equipment Operations

Heavy equipment must be operated in a safe manner and be properly maintained such that operators and ground personnel are protected.

Requirements for Operators

- Only qualified, trained, and authorized operators are allowed to operate equipment
- Seat belts will be used at all times in all equipment and trucks
- Operators will stop work whenever ground personnel or other equipment enter their work area; work will resume only when the area has been cleared
- No personnel may ride on equipment other than the Authorized Operator
- No personnel may be carried or lifted in the buckets or working "arms" of the equipment
- Spotters will be used when ground personnel are in the vicinity of heavy equipment work areas and/or when an operator is backing equipment near other structures or congested area

Requirements for Ground Personnel

- All ground personnel must wear orange protective vests in work areas with any operating heavy equipment
- Ground personnel will stay outside of the swing zone or work area of any operating equipment
- Ground personnel may only enter the swing or work area of any operating equipment when:
  -They have attracted the operators attention and made eye contact
  -The operator has idled the equipment down and grounded all extensions
  -The operator gives the ground personnel permission to approach
- Ground personnel shall never walk or position themselves between any fixed object and running equipment or between two running pieces of equipment

Equipment

- Maintain operations manuals at the site for each piece of equipment that is present and in use
- Ensure operators are familiar with the manual for the equipment and operate the equipment within the parameters of the manual
- Ensure all equipment is provided with roll-over protection systems
- Verify that seatbelts are present and functional in all equipment
- Prohibit the use of equipment that has cab glass which is broken or missing
- Ensure that backup alarms are functional on all trucks and equipment
- Require all extensions such as buckets, blades, forks, etc. to be grounded when not in use
- Require brakes to be set and wheels chocked (when applicable) when not in use

Daily inspections of equipment are required using a Daily Heavy Equipment Safety Checklist. Equipment deemed to be unsafe as a result of daily inspection will not be used until required repairs or maintenance occurs. During maintenance/repair, ensure that motors are turned off, all extensions are grounded or securely blocked, controls are in a neutral position, and the brakes are set.

4.2.8 Drilling and Excavation Safety

Prior to any intrusive work, as previously mentioned, the location of underground utilities, such as sewer, telephone, gas, water and electric lines must be determined and plainly staked. Necessary arrangements must be made with the utility company or owner for the protection, removal or relocation of the underground utilities. In such circumstances, excavation will be done in a manner that

does not endanger the field personnel engaged in the work or the underground utility. Utilities left in place will be protected by barricading, shoring, suspension or other measures, as necessary.

The use of unsafe or defective equipment is not permitted. Equipment must be inspected regularly. If found to be defective, equipment must be immediately removed from use and either repaired or replaced prior to resuming work with that equipment. Field personnel will be familiar with the location of first-aid kits and fire extinguishers. Telephone numbers for emergency assistance must be prominently posted and kept current.

Good housekeeping conditions will be observed in and around the work areas. Suitable storage places will be provided for all materials and supplies. Pipe, drill rods, etc. must be securely stacked on solid, level sills. Work surfaces, platforms, stairways, walkways, scaffolding, and access ways will be kept free of obstructions. All debris will be collected and stored in piles or containers for removal and disposal.

The area of the site to undergo intrusive activity must be walked over with the drillers and/or heavy equipment operators to identify all work locations, as well as making sure all marked utilities are seen by those doing the intrusive work.

Drilling Specific Concerns:

In areas where utilities have been identified or may be suspected, pre-drilling clearance such hand-augering, hand excavation (with shovels or post-hole diggers), or air-knifing to a depth of at least 5' below ground surface (BGS) may be required. The Project Manager will provide guidance in those instances on what has been determined as an acceptable means of clearing drilling locations. It should be noted that if the soil lithology changes to gravel within those 5 feet, that may be an indication of a utility trench and extreme caution should be taken OR the drilling location should be offset 5 horizontal feet from the original location. Should 3 consecutive attempts be made without success to offset a particular drilling location, the field personnel should stop and contact the Project Manager for further instruction.

Special precaution must be taken when using a drill rig on a site within the vicinity of electrical power lines and other overhead utilities. Electricity can shock, burn and cause death. When overhead electrical power lines exist at or near a drilling site, all wires will be considered dangerous.

A check will be made for sagging power lines before a site is entered. Power lines will not be lifted to gain entrance. The appropriate utility company will be contacted and a request will be made that it lift or raise cut off power to the lines.

The area around the drill rig will be inspected before the drill rig mast (derrick) is raised at a site in the vicinity of power lines. The minimum distance from any point on the drill rig to the nearest power line will be determined when the mast is raised or is being raised. The mast will not be raised and the drill rig will not be operated if this distance is less than 20 feet, because hoist lines and overhead power lines can be moved toward each other by the wind.

Before the mast is raised, personnel will be cleared from the immediate area, with the exception of the operator and a helper, when necessary. A check will be made to ensure safe clearance from energized power lines or equipment (minimum 20-foot clearance). Unsecured equipment must be removed from the mast and cables, mud lines and catline ropes must be adequately secured to the mast before raising. After it is raised, the mast must be secured to the rig in an upright position with steel pins.

Excavation Specific Concerns:

For excavation work, entry into an excavated area or trench will only be allowed when:

- Shoring, sloping, and spoil pile placement is in conformance with 29 CFR 1926 Subpart P, and
- Personal protection and monitoring, as detailed in this HASP, has been implemented.

All excavation contractors are required to provide an OSHA trained and certified Competent Person. Daily inspections of excavations, the adjacent areas, and protective systems shall be made by the Competent Person for evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the Competent Person prior to the start of work and as needed throughout each shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. All inspections made by the Competent Person should be recorded in the field log book. No personnel shall perform work in a trench or excavation that contains accumulated water (any accumulated water will need to be either pumped out until the trench/excavation is dry, or the accumulated water is allowed to disperse naturally). Each employee in an excavation shall be protected from cave-ins by an adequate protective system except when excavations are made entirely in stable rock or the excavation is less than 5 feet in depth and examination by the Competent Person provides no indication of a potential cave-in. Protective systems consist of sloping or benching, use of trench boxes or other shielding mechanisms, or the use of a shoring system in accordance with the regulations.

When mobile equipment is operated adjacent to an excavation and the operators/drivers do not have a clear and direct view of the edge of the excavation, a warning system such as barricades, hand or mechanical signals, or spotters are required.

Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard to personnel in the excavation. All temporary spoil piles shall be kept at least 2 feet away from the edge of the excavation. Spoil piles should be placed to channel rainwater or other run-off water away from the excavation.

All excavations deeper than 4 feet deep and which have the potential to have a hazardous atmosphere or oxygen deficient atmospheres (less than 19.5% oxygen) must be tested to ensure safe working conditions, prior to entry.

4.2.9 Use of Hand Tools and Portable Power Tools

Hand tools will be kept in good repair and used only for their designed purposes. Proper protective eyewear will be worn when using hand tools and portable power tools. Unguarded sharp-edged or

pointed tools will not be carried in field personnel's pockets. The use of tools with mushroomed heads, split or defective handles, worn parts, or other defects will not be permitted. Inspect all tools prior to start-up or use to identify any defects. Tools that have become unsafe will be reconditioned before reissue or they will be discarded and replaced. Throwing or dropping of tools from one level to another will not be permitted; rather, containers and hand lines will be used for transporting tools from one level to another if working at heights.

Non-sparking tools will be used in atmospheres where sources of ignition may cause fire or explosion. Electric-powered shop and hand tools will be of the double-insulated, shockproof type, or they will be effectively grounded. Power tools will be operated only by designated personnel who are familiar and trained with their use. When not in use, tools will not be left on scaffolds, ladders or overhead working surfaces.

4.2.10 Noise

Exposure to high levels of noise may occur when working near drill rigs or other heavy equipment. Also, depending upon where the work is being performed, local equipment (e.g., airports, factory machines, etc.) may produce high levels of noise. A good indication of the need for hearing protection is when verbal communication is difficult at a distance of 2-3 feet. Personnel will be provided with ear plugs and/or earmuffs when exposed to noise levels in excess of the 8-hour Permissible Exposure Limit (PEL) of 90 decibels.

4.2.11 Work Zone Traffic Control

Personnel will exercise caution when working near areas of vehicular traffic. Work zones will be identified by the use of delineators (traffic cones, flags, vehicles, DOT approved devices, temporary or permanent fencing, and/or safety barrier tape). Personnel will wear reflective vests when working in these areas. Depending on frequency, proximity, and nature of traffic, a flag person may also be utilized.

4.2.12 Work Over Water

If personnel will be working near, above or immediately adjacent to or within 6 feet of water that is 3 feet or more deep or where water presents a drowning hazard (e.g., fast-moving stream, water body with a soft bottom), employees are required to a U.S. Coast Guard (USCG) approved personal flotation device (PFD). All PFDs must have reflective tape on them to facilitate visibility. Employees must inspect PFDs daily before use for defects. Do no use defective PFDs.

4.2.13 Vehicle Use

Personnel must use caution when driving to, from, and across the site, paying special attention to other site traffic, as well as weather and road conditions. Heavy equipment should be transported during non-rush hour traffic.

4.3 Biological Hazards

Site activities on this Site may expose workers to other hazards such as poisonous plants, insects, animals, and indigenous pathogens. Protective clothing and respiratory protection equipment, and being capable of identifying poisonous plants, animals, and insects, can greatly reduce the chances of exposure. Thoroughly washing any exposed body parts, clothing, and equipment will also protect against infections. Avoiding contact with biological hazards is the best way to prevent potential adverse health effects. Recognition of potential hazards is essential. When avoidance is impractical or impossible, PPE, personal hygiene, good general health and awareness must be used to prevent adverse effects. If working in wooded/grassy areas, use appropriate insect repellants (containing DEET and/or Permethrin) and apply them per the manufacturers' directions. The following is a list of biological hazards that may be encountered while performing field activities at the project site and surrounding areas:

BIOLOGICAL HAZARD and LOCATION	CONTROL MEASURES
Snakes typically are found in underbrush and tall grassy areas.	If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound or apply a tourniquet. Carry the victim or have him/her walk slowly if the victim must be moved. Try to identify the snake: note color, size, patterns and markings.
Poison ivy, poison oak and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas.	Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.
Exposure to **bloodborne pathogens** may occur when rendering first aid or CPR, or when coming into contact with medical or other potentially infectious material or when coming into contact with landfill waste or waste streams containing such infectious material.	Training is required before a task involving potential exposure is performed. Exposure controls and personal protective equipment (PPE) area required. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.
Bees, spiders and other stinging insects may be encountered almost anywhere and may present a serious hazard particularly to people who are allergic.	Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past and inform the Project Manager and/or the buddy. If a stinger is present, remove it carefully with tweezers. Watch for allergic reaction; seek medical attention if a reaction develops.
Ticks typically are in wooded areas, bushes, tall grass and brush. Ticks are black, black and red or brown and can be up to one-quarter inch in size.	Avoid tick areas. Wear tightly woven, light-colored clothing with pants tucked into boots or socks. Spray outside of clothing with insect repellent containing permethrin. Check yourself for ticks often. If bitten, carefully remove tick with tweezers. Report the bit to the Project Manager. Look for symptoms of Lyme

	disease that include a rash that looks like a bulls eye and chills, fever, headache, fatigue, stiff neck or bone pain. If symptoms appear, seek medical attention.

5.0 PERSONAL PROTECTIVE EQUIPMENT

PPE ensembles are used to protect employees and subcontractors from potential contamination hazards while conducting project field activities. Level D is expected to be used for most activities at the site. The following subsections describe the PPE requirements for the field activities.

5.1 Level D Protection

When the atmosphere contains no known hazards and work functions preclude splashes, immersions or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals, Level D protection may be used. Level D does not provide respiratory protection and only provides minimal dermal protection. The Level D ensemble consists of the following:

- Work clothes that may consist of a short or long-sleeved cotton shirt and cotton pants, cotton overalls, or disposal overalls such as Tyvek™
- Steel-toe/steel-shank work boots
- Safety glasses with side shields
- Hearing protection, as necessary
- Hand protection, as appropriate
- Hard hat when working around overhead equipment such as a drilling rig
- Reflective vests when working around heavy equipment or near roadways
- Body harness and life vests when working on or within 6 feet of bulkheads, at heights, or in 3 feet or more of standing water (such as in Tin Mill Canal)

5.2 Modified Level D Protection

This is the level of protection that may be needed for material handling, sampling operations, and operation of remediation equipment when splash hazards are present. Modified Level D protection consists of the following:

- Disposable overalls such as polyethylene-coated Tyvek™
- Latex, vinyl, or nitrite inner gloves when handling liquids/fluids
- Nitrile outer gloves (taped to outer suit)
- Chemical-protective over-boots (taped to outer suit)
- Steel-toe/steel-shank, high-ankle work boots
- Hard hat with face shield
- Safety glasses with side shields or goggles
- Hearing protection, as necessary

5.3 Level C Protection

Level C protection will be used when site action levels are exceeded and respiratory protection is required. The Level C ensemble consists of Modified Level D with the following modifications:

- Half or full-face air-purifying respirator (APR) equipped with appropriate cartridges/filters
- Chemical resistant clothing such as poly-coated Tyvek™
- Inner and outer nitrile gloves
- Chemical-resistant safety boots or boot covers to go over safety boots

Upgrading or downgrading the level of protection used by EAG employees and subcontractors is a decision made by EAG based on the air monitoring protocols presented in Section 7.0 for respiratory protection, the potential for inhalation exposure to toxic chemicals, and the need for dermal protection during the activity.

5.4 First Aid, Emergency and Safety Equipment

The following first aid, emergency and safety equipment will be maintained onsite at the work area:

- A portable eye wash
- Appropriate ABC-type fire extinguishers (minimum of 10 pounds; remediation systems to house individual 20 pound extinguishers) carried in every vehicle used during field operations
- Industrial first-aid kit (one 16-unit that complies with American National Standards Institute (ANSI) Z308A for every 25 persons or less)
- Bloodborne pathogen precaution kit with CPR mouth shield
- Instant cold packs
- Soap or waterless hand cleaner and towels
- American Red Cross First Aid and CPR Instruction Manuals

6.0 PERSONNEL TRAINING AND STANDARD SAFETY PROCEDURES

Employees must have received, at the time of project assignment, a minimum of 40 hours of initial OSHA health and safety training for hazardous waste site operations. Personnel who have not met the requirements for the initial training will not be allowed in the Exclusion Zone (EZ) or Contamination Reduction Zone (CRZ) of any active work area. A copy of each subcontractor site worker's 40-hour training certificate must be sent to the Project Manager for review prior to the start of the site work.

The 8-hour refresher training course must be taken at a minimum of once per year. At the time of the job assignment, all site workers must have received 8 hours of refresher training within the past year. This course is required of all field personnel to maintain their qualifications for hazardous waste site work. A copy of each subcontractor site worker's most recent 8-hour refresher training certificate must be sent to the Project Manager for review prior to the start of the site work.

A site-specific safety orientation will be conducted by EAG for all EAG employees and subcontractors engaged in fieldwork.

6.1 Onsite Safety, Health and Emergency Response Training

The OSHA 1910.120 standard requires that site safety and health training be provided by a trained, experienced supervisor. "Trained" is defined to mean an individual that has satisfactorily completed the OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) course and 8-hour site supervisor training. Training will be offered at the time of the initial task assignment and/or whenever new chemicals are introduced into the workplace. Training will include all applicable regulatory requirements, location of the program, inventory and MSDSs, chemicals used and their hazards (chemical, physical, and health), how to detect the presence or release of chemicals, safe work practices and methods employees can take to protect themselves from hazards, how to read MSDSs and site or project specific information on hazard warnings and labels in use at that location. All training will be documented and training certificates will be kept in the employee's permanent training file. All applicable training will also require annual refreshers.

EAG qualified personnel must also provide safety meetings.

6.2 Standard Safety Procedures

This section describes the standard safety procedures that EAG requires all onsite personnel to follow during site activities.

6.2.1 General Safety Work Practices

All onsite employees and subcontractors will observe the following general safety work practices:

- Health and safety tailgate briefings will occur to introduce new activities, any new safety issues, and emergency egress routes for work areas; any significant change (added personnel, change in scope, or change in field conditions) will trigger a second (or more) tailgate meeting to address whatever change occurred
- No food, drink, or tobacco products will be allowed in the Exclusion and Contamination Reduction Zones
- Loose clothing, hair, and/or jewelry will not be permitted around moving or rotating equipment
- The "buddy system" will be implemented as necessary whereby a pair of co-workers watches out for each other while in proximity of potential physical work hazards
- Good housekeeping of all work areas will be maintained on an ongoing basis

6.2.2 Hand Safety

This standard is intended to protect employees from activities that may expose them to injury. This standard provides information on recognizing those conditions that require personal protective equipment (PPE) or specific work practices to reduce the risk of hand injury.

Appropriate gloves must be worn when persons work with materials or equipment that presents the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc.

<u>Guidelines for Working With and Around Equipment (Hand Tools, Portable Powered Equipment)</u>:

- Employees should be trained in the use of all tools.
- Keep hand and power tools in good repair and use them only for the task for which they were designed.

- Inspect tools before use and remove damaged or defective tools from service.
- Operate tools in accordance with manufacturer's instructions.
- Do not remove or bypass a guarding device for any reason.
- Keep surfaces and handles clean and free of excess oil to prevent slipping.
- Wear proper PPE, including gloves, as necessary.
- Do not carry sharp tools in pockets.
- Clean tools and return to the toolbox or storage area upon completion of a job.
- Before applying pressure, ensure that wrenches have a good bite.
- Brace yourself by placing your body in the proper position so you will not fall if the tool slips.
- Make sure hands and fingers have sufficient clearance in the event the tool slips.
- Always pull on a wrench, never push.
- When working with tools overhead, place tools in a holding receptacle when not in use.
- Do not throw tools from place to place or from person to person, or drop tools from heights.
- Inspect all tools prior to start-up or use to identify any defects.
- Powered hand tools should not be capable of being locked in the ON position.
- Require that all power-fastening devices be equipped with a safety interlock capable of activation only when in contact with the work surface.
- Do not allow loose clothing, long hair, loose jewelry, rings, and chains to be worn while working with power tools.
- Do not use cheater pipes.
- Make provisions to prevent machines from restarting through proper lockout/tagout.

<u>Guidelines for using Cutting Tools:</u>

- Always use the specific tool for the task. Tubing cutters, snips, self- retracting knives, concealed blade cutters, and related tools are task specific and minimize the risk of hand injury. For more information about cutting tools, see Supplemental Information A.
- Fixed open-blade knives (FOBK) are prohibited from use. Examples of fixed open-blade knives include pocket knives, multitools, hunting knives, and standard utility knives.
- When utilizing cutting tools, personnel will observe the following precautions to the fullest extent possible:
- Use the correct tool and correct size tool for the job.
- Cut in a direction away from yourself and not toward other workers in the area.
- Maintain the noncutting hand and arm toward the body and out of the direction of the cutting tool if it were to slip out of the material being cut.
- Ensure that the tool is sharp and clean; dirty and dull tools typically cause poor cuts and more hazard than a sharp, clean cutting tool.
- Store these tools correctly with covers in place or blades retracted, as provided by the manufacturer.
- On tasks where cutting may be very frequent or last all day (e.g., liner samples), consider Kevlar® gloves in the PPE evaluation for the project.
- Do not remove guards on paper cutters.

6.2.3 Respiratory Protection

Based on air monitoring, an upgrade to Level C protection may be indicated. Half or full-face APRs will be utilized for protection against organic vapors and particulates. All employees required to wear respirators will be need to be medically cleared, in writing to do so by a qualified Occupational Physician.

All respirator users must be trained before they are assigned a respirator, annually thereafter, whenever a new hazard or job is introduces and whenever employees fail to demonstrate proper use or knowledge. Training will include, at a minimum:

- Why the respirator is necessary and what conditions can make the respirator ineffective.
- What limitation and capabilities of the respirators area.
- How to inspect, put on and remove and check the seals of the respirator.
- What respirator maintenance and storage procedures are.
- How to recognize medicals signs and symptoms that may limit or prevent effective use of the respirator.
- The engineering and administrative controls being used and the need for respirators.
- The hazards and consequences of improper respirator use.
- How to recognize and handle emergency situations.

Training will be documented and training certificated will be kept in the employee's permanent training file.

6.2.4 Personal Hygiene Practices

The field team must pay strict attention to sanitation and personal hygiene requirements to avoid personal contamination. The following instructions will be discussed and must be followed:

- During field activities, never put anything in the mouth, including fingers
- All employees must wash their hands, forearms, face, and neck before eating drinking, smoking or using the restroom
- Smoking is prohibited except in designated areas outside the work zone
- At the end of the day, all employees will shower upon returning home or to their hotel

6.2.5 Electrical Safety

All extension cords used onsite must be heavy-duty variety and must be properly grounded. All temporary circuitry must incorporate the use of GFCI devices. Refer to electrical safety in Section 4.2.6, Electrical Hazards.

6.2.6 Fire Safety

All flammable liquids will be used only for their intended purpose and stored and handled only in approved containers. Portable containers must be the approved red safety containers equipped with flame arresters and self-closing lids. All transfers of flammable liquids must be made with the containers grounded or bonded. Also, gasoline containers will be clearly labeled and storage areas (if

applicable) will be posted with "No Smoking" signs. Fire extinguishers will be stalled in all areas that contain flammable liquids.

6.2.7 Illumination

All work is planned for daylight hours. No special requirements are anticipated. However, should any work take place outdoors after daylight hours, suitable lighting will be required. In addition, suitable lighting is to be provided in each remediation system building or enclosure.

6.2.8 Sanitation

Potable water and toilet facilities will be provided in compliance with the OSHA 1926.51 standard. Any container used to distribute drinking water shall be clearly marked and not used for any other purpose. Single drinking cups will be supplied, both a sanitary container for the unused cups and a receptacle for disposed of the used cups will also be provided. Port-a-johns will be provided since there are no sanitary sewers on the job site.

7.0 EXPOSURE MONITORING PLAN

This section describes air and personnel monitoring protocols, sampling methods, and instrumentation to be used, as well as the methods and frequency of sampling instrument calibration and action levels for potential work site hazards. When engaged in air monitoring, EAG personnel and subcontractors must use the forms to record air monitoring data and air monitoring instrument calibration records. All monitoring records/forms are to be maintained in the project file by the EAG Project Manager.

7.1 Air Monitoring

The surveillance program is established to detect changes in the ambient air at the work site and to ensure the continuing safety of the work zones and adequacy of the level of worker protection. During field activities, the designated field team member will monitor the work site for combustible gas concentrations and organic vapors. Calibration of all monitoring equipment will be performed in accordance with the manufacturers' procedures by trained EAG employees and subcontractors. The Project Manager, Project Field Team Leader or representative will be notified immediately of any contaminant levels that could trigger an upgrade in PPE or cause a suspension of site activities.

- One or more of the following direct-reading instruments may be used to aid in this determination. Photoionization Detectors (PID) and Flame Ionization Detectors (FID) will measure non-specific organic gases and vapors. Combustible Gas Indicators (CGI) will detect explosive atmospheres. Oxygen (O2) meters will detect fluctuations in oxygen concentrations. These instruments should be calibrated or bump tested daily and whenever the readings may be erratic. All readings should be recorded in the field log books.

Air monitoring results obtained from the breathing zone during field activities will be recorded in field log books. All such records will also include the location, date/time, weather conditions, person monitored, background concentration, and identification of specific contaminant whenever possible. Air monitoring information will be utilized to evaluate personnel exposure and assess the appropriateness of PPE for Site conditions.

7.1.1 Combustible Gas and Oxygen Deficiency/Excess Monitoring

Explosive gas concentrations are not expected to exceed 10% of the lower explosive level (LEL). Should the need be indicated for monitoring, action guidance for the CGI/O2 meter responses is contained in **Table 7-1**.

Table 7-1

CGI/Oxygen Meter Action Levels	
Meter Response	**Action**
CGI response 0%-10% LEL	Continue normal operations
CGI initial response >10% and <20% LEL	Eliminate all sources of ignition from the work area; temporarily retreat from work area for 15-30 minutes and then monitor area again
CGI response after 15-30 minute retreat >10% and <20% LEL	Retreat from work area; notify Project Manager
CGI response >20%	Discontinue operations; retreat from work area
Oxygen level <19.5%	Retreat from work area; notify Project Manager
Oxygen level >23.5%	Retreat from work area; notify Project Manager

7.1.2 Organic Vapor Concentrations

Real-time monitoring for organic vapor concentrations in the breathing zone and down hole will be conducted during field operations (installation of groundwater monitoring and groundwater sampling by EAG and EAG subcontractor personnel) with a PID equipped with a 10.2- or 11.7-electron volt (eV) probe. The PID will be taken into the field and operated during site activities where contaminated soil and/or groundwater may be present. Air monitoring will be conducted during well installation and when a well is opened for groundwater measurements. Measurements will be made at the well head and personnel breathing zones where activities are being performed. The instrument will be calibrated using ultra-high purity air and isobutylene vapor of known concentration before and after use each day. Air calibration measurements will be documented in writing and kept in the project file. Action guidance for PID responses is contained in **Table 7-2**.

Table 7-2

Action Levels for General Site Work	
Meter Response in Breathing Zone (minimum of 3 minutes)	**Action Required**
<5ppm above background	Use Level D PPE
>5ppm above background	Level C PPE, including half or full-face APR with organic vapor cartridges/P100 filters
>50ppm above background	Stop work
Action Levels for Handling NAPL	
Meter Response in Breathing Zone (minimum of 3 minutes)	**Action Required**
<1ppm above background	Use Modified Level D PPE
>1ppm to <10ppm	Level C PPE, including half or full-face APR with organic vapor cartridges
>10ppm above background	Immediately withdraw; monitoring will continue until action levels will allow safe re-entry

If air concentrations of organic vapors are greater than 5 ppm above background in the breathing zone for a 3-minute period, personnel will stop work, retreat from site, and allow time (at least 15 minutes) for vapors to dissipate. If monitoring indicates that concentrations still exceed 5 ppm, workers will upgrade to Level C PPE. If monitoring indicates that concentrations exceed 50 ppm, work will be stopped until site conditions can be re-evaluated.

These action levels are based on the assumption that the major component of free product being recovered will be benzene or naphthalene.

Work involving NAPL recovery from monitoring wells will be conducted in Level C PPE. This level may be downgraded based on air monitoring data and actual field conditions. Downgrading of PPE must be approved by the PM and HSE staff. If ventilation is conducted, additional air monitoring will be performed to the resumption of work to determine the level of PPE required.

7.2 Physical Conditions Monitoring

Site workers will be monitored by the Project Manager for signs of weather-related symptoms from exposure to excessive heat or cold.

Whenever the air temperature exceeds 70°F for personnel wearing chemical protective clothing or 90°F for personnel wearing regular work clothes, the Project Manager will assess conditions that may cause heat stress in site workers.

8.0 MEDICAL SURVEILLANCE

This section discusses the medical surveillance program, how the results are reviewed by a physician and how participation is documented.

8.1 Medical Surveillance Program

All personnel who will be performing any task where potential exposure to hazardous material exists will undergo medical surveillance as outlined in OSHA 29 CFR 1910.120(f). All personnel performing tasks in the Exclusion Zone or Contamination Reduction Zone will be required to have passed the EAG medical surveillance examination (or equivalent), performed by a licensed Occupational Physician. The Project Manager will verify that all EAG and subcontractor personnel meet applicable OSHA medical surveillance requirements.

Applicable field employees will undergo an annual comprehensive medical examination, including a comprehensive health history, blood chemistry with complete blood count and differential, urinalysis, medical history, required chest x-rays, audiogram, pulmonary function testing, testing for heavy metals (as needed), and a physician's interpretation of each employee's medical surveillance examination, including the ability of the employee to wear a respirator. A comprehensive medical examination will be performed if an employee develops signs or symptoms indicating possible overexposure to hazardous substances and/or heat or cold stress.

8.2 Physician Review

All medical surveillance and examination results are reviewed by a licensed physician who is certified in Occupational Medicine by the American Board of Preventive Medicine. EAG employee participation in the medical surveillance program is a part of their permanent medical record maintained in the employee's home office. A copy of the current medical clearance signed by the occupational health physician for all EAG employees must be maintained at the home office.

9.0 SITE CONTROL MEASURES AND DECONTAMINATION

To provide for the protection of public health and safety and minimize the possibility of transferring hazardous substances from the site, contamination control procedures are required. These procedures consist of site control measures (which entail the delineation of work zones, communications, and site security) and decontamination procedures (which are necessary for both personnel and equipment). Contaminants that may be uncovered during sampling operations must not be transferred outside the work zone unless properly containerized, and must be removed from clothing, personnel, and equipment prior to relocation from that zone. This section discusses site control measures and decontamination procedures to be used during the collection of samples, the installation of soil borings and/or groundwater monitoring/remediation wells, excavations, and other intrusive work where contact with impacted soils and groundwater could occur by EAG and/or EAG subcontractor personnel.

9.1 Site Control Measures

Site control can be achieved by effectively delineating the work zone, providing appropriate communication, and establishing site security.

9.1.1 Work Zone Delineation

To minimize the transfer of hazardous substances from the site and to ensure proper protection of employees and subcontractors, work zones will be established by the Field Project Team Leader. Applicable site work and the associated requirement for work zones will be determined by the Project Manager. The work area will be divided into an Exclusion Zone (EZ), a Contamination Reduction Zone (CRZ), and a Support Zone (SZ). A typical work zone delineation setup is shown as **Figure 9-1**, below.

Exclusion Zone (EZ)

Contamination does or could exist in this zone. Only properly authorized and trained individuals (refer to Section 6.0) wearing appropriate PPE will be allowed to enter and work in this zone. All people entering the EZ must wear, at a minimum, Level D protection. An entry and exit point for personnel and equipment will be established at the periphery of the EZ (between the EZ and the CRZ) to regulate the flow of personnel and equipment.

Contamination Reduction Zone (CRZ)

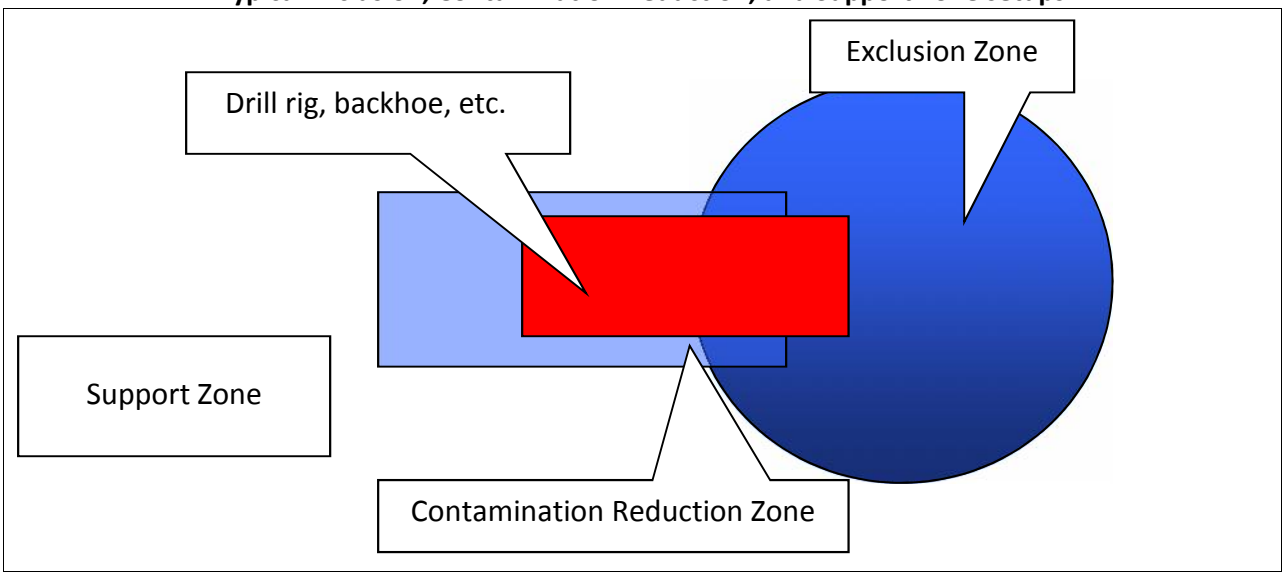
Between the EZ and the SZ will be the CRZ, which will provide a transition between the potentially contaminated EZ and the clean SZ. The CRZ (located upwind of the EZ, if possible) will be a corridor leading from the EZ and will serve as a buffer to further reduce the probability of the SZ becoming contaminated. Exit from the EZ will only be allowed through this CRZ. The CRZ will provide additional assurance that the physical transfer of contaminating substances on people, equipment, and/or in the air will be limited through a combination of decontamination and zone restrictions. Within this zone, employees and subcontractors may perform personal decontamination (e.g., face and hand washing), and certain PPE and small equipment decontamination. Buckets or wash basins for boot

washing and equipment decontamination will be stationed on a sheet of plastic (a minimum of 8 feet by 8 feet), the boundaries of which will constitute the CRZ.

Support Zone (SZ)

The Support Zone will be considered a non-contaminated area. The location of support facilities in the SZ will be upwind of the EZ (where possible) and readily accessible to the nearest road. The field office/support facilities, equipment vehicles, a first aid station and a visitors/personnel entry and exit log for the work site will be located in this zone. Potentially contaminated personal clothing, equipment and samples are not permitted in this zone unless properly containerized.

Figure 9-1
Typical Exclusion, Contamination Reduction, and Support Zone setups



9.1.2 Communications

A loud and clear form of communication should be made available for Site personnel entering the work zones. Site communication may be in the form of hand signals, voice, or other communication devices. All forms of communication should be understood by all workers on the Site prior to starting work. Offsite communications may be conducted with mobile phones or walkie-talkies only if the atmosphere has been deemed non-explosive, and the person using the mobile device is in the SZ while placing the call, or inside the cab of a stationary vehicle.

9.1.3 Site Security

The Sparrows Point facility is not open to the public, and there is a strictly monitored main entrance with a security guard on duty at all times who only allows authorized personnel onto the Site. This limited access to the facility should eliminate the need for many requirements for specific site security except those needed to maintain work zone integrity, such as visible barriers around open excavations or EZs and CRZs. No site visitors will be allowed to travel unescorted by EAG or subcontractor personnel around the facility.

Once site visitors arrive at their intended work zone, they must check in with the Field Team Lead. If visitors are authorized to enter the CRZ and/or the EZ, they must have completed OSHA 1910.120 medical surveillance and training requirements (refer to Section 8.0 and Section 6.0). Visitors must wear

appropriate PPE before they will be allowed to enter the CRZ and/or the EZ. They must also be taken through this HASP during a brief tail-gate meeting and sign the Acknowledgement page in the back prior to engaging in any activities inside the CRZ or the EZ. All site visitors must follow the same site control measures and decontamination procedures as EAG personnel and subcontractors. The Project Manager must also be informed of each visitor's name, purpose for their visit, time of entry (and exit), location of tasks they wish to perform, whether they completed their intended task(s), and any other relevant information pertaining to their visit.

9.2 Decontamination Procedures

Decontamination of employees, subcontractors, and equipment leaving the EZ will be performed to minimize human exposure to hazardous substances and to minimize the spread of contamination to surrounding areas. The purpose of the CRZ is to provide a location to perform limited personnel decontamination and certain PPE and small equipment decontamination.

9.2.1 Personnel Decontamination

Persons leaving the EZ must pass through the CRZ and follow decontamination procedures before entering the SZ. Hand tools and other sampling equipment used in the EZ and reusable PPE (boots, safety glasses, etc.) will be appropriately cleaned prior to removal from the site each day. The step-by-step sequence for personnel decontamination is as follows:

- Remove boot covers (if used) at the boot washing station and place them in the disposal container provided
- Wash outer gloves and chemical resistant boots (if used) at the boot washing station
- Remove wrist tape (if used) and outer gloves and place them in the disposal container provided
- Remove ankle tape (if used) and disposable coveralls (if used) and place them in the disposal container provided
- Remove respirators (if used) and place each in designated locations in the CRZ
- Remove inner gloves and discard in the disposal container provided
- Wash hands and face and proceed to the SZ

Respirators must be fully decontaminated after each use by the personnel who previously wore them. All project employees and subcontractors are required to take a thorough soap and water shower in their home or motel room at the end of each workday. If monitoring or a general exposure assessment indicates that an employee has become contaminated, the employee or subcontractor will notify the EAG Project Manager and the Field Team Lead as soon as the contaminated state has been discovered.

9.2.2 Equipment Decontamination

All equipment leaving the EZ must be decontaminated either within the CRZ or at the central decontamination area. Small equipment, such as hand tools, will be thoroughly decontaminated within the CRZ before being placed in the SZ. The field tools may be scrubbed visually clean using a detergent solution (Alconox/Liquinox) with water and a stiff, long-bristled scrub brush. Following the solution scrubbing, the tools may be rinsed with distilled water or isopropyl alcohol. Any vehicle working in an EZ will be decontaminated before leaving the site. The vehicle will be cleaned by sweeping excess soil and debris off the wheels. A high-pressure sprayer will then be used to wash the wheels, if necessary.

Each piece of equipment will be inspected after cleaning for any soil remaining on the tires or elsewhere. All vehicles will be cleaned to the satisfaction of the Field Team Lead or a designated assistant prior to entering the SZ or leaving the site. Employees or subcontractors performing decontamination shall wear the appropriate level of PPE (refer to Section 5.0).

9.2.3 Waste Management

The Project Manager and the Field Team Leads will be responsible for overseeing the containerization and disposal of any field derived wastes. Contaminated or suspected contaminated field derived wastes shall be disposed of in accordance with all local, state, and/or federal regulations. Field derived wastes include decontamination rinse waters and other related decontamination generated wastes.

Soils and groundwater expected to be encountered during any sampling or intrusive work not to be contaminated, based on existing data, may be discharged to the ground surface in the immediate vicinity of the monitoring well. However, any known or suspected to be contaminated soil (in small quantities) or groundwater will be containerized for future removal, likely in 55-gallon drums or other approved storage vessels. Depending on the suspected contaminants, the recovered groundwater may be sent through one of the onsite groundwater treatment units. However, the treatment unit must be designed to address the contaminants of concern in the groundwater being treated. Otherwise, the liquid must be staged onsite for eventual offsite disposal at an approved facility.

Impacted soil, if in drums, will be staged in an area designated by the Project Manager or Field Team Lead for eventual disposal. For large excavations, where excavated soil is stockpiled, it may be necessary to place soils on plastic and cover with plastic to prevent any potential leachable runoff. The Project Manager and/or Field Team Lead will provide the proper guidance necessary for handling bulk soil piles.

Any NAPL recovered via remediation systems or manual recovery efforts will be properly containerized and either disposed of offsite as a recyclable material, if possible, or as a hazardous waste. The receiving facility must be an approved facility.

10.0 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

The objective of emergency response and contingency procedures is to ensure that effective actions are implemented in a timely manner to minimize or control the effects of adverse events (e.g., potential chemical exposures, personal injuries, fires/explosions, and spills/releases). The following subsections describe the basic emergency responses required should an emergency take place during field investigation or remedial effort activities.

10.1 Emergency Phone Numbers

Emergency telephone numbers are listed in **Table 10-1**.

Table 10-1
Emergency Telephone Numbers and Agencies

Agency	Telephone Number
Security (Sparrows Point facility)	(410) 388-7761
Ambulance	911
Fire	911
Occupational Health Clinic	(410) 633-3600
Hospital	(410) 550-0100 (general) (410) 550-0350 (emergency)
National Response Center	(800) 424-8802
Poison Control Center - Maryland	(800) 222-1222
EAG Main Contact	
VP Remediation, Russ Becker	(314) 686-5611
Project Manager, James Calenda	(314) 620-3056

10.2 Injury/Illness Treatment

In the event of illness or injury, the following steps will be taken:

- Evaluate the extent of injuries or seriousness of illness.
- When employees require urgent medical attention, call for emergency assistance. First aid should be administered while awaiting an ambulance or paramedics. All emergency medical treatment, other than first aid, will be administered by the local paramedics. **Table 10-1** lists site emergency telephone numbers. In all cases, critical injuries must be immediately referred for professional medical attention.
- For a non-critical injury/illness, first aid will be administered by onsite personnel. Anyone sustaining a non-critical injury/illness who continues to work will be monitored by the Field Team Lead for any signs of worsening condition, if it is deemed that the person can return to work by the Team Lead and Project Manager. Injured personnel who later suffer any worsening change in status are to immediately notify the Team Lead or the Project Manager.

10.3 Occupational Health Clinic and Hospital Information

Occupational Health Clinic

The Concentra Medical Center, located at 1833 Portal Street, Baltimore, MD, is the closest occupational health clinic, just over 6 miles away. A map to the clinic in included as **Figure 10-1**. The clinic should be used for non-emergency injuries and illnesses.

Directions:
From Sparrow's Point Road, turn left onto Wharf Road;
Turn left onto MD-158 W/Bethlehem Blvd. (0.4 mile);
Turn right onto MD-157 N/Peninsula Expy. (2.7 miles);
Turn slight left onto Merritt Ave. (0.1 mile);
Merritt Ave. becomes Sollers Point Rd. (0.3 mile);
Turn left to stay on Sollers Point Rd (0.6 mile);
Turn left onto Williams Ave. (0.2 mile);
Turn right onto Dundalk Ave. (<0.1 miles);
Turn left onto Chandlery St. (0.1 mile);
Turn left onto Portal St.

Figure 10-1: Health Clinic (Non-Emergency) Map



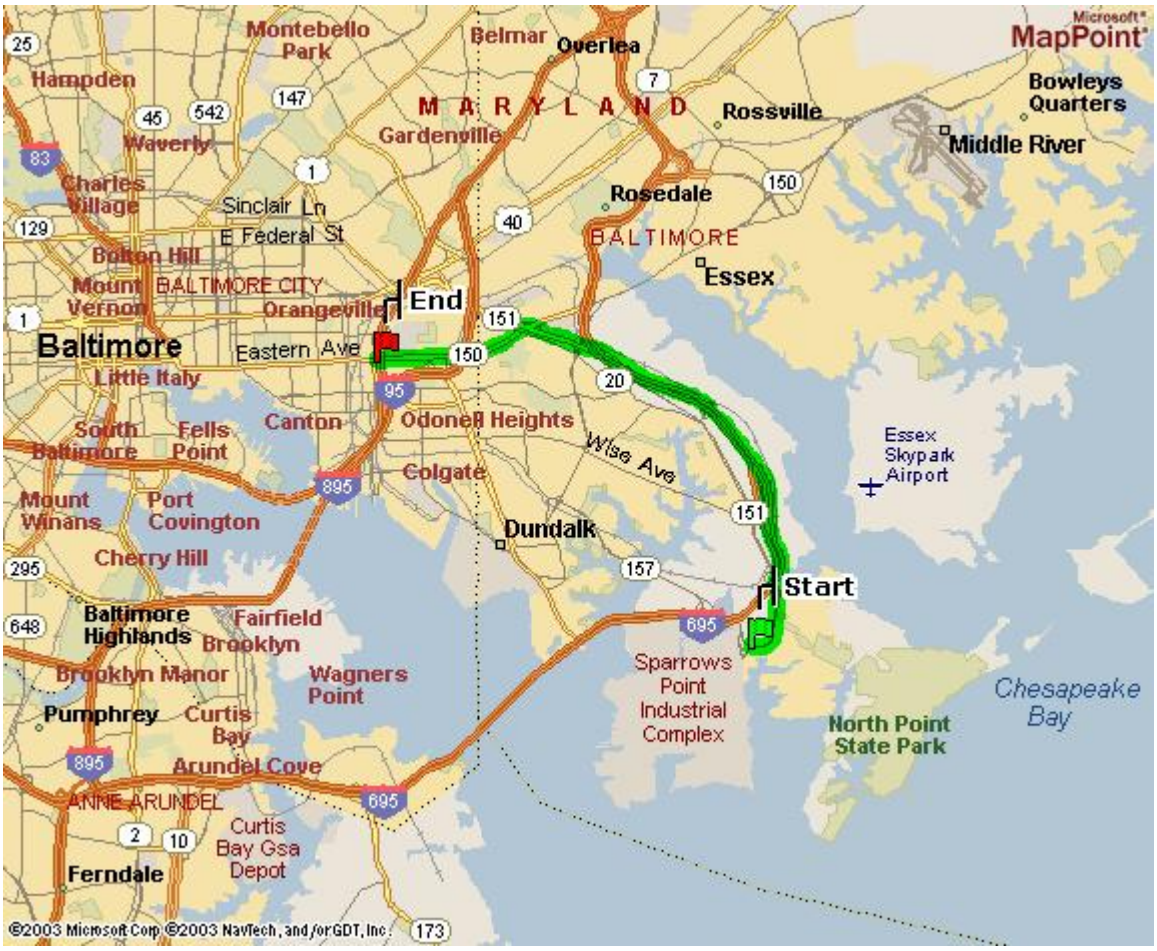
Hospital

The Johns Hopkins Bayview Hospital is the closest emergency facility, just over 9 miles away. The hospital is located at 4940 Eastern Avenue in Baltimore, MD. **Figure 10-2** is a map to this hospital. Maps are also included in **Attachment E**.

Directions:

From the Sparrows Point Industrial Complex, go north on Route 151 for approximately one mile.
Take ramp (right) onto I-695 towards I-695/Essex.
At exit 40, take ramp (right) onto Route 151/North Point Boulevard North/MD 150;
Take ramp (right) onto Route 150 (Eastern Avenue).
Continue on Eastern Avenue to hospital on right.

Figure 10-2: Hospital Map



Prior to the start of field activities, the Project Field Team Leader will call to verify the telephone numbers and directions for the clinic and hospital, and then distribute location maps and the emergency telephone list to workers and vehicles.

10.4 Accident and Emergency Medical Response

All field team members will be aware of the location of a first aid kit kept onsite. All vehicles used to transport injured persons to an offsite medical facility will be provided with directions and a map to the medical facility.

If treatment beyond first aid is required, emergency response personnel will be contacted for assistance and transport. Before beginning site activities, the Project Field Team Leader will ensure that each field team member knows where the nearest emergency medical facilities are and how to get there. The closest hospital will be used in cases of life-threatening emergencies at the direction of the Project Field Team Leader. The telephone numbers of the local emergency services will be available in the SZ, and the Project Field Team Leader will brief the field team on the procedures for calling for help in an emergency.

Site personnel will inform the Project Manager of any medications, allergies, or other medical information that may be applicable for their medical treatment. The Project Manager will supply this information to emergency response personnel, and will accompany the victim to the hospital, if possible.

10.4.1 Chemical Exposure

In case of accidental overexposure to a hazardous material (groundwater, soil, and/or off-gas materials), guidelines shown in **Table 10-2** will be used.

Table 10-2
Chemical Exposure Guidelines

Type of Overexposure	First Aid Guidelines
Skin Contact	Skin: Wash/rinse the affected area thoroughly with copious amounts of soap and water.
	Eyes: Eyes should be rinsed for at least 15 minutes following chemical contamination.
	Contact emergency response personnel if required, or transport victim to the hospital.
Inhalation	Move the victim to fresh air.
	Contact emergency response personnel if required, or transport victim to the hospital.
Ingestion	Contact Poison Control Center.
	Contact emergency response personnel, or transport victim to the hospital.

10.4.2 Decontamination During a Medical Emergency

For minor medical problems or injuries, regular decontamination procedures will be followed. If emergency, life-saving first aid and/or medical treatment are required, regular decontamination procedures may need to be abbreviated or omitted:

- Do not attempt to wash or rinse an unresponsive victim unless the victim has been contaminated with an extremely toxic or corrosive chemical that may cause injury or loss of life to emergency response personnel.
- Outer garments can be removed if it does not cause a delay, interfere with treatment, or aggravate the problem.

- PPE can be cut away and respiratory protective equipment must always be removed.
- If contaminated clothing cannot be safely removed, then the victim should be wrapped in a blanket or plastic sheeting to prevent contamination to the inside of the ambulance and/or emergency response personnel.

The Project Manager or Field Team Lead will advise the medical staff as to the type of contamination possibly involved.

10.4.3 Small or Incipient Fire

A small fire is defined as a fire that can be extinguished with an available 20 pound type ABC fire extinguisher. An incipient fire is a fire that is small because it has just started. In the event of a small or incipient fire, the following minimum actions will be taken:

- Evacuate nearby personnel from the area, if possible, to an upwind location or to an area not affected by smoke or hazardous decomposition products if an upwind location is not feasible.
- Attempt to extinguish fire using portable fire extinguisher or by smothering.
- Contact emergency response personnel, as needed, for any injuries or exposures to hazardous decomposition products, or if fire cannot be put out.
- After the fire has been extinguished, or emergency response personnel have been contacted, notify the following project personnel:
  The Project Manager

10.4.4 Large Fire or Explosion

An explosion, large fire or a small fire which cannot be extinguished is beyond the first line capabilities of EAG personnel. Professional emergency response personnel would be needed to provide emergency assistance for these types of incidents. In the event of a large fire, explosion or a small fire that cannot be extinguished, the following minimum actions will be taken:

- Evacuate all personnel from the site, if possible, to an upwind location, or to an area not affected by smoke or hazardous decomposition products if an upwind location is not feasible
- Perform a quick role call to account for all site personnel
- Contact the fire department
- Contact emergency response personnel, as needed, for any injuries or exposures to hazardous decomposition products
- After emergency response personnel have been contacted, notify the following project personnel:
  The Project Manager

10.4.5 Adverse Weather Conditions

In the event of adverse weather conditions, the Project Manager will determine if work can continue without sacrificing the health and safety of site personnel. Threatening weather conditions will be monitored by the Project Manager and possibly the Team Lead via radio, television, internet, and/ or calls to the National Weather Service. Some of the conditions to be considered include:

- Potential for heat or cold stress
- Limited visibility

- Electrical storms
- Treacherous weather-related working conditions (i.e., heavy rainfall, icy conditions causing slippery footing hazards, etc.).

10.4.6 First Aid for Heat Stress/Cold Stress

First aid treatment for **heat cramps** includes shade, rest and fluid replacement. If available, the individual should drink electrolyte replacement fluids (e.g., Gatorade, Squincher or 10-K). The individual should recover within half an hour.

First aid treatment for **heat exhaustion** includes cooling the victim, elevating the feet and fluid replacement. If the individual has not recovered within half an hour, then transport the victim to the hospital for medical attention.

Heat stroke is a medical emergency, requiring the immediate cooling of the victim and transport to the hospital for medical treatment immediately.

First aid treatment for **frost nip** and **frostbite** includes covering the affected area with warmth and retreating to a warm area. If the individual has not recovered within half an hour, then transport the victim to the hospital for medical attention.

Frozen tissue is a medical emergency and the victim must receive medical attention immediately. Contact emergency response personnel immediately or transport the victim to the hospital.

First aid treatment of **mild hypothermia** includes using heat to raise the individual's body temperature. Heat may be applied to the victim in the form of heat packs, hot water bottles and blankets. If the individual has not recovered within half an hour, then transport the victim to the hospital for medical attention.

Severe hypothermia is a medical emergency and the victim must be transported to the hospital immediately. First aid treatment for severe hypothermia includes handling the victim very gently; rough handling may set off of an irregular heartbeat. ***DO NOT*** attempt to re-warm the severely hypothermic victim; re-warming may cause the development of an irregular heartbeat.

10.4.7 Snake Bites

If bitten, lower the extremity below the heart to reduce the poison's dissemination through the body. Remain calm, try to keep the heart rate reduced and seek medical attention immediately. Do not cut the wound or attempt to suck out the venom. Note any physical features (e.g., shape of head and color or pattern on body) of the snake.

10.4.8 Animal Bites

All bites should be treated as contaminated soft tissue injuries. Bites should be washed immediately with large amounts of soap and water. If soap is not available, flush the wound with water. The severity and onset of any infection is dependent upon the number of organisms (viruses or bacteria) introduced into the wound. Washing saliva out of the wound immediately will reduce the number of bacteria or viruses that can enter the tissue. Medical attention must be sought if rabies is suspected or the individual has not had a recent tetanus booster.

10.4.9 Insect Bites and Stings

Emergency care for insect bites and stings depends on the individual's reaction. To treat a sting that results in a minor reaction, remove the stinger by gently scraping it off the skin. Do not try to grasp the sac or stinger, because this forces the remaining venom into the skin. Once the stinger has been removed, clean the wound and surrounding area. Apply cold packs to slow the absorption of the venom and reduce pain and swelling. The treatment for a severe reaction to insect stings includes the following:

- Confirm with the victim whether they are highly allergic to the insect that stung them
    - If victim has gone into anaphylactic shock, retrieve their epi pen or other auto-injector and administer per the directions as hastily as possible
- Assuming the victim remains conscious, ask them to refrain from moving around, and to lie down
- Immobilize the injured area immediately
- If an extremity is involved, remove any rings or watch
- Keep the affected part low, below the level of the heart
- Apply cold compresses to the affected area
- If possible, try to identify the type of insect that inflicted the sting
- Transport the victim to a medical facility immediately, continuing supportive measures en route.

All employees and subcontractors must report severe reactions to insect stings prior to the beginning of work to both the Project Manager and Field Team Lead.

10.4.10 Poisonous Plants

Decontamination: Wash the skin immediately after contact with the plant. Proper washing may not be practical in the middle of the woods, but a product such as Technu or a small wash-up kit with prepackaged, alcohol-based cleansing tissues can be effective. Employees and subcontractors should not forget to wash contaminated clothing and clean up contaminated equipment prior to re-use.

Treatment: Options are as follows:

- Home treatment: Calamine lotion and an oatmeal bath (one cup to a tub full of water) can help relieve itching. To prevent secondary skin infection, scratching is not helpful and the fingernails should be cut to avoid damage to the skin. Over-the-counter hydrocortisone cream can decrease inflammation and itching; however, the label should be read and the cream used according to directions.
- When to see the doctor: Severe cases may require further treatment. A physician should be seen if the rash appears infected, is on the face or other sensitive body areas, or is too extensive to be easily treated at home.

10.4.11 Ticks

To remove an attached tick:

- Use fine-tipped tweezers or a "tick tool" to grasp the tick at the surface of the skin
- If tweezers are not available, use a tissue to protect the fingers (exposure to the tick's body fluid may lead to transmission of disease)
- With a steady motion, pull the tick straight out

Disinfect the bite site and the tweezers. Wash your hands thoroughly with soap and water. Save the tick if you can by placing it in a Ziploc bag in the freezer; this may help with diagnosis in the future.

If flu-like symptoms such as fatigue, headache, neck-stiffness or jaw discomfort begin following a tick bite, seek medical attention.

APPENDICES

EnviroAnalytics Group

Environmental Engineers

ATTACHMENT A

COMPLIANCE AGREEMENT

EAG HEALTH AND SAFETY PLAN

ACKNOWLEDGEMENT FORM

I, _____, have read (or had read to me), EAG's health and safety plan.
(Print Name)

I understand my responsibilities as they are defined in this plan and will abide by these rules and procedures, as well as any regulations or otherwise governing safety. When in doubt concerning safe job performance, I will speak to my immediate supervisor and/or Project Manager.

I understand EAG reserves the right to change or amend the HASP at any time.

I understand any violation to the plan policies or procedures will be cause for disciplinary action up to and including termination.

_____ _____

Employee Signature Date

_____ _____

EAG Supervisor/Project Manager Signature Date

ATTACHMENT B

Material Safety Data Sheets (MSDSs)

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	ChemTreat CL5432
Product Use:	Cooling Water Treatment Dispersant
Supplier's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424−9300 (Toll Free) (703) 527−3887
Address (Corporate Headquarters):	5640 COX ROAD Glen Allen, VA 23060
Telephone Number for Information:	(800) 648−4579
Date of MSDS:	February 6, 2013

Section 2. Hazard(s) Identification



Signal Word: **DANGER!**

Hazard Statement(s): Causes severe skin burns and eye damage.
Causes serious eye damage.
Harmful in contact with skin.
Harmful if inhaled.
Harmful if swallowed.

Precautionary Statement(s): Wear protective gloves/clothing and eye/face protection. Do not breathe dust/fume/gas/mist/vapors/spray. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling. Use only outdoors or in a well−ventilated area.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
1−Hydroxyethylidene−1,1−diphosphonic acid	2809−21−4	10 − 30

Section 4. First Aid Measures

Inhalation:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.
Eyes:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.
Skin:	Wash with plenty of soap and water. Call a poison center or doctor/physician if you feel unwell.
Ingestion:	DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician.
Notes to Physician:	N/A
Additional First Aid Remarks:	N/A

Section 5. Fire Fighting Measures

Flammability of the Product:	Not flammable.
Suitable Extinguishing Media:	Use extinguishing media suitable to surrounding fire.
Specific Hazards Arising from the Chemical:	None known.
Protective Equipment:	If product is involved in a fire, wear full protective clothing including a positive−pressure, NIOSH approved, self−contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions:	Use appropriate Personal Protective Equipment (PPE).
Environmental Precautions:	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains, and sewers.
Methods for Cleaning up:	Contain and recover liquid when possible. Flush spill area with water spray.
Other Statements:	None.

Section 7. Handling and Storage

Handling: Wear appropriate Personal Protective Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.

Storage: Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations. For Industrial use only.

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
1−Hydroxyethylidene−1,1−diphosphonic acid		N/E

Carcinogenicity Category

Component	Source	Code	Brief Description
1−Hydroxyethylidene−1,1−diphosphonic acid			N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes: Wear chemical splash goggles or safety glasses with full−face shield. Maintain eyewash fountain in work area.

Skin: Maintain quick−drench facilities in work area.
Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.

Respiratory: If misting occurs, use NIOSH approved organic vapor/acid gas dual cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Dark Straw, Clear
Specific Gravity:	1.230 @ 20°C
pH:	1.6 @ 20°C, 100.0%
Freezing Point:	32°F
Flash Point:	N/D
Odor:	Mild
Melting Point:	N/D
Boiling Point:	N/D
Solubility in Water:	Complete
Evaporation Rate:	N/D
Vapor Density:	N/D
Molecular Weight:	N/D
Viscosity:	<100CP
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	10.26 lb/ga
Vapor Pressure:	N/D
% VOC:	N/D

Section 10. Stability and Reactivity

Chemical Stability: Stable at normal temperatures and pressures.

Incompatibility with Various Substances: Strong reducing agents, Strong bases

Hazardous Decomposition Products: Oxides of carbon, Oxides of nitrogen, Oxides of phosphorus

Possibility of Hazardous Reactions: None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
1−Hydroxyethylidene−1,1−diphosphonic acid	Oral	LD50	2400 mg/kg	Rat
	Dermal	LD50	7940 mg/kg	Rabbit

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
Ceriodaphnia dubia	48h	LC50	892 mg/l
Fathead Minnow	96h	LC50	3252 mg/l

Comments: None.

Section 13. Disposal Considerations

Dispose of in accordance with local, state and federal regulations.
EPA corrosivity characteristic hazardous waste D002 when disposed of in the original product form.

Section 14. Transport Information

DOT

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.
Technical Name: (1−HYDROXYETHYLIDENE−1, 1−DIPHOSPHONIC ACID)
Hazard Class: Corrosive
UN/NA#: UN3265
Packing Group: PGIII

Section 15. Regulatory Information

Inventory Status

United States (TSCA): All ingredients listed.
Canada (DSL/NDSL): All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard: No
Reactive Hazard: No
Release of Pressure: No
Acute Health Hazard: Yes
Chronic Health Hazard: No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
1−Hydroxyethylidene−1,1−diphosphonic acid	N/A	N/A	N/A

Comments: None.

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
1−Hydroxyethylidene−1,1−diphosphonic acid	None

International Regulations

Canada

WHMIS Classification: D2B (Toxic Material)
E (Corrosive Material)

Controlled Product Regulations (CPR): This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Section 16. Other Information

HMIS Hazard Rating

Health: 2
Flammability: 0
Physical Hazard: 0
PPE: X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha−numeric symbolic system for

recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end−user must determine if the code is appropriate for their use.

NSF: N/A

FDA/USDA/GRAS: N/A

KOSHER: This product has not been evaluated for Kosher approval.

FIFRA: N/A

Other: None

Abbreviations

Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Regulatory Affairs Department

Disclaimer

Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, ChemTreat, Inc. makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will ChemTreat, Inc. be responsible for damages of any nature whatsoever resulting from the use or reliance upon information. No representation or warranties, either expressed or implied, of merchantability, fitness for a particular purpose, or of any other nature are made hereunder with respect to information or the product to which information refers.

SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	ChemTreat CL561
Product Use:	Cooling Water Treatment
Supplier's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424−9300 (Toll Free) (703) 527−3887
Address (Corporate Headquarters):	5640 COX ROAD Glen Allen, VA 23060
Telephone Number for Information:	(800) 648−4579
Date of MSDS:	February 27, 2014

Section 2. Hazard(s) Identification



Signal Word: **DANGER**

Hazard Statement(s):

May be corrosive to metals.
Causes severe skin burns and eye damage.
May cause cancer.
Fatal if inhaled.
May cause damage to organs through prolonged or repeated exposure.

Precautionary Statement(s):

Keep only in original packaging.
Do not breathe dust/fume/gas/mist/vapors/spray.
Wash thoroughly after handling.
Wear protective gloves/protective clothing/eye protection/face protection.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Use only outdoors or in a well−ventilated area.
Wear respiratory protection.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
Sulfuric acid	7664−93−9	15 − 40

Section 4. First Aid Measures

Inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.

Eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.

Skin: Immediately remove/take off all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before re−use. Immediately call a poison center or doctor/physician.

Ingestion: DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician.

Notes to Physician: N/A

Additional First Aid Remarks: N/A

Section 5. Fire Fighting Measures

Flammability of the Product: Not flammable.

Suitable Extinguishing Media: Use extinguishing media suitable to surrounding fire.

Specific Hazards Arising from the Chemical: None known.

Protective Equipment: If product is involved in a fire, wear full protective clothing including a positive−pressure, NIOSH approved, self−contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions: Use appropriate Personal Protective Equipment (PPE).

Environmental Precautions: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains, and sewers.

Methods for Cleaning up: Contain and recover liquid when possible. Flush spill area with water spray.

Other Statements: If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1−800−424−8802.

Section 7. Handling and Storage

Handling: Wear appropriate Personal Protective Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.

Storage: Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations. For Industrial use only.
Do not store or handle in aluminum, zinc, copper, or their alloys.

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
Sulfuric acid	ACGIH TLV	0.2 ppm TWA
	OSHA PEL	1 mg/m³ TWA; Aerosol

Carcinogenicity Category

Component	Source	Code	Brief Description
Sulfuric acid	NTP	NTP−K	Known to be a human carcinogen

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes:	Wear chemical splash goggles or safety glasses with full−face shield. Maintain eyewash fountain in work area.
Skin:	Maintain quick−drench facilities in work area. Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.
Respiratory:	If misting occurs, use NIOSH approved organic vapor/acid gas dual cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance:	Liquid, Colorless, Clear
Specific Gravity:	1.264 @ 20°C
pH:	0.5 @ 20°C, 10.0%
Freezing Point:	<−11°F
Flash Point:	N/D
Odor:	Mild
Melting Point:	N/A
Boiling Point:	230°F
Solubility in Water:	Complete
Evaporation Rate:	<1
Vapor Density:	3.40 lb/ga
Molecular Weight:	N/D
Viscosity:	N/D
Flammable Limits:	N/A
Autoignition Temperature:	N/A
Density:	10.54 lb/ga
Vapor Pressure:	1 mmHg, @ 145C
% VOC:	0

Section 10. Stability and Reactivity

Chemical Stability:	Stable at normal temperatures and pressures.
Incompatibility with Various Substances:	Bases, Strong oxidizers, Halogens, Metals or metal oxides, Reducing agents, Combustible materials
Hazardous Decomposition Products:	Oxides of sulfur
Possibility of Hazardous Reactions:	None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
Sulfuric acid	Oral	LD50	2140 mg/kg	Rat

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
Bluegill Sunfish	96h	LC50	10.5 ppm

Comments: None.

Section 13. Disposal Considerations

Dispose of in accordance with local, state and federal regulations.
EPA corrosivity characteristic hazardous waste D002 when disposed of in the original product form.

Section 14. Transport Information

DOT

Proper Shipping Name: SULFURIC ACID, 35%
Technical Name: N/A
Hazard Class: Corrosive
UN/NA#: UN2796
Packing Group: PGII

Over 271 GA

Proper Shipping Name: RQ SULFURIC ACID, 35%
Technical Name: N/A
Hazard Class: Corrosive
UN/NA#: UN2796
Packing Group: PGII

IMDG

Proper Shipping Name:	SULFURIC ACID, 35%
Technical Name:	N/A
Hazard Class:	Corrosive
UN/NA#:	UN2796
Packing Group:	PGII

TDG

Proper Shipping Name:	SULFURIC ACID, 35%
Technical Name:	N/A
Hazard Class:	Corrosive
UN/NA#:	UN2796
Packing Group:	PGII

ICAO

Proper Shipping Name:	SULFURIC ACID, 35%
Technical Name:	N/A
Hazard Class:	Corrosive
UN/NA#:	UN2796
Packing Group:	PGII

Section 15. Regulatory Information

Inventory Status

United States (TSCA):	All ingredients listed.
Canada (DSL/NDSL):	All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard:	No
Reactive Hazard:	Yes
Release of Pressure:	No
Acute Health Hazard:	Yes
Chronic Health Hazard:	Yes

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
Sulfuric acid	N/A	1000	1000

Comments: None.

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
Sulfuric acid	MA, MN, NJ, NY, PA, WA

International Regulations

Canada

WHMIS Classification: D2B (Toxic Material)
E (Corrosive Material)

Controlled Product Regulations (CPR): This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Section 16. Other Information

HMIS Hazard Rating

Health: 3
Flammability: 0
Physical Hazard: 2
PPE: X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha−numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end−user must determine if the code is appropriate for their use.

NSF: N/A

FDA/USDA/GRAS: N/A

KOSHER: This product is certified by the Orthodox Union as kosher pareve. Only when prepared by the following ChemTreat facilities: Ashland, VA; Eldridge, IA; Nederland, TX; Vernon, CA.

FIFRA: N/A

Other: None

Abbreviations

Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Product Compliance Department;
ProductCompliance@chemtreat.com

Disclaimer

Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, ChemTreat, Inc. makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will ChemTreat, Inc. be responsible for damages of any nature whatsoever resulting from the use or reliance upon information. No representation or warranties, either expressed or implied, of merchantability, fitness for a particular purpose, or of any other nature are made hereunder with respect to information or the product to which information refers.

MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Product Name:	ChemTreat FO220
Product Use:	Defoamer
Supplier's Name:	ChemTreat, Inc.
Emergency Telephone Number:	(800) 424−9300 (Toll Free) (703) 527−3887
Address (Corporate Headquarters):	5640 COX ROAD Glen Allen, VA 23060
Telephone Number for Information:	(800) 648−4579
Date of MSDS:	January 5, 2012

Section 2. Hazard(s) Identification



Signal Word: **WARNING!**

Hazard Statement(s): May be harmful in contact with skin.
May be harmful if inhaled.
May be harmful if swallowed.

Precautionary Statement(s): No significant health risks are expected from exposures under normal conditions of use.

Section 3. Composition/Hazardous Ingredients

Component	CAS Registry #	Wt.%
There are no hazardous ingredients in this product as defined in 29 CFR 1910.1200.	Proprietary	N/A

Section 4. First Aid Measures

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.

Eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention.

Skin: Wash with plenty of soap and water. Call a poison center or doctor/physician if you feel unwell.

Ingestion: DO NOT INDUCE VOMITING. Rinse mouth. Call a POISON CENTER or doctor/physician if you feel unwell.

Notes to Physician: N/A

Additional First Aid Remarks: N/A

Section 5. Fire Fighting Measures

Flammability of the Product: Not flammable.

Suitable Extinguishing Media: Use extinguishing media suitable to surrounding fire.

Specific Hazards Arising from the Chemical: None known.

Protective Equipment: If product is involved in a fire, wear full protective clothing including a positive−pressure, NIOSH approved, self−contained breathing apparatus.

Section 6. Accidental Release Measures

Personal Precautions: Use appropriate Personal Protective Equipment (PPE).

Environmental Precautions: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains, and sewers.

Methods for Cleaning up: Contain and recover liquid when possible. Flush spill area with water spray.

Other Statements: None.

Section 7. Handling and Storage

Handling: Wear appropriate Personal Protective Equipment (PPE) when handling this product. Do not get in eyes, or on skin and clothing. Wash thoroughly after handling. Do not ingest. Avoid breathing vapors, mist or dust.

Storage: Store away from incompatible materials (see Section 10). Store at ambient temperatures. Keep container securely closed when not in use. Label precautions also apply to empty container. Recondition or dispose of empty containers in accordance with government regulations.
For Industrial use only.
Keep from freezing.
Protect from heat and sources of ignition.

Section 8. Exposure Controls/Personal Protection

Exposure Limits

Component	Source	Exposure Limits
There are no hazardous ingredients in this product as defined in 29 CFR 1910.1200.		N/E

Carcinogenicity Category

Component	Source	Code	Brief Description
There are no hazardous ingredients in this product as defined in 29 CFR 1910.1200.			N/E

Engineering Controls: Use only with adequate ventilation. The use of local ventilation is recommended to control emission near the source.

Personal Protection

Eyes: Wear chemical splash goggles or safety glasses with full−face shield. Maintain eyewash fountain in work area.

Skin: Maintain quick−drench facilities in work area.
Wear butyl rubber or neoprene gloves. Wash them after each use and replace as necessary. If conditions warrant, wear protective clothing such as boots, aprons, and coveralls to prevent skin contact.

Respiratory: If misting occurs, use NIOSH approved organic vapor/acid gas dual cartridge respirator with a dust/mist prefilter in accordance with 29 CFR 1910.134.

Section 9. Physical and Chemical Properties

Physical State and Appearance: Liquid Emulsion, White, Opaque
Specific Gravity: 1.009 @ 20°C
pH: N/A
Freezing Point: 32°F
Flash Point: >200°F
Odor: Mild
Melting Point: N/A
Boiling Point: >212°F
Solubility in Water: Dispersible
Evaporation Rate: Similar to water
Vapor Density: Lighter than air
Molecular Weight: N/D
Viscosity: 600−2000
Flammable Limits: N/A
Autoignition Temperature: N/A
Density: 8.42 lb/ga

Vapor Pressure: Similar to water
% VOC N/D

Section 10. Stability and Reactivity

Chemical Stability: Stable at normal temperatures and pressures.

Incompatibility with Various Substances: Strong oxidizers, Excessive heat

Hazardous Decomposition Products: Carbon dioxide, Carbon monoxide

Possibility of Hazardous Reactions: None known.

Section 11. Toxicological Information

Chemical Name	Exposure	Type of Effect	Concentration	Species
N/D				

Comments: None.

Section 12. Ecological Information

Species	Duration	Type of Effect	Test Results
Ceriodaphnia dubia	48h	LC50	7878 mg/l
Fathead Minnow	96h	LC50	4204 mg/l
	48h	LC50	4665 mg/l
Daphnia pulex	48h	LC50	>10000 mg/l

Comments: None.

Section 13. Disposal Considerations

Dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information

DOT

Proper Shipping Name:	COMPOUND, INDUSTRIAL WATER TREATMENT, LIQUID
Technical Name:	N/A
Hazard Class:	Not D.O.T. Regulated
UN/NA#:	N/A
Packing Group:	N/A

IMDG

Proper Shipping Name:	COMPOUND, INDUSTRIAL WATER TREATMENT, LIQUID
Technical Name:	N/A
Hazard Class:	Not D.O.T. Regulated
UN/NA#:	N/A
Packing Group:	N/A

TDG

Proper Shipping Name:	COMPOUND, INDUSTRIAL WATER TREATMENT, LIQUID
Technical Name:	N/A
Hazard Class:	Not D.O.T. Regulated
UN/NA#:	N/A
Packing Group:	N/A

ICAO

Proper Shipping Name:	COMPOUND, INDUSTRIAL WATER TREATMENT, LIQUID
Technical Name:	N/A
Hazard Class:	Not D.O.T. Regulated
UN/NA#:	N/A
Packing Group:	N/A

Section 15. Regulatory Information

Inventory Status

United States (TSCA):	All ingredients listed.
Canada (DSL/NDSL):	All ingredients listed.

Federal Regulations

SARA Title III Rules

Sections 311/312 Hazard Classes

Fire Hazard: No
Reactive Hazard: No
Release of Pressure: No
Acute Health Hazard: Yes
Chronic Health Hazard: No

Other Sections

Component	Section 313 Toxic Chemical	Section 302 EHS TPQ	CERCLA RQ
There are no hazardous ingredients in this product as defined in 29 CFR 1910.1200.	N/A	N/A	N/A

Comments: None.

State Regulations

California Proposition 65: None known.

Special Regulations

Component	States
There are no hazardous ingredients in this product as defined in 29 CFR 1910.1200.	None

International Regulations

Canada

WHMIS Classification: N/A

Controlled Product Regulations (CPR): N/A

Section 16. Other Information

HMIS Hazard Rating

Health:	1
Flammability:	1
Physical Hazard:	0
PPE:	X

Notes: The PPE rating depends on circumstances of use. See Section 8 for recommended PPE.
The Hazardous Material Information System (HMIS) is a voluntary, subjective alpha−numeric symbolic system for recommending hazard risk and personal protection equipment information. It is a subjective rating system based on the evaluator's understanding of the chemical associated risks. The end−user must determine if the code is appropriate for their use.

NSF: N/A

FDA: N/A

KOSHER: This product has not been evaluated for Kosher approval.

FIFRA: N/A

Other: None

Abbreviations

Abbreviation	Definition
<	Less Than
>	Greater Than
ACGIH	American Conference of Governmental Industrial Hygienists
EHS	Environmental Health and Safety Dept
N/A	Not Applicable
N/D	Not Determined
N/E	Not Established
OSHA	Occupational Health and Safety Dept
PEL	Personal Exposure Limit
STEL	Short Term Exposure Limit
TLV	Threshold Limit Value
TWA	Time Weight Average
UNK	Unknown

Prepared by: Regulatory Affairs Department

Disclaimer

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Bill of Lading # -0505537
SULFURIC ACID 66 DEG BE

November 25, 2014

SAFETY CONTACT
ENVIRO ANALYTICS GROUP
1430 SPARROWS POINT BLVD
SPARROWS POINT MD, 21219

DEAR SAFETY CONTACT

We have enclosed Material Safety Data Sheets for those chemicals you have just received from us either for the first time or since our last MSDS revision.

Product Name: SULFURIC ACID 66 DEG BE

The OSHA right to know requires that you distribute or make available the MSDS's to people in your company who are involved with these chemicals.

We thank you for your valued business and hope we may continue to merit serving your future requirements.

Very truly yours,
Jack Thorne
Director of Quality Assurance

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Honeywell

Material Safety Data Sheet

Sulfuric Acid

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Sulfuric Acid
OTHER/GENERIC NAMES: Sulfuric Acid, Battery Acid

PRODUCT USE: Industrial Chemical.

MANUFACTURER: Honeywell
101 Columbia Road
Morristown, New Jersey 07962-1139

FOR MORE INFORMATION CALL:
(Monday-Friday, 8:30am-5:00 pm) (EST)
Customer Service
1-877-370-7007

IN CASE OF EMERGENCY CALL:
(24 Hours/Day, 7 Days/Week)
1-800-707-4555 (Honeywell)
Transportation Emergencies
1-800-424-9300 (CHEMTREC-Domestic)
703-527-3887 (CHEMTREC – International)
Health Emergencies
1-800-498-5701 (PROSAR)

2. COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT NAME	CAS NUMBER	WEIGHT %
Sulfuric Acid	7664-93-9	93.0 – 99.0
Water	7732-18-5	1.0 – 7.0

Trace impurities and additional material names not listed above may also appear in Section 15 towards the end of the MSDS. These materials may be listed for local "Right-To-Know" compliance and for other reasons.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: An oily, colorless to sightly yellow, clear to turbid liquid. Odorless. Corrosive. Causes severe burns to skin, eyes and repiratory tract. Do not get in eyes, on skin or on clothing. Do not breathe vapor or mist.

POTENTIAL HEALTH HAZARDS

SKIN: Can cause severe burns.

EYES: Liquid contact can cause irritation, corneal burns, and conjunctivitis. Blindless, or severe or permanent injury may result.

IMPORTANT: While Brenntag believes the information contained herein to be accurate, Brenntag makes no representation or warranty, express or implied, regarding, and assumes no liability for, the accuracy or completeness of the information. The Buyer assumes all responsibility for handling, using and/or reselling the Product in accordance with the applicable federal, state, and local law. This MSDS shall not in any way limit or preclude the operation and effect of any of the provisions of Brenntag's terms and conditions of sale.

Honeywell

Material Safety Data Sheet

Sulfuric Acid

INHALATION: Inhalation of fumes or acid mist can cause irritation or corrosive burns to the upper respiratory system, including nose, mouth, and throat. Lung irritation and pulmonary edema can also occur.

INGESTION: Can cause irritation and corrosive burns to mouth, throat, and stomach. Can be fatal if swallowed.

DELAYED EFFECTS: Erosion of teeth, lesions of the skin, tracheo-bronchitis, mouth inflammation, conjunctivitis, and gastritis. NOTE: IARC has classified workplace exposures to sulfuric acid mist as a Group 1 carcinogen (known human carcinogen).

Ingredients found on one of the OSHA designated carcinogen lists are listed below.

INGREDIENT NAME	NTP STATUS	IARC STATUS	OSHA LIST
Sulfuric Acid	No	No *(See Section 3-Delayed Effects	No

4. FIRST AID MEASURES

SKIN: Immediately flush with plenty of water for at lease 15 minutes. Remove contaminated clothing while washing. Continue flushing with water if medical attention is not immediately available. Get immediate medical attention for irritation or burns.

EYES: Immediately flush eyes with water for at least 15 minutes. Get immediate medical attention.

INHALATION: Remove to fresh air. Observe for possible delayed reaction. If breathing has stopped, apply artificial respiration. If breathing is difficult, give oxygen provided a qualified operator is available. Get immediate medical attention.

INGESTION: Do not induce vomiting. If conscious, give several glasses of milk (preferred) or water. Get immediate medical attention.

ADVICE TO PHYSICIAN: No additional instructions.

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Honeywell

Material Safety Data Sheet

Sulfuric Acid

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASH POINT: Not flammable.
FLASH POINT METHOD: Not applicable.
AUTOIGNITION TEMPERATURE: Not applicable.
UPPER FLAME LIMIT (Volume % in air): Not applicable.
LOWER FLAME LIMIT (Volume % in air): Not applicable.
FLAME PROPAGATION RATE (Solids): Not applicable.
OSHA FLAMMABILITY CLASS: Not flammable.

EXTINGUISHING MEDIA:
If involved in a fire, use water spray; avoid spraying water into containers. If only a small amount of combustibles is present, smother fire with dry chemical. Do not use solid water streams near ruptured tanks or spills of sulfuric acid. Acid reacts violently with water can can spatter acid onto personnel.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Flammable and potentially explosive hydrogen gas can be generated inside metal drums and storage tanks. Concentrated sulfuric acid can ignite combustible materials on contact.

SPECIAL FIRE FIGHTING PRECAUTIONS/INSTRUCTIONS:
At high temperatures, sulfuric acid mist or sulfur trioxide gas can be released from vented or ruptured containers. If water is added to concentrated sulfuric acid, violent spattering can occur, and considerable heat may be evolved. Wear NIOSH approved self-contained breathing apparatus with full facepiece and full protective clothing. Cool non-leaking fire-exposed containers with water spray.

6. ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE: (Always wear recommended personal protective equipment.) Dilute small spills or leaks cautiously with plenty of water. Neutralize residue with alkali such as soda ash or lime. Adequate ventilation is required when adding soda ash due to release of carbon dioxide gas. Major spills must be handled by a pre-determined plan. Diking with soda ash is recommended. Attempt to keep out of sewer. Any release to the environment of this product may be subject to Federal and/or State reporting requirements.

Spills and releases may have to be reported to Federal and/or local authorities. See the Regulatory Information (#15) regarding requirements.

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Honeywell

Material Safety Data Sheet

Sulfuric Acid

7. HANDLING AND STORAGE

NORMAL HANDLING: (Always wear recommended personal protective equipment.)
Do not get in eyes, on skin or on clothing. Do not breath vapor or mist. Use only with adequate ventilation and with protective equipement. Do not add water to acid. When diluting, always add acid to water cautiously and with agitation.

STORAGE RECOMMENDATIONS: Protect from physical damage. Store in cool, well-ventilated area away from combustibles and reactive chemicals. Keep out of sun and away from heat. Keep containers upright. Vent tanks routinely to prevent hydrogen gas buildup.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Use ventilation sufficient to reduce vapor and acid mists to permissible levels. Packaging and unloading areas and open processing equipment may require mechanical exhaust systems. Corrosion-proof construction recommended..

PERSONAL PROTECTIVE EQUIPMENT
SKIN PROTECTION: As a minimum, wear acid-resistant apron (preferably rubber), protective clothing, boots, and gauntlet gloves gloves for routine product use. For increased protection, include acid-resistant trousers and jacket.

EYE PROTECTION: As a minium, wear hard hat, chemical safety goggles, and full-face shield. Do not wear contact lenses. For increased protection, use supplied-air acid hood.

RESPIRATORY PROTECTION: Minimum recommended respiratory protection for exposures above the PEL/TLV: NIOSH approved full-face mask with acid gas/high effiency particulate canister/cartridges. Exposures above 100 mg/m^3 require a self-contained breathing apparatus with full facepiece or supplied-air respirator with a full facepiece, helmet or hood.llowing:

ADDITIONAL RECOMMENDATIONS: Eyewash and quick-drench shower facilities (protected from freezing) should be available wherever sulfuric acid is stored and handled. Neutralization supplies and equipment should also be available.

EXPOSURE GUIDELINES (Guidelines exist for the following ingredients)

INGREDIENT NAME	ACGIH TLV	OSHA PEL	OTHER LIMIT
Sulfuric Acid	0.2 mg/m^3 TWA	1 mg/m^3 TWA; Vapor:	None

* = Limit established by Honeywell for internal use.
** = Workplace Environmental Exposure Level (AIHA).
*** = Biological Exposure Index (ACGIH).

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Honeywell

Material Safety Data Sheet

Sulfuric Acid

Other exposure limits for the decomposition products normally associated with product use are as follows:

None.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Oily, colorless to slightly yellow, clear to turbid liquid.
PHYSICAL STATE: Liquid.
MOLECULAR WEIGHT: 98.08
CHEMICAL FORMULA: H_2SO_4.
ODOR: Odorless.
SPECIFIC GRAVITY: (Water = 1.0) 1.8354 (93.19%)
1.8407 (95.0%)
SOLUBILITY IN WATER: (Weight %) Complete.
PH: 0.9 (1% solution).
BOILING POINT: 279.4°C (93.19%)
296.7°C (95.0%)
MELTING POINT: -29.4°C (95.0%)
-22.2°C (95.0%)
VAPOR PRESSURE: Negligible @ ambient.
VAPOR DENSITY: (Air = 1.0) Not applicable.
EVAPORATION RATE: Not applicable. Compared to: Not applicable.
% VOLATILES: Not applicablle.
FLASH POINT: Not flammable.

(Flash point method and additional flammability data are found in section 5.)

10. STABILITY AND REACTIVITY

NORMALLY STABLE? (CONDITIONS TO AVOID):
Stable under normal conditions. Avoid temperatures of 300°C or higher: yields sulfur trioxide gas, which is toxic, corrosive, and an oxidizer.

INCOMPATIBILITIES: Nitro compounds, carbides, dienes, alcohols (when heated): cause explosions. Oxidizing agents, such as chlorates and permanganates: cause fires and possibly explosions. Allyl compounds and aldehydes: undergo polymerization, possibly violent. Alkalis, amines, water, hydrated salts, carboxylic acid anhydrides, nitriles, olefinic organics, glycols, aqueous acids: cause strong exothermic reactions. Carbonates, cyanides, sulfides, sulfites, metals such as copper: yield toxic gases.

HAZARDOUS DECOMPOSITION PRODUCTS: Sulfur trioxide gas. This is also fire risk if in contact with organic materials.

HAZARDOUS POLYMERIZATION: Will not occur.

IMPORTANT: While Brenntag believes the information contained herein to be accurate, Brenntag makes no representation or warranty, express or implied, regarding, and assumes no liability for, the accuracy or completeness of the information. The Buyer assumes all responsibility for handling, using and/or reselling the Product in accordance with the applicable federal, state, and local law. This MSDS shall not in any way limit or preclude the operation and effect of any of the provisions of Brenntag's terms and conditions of sale.

Honeywell

Material Safety Data Sheet

Sulfuric Acid

11. TOXICOLOGICAL INFORMATION

IMMEDIATE (ACUTE) EFFECTS:
LD_{50} (rat): 510 mg/kg
Eye (rabbit); Severe; 1300 ug

DELAYED (SUBCHRONIC AND CHRONIC) EFFECTS: LARC has classified workplace exposure to sulfuric acid mist as a Group 1 carcinogen (known human carcinogen).

OTHER DATA:
None.

12. ECOLOGICAL INFORMATION

24.5 ppm/24 hr./bluegill/letal/fresh water
42.5 ppm/48 hr./prawn/LC_{50}/salt water

13. DISPOSAL CONSIDERATIONS

RCRA
Is the unused product a RCRA hazardous waste if discarded? Yes.
If yes, the RCRA ID number is: D002

OTHER DISPOSAL CONSIDERATIONS: Waste sulfuric acid should be cautiously diluted with water and neutralized with an alkali. Neutralized waste must be disposed of in accordance with applicable disposal regulations. Waste may have to be disposed of by an approved contractor. (EPA corrosive waste -- D002 applicable to the unneutralized acid).

The information offered here is for the product as shipped. Use and/or alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classificaiton and the proper disposal method.

14. TRANSPORT INFORMATION

US DOT HAZARD CLASS: PROPER DOT SHIPPING DESC.: Sulfuric acid, 8, UN1830, PGII
US DOT HAZARD CLASS: 8, Corrosive
US DOT ID NUMBER: UN1830
ERG NUMBER (2004 Edition): Guide No. 137

UN ID NUMBER: UN 1830
UN 1832 (spent sulfuric acid)

For additional information on shipping regulations affecting this material, contact the information number found on the first page.

IMPORTANT: While Brenntag believes the information contained herein to be accurate, Brenntag makes no representation or warranty, express or implied, regarding, and assumes no liability for, the accuracy or completeness of the information. The Buyer assumes all responsibility for handling, using and/or reselling the Product in accordance with the applicable federal, state, and local law. This MSDS shall not in any way limit or preclude the operation and effect of any of the provisions of Brenntag's terms and conditions of sale.

Honeywell

Material Safety Data Sheet

Sulfuric Acid

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA)

TSCA INVENTORY STATUS: Material is on the TSCA Inventory.

OTHER TSCA ISSUES: None.

SARA TITLE III/CERCLA
RQs & TPQs:
"Reportable Quantities" (RQs) and/or "Threshold Planning Quantities" (TPQs) exist for the following ingredients.

INGREDIENT NAME	SARA/CERCLA RQ (lb)	SARA EHS TPQ (lb)
Sulfuric Acid	1000	1000

Spills or releases resulting in the loss of any ingredient at or above its RQ requires immediate notification to the National Response Center [(800) 424-8802] and to your Local Emergency Planning Committee.

SECTION 311 HAZARD CLASS: Immediate.

SARA 313 TOXIC CHEMICALS:
The following ingredients are SARA 313 "Toxic Chemicals". CAS numbers and weight percents are found in Section # 2.

INGREDIENT	COMMENT
Sulfuric Acid	None

STATE RIGHT-TO-KNOW

*No addition to the ingredients found in section 2, the following are listed for state right-to-know purposes.

INGREDIENT	WEIGHT %	COMMENT
No ingredients listed in this section		

ADDITIONAL REGULATORY INFORMATION:
Sulfuric acid is considered a DEA Precursor and Essential Chemical (21 CFR Parts 1310 and 1313).

WHMIS CLASSIFICATION (CANADA):
Class E.

FOREIGN INVENTORY STATUS:
Canadian DSL (Domestic Substances List)
EINECS (European Inventory of Existing Commerical Chemical Substances)

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Honeywell

Material Safety Data Sheet

Sulfuric Acid

16. OTHER INFORMATION

CURRENT ISSUE DATE: January 2, 2007
PREVIOUS ISSUE DATE: April 21, 2006

CHANGES TO MSDS FROM PREVIOUS ISSUE DATE ARE DUE TO THE FOLLOWING:

Change name AlliedSignal to Honeywell
Section 14 technical corrections.
Updated ACGIH TLV values.

OTHER INFORMATION: None.

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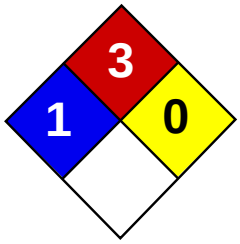



Material Safety Data Sheet
Methyl alcohol MSDS

Section 1: Chemical Product and Company Identification

Product Name: Methyl alcohol

Catalog Codes: SLM3064, SLM3952

CAS#: 67-56-1

RTECS: PC1400000

TSCA: TSCA 8(b) inventory: Methyl alcohol

CI#: Not applicable.

Synonym: Wood alcohol, Methanol; Methylol; Wood Spirit; Carbinol

Chemical Name: Methanol

Chemical Formula: CH3OH

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Methyl alcohol	67-56-1	100

Toxicological Data on Ingredients: Methyl alcohol: ORAL (LD50): Acute: 5628 mg/kg [Rat]. DERMAL (LD50): Acute: 15800 mg/kg [Rabbit]. VAPOR (LC50): Acute: 64000 ppm 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator). Severe over-exposure can result in death.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified POSSIBLE for human. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to eyes. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS), optic nerve. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 464°C (867.2°F)

Flash Points: CLOSED CUP: 12°C (53.6°F). OPEN CUP: 16°C (60.8°F).

Flammable Limits: LOWER: 6% UPPER: 36.5%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Explosive in presence of open flames and sparks, of heat.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition, it emits acrid smoke and irritating fumes. CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME

Special Remarks on Explosion Hazards:
Forms an explosive mixture with air due to its low flash point. Explosive when mixed with Choroform + sodium methoxide and diethyl zinc. It boils violently and explodes.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Poisonous liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 200 from OSHA (PEL) [United States] TWA: 200 STEL: 250 (ppm) from ACGIH (TLV) [United States] [1999] STEL: 250 from NIOSH [United States] TWA: 200 STEL: 250 (ppm) from NIOSH SKIN TWA: 200 STEL: 250 (ppm) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Alcohol like. Pungent when crude.

Taste: Not available.

Molecular Weight: 32.04 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 64.5°C (148.1°F)

Melting Point: -97.8°C (-144°F)

Critical Temperature: 240°C (464°F)

Specific Gravity: 0.7915 (Water = 1)

Vapor Pressure: 12.3 kPa (@ 20°C)

Vapor Density: 1.11 (Air = 1)

Volatility: Not available.

Odor Threshold: 100 ppm

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.8

Ionicity (in Water): Non-ionic.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ingnition sources, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizers. Violent reaction with alkyl aluminum salts, acetyl bromide, chloroform + sodium methoxide, chromic anhydride, cyanuirc chlorite, lead perchlorate, phosphorous trioxide, nitric acid. Exothermic reaction with sodium hydroxide + chloroform. Incompatible with beryllium dihydride, metals (potassium and magnesium), oxidants (barium perchlorate, bromine, sodium hypochlorite, chlorine, hydrogen peroxide), potassium tert-butoxide, carbon tetrachloride, alkali metals, metals (aluminum, potassium magnesium, zinc), and dichlormethane. Rapid autocatalytic dissolution of aluminum, magnesium or zinc in 9:1 methanol + carbon tetrachloride - sufficiently vigorous to be rated as potentially hazardous. May attack some plastics, rubber, and coatings.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 5628 mg/kg [Rat]. Acute dermal toxicity (LD50): 15800 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 64000 4 hours [Rat].

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified POSSIBLE for human. Causes damage to the following organs: eyes. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS), optic nerve.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

Passes through the placental barrier. May affect genetic material. May cause birth defects and adverse reproductive effects(paternal and maternal effects and fetotoxicity) based on animal studies.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 29400 mg/l 96 hours [Fathead Minnow].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation:
Methanol in water is rapidly biodegraded and volatilized. Aquatic hydrolysis, oxidation, photolysis, adsorption to sediment, and bioconcentration are not significant fate processes. The half-life of methanol in surfact water ranges from 24 hrs. to 168 hrs. Based on its vapor pressure, methanol exists almost entirely in the vapor phase in the ambient atmosphere. It is degraded by reaction with photochemically produced hydroxyl radicals and has an estimated half-life of 17.8 days. Methanol is physically removed from air by rain due to its solubility. Methanol can react with NO2 in pollulted to form methyl nitrate. The half-life of methanol in air ranges from 71 hrs. (3 days) to 713 hrs. (29.7 days) based on photooxidation half-life in air.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Methyl alcohol UNNA: 1230 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Methyl alcohol Illinois toxic substances disclosure to employee act: Methyl alcohol Illinois chemical safety act: Methyl alcohol New York release reporting list: Methyl alcohol Rhode Island RTK hazardous substances: Methyl alcohol Pennsylvania RTK: Methyl alcohol Minnesota: Methyl alcohol Massachusetts RTK: Methyl alcohol Massachusetts spill list: Methyl alcohol New Jersey: Methyl alcohol New Jersey spill list: Methyl alcohol Louisiana spill reporting: Methyl alcohol California Directors List of Hazardous Substances (8CCR 339): Methyl alcohol Tennesse Hazardous Right to Know : Methyl alcohol TSCA 8(b) inventory: Methyl alcohol SARA 313 toxic chemical notification and release reporting: Methyl alcohol CERCLA: Hazardous substances.: Methyl alcohol: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). Class D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R23/24/25- Toxic by inhalation, in contact with skin and if swallowed. R39- Danger of very serious irreversible effects. R39/23/24/25- Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed. S7- Keep container tightly closed. S16- Keep away from sources of ignition - No smoking. S36/37- Wear suitable protective clothing and gloves. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -Material safety data sheet emitted by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. LOLI, HSDB, RTECS, HAZARDTEXT, REPROTOX databases

Other Special Considerations: Not available.

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Last Updated: 05/21/2013 12:00 PM

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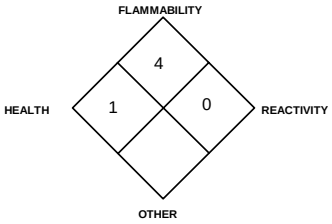
MATERIAL SAFETY DATA SHEET

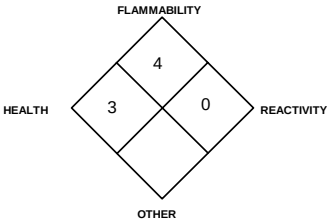
METHANE GAS

NFPA RATING



LIQUID METHANE

NFPA RATING



Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: **METHANE - CH_4, Gaseous Including CH4 with impurities**
Document Number: Methane

PRODUCT USE: For general analytic/synthetic chemical uses.

SUPPLIER/MANUFACTURER'S NAME: MESA Specialty Gases & Equipment
ADDRESS: 3619 Pendleton Avenue, Suite C
Santa Ana, CA 92704

BUSINESS PHONE: 1-714-434-7102
EMERGENCY PHONE: INFOTRAC: 1-800-535-5053

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV Ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Methane	74-82-8	> 98.0%	There are no specific exposure limits for Methane. Methane is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					
Maximum Impurities Including Carbon Monoxide, Carbon Dioxide, Hydrogen, Hydrogen Sulfide		< 2.0%	None of the trace impurities in this mixture contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.					

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Methane is an odorless, colorless gas, or a colorless, odorless liquid in its cryogenic form. Both the liquid and the gas pose a serious fire hazard when accidentally released. The liquid will rapidly boil to the gas at standard temperatures and pressures. As a gas, it will act as a simple asphyxiant and present a significant health hazard by displacing the oxygen in the atmosphere. The gas is lighter than air and may spread long distances. Distant ignition and flashback are possible. The liquefied gas can cause frostbite to any contaminated tissue. Rapid evaporation of the liquid from the cylinder may cause frostbite. Flame or high temperature impinging on a localized area of the cylinder of Methane can cause the cylinder to rupture without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situations. Allow the released gas to dissipate in the atmosphere.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant route of overexposure for this gas is by inhalation. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: High concentrations of this gas can cause an oxygen-deficient environment. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of overexposure, death may occur. Isobutylene also has some degree of anesthetic action and can be mildly irritating to the mucous membranes. The effects associated with various levels of oxygen are as follows:

CONCENTRATION	**SYMPTOMS OF EXPOSURE**
12-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea and vomiting, collapse or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

OTHER POTENTIAL HEALTH EFFECTS: Contact with cryogenic liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with the liquid can quickly subside.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	1
FLAMMABILITY	(RED)	4
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

See Section 16 for Definition of Ratings

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. Overexposure to Methane may cause the following health effects:

ACUTE: The most significant hazard associated with this gas is inhalation of oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, headache, dizziness, and nausea. At high concentrations, unconsciousness or death may occur. Contact with cryogenic liquid or rapidly expanding gases may cause frostbite.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to Methane.

TARGET ORGANS: Respiratory system.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO METHANE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant Personal Protective equipment should be worn. Adequate fire protection must be provided during rescue situations.

4. FIRST-AID MEASURES (Continued)

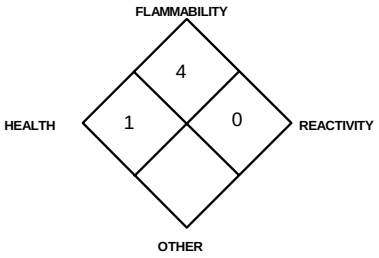
Remove victim(s) to fresh air as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

In case of frostbite, place the frostbitten part in warm water. DO NOT USE HOT WATER. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit, Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention. Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

5. FIRE-FIGHTING MEASURES

METHANE GAS

NFPA RATING



FLASH POINT (Closed Cup):
-187°C (-306°F)

AUTOIGNITION TEMPERATURE:
650°C (1202°F)

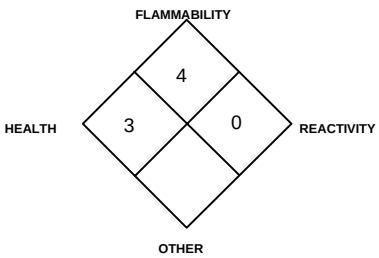
FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 5.0%
Upper (UEL): 15.0%

See Section 16 for Definition of Ratings

LIQUID METHANE

NFPA RATING



FIRE EXTINGUISHING MATERIALS: Extinguish fires of this gas by shutting off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment.

UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this gas will ignite and produce toxic gases including carbon monoxide and carbon dioxide. An extreme explosion hazard exists in areas in which the gas has been released, but the material has not yet ignited.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected pressure storage vessels of Methane can be very dangerous. Direct flame exposure on the cylinder wall can cause an explosion either by BLEVE (Boiling Liquid Expanding Vapor Explosion) or by exothermic decomposition. This is a catastrophic failure of the vessel releasing the contents into a massive fireball and explosion. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the vessel. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

RESPONSE TO FIRE INVOLVING CRYOGEN: Cryogenic liquids can be particularly dangerous during fires because of their potential to rapidly freeze water. Careless use of water may cause heavy icing. Furthermore, relatively warm water greatly increases the evaporation rate of Methane. If large concentrations of Methane gas are present, the water vapor in the surrounding air will condense, creating a dense fog that may make it difficult to find fire exits or equipment. Liquid Methane, when exposed to the atmosphere, will produce a cloud of ice/fog in the air upon its release. A flammable mixture will exist within the vapor cloud and it is advisable that personnel keep well outside the area of visible moisture.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Static discharge may cause Methane to ignite explosively.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipeline. Stop the leak before extinguishing fire. If the fire is extinguished before the leak is sealed, the still-leaking gas could explosively re-ignite without warning and cause extensive damage, injury, or fatality. In this case, increase ventilation (in enclosed areas) to prevent flammable or explosive mixture formation. For large releases, consider evacuation. Refer to the North American Emergency Response Guidebook for additional information.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Adequate fire protection must be provided. Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, gloves resistant to tears, and Self-Contained Breathing Apparatus.**

Use only non-sparking tools and equipment. Locate and seal the source of the leaking gas. Protect personnel attempting the shut-off with water-spray. Allow the gas, which is lighter than air, to dissipate. Liquid Methane, when exposed to the atmosphere, will produce a cloud of ice/fog in the air upon its release. A flammable mixture will exist within the vapor cloud, and it is advisable that personnel keep well outside the area of visible moisture. If cryogenic liquid is released, keep area clear and allow the liquid to evaporate. The gas that is then formed should be allowed to dissipate.

Monitor the surrounding area for combustible gas levels and oxygen. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Combustible gas concentration must be below 10% of the LEL (LEL = 5.0%) prior to entry. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there.

RESPONSE TO CRYOGENIC RELEASE: Clear the affected area and allow the liquid to evaporate and the gas to dissipate. After the gas is formed, follow the instructions provided in the previous paragraphs. If the area must be entered by emergency personnel, SCBA, Kevlar gloves, and appropriate foot and leg protection must be worn.

THIS IS AN EXTREMELY FLAMMABLE GAS. Protection of all personnel and the area must be maintained.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Methane IN YOU. Do not eat or drink while handling chemicals. Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of Methane could occur without any significant warning symptoms.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored in dry, well-ventilated areas away from sources of heat. Compressed gases can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits. Post “No Smoking or Open Flames” signs in storage or use areas.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated area, away from sources of heat, ignition and direct sunlight. Do not allow area where cylinders are stored to exceed 52°C (125°F). Isolate from oxidizers such as oxygen, chlorine, or fluorine. Use a check valve or trap in the discharge line to prevent hazardous backflow. Post “No Smoking or Open Flame” signs in storage and use areas. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. Electrical equipment should be non-sparking or explosion proof. The following rules are applicable to work situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand truck. Do not drag, slide, or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap, if provided, in place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap, if provided. Mark empty cylinders “EMPTY”.

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Methane. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Pamphlet P-1, *Safe Handling of Compressed Gases in Containers*. Additionally, refer to CGA Bulletin SB-2 “*Oxygen Deficient Atmospheres*”.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (e.g., nitrogen) before attempting repairs.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents Methane dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the presence of potentially explosive air-gas mixtures and the level of oxygen. Monitoring devices should be installed near the ceiling.

RESPIRATORY PROTECTION: Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if oxygen levels are below 19.5% or during emergency response to a release of Methane. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards.

EYE PROTECTION: Splash goggles or safety glasses, for protection from rapidly expanding gases and splashes of liquid Methane.

HAND PROTECTION: Wear gloves resistant to tears when handling cylinders of Methane. Use low-temperature protective gloves (e.g., Kevlar) when working with containers of liquid Methane.

BODY PROTECTION: Use body protection appropriate for task. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from splashes of liquefied product, as well as fire retardant items.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: 0.6784 kg/m^3 (0.042 35 lb/ft^3)
SPECIFIC GRAVITY (air = 1): 0.555
SOLUBILITY IN WATER: Very slight.
EXPANSION RATIO: 626 (cryogenic liquid)
ODOR THRESHOLD: Not applicable. Odorless.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.
SPECIFIC VOLUME: 23.7
FREEZING POINT: -182.2°C (-296°F)
BOILING POINT @ 1 atm: -161°C (-258.7°F)
EVAPORATION RATE (n-BuAc): Not applicable.
VAPOR PRESSURE (psia): Not applicable.
pH: Not applicable.

APPEARANCE AND COLOR: Colorless, odorless gas, or colorless, odorless, cryogenic liquid.
HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinct warning properties. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.
NOTE: This gas is lighter than air and must not be allowed to accumulate in elevated locations.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: When ignited in the presence of oxygen, this gas will burn to produce carbon monoxide, carbon dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers (e.g., chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks, and other sources of ignition. Cylinders exposed to high temperatures or direct flame can rupture or burst.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: There are no specific toxicology data for Methane. Methane is a simple asphyxiant, which acts to displace oxygen in the environment.

SUSPECTED CANCER AGENT: Methane is not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA, and therefore, is neither considered to be nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Methane is not irritating; however, contact with rapidly expanding gases can cause frostbite to exposed tissue.

SENSITIZATION TO THE PRODUCT: Methane does not cause sensitization with prolonged or repeated contact.

11. TOXICOLOGICAL INFORMATION (Continued)

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Methane on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for Methane.
Embryotoxicity: No embryotoxic effects have been described for Methane.
Teratogenicity: No teratogenicity effects have been described for Methane.
Reproductive Toxicity: No reproductive toxicity effects have been described for Methane.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e., within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by overexposure to the components of Methane.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen if necessary. Treat symptoms and eliminate exposure.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for Methane.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: Methane occurs naturally in the atmosphere. This gas will be dissipated rapidly in well-ventilated areas.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on animals would be related to oxygen-deficient environments. No adverse effect is anticipated to occur to plant-life, except for frost produced in the presence of rapidly expanding gases.
EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of Methane on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with residual product to MESA International Inc. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

For Methane Gas:

PROPER SHIPPING NAME:	Methane, compressed
HAZARD CLASS NUMBER and DESCRIPTION:	2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1971
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

For Liquefied Methane:

PROPER SHIPPING NAME:	Methane, refrigerated liquid
HAZARD CLASS NUMBER and DESCRIPTION:	2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1972
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

MARINE POLLUTANT: Methane is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Methane is not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

CANADIAN DSL/NDSL INVENTORY STATUS: Methane is on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: Methane is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Methane is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 lb. Depending on specific operations involving the use of Isobutylene, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Under this regulation Methane is not listed in Appendix A; however, any process that involves a flammable gas on-site, in one location, in quantities of 10,000 lb (4,553 kg) or greater is covered under this regulation unless it is used as a fuel.

U.S. STATE REGULATORY INFORMATION: Methane is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Methane.
California - Permissible Exposure Limits for Chemical Contaminants: Methane.
Florida - Substance List: No.
Illinois - Toxic Substance List: Methane.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Methane.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: Methane.
Missouri - Employer Information/Toxic Substance List: Methane.
New Jersey - Right to Know Hazardous Substance List: Methane.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Methane.
Rhode Island - Hazardous Substance List: Methane.
Texas - Hazardous Substance List: No.
West Virginia - Hazardous Substance List: No.
Wisconsin - Toxic and Hazardous Substances: No.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Methane is not on the California Proposition 65 lists.

LABELING:

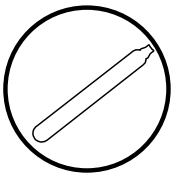
DANGER: FLAMMABLE HIGH PRESSURE GAS.
CAN FORM EXPLOSIVE MIXTURES WITH AIR.

Keep away from heat, flames, and sparks.
Store and use width adequate ventilation.
Use equipment rated for cylinder pressure.
Close valve after each use and when empty.
Use in accordance with the Material Safety Data Sheet.

DO NOT REMOVE THIS PRODUCT LABEL

CANADIAN WHMIS SYMBOLS:

Class A: Compressed Gas
Class B1: Flammable Gas





16. OTHER INFORMATION

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. MESA Specialty Gases & Equipment assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, MESA Specialty Gases & Equipment assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV -** Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration. **PEL -** Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

IDLH - Immediately Dangerous to Life and Health **-** This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**REL**s). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); 1 (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury).

NATIONAL FIRE PROTECTION ASSOCIATION (Continued): Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act **(SARA)**; the Canadian Domestic/Non-Domestic Substances List **(DSL/NDSL)**; the U.S. Toxic Substance Control Act **(TSCA)**; Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act **(CERCLA or Superfund)**; and various state regulations.

SAFETY DATA SHEET

Version 5.4
Revision Date 06/29/2014
Print Date 12/11/2014

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Naphthalene
Product Number	:	147141
Brand	:	Aldrich
Index-No.	:	601-052-00-2
CAS-No.	:	91-20-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable solids (Category 1), H228
Acute toxicity, Oral (Category 4), H302
Carcinogenicity (Category 2), H351
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)

H228	Flammable solid.
H302	Harmful if swallowed.
H351	Suspected of causing cancer.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312	IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P330	Rinse mouth.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_{10}H_8$
Molecular Weight	:	128.17 g/mol
CAS-No.	:	91-20-3
EC-No.	:	202-049-5
Index-No.	:	601-052-00-2

Hazardous components

Component	Classification	Concentration
Naphthalene		
	Flam. Sol. 1; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H228, H302, H351, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Naphthalene	91-20-3	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Eye & Upper Respiratory Tract irritation Hematologic effects Eye damage Not classifiable as a human carcinogen Danger of cutaneous absorption		

		STEL	15 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Eye & Upper Respiratory Tract irritation Hematologic effects Eye damage Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	10 ppm 50 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	15 ppm 75 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	10 ppm 50 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	10 ppm 50 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	15 ppm 75 mg/m3	USA. NIOSH Recommended Exposure Limits

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the

sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	no data available
c)	Odour Threshold	no data available
d)	pH	no data available
e)	Melting point/freezing point	Melting point/range: 80 - 82 °C (176 - 180 °F) - lit.
f)	Initial boiling point and boiling range	218 °C (424 °F) - lit.
g)	Flash point	80.0 °C (176.0 °F) - closed cup
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	The substance or mixture is a flammable solid with the category 1.
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 5.9 %(V) Lower explosion limit: 0.9 %(V)
k)	Vapour pressure	1.3 hPa (1.0 mmHg) at 53.0 °C (127.4 °F) 0.04 hPa (0.03 mmHg) at 25.0 °C (77.0 °F)
l)	Vapour density	no data available
m)	Relative density	no data available
n)	Water solubility	no data available
o)	Partition coefficient: n-octanol/water	log Pow: 3.30
p)	Auto-ignition temperature	526.0 °C (978.8 °F)
q)	Decomposition temperature	no data available
r)	Viscosity	no data available
s)	Explosive properties	no data available
t)	Oxidizing properties	no data available

9.2 Other safety information

Surface tension	31.8 mN/m at 100.0 °C (212.0 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity
no data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
no data available

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - rat - 490.0 mg/kg

LC50 Inhalation - rat - 1 h - > 340 mg/m3
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Behavioral:Somnolence (general depressed activity).

LD50 Dermal - rabbit - 20,000 mg/kg

no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
Eyes - rabbit
Result: Mild eye irritation

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Naphthalene)
NTP:	Reasonably anticipated to be a human carcinogen (Naphthalene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

no data available

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Additional Information
RTECS: QJ0525000

Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer., Naphthalene is retinotoxic and systemic absorption of its vapors above 15ppm, may result in:, cataracts, optic neuritis, corneal injury, Eye irritation, Ingestion may provoke the following symptoms:, hemolytic anemia, hemoglobinuria, Nausea, Headache, Vomiting, Gastrointestinal disturbance, Convulsions, anemia, Kidney injury may occur., Seizures., Coma.

Heart -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.9 - 9.8 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 1 - 6.5 mg/l - 96.0 h
	NOEC - other fish - 1.8 mg/l - 3.0 d
	LOEC - other fish - 3.2 mg/l - 3.0 d
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 1.00 - 3.40 mg/l - 48 h
Toxicity to algae	EC50 - No information available. - 33.00 mg/l - 24 h

12.2 Persistence and degradability

Biodegradability Result: - According to the results of tests of biodegradability this product is not readily biodegradable.

no data available

12.3 Bioaccumulative potential

Bioaccumulation Fish

Bioconcentration factor (BCF): 427 - 1,158

12.4 Mobility in soil

no data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1334 Class: 4.1 Packing group: III
Proper shipping name: Naphthalene, refined
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1334 Class: 4.1 Packing group: III EMS-No: F-A, S-G
Proper shipping name: NAPHTHALENE, REFINED
Marine pollutant: No

IATA
UN number: 1334 Class: 4.1 Packing group: III
Proper shipping name: Naphthalene, refined

15. REGULATORY INFORMATION

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Naphthalene	91-20-3	1990-01-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Flam. Sol.	Flammable solids
H228	Flammable solid.
H302	Harmful if swallowed.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	2
Physical Hazard	2

NFPA Rating
Health hazard: 2

Fire Hazard: 2
Reactivity Hazard: 2

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.4 Revision Date: 06/29/2014 Print Date: 12/11/2014

SAFETY DATA SHEET

Version 5.2
Revision Date 06/23/2014
Print Date 12/11/2014

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benzene

Product Number : 12540
Brand : Fluka
Index-No. : 601-020-00-8

CAS-No. : 71-43-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 1B), H340
Carcinogenicity (Category 1A), H350
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H401 Toxic to aquatic life.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P264	Wash skin thoroughly after handling.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P321	Specific treatment (see supplemental first aid instructions on this label).
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	C_6H_6
Molecular Weight	:	78.11 g/mol
CAS-No.	:	71-43-2
EC-No.	:	200-753-7
Index-No.	:	601-020-00-8
Registration number	:	01-2119447106-44-XXXX

Hazardous components

Component	Classification	Concentration
Benzene		
	Flam. Liq. 2; Skin Irrit. 2; Eye Irrit. 2A; Muta. 1B; Carc. 1A; STOT RE 1; Asp. Tox. 1; Aquatic Acute 2; H225, H304, H315, H319, H340, H350, H372, H401	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides
Flash back possible over considerable distance., Container explosion may occur under fire conditions.

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Benzene	71-43-2	TWA	0.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		
		STEL	2.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		
		TWA	10 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z2
		Z37.40-1969		
		CEIL	25 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z2
		Z37.40-1969		
		Peak	50 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z2
		Z37.40-1969		
		See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028 The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.		
		TWA	0.1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		ST	1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Benzene	71-43-2	S-Phenylmercapturic acid	0.03 mg/g	In urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			
		t,t-Muconic acid	0.5 mg/g	In urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	no data available
c)	Odour Threshold	no data available
d)	pH	no data available
e)	Melting point/freezing point	Melting point/range: 5.5 °C (41.9 °F)
f)	Initial boiling point and boiling range	80 °C (176 °F)

g)	Flash point	-11.0 °C (12.2 °F) - closed cup
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	no data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 8 %(V) Lower explosion limit: 1.3 %(V)
k)	Vapour pressure	221.3 hPa (166.0 mmHg) at 37.7 °C (99.9 °F) 99.5 hPa (74.6 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	no data available
m)	Relative density	0.874 g/mL at 25 °C (77 °F)
n)	Water solubility	no data available
o)	Partition coefficient: n-octanol/water	no data available
p)	Auto-ignition temperature	562.0 °C (1,043.6 °F)
q)	Decomposition temperature	no data available
r)	Viscosity	no data available
s)	Explosive properties	no data available
t)	Oxidizing properties	no data available

9.2 Other safety information
no data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
no data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
acids, Bases, Halogens, Strong oxidizing agents, Metallic salts

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - rat - 2,990 mg/kg

LC50 Inhalation - rat - female - 4 h - 44,700 mg/m3

LD50 Dermal - rabbit - 8,263 mg/kg

no data available

Skin corrosion/irritation
Skin - rabbit
Result: Skin irritation

Serious eye damage/eye irritation
Eyes - rabbit
Result: Eye irritation

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.
In vivo tests showed mutagenic effects

Human
lymphocyte
Sister chromatid exchange

mouse
lymphocyte
Mutation in mammalian somatic cells.

mouse
Sister chromatid exchange

Carcinogenicity

Carcinogenicity - Human - male - Inhalation
Tumorigenic:Carcinogenic by RTECS criteria. Leukaemia Blood:Thrombocytopenia.

Carcinogenicity - rat - Oral
Tumorigenic:Carcinogenic by RTECS criteria. Endocrine:Tumors. Leukaemia

This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Human carcinogen.

IARC:	1 - Group 1: Carcinogenic to humans (Benzene)
NTP:	Known to be human carcinogen (Benzene)
OSHA:	OSHA specifically regulated carcinogen (Benzene)

Reproductive toxicity

Reproductive toxicity - mouse - Intraperitoneal
Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Embryo or Fetus: Fetal death.

Developmental Toxicity - rat - Inhalation
Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Developmental Toxicity - mouse - Inhalation
Effects on Embryo or Fetus: Cytological changes (including somatic cell genetic material). Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow).

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Additional Information
RTECS: CY1400000

Nausea, Dizziness, Headache, narcosis, Inhalation of high concentrations of benzene may have an initial stimulatory effect on the central nervous system characterized by exhilaration, nervous excitation and/or giddiness, depression, drowsiness, or fatigue. The victim may experience tightness in the chest, breathlessness, and loss of consciousness. Tremors, convulsions, and death due to respiratory paralysis or circulatory collapse can occur in a few minutes to several hours following severe exposures. Aspiration of small amounts of liquid immediately causes pulmonary edema and hemorrhage of pulmonary tissue. Direct skin contact may cause erythema. Repeated or prolonged skin contact may result in drying, scaling dermatitis, or development of secondary skin infections. The chief target organ is the hematopoietic system. Bleeding from the nose, gums, or mucous membranes and the development of purpuric spots, pancytopenia, leukopenia, thrombocytopenia, aplastic anemia, and leukemia may occur as the condition progresses. The bone marrow may appear normal, aplastic or hyperplastic, and may not correlate with peripheral blood-forming tissues. The onset of effects of prolonged benzene exposure may be delayed for many months or years after the actual exposure has ceased., Blood disorders

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 5.90 mg/l - 96 h
	LC50 - Pimephales promelas (fathead minnow) - 15.00 - 32.00 mg/l - 96 h
	LC50 - Lepomis macrochirus (Bluegill) - 230.00 mg/l - 96 h
	NOEC - Pimephales promelas (fathead minnow) - 10.2 mg/l - 7 d
	LOEC - Pimephales promelas (fathead minnow) - 17.2 mg/l - 7 d
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 22.00 mg/l - 48 h
	EC50 - Daphnia magna (Water flea) - 9.20 mg/l - 48 h
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 29.00 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability — Result: - Readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation — Leuciscus idus (Golden orfe) - 3 d
- 0.05 mg/l

Bioconcentration factor (BCF): 10

12.4 Mobility in soil

no data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene
Reportable Quantity (RQ): 10 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG

UN number: 1114 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: BENZENE
Marine pollutant: No

IATA

UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene

15. REGULATORY INFORMATION

SARA 302 Components

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benzene	71-43-2	2009-02-01
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Benzene	71-43-2	2009-02-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Asp. Tox.	Aspiration hazard
Carc.	Carcinogenicity

Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H340	May cause genetic defects.
H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.2 Revision Date: 06/23/2014 Print Date: 12/11/2014

SAFETY DATA SHEET

Version 3.9
Revision Date 07/01/2014
Print Date 12/11/2014

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Cadmium
Product Number	:	00623
Brand	:	Fluka
Index-No.	:	048-002-00-0
CAS-No.	:	7440-43-9

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 2), H330
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - repeated exposure (Category 1), H372
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)

H301	Toxic if swallowed.
H330	Fatal if inhaled.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P284	Wear respiratory protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P310	Immediately call a POISON CENTER or doctor/ physician.
P320	Specific treatment is urgent (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	Cd
Molecular Weight	:	112.41 g/mol
CAS-No.	:	7440-43-9
EC-No.	:	231-152-8
Index-No.	:	048-002-00-0

Hazardous components

Component	Classification	Concentration
Cadmium Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Acute Tox. 3; Acute Tox. 2; Muta. 2; Carc. 1B; Repr. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H301, H330, H341, H350, H361, H372, H410	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Cadmium/cadmium oxides

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
no data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Cadmium	7440-43-9	TWA	0.01 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Kidney damage		

		Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		TWA	0.002 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Kidney damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		Substance listed; for more information see OSHA document 1910.1027		
		TWA	0.1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z2
		Z37.5-1970 This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.		
		TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z2
		Z37.5-1970 This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.		
		CEIL	0.3 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z2
		Z37.5-1970 This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.		
		CEIL	0.6 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z2
		Z37.5-1970 This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.		
		See 1910.1027. See Table Z-2 for the exposure limits for any operations or sectors where the exposure limits in 1910.1027 are stayed or are otherwise not in effect.		
		Potential Occupational Carcinogen See Appendix A		
		PEL	0.005 mg/m3	OSHA Specifically Regulated Chemicals/Carcinogens
		1910.1027 This standard applies to all occupational exposures to cadmium and cadmium compounds, in all forms, and in all industries covered by the Occupational Safety and Health Act, except the construction-related industries, which are covered under 29 CFR 1926.63. OSHA specifically regulated carcinogen		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Cadmium	7440-43-9	cadmium	0.005 mg/g	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Not critical			
		cadmium	5 µg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		Not critical			

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Colour: light grey
b)	Odour	no data available
c)	Odour Threshold	no data available
d)	pH	no data available
e)	Melting point/freezing point	Melting point/range: 320.9 °C (609.6 °F)
f)	Initial boiling point and boiling range	765 °C (1,409 °F) at 1,013 hPa (760 mmHg)
g)	Flash point	not applicable

h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	no data available
j)	Upper/lower flammability or explosive limits	no data available
k)	Vapour pressure	no data available
l)	Vapour density	no data available
m)	Relative density	8.650 g/cm3
n)	Water solubility	no data available
o)	Partition coefficient: n-octanol/water	no data available
p)	Auto-ignition temperature	no data available
q)	Decomposition temperature	no data available
r)	Viscosity	no data available
s)	Explosive properties	no data available
t)	Oxidizing properties	no data available

9.2 Other safety information
no data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
no data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
no data available

10.4 Conditions to avoid
no data available

10.5 Incompatible materials
Oxidizing agents, acids

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - rat - 225 mg/kg

LC50 Inhalation - rat - 30 h - 25 mg/m3
Remarks: Lungs, Thorax, or Respiration:Dyspnea.

Dermal: no data available

no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
In vitro tests showed mutagenic effects

Carcinogenicity

Possible human carcinogen

IARC:	1 - Group 1: Carcinogenic to humans (Cadmium)
NTP:	Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Cadmium)
OSHA:	OSHA specifically regulated carcinogen (Cadmium)

Reproductive toxicity
no data available

Suspected human reproductive toxicant

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard
no data available

Additional Information
RTECS: EU9800000

Damage to the lungs., Kidney injury may occur., prolonged or repeated exposure can cause:, Vomiting, Diarrhoea, Lung irritation

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	mortality LOEC - Oncorhynchus mykiss (rainbow trout) - 0.0015 mg/l - 96 h
	LC50 - Pimephales promelas (fathead minnow) - 1.0 µg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	mortality NOEC - Daphnia - 0.019 mg/l - 24 h
	mortality LOEC - Daphnia - 0.039 mg/l - 24 h
	EC50 - Daphnia magna (Water flea) - 0.024 mg/l - 48 h
Toxicity to algae	Growth inhibition IC50 - Chaetoceros sp. - 0.028 mg/l - 48 h

12.2 Persistence and degradability
no data available

12.3 Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 72 d - 1.27 µg/l
	Bioconcentration factor (BCF): 55

12.4 Mobility in soil
no data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
Very toxic to aquatic life with long lasting effects.
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3288 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, inorganic, n.o.s. (Cadmium)
Reportable Quantity (RQ): 10 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 3288 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, INORGANIC, N.O.S. (Cadmium)
Marine pollutant: No

IATA
UN number: 3288 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, inorganic, n.o.s. (Cadmium)

15. REGULATORY INFORMATION

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Cadmium	7440-43-9	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Cadmium	7440-43-9	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Cadmium	7440-43-9	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Cadmium	7440-43-9	2007-07-01

California Prop. 65 Components
WARNING! This product contains a chemical known to the CAS-No. Revision Date

State of California to cause cancer. Cadmium	7440-43-9	2009-02-01

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Cadmium	CAS-No. 7440-43-9	Revision Date 2009-02-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301	Toxic if swallowed.
H330	Fatal if inhaled.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H361	Suspected of damaging fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	4
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.9 Revision Date: 07/01/2014 Print Date: 12/11/2014

SAFETY DATA SHEET

Version 5.6
Revision Date 08/13/2014
Print Date 12/11/2014

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Zinc

Product Number : 96454
Brand : Fluka
Index-No. : 030-001-01-9

CAS-No. : 7440-66-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Warning

Hazard statement(s)
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P273 Avoid release to the environment.
P391 Collect spillage.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : Zn

Molecular weight	:	65.39 g/mol
CAS-No.	:	7440-66-6
EC-No.	:	231-175-3
Index-No.	:	030-001-01-9

No components need to be disclosed according to the applicable regulations.
For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Special powder against metal fire Dry sandUse water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable extinguishing media
Water

5.2 Special hazards arising from the substance or mixture
Zinc/zinc oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Colour: grey
b)	Odour	odourless
c)	Odour Threshold	No data available
d)	pH	Not applicable
e)	Melting point/freezing point	Melting point/range: 420 °C (788 °F) - lit.
f)	Initial boiling point and boiling range	907 °C (1,665 °F) - lit.
g)	Flash point	Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	May form combustible dust concentrations in air
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	Not applicable
l)	Vapour density	No data available
m)	Relative density	7.133 g/mL at 25 °C (77 °F)
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	Not applicable
p)	Auto-ignition temperature	does not ignite
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	During processing, dust may form explosive mixture in air.
t)	Oxidizing properties	No data available

9.2 Other safety information

Bulk density	1.8 - 3.2 kg/m3

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Dust may form explosive mixture in air.

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Acids and bases

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
Did not cause sensitisation on laboratory animals.

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: ZG8600000

Effects due to ingestion may include:, chills, dry throat, sweet taste, Fever, Cough, Nausea, Vomiting, Weakness, Contact with eyes or skin may cause:, Irritation

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Cyprinus carpio (Carp) - 450 µg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	LC50 - Daphnia magna (Water flea) - 0.068 mg/l - 48 h
	mortality NOEC - Daphnia (water flea) - 0.101 - 0.14 mg/l - 7 d

12.2 Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Bioaccumulation	Algae - 7 d at 16 °C - 5 µg/l
	Bioconcentration factor (BCF): 466

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s.
Reportable Quantity (RQ): 1000 lbs
Marine pollutant:
Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc powder (stabilized))
Marine pollutant: No

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Zinc powder (stabilized))

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Zinc powder (stabilized)	7440-66-6	1993-04-24

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Zinc powder (stabilized)	7440-66-6	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Zinc powder (stabilized)	7440-66-6	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Zinc powder (stabilized)	7440-66-6	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6 Revision Date: 08/13/2014 Print Date: 12/11/2014

SAFETY DATA SHEET

Version 4.6
Revision Date 07/03/2014
Print Date 12/11/2014

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Nitric acid

Product Number : 309079
Brand : Sigma-Aldrich

CAS-No. : 7697-37-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Oxidizing liquids (Category 3), H272
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Skin corrosion (Category 1A), H314
Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H272 May intensify fire; oxidiser.
H311 + H331 Toxic in contact with skin or if inhaled
H314 Causes severe skin burns and eye damage.

Precautionary statement(s)
P210 Keep away from heat.
P220 Keep/Store away from clothing/ combustible materials.
P221 Take any precaution to avoid mixing with combustibles.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.

P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/ physician.
P322	Specific measures (see supplemental first aid instructions on this label).
P361	Remove/Take off immediately all contaminated clothing.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula : HNO_3

Molecular Weight : 63.01 g/mol

Hazardous components

Component		Classification	Concentration
Nitric acid			
CAS-No. EC-No. Index-No.	7697-37-2 231-714-2 007-004-00-1	Ox. Liq. 3; Skin Corr. 1A; Eye Dam. 1; H272, H314	90 - 100 %
Dinitrogen trioxide			
CAS-No. EC-No.	10544-73-7 234-128-5	Ox. Gas 1; Press. Gas ; Acute Tox. 1; Acute Tox. 2; Skin Corr. 1B; Eye Dam. 1; H270, H280, H310 + H330, H314	10 - 20 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.Continue rinsing eyes during transport to hospital.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
nitrogen oxides (NOx)

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking.Keep away from heat and sources of ignition.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Nitric acid	7697-37-2	TWA	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Eye & Upper Respiratory Tract irritation Dental erosion		
		STEL	4 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Eye & Upper Respiratory Tract irritation		

		Dental erosion		
		ST	4 ppm 10 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	2 ppm 5 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	2 ppm 5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	2 ppm 5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	4 ppm 10 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nature latex/chloroprene
Minimum layer thickness: 0.6 mm
Break through time: 120 min
Material tested:Lapren® (KCL 706 / Aldrich Z677558, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance Form: clear, liquid

		Colour: colourless
b)	Odour	no data available
c)	Odour Threshold	no data available
d)	pH	< 1 at 20 °C (68 °F)
e)	Melting point/freezing point	no data available
f)	Initial boiling point and boiling range	100 °C (212 °F) at 1,013 hPa (760 mmHg)
g)	Flash point	no data available
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	no data available
j)	Upper/lower flammability or explosive limits	no data available
k)	Vapour pressure	11 hPa (8 mmHg) at 20 °C (68 °F)
l)	Vapour density	no data available
m)	Relative density	1.48 g/cm3 at 20 °C (68 °F)
n)	Water solubility	completely miscible
o)	Partition coefficient: n-octanol/water	no data available
p)	Auto-ignition temperature	no data available
q)	Decomposition temperature	no data available
r)	Viscosity	no data available
s)	Explosive properties	no data available
t)	Oxidizing properties	no data available

9.2 Other safety information
no data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
no data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
no data available

10.4 Conditions to avoid
no data available

10.5 Incompatible materials
Acids, Reducing agents, Alcohols, Acetic anhydride, Acrylonitrile, Acetonitrile, Organic materials, Alkali metals

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
no data available

Inhalation: no data available

Dermal: no data available

no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available
no data available

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Additional Information
RTECS: QU5900000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin.

Liver - Irregularities - Based on Human Evidence
Liver - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity
no data available

12.2 Persistence and degradability
no data available

12.3 Bioaccumulative potential
no data available

12.4 Mobility in soil
no data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
no data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2032 Class: 8 (5.1, 6.1) Packing group: I
Proper shipping name: Nitric acid, red fuming
Reportable Quantity (RQ): 1000 lbs
Marine pollutant: No
Poison Inhalation Hazard: Hazard zone B

IMDG
UN number: 2032 Class: 8 (5.1, 6.1) Packing group: I EMS-No: F-A, S-Q
Proper shipping name: NITRIC ACID, RED FUMING
Marine pollutant: No

IATA
UN number: 2032 Class: 8 (5.1, 6.1)
Proper shipping name: Nitric acid, red fuming
IATA Passenger: Not permitted for transport
IATA Cargo: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Nitric acid	7697-37-2	2007-07-01

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Nitric acid	7697-37-2	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Nitric acid	7697-37-2	2007-07-01
Dinitrogen trioxide	10544-73-7	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Nitric acid	7697-37-2	2007-07-01
Water	7732-18-5	
Dinitrogen trioxide	10544-73-7	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Nitric acid	7697-37-2	2007-07-01
Water	7732-18-5	
Dinitrogen trioxide	10544-73-7	1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Eye Dam.	Serious eye damage
H270	May cause or intensify fire; oxidiser.
H272	May intensify fire; oxidiser.
H280	Contains gas under pressure; may explode if heated.
H310 + H330	Fatal in contact with skin or if inhaled
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H331	Toxic if inhaled.
Ox. Gas	Oxidising gases
Ox. Liq.	Oxidizing liquids
Press. Gas	Gases under pressure
Skin Corr.	Skin corrosion

HMIS Rating

Health hazard:	4
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	3

NFPA Rating

Health hazard:	4
Fire Hazard:	0
Reactivity Hazard:	3
Special hazard.I:	OX

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.6 Revision Date: 07/03/2014 Print Date: 12/11/2014

SAFETY DATA SHEET

Version 6.10
Revision Date 08/20/2014
Print Date 12/11/2014

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Hydrochloric acid

Product Number : 320331
Brand : Sigma-Aldrich
Index-No. : 017-002-01-X

CAS-No. : 7647-01-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Corrosive to metals (Category 1), H290
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H290 May be corrosive to metals.
H314 Causes severe skin burns and eye damage.
H335 May cause respiratory irritation.

Precautionary statement(s)
P234 Keep only in original container.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/ physician.
P321	Specific treatment (see supplemental first aid instructions on this label).
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P406	Store in corrosive resistant stainless steel container with a resistant inner liner.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula : HCl
Molecular weight : 36.46 g/mol

Hazardous components

Component		Classification	Concentration
Hydrochloric acid			
CAS-No.	7647-01-0	Met. Corr. 1; Skin Corr. 1B; Eye Dam. 1; STOT SE 3; H290, H314, H335	30 - 50 %
EC-No.	231-595-7		
Index-No.	017-002-01-X		
Registration number	01-2119484862-27-XXXX		

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.Continue rinsing eyes during transport to hospital.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Hydrochloric acid	7647-01-0	C	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		C	5 ppm 7 mg/m3	USA. NIOSH Recommended Exposure Limits
		Often used in an aqueous solution.		
		C	5 ppm 7 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate. Ceiling limit is to be determined from breathing-zone air samples.		

		C	5 ppm 7 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: light yellow
b)	Odour	pungent
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-30 °C (-22 °F)
f)	Initial boiling point and boiling range	> 100 °C (> 212 °F)

g)	Flash point	Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	226.636 hPa (169.991 mmHg) at 21.1 °C (70.0 °F) 546.596 hPa (409.981 mmHg) at 37.7 °C (99.9 °F)
l)	Vapour density	No data available
m)	Relative density	1.18 g/mL at 25 °C (77 °F)
n)	Water solubility	soluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Bases, Amines, Alkali metals, Metals, permanganates, e.g. potassium permanganate, Fluorine, metal acetylides, hexalithium disilicide

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available (Hydrochloric acid)

Inhalation: No data available (Hydrochloric acid)

Dermal: No data available (Hydrochloric acid)

No data available (Hydrochloric acid)

Skin corrosion/irritation
Skin - Rabbit (Hydrochloric acid)
Result: Causes burns.

Serious eye damage/eye irritation
Eyes - Rabbit (Hydrochloric acid)
Result: Corrosive to eyes

Respiratory or skin sensitisation
No data available (Hydrochloric acid)

Germ cell mutagenicity
No data available (Hydrochloric acid)

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification. (Hydrochloric acid)

(Hydrochloric acid)

(Hydrochloric acid)

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Hydrochloric acid)

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available (Hydrochloric acid)

No data available (Hydrochloric acid)

Specific target organ toxicity - single exposure
The substance or mixture is classified as specific target organ toxicant, single exposure, category 3 with respiratory tract irritation. (Hydrochloric acid)

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available (Hydrochloric acid)

Additional Information
RTECS: MW4025000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. (Hydrochloric acid)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Gambusia affinis (Mosquito fish) - 282 mg/l - 96 h (Hydrochloric acid)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available (Hydrochloric acid)

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1789 Class: 8 Packing group: II
Proper shipping name: Hydrochloric acid
Reportable Quantity (RQ): 13514 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1789 Class: 8 Packing group: II EMS-No: F-A, S-B
Proper shipping name: HYDROCHLORIC ACID
Marine pollutant: No

IATA
UN number: 1789 Class: 8 Packing group: II
Proper shipping name: Hydrochloric acid

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Hydrochloric acid	7647-01-0	1993-04-24

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Hydrochloric acid	7647-01-0	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	
Hydrochloric acid	7647-01-0	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	
Hydrochloric acid	7647-01-0	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Eye Dam.	Serious eye damage
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.
Met. Corr.	Corrosive to metals
Skin Corr.	Skin corrosion
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	3
Fire Hazard:	0
Reactivity Hazard:	0

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 6.10 Revision Date: 08/20/2014 Print Date: 12/11/2014

SAFETY DATA SHEET

Version 4.5
Revision Date 06/26/2014
Print Date 12/11/2014

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 2-Methylpropene

Product Number : 295469
Brand : Aldrich
Index-No. : 601-012-00-4

CAS-No. : 115-11-7

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable gases (Category 1), H220
Gases under pressure (Liquefied gas), H280

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word Danger

Hazard statement(s)
H220 Extremely flammable gas.
H280 Contains gas under pressure; may explode if heated.

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 Eliminate all ignition sources if safe to do so.
P410 + P403 Protect from sunlight. Store in a well-ventilated place.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Isobutylene
Formula	:	C_4H_8
Molecular Weight	:	56.11 g/mol
CAS-No.	:	115-11-7
EC-No.	:	204-066-3
Index-No.	:	601-012-00-4

Hazardous components

Component	Classification	Concentration
2-Methylpropene		
	Flam. Gas 1; Press. Gas ; H220, H280	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Clean up promptly by sweeping or vacuum.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
2-Methylpropene	115-11-7	TWA	250 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation body weight effects Not classifiable as a human carcinogen		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 60 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an

industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
impervious clothing, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Liquefied gas
b)	Odour	unpleasant
c)	Odour Threshold	no data available
d)	pH	no data available
e)	Melting point/freezing point	Melting point/range: -140 °C (-220 °F)
f)	Initial boiling point and boiling range	-6.9 °C (19.6 °F) - lit.
g)	Flash point	-80 °C (-112 °F) - closed cup
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	no data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 9.6 %(V) Lower explosion limit: 1.8 %(V)
k)	Vapour pressure	4,370 hPa (3,278 mmHg) at 37.7 °C (99.9 °F)
l)	Vapour density	2.25
m)	Relative density	no data available
n)	Water solubility	no data available
o)	Partition coefficient: n-octanol/water	log Pow: 2.34
p)	Auto-ignition temperature	no data available
q)	Decomposition temperature	no data available
r)	Viscosity	no data available
s)	Explosive properties	no data available
t)	Oxidizing properties	no data available

9.2 Other safety information

Relative vapour density	2.25

10. STABILITY AND REACTIVITY

10.1 Reactivity
no data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
no data available

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Strong oxidizing agents, Strong acids, Halogens

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LC50 Inhalation - rat - 4 h - 620,000 mg/m3

Dermal: no data available

no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

no data available

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Additional Information
RTECS: UD0890000

Acts as a simple asphyxiant by displacing air., Dizziness, Disorientation, Headache, excitement, Central nervous system depression, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
no data available

12.2 Persistence and degradability
no data available

12.3 Bioaccumulative potential
no data available

12.4 Mobility in soil
no data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1055 Class: 2.1
Proper shipping name: Isobutylene
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1055 Class: 2.1 EMS-No: F-D, S-U
Proper shipping name: ISOBUTYLENE
Marine pollutant: No

IATA
UN number: 1055 Class: 2.1
Proper shipping name: Isobutylene
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard, Sudden Release of Pressure Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2-Methylpropene	115-11-7	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2-Methylpropene	115-11-7	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
2-Methylpropene	115-11-7	1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Flam. Gas	Flammable gases
H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
Press. Gas	Gases under pressure

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	0

NFPA Rating

Health hazard:	1
Fire Hazard:	4
Reactivity Hazard:	0
Health hazard:	0
Fire Hazard:	4
Reactivity Hazard:	0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.5 Revision Date: 06/26/2014 Print Date: 12/11/2014

Appendix G

Soil Management Plan

(Appendix A of Soil Management Plan provided separately)

April 23, 2015
Revised July 6, 2015

SOIL MANAGEMENT PLAN

PARCEL A-1
SPARROWS POINT TERMINAL, MARYLAND

PREPARED FOR:

SCANNELL PROPERTIES

PREPARED BY

Weaver Consultants Group

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1 INTRODUCTION

The following Soil Management Plan (SMP) has been prepared to document the procedures and precautions that will be employed to evaluate proper procedures for management of soils to be utilized during site development activities at the Sparrows Point Parcel A-1. This SMP is intended to support various aspects of future environmental response activities detailed within the Response Action Plan (RAP) being concurrently submitted to the Maryland Department of the Environment (MDE) to fulfill various requirements of the Maryland Voluntary Cleanup Program (VCP).

Site grading activities will represent a sizeable portion of future site development activities. It is anticipated that impacted soils will be encountered during site grading activities. The principal purpose of this SMP is to highlight the standards applicable for management of impacted soil encountered during future site development activities. These procedures are intended as a guide on proper management procedures on site to minimize effects on human health and safety and minimize environmental impacts.

1.1 Overview of Proposed Site Development

The proposed redevelopment use of the Site is Tier 3B, Restricted Industrial Use. The term restricted industrial refers to the planned use of the property that allows exposure and access by workers over the age of 18, adult workers and construction workers, and other potential expected users. Tier 3 properties typically include manufacturing facilities, maritime facilities, metal working shops, oil refineries, chemical plants, and other material plants.

Restricted Industrial also indicates that one or more land use controls are imposed on the property as a condition for the future use of the Site. It is anticipated that a groundwater use restriction, an industrial land use restriction, and a requirement for maintenance of asphalt, concrete, and landscaping to be installed during site development activities will be placed on the property deed before MDE approves No Further Action status and issues the Certificate of Completion under the MDE VCP.

At this time, the site redevelopment plans are still being finalized; however, it is currently proposed that the Site will be redeveloped as a Federal Express Warehouse consisting of an approximate 338,000 square foot, single-story warehouse facility and associated parking lots. The latest available Schematic Design Documents for the Federal Express Warehouse Building are included as Appendix B to the Response Action Plan (RAP) being concurrently submitted to MDE for review along with this SMP.

Although final site development plans are still being refined, the future building foundation will be either conventional concrete slab-on-grade construction or structural concrete on deep foundations. Open areas surrounding the future building are anticipated to consist of surface

level paved parking areas, concrete walkways, and landscaped areas. Site redevelopment will also include four storm water management structures.

The Site is expected to be serviced by municipal water and sanitary sewer (Baltimore County) and below grade storm water drains and storm water management facilities, natural gas, and electric. Groundwater will not be used as a potable water supply. To ensure and maintain this use, a groundwater use restriction will be placed on the Site prior to occupancy.

2 PLANNED ON-SITE SOIL GRADING ACTIVITIES

2.1 Cut/Fill Excavation Plan

A figure depicting current land elevation contours together with proposed final contours is presented as **Figure 1**. Both of these contour surfaces were utilized to generate a contour map illustrating the thickness of cut and fill expected to be associated with future site development. As shown on **Figure 1**, no grading activities are planned for the extreme southern portion of the property. Moderate fill is planned for areas south of the paved area. Cuts are planned along the loading dock at the south end of the building, as well as along the west parking area. Moderate filling is planned for the majority of the building footprint, as well as the east parking area. The majority of the northern parking area is to be cut, while the extreme northern end of the north parking area will need to be raised to attain final grades.

According to the engineer that developed the cut/fill specifications, based on the schematic drawings with a 15.75 finished floor elevation, a net of 85,000 cubic yards of fill are planned to be brought on-site. This resulted from a required fill volume of 115,000 cubic yards, and cut of approximately 30,000 cubic yards (resulting in the net of approximately 85,000 cubic yards that must be imported from an off-site source). The requirements for qualifying offsite fill are presented below in Section 3.

2.2 Storage Locations/Sediment Control

The required off-site fill is planned to be temporarily staged within two soil stockpiles located within the northern portion of the site, as shown on the Mass Grading Plans included within **Appendix A**. Appropriate storm water and erosion control measures will be implemented around the temporary soil stockpiles, as shown on the Schematic Design Drawings contained in Appendix B to the RAP being submitted concurrently to MDE.

A total of four storm water management structures are currently planned for the development:

- One on the northeastern portion of the site;
- One along the northwest border of the site;
- One along the western border of the site; and
- One near the southeast corner of the site.

The location of these planned storm water management facilities is shown on Drawing C-5 in the Schematic Drawing Set included as Appendix B to the RAP. These features are anticipated to consist of wetland plants in a gravel substrate 4 feet thick. A typical section of the

submerged gravel wetland features is shown on Sheet C-12, Stormwater Management Plan, contained in Appendix B to the RAP. As shown on this Sheet, these features will contain an impermeable liner. The liner will consist of a low density polyethylene geomembrane liner, with a minimum thickness of 20 mil. The liner will meet the specifications presented in **Appendix B**, or equivalent. A gravel substrate will overly the impermeable liner and various different wetland species will be planted at the top of the gravel substrate.

Storm water discharge is intended to be treated within these wetland features at Parcel A1 prior to entering the existing storm drain system. The owner, Sparrows Point Terminal's intent is to block off the structure diverting runoff to the waste water treatment plant and open the current weir wall to allow treated runoff from Parcel A1 to the existing outfall located directly west of Parcel A1. Ultimately, the final discharge point will be addressed by Sparrows Point Terminal as future development occurs.

2.3 Disposal Locations

As mentioned above, the soil balance for site development activities is expected to result in a sizable quantity of fill required to be brought on-site from off-site source(s). The procedures for evaluating the environmental characteristics of the imported fill are presented below in Section 3.

While the overall soil balance will result in a need for imported soils, as shown on the Cut/Fill Plan included as **Figure 1**, portions of the Site will need to be cut to attain final grades. Rather than dispose of the impacted soils that will be cut at an off-site disposal facility, assuming that the soils are suitable from a geotechnical standpoint as structural fill, this impacted soil will be relocated so that it is beneath either the concrete slab of the proposed building or the concrete/paved areas surrounding the building.

If impacted soils from areas that require a cut are deemed not suitable from a geotechnical standpoint for structural fill beneath either the paved areas or the building footprint, then the soil will be transported off-site to an appropriate solid waste disposal facility for disposal. Potential disposal facilities include:

Grey's Landfill
1430 Sparrows Point Rd.
Sparrows Point, MD

Honeygo Run Reclamation Center
10710 Philadelphia Rd.
Perry Hill, MD 21128

Belle Grove Landfill
6931 Baltimore-Annapolis Blvd.

Baltimore, MD 21225
If alternative disposal sites become necessary, then MDE will be notified prior to utilization of other facilities.

The soils will be characterized and profiled in accordance with the waste profiling requirements of the destined solid waste facility.

2.4 Dust Control

General construction operations (i.e., soil excavation, grading, and soil relocation operations) and cap construction are anticipated to be performed during site development. These activities may be undertaken in soil impacted by metals, Aroclor 1260, select PAHs, and/or TPH (DRO).

To limit worker exposure to contaminants borne on dust and windblown particulates, dust control measures will be implemented, if warranted, in accordance with local regulations when activities are performed in areas with impacted soil. Dust monitoring requirements are contained in Section 9.2 of the RAP. If monitoring data indicates that action is warranted, dust suppression measures will be implemented. The dust suppression measures may include wetting or misting through use of a hose connected to an available water supply or a water truck stationed on Site.

3 IMPORT OF CLEAN FILL MATERIAL

As described above, a sizable quantity of fill material is expected to be imported to the site during site development. The steps presented in this section of the SMP will be implemented to minimize the possibility of importing contaminated fill onto the site. The information presented in this section is generally based on a publication from the Maryland Department of the Environment entitled, "Facts About…VCP – Clean Imported Fill Material".

Because fill material may come from a variety of sources, it is important to assess whether materials to be brought onto the site not only meets engineering specifications for a particular use, but also that it passes some level of screening to ensure that it is non impacted.

Given that the future site use will be for industrial purposes, the VCP participant has the option of either characterizing the imported fill material or relying upon an affidavit from the vendor stating that the imported material has not been contaminated by controlled hazardous substances or oil. If requested by MDE, a separate workplan for the characterization of offsite fill materials will be prepared and submitted for MDE review and approval.

3.1 Selection of Fill Material

In general, the source of the imported fill should be from non-industrial area(s) and not from sites undergoing an environmental cleanup. Non-industrial sites may include sites that were previously undeveloped, or used solely for residential or agricultural purposes. If the source is from an agricultural area, care should be taken to evaluate the possibility that the fill contains pesticides, herbicides, or metals at unacceptably high concentrations.

Unacceptable sources of fill materials may include industrial and/or commercial sites where hazardous materials were used, handled, or stored as part of the business operations, or unpaved parking areas where petroleum hydrocarbons could have been spilled or leaked into the soil. Commercial sites to be avoided include former gasoline stations, retail strip malls that contained dry cleaners or photographic processing facilities, paint stores, auto repair and/or painting facilities, and agricultural supply stores. Industrial facilities to avoid include metal processing shops, manufacturing facilities, aerospace facilities, oil refineries, waste treatment plants, or other similar facilities.

Viable alternatives to using soil fill from construction sites include the use of fill material obtained from a commercial supplier of fill material or from soil pits in rural or suburban areas. However, care should be taken to ensure that the fill soil materials to be imported are uncontaminated.

3.2 Documentation and Analysis

As mentioned above, two options are available as a means for documenting the appropriateness of imported fill:

1. Appropriate documentation from source; and/or

2. Soil analysis.

Appropriate documentation for imported fill should include detailed information on the previous use of the land from where the fill is taken, whether an environmental site assessment was performed and its findings, and the results of any testing performed. It is recommended that an environmental professional, as defined by ASTM, should sign any such documentation. If such documentation is inadequate, samples of the fill material should be chemically analyzed.

If analytical testing is relied upon to document that imported soils are unimpacted, the fill material must be analyzed for potential contaminants based on the location and history of the source area. The analytical methods in the following table will be used to assess whether potential contaminants are present in fill source areas:

Table 1: Potential Contaminants Based on the Fill Source Area

Fill Source	Target Compounds/Recommended Analyses*
Land near existing highway	• Lead • PAHs
Land near mining area or rock quarry	• Heavy Metals • Asbestos • pH
Agricultural land	• Pesticides or Organophosphorus Pesticides; Chlorinated Herbicides • Heavy Metals
Residential/acceptable commercial land	• VOCs • SVOCs • TPH • PCBs • Heavy Metals, including lead • Asbestos
*Recommended analysis methods should be in accordance with USEPA SW-846 methods (other than asbestos, which should be using PLM or OSHA Method ID-191).	

If detectable concentrations of compounds of concern are identified within the fill material, an evaluation will be performed in accordance with the *Soil and Groundwater Cleanup Guidance Document, June 2008*. Since future use of this site will be industrial, non-residential clean-up

standards will be applicable. A standard laboratory data package, including a summary of the Quality Assurance/Quality Control (QA/QC) sample results should also accompany the analytical report(s). Where possible, representative samples should be collected at the borrow area while the potential fill material is still in place, and analyzed prior to removal from the borrow area.

In addition to performing the appropriate laboratory analyses of the fill material, an appropriate number of samples should also be determined based upon the approximate volume or area of soil to be used as fill material. The following Table 2 will be used as a guide for selecting the proper number of samples needed to adequately characterize the fill material when sampled at the borrow site.

Table 2: Recommended Fill Material Sampling Schedule	
Area of Individual Borrow Area	*Sampling Requirements*
2 acres or less	Minimum of 4 samples
2 to 4 acres	Minimum of 1 sample every ½ acre
4 to 10 acres	Minimum of 8 samples
Greater than 10 acres	Minimum of 8 locations with 4 sub samples per location
Volume of Borrow Area Stockpile	Samples per Volume
Up to 1,000 cubic yards	1 sample per 250 cubic yards
1,000 to 5,000 cubic yards	4 samples for first 1000 cubic yards + 1 sample each additional 500 cubic yards
Greater than 5,000 cubic yards	10-12 samples for first 5,000 cubic yards + 1 sample per each additional 5,000 cubic yards

3.3 Alternative Sampling

A Phase I Environmental Site Assessment may be conducted prior to sampling at a borrow location to assess whether the borrow area may have been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be determined during a meeting with MDE. However, if it is not possible to analyze the fill material at the borrow area or determine that it is appropriate for use based on a Phase I ESA, it is recommended that the schedule presented above in Table 2 be employed.

However, this sampling frequency may be modified upon consultation with MDE if all of the fill material is derived from a common borrow area. However, fill material that is not characterized at the borrow area will need to be stockpiled either on or off-site until the analyses have been completed. In addition, should contaminants with concentrations exceeding the non-residential clean-up standards in *Soil and Groundwater Cleanup Guidance Document, June 2008* be identified in the stockpiled fill material, that material will be deemed unacceptable and new fill material will need to be obtained and properly evaluated.

Composite sampling for fill material characterization may or may not be appropriate, depending on quality and homogeneity of the source/borrow area, and compounds of concern. It is not acceptable to composite samples for volatile and semi-volatile constituents. Composite sampling for heavy metals, pesticides, herbicides or PAHs from unanalyzed stockpiled soil is also unacceptable, unless it is stockpiled at the borrow area and originates from the same source area. In addition, if samples are composited, they should be from the same soil layer, and not from different soil layers.

When very large volumes of fill material are anticipated, or when larger areas are being considered as borrow areas, MDE recommends that a Phase I Environmental Site Assessment be conducted on the area to assess that the borrow area has not been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be evaluated in consultation with MDE.

4 REFERENCES

Facts About…VCP – Clean Imported Fill Material, Maryland Department of the Environment, undated.

Cleanup Standards For Soil and Groundwater, State of Maryland Department of the Environment, Interim Final Guidance (Update No. 2.1), June 2008.

Figures



SOURCE: BASE IMAGE ADAPTED FROM KCI TECHNOLOGIES SITE MAP AND SOIL BORING PLAN DATED JANUARY 9, 2015.

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PREPARED FOR:

SCANNELL PROPERTIES

CUT/FILL QUANTITY PLAN

PARCEL A1
FORMER SPARROWS POINT STEEL MILL
SPARROWS POINT, MD

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Weaver Consultants Group
CHICAGO, ILLINOIS
(312) 922-1030 www.wcgrp.com

DRAWN BY: RMD
REVIEWED BY: MM
DATE: 2/19/2015
FILE: 3751-300-01
CAD: base5-15-2014.dwg

FIGURE 1

Appendix A

Mass Grading Plans

(Provided separately due to size of documents)

SITE NOTES

1. SITE ADDRESS: 2001 WHARF ROAD
   BALTIMORE, MD 21219
2. ELECTION DISTRICT: 15
3. COUNCILMANIC DISTRICT: 7
4. CENSUS TRACT: 452200
5. DEED REF: 32617/00144
6. TAX MAP: 111 GRID: 14 PARCEL: 318
7. PROPERTY TAX ACCOUNT NO. 1502024000
8. PROPERTY OWNER: HRE SPARROWS POINT LLC
   1650 DES PERES RD
   SUITE 303
   ST LOUIS, MO 63131
9. TOTAL SITE (LEASE) AREA: 2,102,845 SQ. FT OR 48.47 AC.± LOT 1
10. SITE IS LOCATED WITHIN THE BALTIMORE HARBOR WATERSHED DRAINAGE AREA.
11. ZONING: MH/M (MANUFACTURING HEAVY/INDUSTIRAL MAJOR) 2-5 N/A
12. PARKING:
    TOTAL PARKING REQUIRED:
    1 PARKING SPACE PER EMPLOYEE ON LARGEST SHIFT

    TOTAL PARKING PROVIDED:

    EMPLOYEE PARKING:
    EMPLOYEE SPACES: N/A

    MOTORCYCLE PARKING: N/A

    FEDEX VEHICLE PARKING:
    TRACTOR PARKING: N/A
    HOME DELIVERY VANS: N/A
    DEADLINE SPACES: N/A
    28' TRAILER PARKING: N/A
    LONG TRAILER PARKING N/A
    INBOUND PARKING: N/A
13. SET BACKS: FRONT = 50'
    SIDE = 30'
    REAR = 30'
14. BUILDING HEIGHT: NO RESTRICTIONS
15. UTILITIES AND TOPOGRAPHICAL FEATURES SHOWN ON THESE PLANS ARE ONLY FOR THE CONVENIENCE OF THE USER AND THERE IS NO WARRANTY OR GUARANTEE OF THE CORRECTNESS OR THE COMPLETENESS OF THE INFORMATION GIVEN. THE USER OF THESE DRAWINGS MUST VERIFY ALL SUCH INFORMATION TO HIS OWN SATISFACTION.
16. UNLESS OTHERWISE NOTED, ALL CONSTRUCTION AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH:

A. BALTIMORE COUNTY DEPARTMENT OF PUBLIC WORKS STANDARD DETAILS FOR CONSTRUCTION DATED APRIL 1999 AND ADDENDA OR :BOOK OF STANDARDS, HIGHWAY AND INCIDENTAL STRUCTURES" OF THE MD. DEPT. OF TRANSPORTATON-STATE HIGHWAY ADMINISTRATION.

B. BALTIMORE COUNTY DEPARTMENT OF PUBLIC WORKS STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS DATED FEBRUARY 2000 AND ADDENDA.

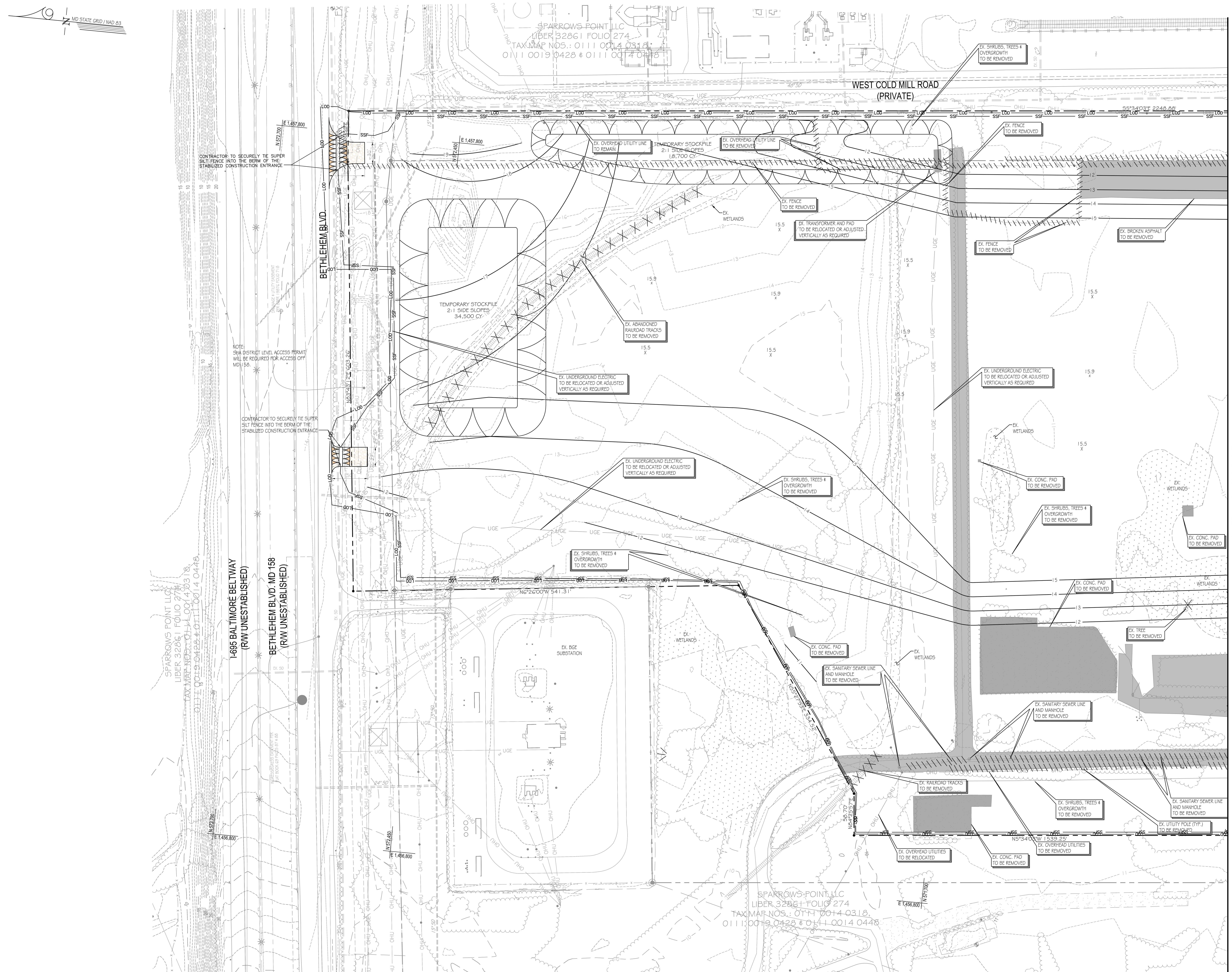
C. NATURAL RESOURCES CONSERVATION SERVICE OF MARYLAND STANDARDS AND SPECIFICATIONS POND CODE 378, JANUARY 2000.

D. MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION JANUARY 2001, STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MATERIALS.

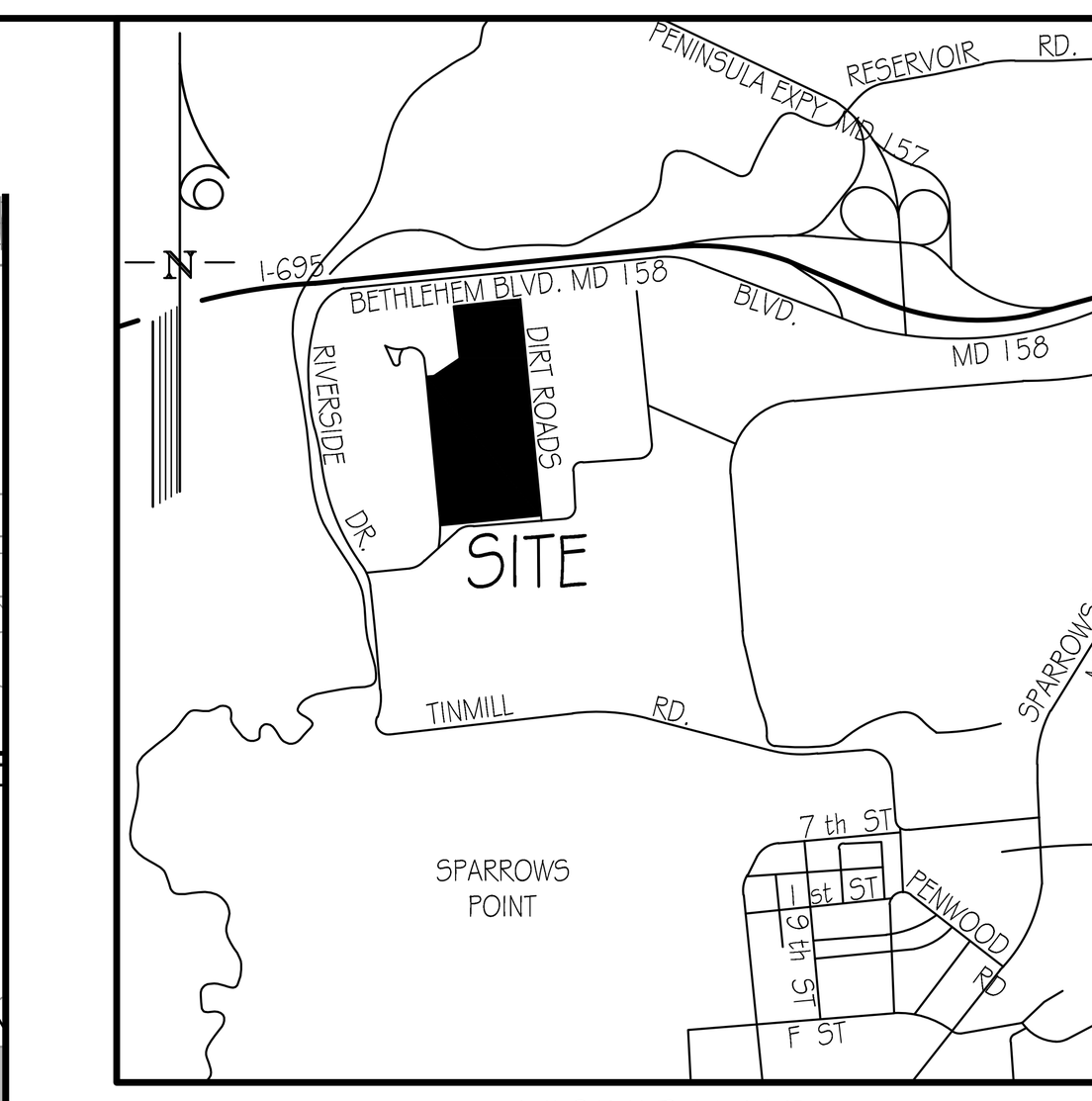
17. ALL CONSTRUCTION MUST BE SUPERVISED BY A GEOTECHNICAL ENGINEER.
18. THE CONSTRUCTION SHOWN HEREON MUST BE CERTIFIED TO THE BALTIMORE COUNTY SOIL CONSERVATION DISTRICT.
19. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE ENGINEER OF ANY DEVIATION FROM THE PLANS PRIOR TO ANY CHANGE BEING MADE. ANY DEVIATION OF THIS PLAN WITHOUT WRITTEN AUTHORIZATION FROM THE ENGINEER WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.
20. OBSTRUCTIONS SHOWN ON THESE DRAWINGS ARE FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. KCI TECHNOLOGIES, INC. DOES NOT WARRANT OR GUARANTEE THE CORRECTNESS OR THE COMPLETENESS OF THE INFORMATION GIVEN. THE CONTRACTOR MUST VERIFY ALL SUCH INFORMATION TO HIS OWN SATISFACTION.
21. THE CONTRACTOR SHALL NOTIFY MISS UTILITY - (800) 257-7777 AT LEAST FIVE (5) WORKING DAYS PRIOR TO STARTING ANY WORK.
22. IT SHALL BE DISTINCTLY UNDERSTOOD THAT FAILURE TO MENTION SPECIFICALLY ANY WORK WHICH WOULD NORMALLY BE REQUIRED TO COMPLETE THE PROJECT SHALL NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO COMPLETE ANY WORK.
23. SHOULD THE CONTRACTOR DISCOVER DISCREPANICIES BETWEEN THE PLANS AND FIELD CONDITIONS, THE ENGINEER IS TO BE NOTIFIED IMMEDIATELY TO RESOLVE THE SITUATION. SHOULD THE CONTRACTOR MAKE FIELD CORRECTIONS OR ADJUSTMENTS WITHOUT WRITTEN PERMISSION OF THE ENGINEER, THEN THE CONTRACTOR ASSUMES ALL RESPONSIBILITY FOR THOSE CHANGES.
24. IF CONFLICT EXISTS BETWEEN DRAWINGS (AND/OR SPECIFICATIONS). THE MORE STINGENT AND MORE COSTLY REQUIREMENT SHALL APPLY. ITEMS SHOWN ON THE DRAWINGS, BUT NOT SPECIFIED, SHALL APPLY AND BE FURNISHED AND INSTALLED BY THE CONTRACTOR. IF AN ITEM IS SHOWN ON THE DRAWINGS, BUT NOT INCLUDED IN THE SPECIFICATIONS, PROVIDE ITEM OF QUALITY LEVEL CONSISTENT WITH THE GENERAL QUALITY LEVEL OF THE CONTACT REQUIREMENTS. BRING CONFLICTS BETWEEN THE DRAWINGS AND SPECIFICATIONS TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
25. TOPOGRAPHY AS SHOWN HEREON IS BASED ON INFORMATION OBTAINED FROM ASM INC. DATED SEPTEMBER, 2014 & SUPPLEMENTED WITH INFORMATION COLLECTED BY KCI TECHNOLOGIES, INC.

LEGEND

- EXISTING MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING UNDERGROUND ELECTRIC
- EXISTING OVERHEAD WIRE, UTILITY POLE AND GUY WIRE
- EXISTING BUILDING
- EXISTING SIDEWALK
- EXISTING EASEMENT LINE
- EXISTING ROAD EDGE
- EXISTING TRAIN TRACKS
- EXISTING STORM DRAIN LINE AND STRUCTURES
- EXISTING SANITARY SEWER LINE AND STRUCTURE
- EXISTING WATER LINE AND VALVE
- EXISTING FENCE LINE
- EXISTING WETLANDS (SEE NOTE 5)
- STABILIZED CONSTRUCTION ENTRANCE W/MOUNTABLE BERM
- SSF — SUPER SILT FENCE
- SF — SILT FENCE
- LOD — LIMITS OF DISTURBANCE
- 50.00' N84°25'57"E — PROPOSED LEASE PARCEL LINE
- PROPOSED MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- SfB(B) / UuB(D) — SOILS LINE/LABEL
- APPROXIMATE LIMITS OF EX. PAVING, SIDEWALK, AND CONCRETE TO BE REMOVED
- EX. OVERHEAD UTILITY TO BE REMOVED
- EX. RAILROAD TRACKS TO BE REMOVED
- EX. FENCE LINE TO BE REMOVED



MASS GRADING PLAN AND SEDIMENT AND EROSION CONTROL PLAN
SCALE: 1" = 50'



VICINITY MAP
SCALE: 1" = 2000'

BENCHMARK

VERTICAL DATUM:

PROJECT BENCHMARK: BALTIMORE COUNTY CONTROL MONUMENT GIS-1, BEING A 10 INCH DIAMETER CONCRETE MONUMENT SET FLUSH IN THE GROUND WITH A BRASS DISK STAMPED "BALTIMORE COUNTY GIS CONTROL POINT, SURVEY MARKER, STATION DESIGNATION NO. GIS-1, 1995, DO NOT DISTURB". ELEVATION=6.72 FEET, NAVD 88 DATUM.

NOTES:
1. SEE SHEET 3 FOR SEQUENCE OF CONSTRUCTION
2. THE PROPOSED GRADING SHOWN ON THIS PLAN MEETS THE REQUIREMENTS SET FORTH BY BALTIMORE COUNTY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND SUSTAINABILITY AND COMPLIES WITH ARTICLE 33, TITLE 5 OF THE BALTIMORE COUNTY CODE. HOWEVER, DUE TO BUILDING TYPES AND LAYOUT, SOME FIELD ADJUSTMENTS MAY BE REQUIRED. ALL CHANGES MUST COMPLY WITH THE ABOVE MENTIONED REQUIREMENTS.
3. ALL SWALES HAVE BEEN DESIGNED BY THE ENGINEER TO COVEY RUNOFF ACCORDING TO BALTIMORE COUNTY DEPARTMENT OF PUBLIC WORKS DESIGN STANDARDS.
4. THERE SHALL BE NO CLEARING OR GRADING, CONSTRUCTION OR DISTURBANCE OF VEGETATION IN THE CRITICAL AREA EASEMENT, FOREST CONSERVATION EASEMENT, AND FOREST BUFFER EASEMENT OR OTHER FOREST RETENTION AREAS, EXCEPT AS PERMITTED BY THE BALTIMORE COUNTY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND SUSTAINABILITY.
5. THE EXISTING WETLANDS ONSITE ARE CURRENTLY BEING INVESTIGATED BY KCI, MDE, AND BALTIMORE COUNTY TO DETERMINE THE OVERALL QUALITY AND JURISDICTIONAL REQUIREMENTS, IF ANY. A DETERMINATION WILL BE MADE PRIOR TO THE START OF ANY SITE WORK.
6. CURRENT PLANNED FEDEX WAREHOUSE FINISHED FLOOR ELEVATION IS 15.75. THE GRADING SHOWN ON THIS PLAN REFLECTS THE FUTURE FINISHED FLOOR ELEVATION.

NOTE: STORMWATER MANAGEMENT TO BE REQUIRED AFTER MASS GRADING IS COMPLETE AND BEFORE BUILDING CONSTRUCTION.

STORMWATER MANAGEMENT REQUIRED

BALTIMORE COUNTY
DEPARTMENT OF ENVIRONMENTAL PROTECTION AND SUSTAINABILITY

APPROVED FOR GRADING

DATE

OWNER/DEVELOPER

I/WE CERTIFY THAT ALL GRADING ON THIS SITE WILL BE DONE IN ACCORDANCE WITH THE CURRENT GRADING REQUIREMENTS AS SET FORTH BY THE BALTIMORE COUNTY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND SUSTAINABILITY AND WITH THE REQUIREMENTS SPECIFIED IN ARTICLE 33, TITLE 5 OF THE BALTIMORE COUNTY CODE.

SIGNATURE OF OWNER/DEVELOPER TITLE DATE

PRINT NAME

ENGINEER DESIGN CERTIFICATION

"I HEREBY CERTIFY THAT THE PLANS HAVE BEEN DESIGNED IN ACCORDANCE WITH LOCAL ORDINANCES, COMAR 26.17.01 AND 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL."

SIGNATURE REGISTRATION NUMBER DATE

Baltimore County Soil Conservation District

APPROVED FOR SEDIMENT CONTROL ________ Date

DISTRICT OFFICIAL Plan No.

Technical Review for the District By:

If a grading permit has not been obtained within two years of this approval, this plan shall be re-submitted to the District.

DESIGN AND DRAWING BASED ON MARYLAND COORDINATE SYSTEM NAD 83/91 HORIZONTAL AND NAVD 1988 VERTICAL DATUM.

50' 0 50' 100'
SCALE: 1"= 50'

LIMIT OF DISTURBANCE THIS SHEET = 1,015,406.49 S.F. OR 23.31 AC
TOTAL DISTURBED AREA = 2,049,398.47 S.F. OR 47.05 AC

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 28935 EXPIRATION DATE: 1/15/17.

KCI TECHNOLOGIES
ENGINEERS
PLANNERS
SCIENTISTS
CONSTRUCTION MANAGERS
936 RIDGEBROOK ROAD
SPARKS, MARYLAND 21152
TELEPHONE: (410) 316-7800
FAX: (410) 316-7818

REVISIONS			
NO.	DATE	DESCRIPTION	BY

DATE 02/09/2015
SCALE 1"=50'
DESIGNED BY CTS
DRAWN BY FW/CTS

MASS GRADING PLAN AND SEDIMENT AND EROSION CONTROL PLAN
FED EX WAREHOUSE BUILDING
2001 WHARF ROAD
SPARROWS POINT, MARYLAND

15th ELECTION DISTRICT 7th COUNCILMANIC DISTRICT

DRAWING NO. C-1
SHEET 1 OF 3
KCI JOB NUMBER 27157328

Friday, February 13, 2015 10:55:33 AM
FRANK WHITE
M:\2015\27157328\DRAWINGS\GR-01 MASS GRADING PLAN.DWG

SITE NOTES

1. SITE ADDRESS: 2001 WHARF ROAD
   BALTIMORE, MD 21219
2. ELECTION DISTRICT: 15
3. COUNCILMANIC DISTRICT: 7
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11. ZONING: MMM (MANUFACTURING HEAVY/INDUSTRIAL MAJOR) 2-5 N/A
12. PARKING:
    TOTAL PARKING REQUIRED:
    1 PARKING SPACE PER EMPLOYEE ON LARGEST SHIFT

    TOTAL PARKING PROVIDED:

    EMPLOYEE PARKING:
    EMPLOYEE SPACES: N/A

    MOTORCYCLE PARKING: N/A

    FEDEX VEHICLE PARKING:
    TRACTOR PARKING: N/A
    HOME DELIVERY VANS: N/A
    DEADLINE SPACES: N/A
    28' TRAILER PARKING: 200
    LONG TRAILER PARKING N/A
    INBOUND PARKING: N/A
13. SET BACKS: FRONT = 50'
    SIDE = 30'
    REAR = 30'
14. BUILDING HEIGHT: NO RESTRICTIONS
15. UTILITIES AND TOPOGRAPHICAL FEATURES SHOWN ON THESE PLANS ARE ONLY FOR THE CONVENIENCE OF THE USER AND THERE IS NO WARRANTY OR GUARANTEE OF THE CORRECTNESS OR THE COMPLETENESS OF THE INFORMATION GIVEN. THE USER OF THESE DRAWINGS MUST VERIFY ALL SUCH INFORMATION TO HIS OWN SATISFACTION.
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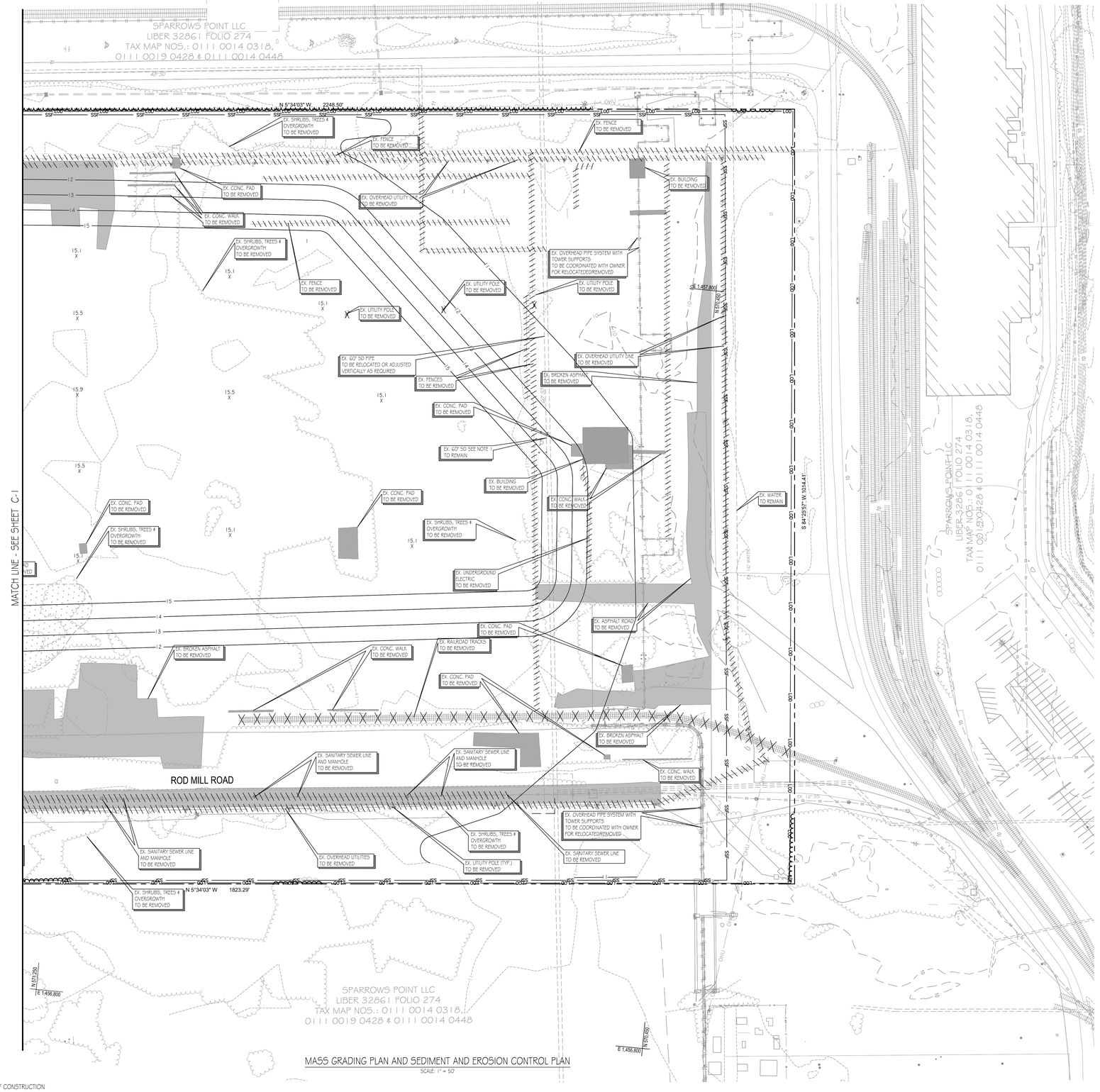
25. TOPOGRAPHY AS SHOWN HEREON IS BASED ON INFORMATION OBTAINED FROM ASM, INC. DATED SEPTEMBER, 2014 & SUPPLEMENTED WITH INFORMATION COLLECTED BY KCI TECHNOLOGIES, INC.

MD STATE GRID / NAD 83



MASS GRADING PLAN AND SEDIMENT AND EROSION CONTROL PLAN
SCALE: 1" = 50'

LEGEND

- EXISTING MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- UGE — EXISTING UNDERGROUND ELECTRIC
- OHU — EXISTING OVERHEAD WIRE, UTILITY POLE AND GUY WIRE
- EXISTING BUILDING
- EXISTING SIDEWALK
- EXISTING EASEMENT LINE
- EXISTING ROAD EDGE
- EXISTING TRAIN TRACKS
- EXISTING STORM DRAIN LINE AND STRUCTURES
- SS — EXISTING SANITARY SEWER LINE AND STRUCTURE
- W — EXISTING WATER LINE AND VALVE
- EXISTING FENCE LINE
- EXISTING WETLANDS (SEE NOTE 5)
- STABILIZED CONSTRUCTION ENTRANCE W/MOUNTABLE BERM
- SSF — SUPER SILT FENCE
- SF — SILT FENCE
- LOD — LIMITS OF DISTURBANCE
- 50.00' N84°29'57"W — PROPOSED LEASE PARCEL LINE
- PROPOSED MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- SHRUB — SOILS LINE/LABEL
- APPROXIMATE LIMITS OF EX. PAVING, SIDEWALK, AND CONCRETE TO BE REMOVED
- EX. OVERHEAD UTILITY TO BE REMOVED
- EX. RAILROAD TRACKS TO BE REMOVED
- EX. FENCE LINE TO BE REMOVED

NOTES:
1. SEE SHEET 3 FOR SEQUENCE OF CONSTRUCTION
2. THE PROPOSED GRADING SHOWN ON THIS PLAN MEETS THE REQUIREMENTS SET FORTH BY BALTIMORE COUNTY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND SUSTAINABILITY AND COMPLIES WITH ARTICLE 33, TITLE 5 OF THE BALTIMORE COUNT

LIMIT OF DISTURBANCE THIS SHEET = 1,033,991.98 S.F. OR 23.74 AC
TOTAL DISTURBED AREA = 2,049,398.47 S.F. OR 47.05 AC

50' 0 50' 100'
SCALE: 1"= 50'

DESIGN AND DRAWING BASED ON MARYLAND COORDINATE SYSTEM NAD 83/91 HORIZONTAL AND NAVD 1988 VERTICAL DATUM.

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 28935 EXPIRATION DATE: 1/15/17.

KCI TECHNOLOGIES
ENGINEERS
PLANNERS
SCIENTISTS
CONSTRUCTION MANAGERS
936 RIDGEBROOK ROAD
SPARKS, MARYLAND 21152
TELEPHONE: (410) 316-7800
FAX: (410) 316-7818

REVISIONS			
NO.	DATE	DESCRIPTION	BY

DATE 02/09/2015
SCALE 1"=50'
DESIGNED BY CTS
DRAWN BY FW/CTS

MASS GRADING PLAN AND SEDIMENT AND EROSION CONTROL PLAN
FED EX WAREHOUSE BUILDING
2001 WHARF ROAD
SPARROWS POINT, MARYLAND
15th ELECTION DISTRICT 7th COUNCILMANIC DISTRICT

DRAWING NO. C-2
SHEET 2 OF 3
KCI JOB NUMBER 27157328

Plotted: February 13, 2015 11:00:00 AM
FRAME: 36x48
W:\2015\27157328.00\MXD\GRADING PLAN.MXD

Appendix B

Geomembrane Specifications

(LLDPE) Low Density Polyethylene - Smooth Geomembrane Liners

Polyethylene liners typically offer superior tensile strength and stiffness and are resistant to chemicals and puncture. These geomembranes are safe for potable water containment and can be fabricated into panels of up to one acre in size. Based on GM 17 "Standard Specification for Test Methods, Test Properties and Testing Frequency for
Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes"
11/14/14

PROPERTY	TEST METHOD	TEST VALUE							
Thickness	ASTM D-5199	20 MIL	30 MIL	40 MIL	50 MIL	60 MIL	80 MIL	100 MIL	120 MIL
Density	ASTM D-1505/D-792	0.939 g/ml	0.939 g/ml	0.939 g/ml	0.939 g/ml	0.939 g/ml	0.939 g/ml	0.939 g/ml	0.939 g/ml
Tensile Properties	ASTM D-6693 Type IV	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1
- Break Strength	ASTM D-6693 Type IV	76 lb/in	114 lb/in	152 lb/in	190 lb/in	228 lb/in	304 lb/in	380 lb/in	456 lb/in
- Break Elongation	ASTM D-6693 Type IV	800 %	800 %	800 %	800 %	800 %	800 %	800 %	800 %
2% Modulus - lb/inch (max.)	ASTM D-5323	1200 lb/in	1800 lb/in	2400 lb/in	3000 lb/in	3600 lb/in	4800 lb/in	6000 lb/in	7200 lb/in
Tear Resistance (min. avg)	ASTM D-1004	11 lb	16 lb	22 lb	27 lb	33 lb	44 lb	55 lb	66 lb
Puncture Resistance (min. avg)	ASTM D-4833*	28 lb	42 lb	56 lb	70 lb	84 lb	112 lb	140 lb	168lb
Axi-Symmetric Break Resistance Strain - % (min.)	ASTM D-5617	30 %	30 %	30 %	30 %	30 %	30 %	30 %	30 %
Carbon Black Content	ASTM D-1603	2.0-3.0 % (2)	2.0-3.0 % (2)	2.0-3.0 % (2)	2.0-3.0 % (2)	2.0-3.0 % (2)	2.0-3.0 % (2)	2.0-3.0 % (2)	2.0-3.0 % (2)
Carbon Black Dispersion	ASTM D-5596	Note 3	Note 3	Note 3	Note 3	Note 3	Note 3	Note 3	Note 3
Oxidative Induction Time (OIT) (min. avg)		Note 4	Note 4	Note 4	Note 4	Note 4	Note 4	Note 4	Note 4
- Standard OIT	ASTM D-3895	100	100	100	100	100	100	100	100
- High Pressure OIT	ASTM D-5885	400	400	400	400	400	400	400	400
Oven aging at 85 degrees C	ASTM D-5721	Note 5	Note 5	Note 5	Note 5	Note 5	Note 5	Note 5	Note 5
- Standard OIT (min. avg) - % retained after 90 days	ASTM D-3895	35 %	35 %	35 %	35 %	35 %	35 %	35 %	35 %
- High Pressure OIT (min. avg) - % retained after 90 days	ASTM D-5885	60 %	60 %	60 %	60 %	60 %	60 %	60 %	60 %
UV Resistance		Note 6	Note 6	Note 6	Note 6	Note 6	Note 6	Note 6	Note 6
- Standard OIT (min. avg)	ASTM D-3895	N.R. (7)	N.R. (7)	N.R. (7)	N.R. (7)	N.R. (7)	N.R. (7)	N.R. (7)	N.R. (7)
- High Pressure OIT (min. avg) - % retained after 1600 hours	ASTM D-5885	35 % (8)	35 % (8)	35 % (8)	35 % (8)	35 % (8)	35 % (8)	35 % (8)	35 % (8)

(1) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Break elongation is calculated using a gage length of 2.0 inches at 2.0 in/min.
(2) Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.
(3) Carbon black dispersion (only near spherical agglomerates) for 10 different views: 9 in Categories 1 or 2 and 1 in Category 3
(4) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(5) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(6) The condition of the test should be 20 hr. UV cycle at 75 Degree C followed by 4 hr. condensation at 60 Degree C.
(7) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
(8) UV resistance is based on percent retained value regardless of the original HP-OIT value.

This information is provided for reference only and is not intended as a warranty or guarantee. US Fabrics assumes no liability in connection with the use of this information (1/2015).

Appendix H

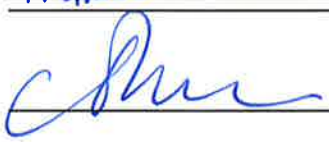
Administrative Requirements

WRITTEN AGREEMENT

Parcel A1, Former Sparrows Point Steel Mill Property

If the Response Action Plan is approved by the Maryland Department of the Environment, the participant agrees, subject to the withdrawal provisions of Section 7-512 of the Environmental Article, to comply with the provisions of the Response Action Plan. Participant understands that if he fails to implement and complete the requirements of the approved plan and schedule, the Maryland Department of the Environment may reach an agreement with the participant to revise the schedule of completion in the approved Response Action Plan or, if an agreement cannot be reached, the Department may withdraw approval of the plan.

Printed Name: MICHAEL T. PEDONE Title: CHIEF OPERATING OFFICER

Signature:  Date: 4-20-2015

Document: Phase II Environmental Site Assessment/Response Action Plan, Parcel A1, Former Sparrows Point Steel Mill, Sparrows Point, Maryland prepared by Weaver Consultants Group and dated ~~February~~ April 2015

CERTIFIED STATEMENT FOR COUNTY AND MUNICIPAL ZONING REQUIREMENTS

Parcel A1, Former Sparrows Point Steel Mill

The participant hereby certifies under penalty of law that the current use and proposed use of the eligible property upon which the Response Action Plan is based are in conformance with all applicable zoning requirements.

The participant acknowledges that there are significant penalties for falsifying any information required by MDE under Title 7, Subtitle 5 of the Environmental Article, Annotated Code of Maryland and that this certification is required to be included in a Response Action Plan for the Voluntary Cleanup Program pursuant to Title 7, Subtitle 5 of the Environmental Article, annotated Code of Maryland.

Printed Name: MICHAEL T. PEDONE Title: CHIEF OPERATING OFFICER

Signature: [signature] Date: 4-20-2015

Document: Phase II Environmental Site Assessment/Response Action Plan, Parcel A1, Former Sparrows Point Steel Mill, Sparrows Point, Maryland prepared by Weaver Consultants Group and dated ~~February~~ April 2015