# Additional Investigation Results, Response Action Plan Addendum and Construction Contingency Plan

Proposed Trillium Nature Sanctuary and Trout Brook Regional Trail
Saint Paul, Minnesota

*Prepared for*

## The City of Saint Paul Parks and Recreation

Project SP-12-00179B
March 19, 2013

Braun Intertec Corporation

# Table of Contents

**Description** **Page**


A. Introduction ..... 1
B. Project Contacts ..... 2
C. Proposed Development ..... 3
D. Project Background ..... 4
D.1. Site Location ..... 4
D.2. Site Investigations ..... 5
E. 2012 Additional Investigation ..... 10
E.1 Scope of Services ..... 10
E.2 Investigation Methods and Procedures ..... 11
E.3 Investigation Locations ..... 11
E.4 Soil Classification ..... 12
E.5 Soil Screening ..... 12
E.6 Soil Sampling Procedures ..... 13
E.7 Investigation Results ..... 13
E.7.1 Geologic Conditions ..... 13
E.7.2 Field-Screening Results ..... 15
E.7.3 Soil Analytical Testing Results ..... 15
F. Response Action Plan ..... 17
F.1 Proposed Response Actions ..... 17
F.1.2 Dewatering ..... 21
F.1.3 Construction Contingency Plan ..... 21
F.1.4 Imported Soil ..... 21
F.2 Methods and Procedures ..... 22
F.2.1. Soil Screening ..... 22
F.2.2. Stockpile Procedures ..... 22
F.2.3. Confirmation Sampling and Analytical Testing ..... 23
F.2.4. Soil Reuse and/or Disposal ..... 23
F.2.5. Soil Import ..... 25
G. Construction Contingency Plan ..... 25
G.1 Notification Requirements ..... 26
G.2 Preliminary Reconnaissance ..... 27
G.3 Potential Response Actions ..... 27
G.3.1. Petroleum-Contaminated Soils ..... 28
G.3.2. Debris and Asbestos-Containing Materials ..... 28
G.3.3. Non-Petroleum-Impacted Soil ..... 28
G.3.4. Storage Tanks or Drums ..... 28
H. Site Health and Safety Plan ..... 29
I. Schedule ..... 29
J. Reporting ..... 29
K. Standard of Care ..... 30

**Figures:**


Figure 1: Site Location Map
Figure 2A: Site Overview Map
Figure 2B: North Soil Boring Location Map
Figure 2C: South Soil Boring Location Map
Figure 3: Trillium Nature Sanctuary & Trout Brook Regional Trail Redevelopment Map
Figure 4: Overview of Fill Areas
Figure 5: South & Magnolia Wetland Trail Fill Areas
Figure 6: Magnolia Pond Fill Area
Figure 7: Maryland Pond Fill Area
Figure 8: Trailhead Fill Area Plan
Figure 9: Trailhead Fill Area Profile


**Tables:**


Table 1: Soil Analytical Results – Surface Soil Samples
Table 2: Soil Analytical Results - Soil Borings
Table 3: Toxicity characteristic Leaching Procedure Results


**Appendices:**


Appendix A: Summary of Previous Investigations
Appendix B: Soil Boring Logs
Appendix C: Laboratory Analytical Reports

March 19, 2013 Project SP-12-00179B

Ms. Kathleen Anglo
City of Saint Paul Parks and Recreation
25 West 4th Street, Suite 400
Saint Paul, Minnesota 55115

Re: Additional Investigation Results, Response Action Plan Addendum
and Construction Contingency Plan
Proposed Trillium Nature Sanctuary and Trout Brook Regional Trail
Saint Paul, Minnesota

Dear Ms. Anglo:

Braun Intertec in collaboration with HR Green, prepared the attached report on behalf of the City of Saint Paul for the proposed Trillium Nature Sanctuary and Trout Brook Regional Trail. The attached report provides both a summary of the results of the recently completed additional investigation, as well as a Response Action Plan Addendum/Construction Contingency Plan (RAP Addendum/CCP) for the above-referenced project. A RAP/CCP was prepared for the project on January 13, 2004 based on the preliminary design and was subsequently approved by the Minnesota Pollution Control Agency (MPCA). The RAP Addendum presented herein incorporates the final project design as well as additional environmental data that has been generated for the project area. We understand the City of Saint Paul is planning to redevelop the area generally located west of 35E, south of Maryland Avenue and north of Sims Avenue as part of the Trillium Nature Sanctuary and Trout Brook Regional Trail (Site).

At the start of the project planning phase in 2003 and 2004, Phase I and Phase II environmental site assessments (ESAs) were conducted for portions of the Site, and a RAP was prepared and approved by the MPCA. As the project design is being finalized, additional soil borings and associated soil sampling were requested to further evaluate potential impacts in areas of the sanctuary where water features, the trail, utilities or bridges will be constructed. Our additional investigation activities were based on the summary presented in the Proposed Additional Borings figure and associated sampling request table that were prepared by HR Green and dated November 19, 2012.

HR Green contributed to Section F in this report and will submit this report to the MPCA for review and approval prior to redevelopment of the Site. Following redevelopment, the City intends to request approval of response actions completed and a limited No Further Action for soil.

If you have any questions, please call Sara Shinnefield at 952.995.2494 Jennifer Force at 952.995.2454.

Sincerely,

BRAUN INTERTEC CORPORATION

Sara A. Shinnefield
Staff Scientist

Jennifer A. Force, PG
Associate Principal

Attachment:
Additional Investigation and Response Action Plan Addendum/Construction Contingency Plan

c: Jerry Stahnke, Minnesota Pollution Control Agency
Mike Goalen, HR Green

# Additional Investigation Results, Response Action Plan Addendum and Construction Contingency Plan
# Proposed Trillium Nature Sanctuary and Trout Brook Regional Trail
# Saint Paul, Minnesota

## A. Introduction

On behalf of the City of Saint Paul (City), Braun Intertec prepared this report documenting the results of a recently completed additional investigation for the proposed Trillium Nature Sanctuary and Trout Brook Regional Trail located in Saint Paul, Minnesota (Site). This report also includes a Response Action Plan Addendum and Construction Contingency Plan (RAP Addendum/CCP) for the Site that was prepared in collaboration with HR Green. The Site is generally located west of 35E, south of Maryland Avenue and north of Sims Avenue with the exception of the planned trailhead and parking area located north of Maryland Avenue along Norpac Road and Jackson Street. A Site location map is included as Figure 1.

At the start of the project planning phase for the sanctuary in 2003 and 2004, Phase I and Phase II environmental site assessments (ESAs) were conducted for portions of the Site, and a RAP was prepared and approved by the Minnesota Pollution Control Agency (MPCA).

As the project design was being finalized, additional soil borings and associated soil sampling were conducted to further evaluate potential impacts in areas of the sanctuary where water features, the trail, utilities or bridges will be constructed. Our additional investigation activities were based on the summary presented in the Proposed Additional Borings figure and associated sampling request table that were prepared by HR Green and dated November 19, 2012. The results of the additional investigation that was completed in October and December 2012 are presented herein. The RAP Addendum/CCP portion of this report incorporates the final project design and additional data and provides a description of the methods that will be used to manage contaminated materials at the Site that may be encountered during construction.

## B. Project Contacts

***Site Owner***

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***General Contractor and Excavation Contractor***
TBD

***MPCA Voluntary Investigation and Cleanup Program***
520 Lafayette Road North
St. Paul, MN 55155

Primary Contact: Mr. Gerald Stahnke
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Email: Gerald.Stahnke@state.mn.us

***MPCA Petroleum Brownfields Program***
520 Lafayette Road North
St. Paul, MN 55155

Primary Contact: TBD

***MPCA Emergency (State Duty Officer)***
(651) 649-5451

***Local Emergency***
911

## C. Proposed Development

The majority of the proposed Trillium Nature Sanctuary is located south of Maryland Avenue to the west of Interstate 35E with the exception of the planned trailhead and parking area located north of Maryland Avenue along Norpac Road and Jackson Street. As part of the redevelopment, the buildings located north of Maryland Avenue on the Jackson Street parcels will be demolished. A driveway, parking area, a trailhead facility that will house rest rooms and storage area, and a portion of the regional trail will be constructed on the Jackson Street parcels. To construct the trailhead and park amenities, grades on the majority of the Site will be raised by up to 12 feet. The trail will extend south along Norpac Road.

As part of the project, Trout Brook will be restored south of Maryland Avenue. A trail system and clay-

lined retention ponds and wetlands also will be developed at the Site. The trails will consist of a paved trail (Trout Brook Regional Trail) that will run north to south through the western side of the Site connecting to the regional trail system. A gravel trail also will be constructed that will follow Trout Brook. The Soo Line railroad tracks that run down the western side of the Site will be largely maintained. As part of the project, large areas of the Site will be cleared and grubbed of vegetation and replanted or seeded with prairie, woodland and marsh vegetation. In general, grades on the southern portion of the Site will remain the same except in areas where Trout Brook and associated ponds will be developed.

It is anticipated that soil excavated from the southern portion of the Site will be used as fill, to raise grade on the Jackson Street parcels provided it meets geotechnical as well as environmental considerations.

# D. Project Background

## D.1. Site Location

The Site is in the City of Saint Paul, Ramsey County, Minnesota. The Site, south of Maryland Avenue, consists of an undeveloped, vacant lot measuring approximately 25.4 acres. This portion of the Site is located approximately 800 feet west of Interstate 35E and extends from Maryland Avenue south to Cayuga Avenue. The Site has a width of approximately 420 feet at the northern boundary, narrowing to 190 feet in the central portion, and widening to approximately 450 feet on the southern boundary. The Site is currently vacant, but was historically occupied by a rail yard that had structures including carpenter and tin shops, a car shed and ice house. More recently, the southern portion of the Site was used for fill soil storage by an excavation contractor.

The Site located north of Maryland Avenue consists of an “L” shaped strip of vacant land that is located along Norpac Road and two parcels located at 1200 and 1202 Jackson Street.

The Site is bordered on the north by Norpac Road and AA Auto Insurance with a large storage yard for wrecked automobiles located beyond; on the east by Canadian Pacific Railway and Twin City Garage Door Showroom and Repair and a Minnesota Department of Transportation (Mn/DOT) facility located beyond; on the south by Tilsner Container Company and Cayuga Avenue located beyond; and on the west by Tilsner Container Company, Modernistic Die Cutting, residential properties and Agate Street, Jackson Street with commercial properties located beyond. The Site is located in a mixed residential, commercial, and industrialized area of Saint Paul.

A Site Location Map is provided as Figure 1, and a Site Layout is provided as Figure 2.

## D.2. Site Investigations

### Portion of Site Located South of Maryland Avenue

In 1990, Warzyn Engineering, Inc. completed an environmental investigation of the portion of the Trillium site located south of Maryland Avenue. The results are summarized in a report entitled:

- *Phase II Environmental Assessment; Glacier Park Company; St. Paul, Minnesota; Sequence #230*; dated June 1990

The environmental investigation included advancement of four soil borings at the Site and installation of monitoring wells. At the time of the investigation, several burnt rubble piles and construction debris piles were present at the Site. The soil borings encountered 2.5 feet to 3 feet of fill at the Site. Glacial outwash consisting of sand, silty sand, and sandy clay was encountered below the fill. Groundwater was encountered at depths ranging from 6 feet to 28 feet below ground surface (bgs). Three composite soil samples were collected from each of the borings and analyzed for the following parameters:

- Total petroleum hydrocarbons (TPH) as fuel oil
- TPH as kerosene
- The 8 Resource Conservation and Recovery Act (RCRA) metals
- Polynuclear aromatic hydrocarbons (PAHs)

No metals or PAHs were detected above the current Residential Soil Reference Values (SRVs). TPH as kerosene was detected at a concentration of 1,050 milligrams per kilogram (mg/kg) in MW-1 (0-7'), which was located on the northern portion of the site. TPH as #6 fuel oil was detected at concentrations ranging from 74 mg/kg to 250 mg/kg in soil borings MW-2 through MW-4. Soil boring MW-2 was located in the east-central portion of the site, and MW-4 was located on the south side of the site.

Groundwater samples were collected from three of the monitoring wells and analyzed for 8 RCRA metals; benzene, toluene, ethyl benzene, and total xylenes (BTEX); and TPH as gasoline, kerosene, #2 fuel oil and #6 fuel oil. Arsenic was detected at a concentration exceeding the current Drinking Water Criteria in MW-4, which was located near the existing pond on the southern portion of the Site. No BTEX was detected in the groundwater samples. TPH as #6 fuel oil was detected at a concentration of 2.43 micrograms per liter (µg/L) in MW-2, which was located in the east-central portion of the site.

In March 2003, Braun Intertec conducted a Phase I ESA for the portion of the Trillium site located south of Maryland Avenue. The results of the Phase I ESA were summarized in the report entitled:

- *Phase I Environmental Assessment; Trillium Site; West of Interstate 35E Between Maryland and Cayuga Avenues East; St. Paul, Minnesota*; dated March 14, 2003.

Based on the findings of the Phase I ESA, the following recognized environmental concerns (RECs) were identified:

- The Site was historically used as a rail yard.
- Indications of uncontrolled dumping are present at the site.
- Documented impacts to soil and groundwater at the Site were identified by a 1990 Phase II ESA.
- A closed Leaking Underground Storage Tank (LUST) site is located immediately west of the Site.
- A storage yard for wrecked autos is located immediately north of the Site.

Although not considered a REC, fill soils and various debris piles were identified as an environmental concern.

In November 2003, Braun Intertec conducted a Phase II ESA of the portion of the Site located south of Maryland Avenue. As part of the Phase II ESA, 9 soil borings and 21 test pits were completed at the site. The soil borings and test pits were located in areas that might have been impacted by historical land use or in areas where Trout Brook and associated wetlands will likely be restored. The soil boring and test pit locations are shown on Figure 2. Soil and groundwater samples also were collected for chemical analyses.

During the Phase II ESA, groundwater was observed at depths ranging from 17 feet to 30 feet bgs. Groundwater also was encountered in test pit TP-15 at 9 feet bgs, in TP-16 at a depth of 12 feet bgs, and in TP-21 at a depth of 4 feet bgs.

Based on the results of the Phase II ESA, the following areas of contamination were identified:

- Elevated photoionization detector (PID) readings, staining and petroleum odors were noted in test pit TP-18 and TP-21 at a depth of 4 feet bgs and at the ground surface respectively. Both test pit locations were located on the south side of the Site to the east of the existing storm water pond. An elevated concentration of mercury, relative to the Industrial SRV also was detected at a depth of 4 feet in TP-18, and elevated concentrations of arsenic and diesel range organics (DRO) were detected in TP-21 at a depth of 0 to 4 feet bgs.
- Elevated concentrations of arsenic, relative to the Recreational SRV, were detected at seven sampling locations: ST-1 (10'), ST-3 (5'), ST-9 (7.5'), TP-3 (2-3'), TP-13 (2-5'), TP-16 (3-8') and TP-21 (0-4'). The arsenic appears to generally be associated with fill at the Site; however, elevated concentrations of arsenic were detected in what appeared to be native soils in soil borings ST-3 and ST-9 and test pit TP-13.
- Scattered solid waste was observed at the ground surface of the Site. Solid waste included white goods, bituminous, brick, metal, tires, railroad ties and shingles. No asbestos containing material was identified.
- Fill soil with buried debris was encountered at the following locations:
  - ST-1 – cinders observed at 4 feet
  - ST-2 – cinders observed at 4 feet
  - ST-3 – cinders observed at 1 foot
  - TP-1 – concrete debris observed at 1 to 8 feet
  - TP-3 – burnt layer observed at 2 to 3 feet
  - TP-8 – burnt layer observed at ground surface
  - TP-17 – brick observed at 1 to 4 feet
  - TP-18 – wood debris observed at 7 to 10 feet
  - TP-21 – wood debris observed at 4 to 8 feet

Results of the Phase II ESA were summarized in the report prepared by Braun Intertec in 2003 and entitled:

- *Phase II Environmental Site Assessment; Trillium Site; West of Interstate 35E Between Maryland and Cayuga Avenues East; St. Paul, Minnesota*; dated January 13, 2004

After reviewing the Phase II ESA, the MPCA requested in written correspondence dated February 4, 2004 that additional soil samples be collected at the Site to further evaluate the impacts identified at the

locations of ST-1, ST-2, ST-3 and TP-3 during the 2003 Phase II ESA conducted by Braun Intertec. In response, Braun Intertec conducted additional soil sampling as part of a 2006 Phase II ESA that focused on the portion of the Site adjacent to Norpac Road. Results of the additional soil sampling activities were summarized in the report prepared by Braun Intertec in 2006 and entitled:

- *Phase II Environmental Site Assessment; Northern Portion of Trillium Site West of Interstate 35E Between Maryland and Cayuga Avenues East; St. Paul, Minnesota;* dated August 2, 2006

The analytical results for soil samples collected from the shallow soil borings south of Maryland Avenue indicate:

- Vicinity of ST-1: In the initial sample collected from ST-1 at a depth of 10 feet bgs, arsenic was detected at a concentration of 24 mg/kg. During the 2006 Phase II ESA, arsenic was detected in shallow soil (i.e., 0 to 2 feet bgs) at the initial sampling location and in a 5-foot radius from the initial sampling locations at concentrations ranging from 1.6 mg/kg to 1.9 mg/kg. None of these concentrations exceed the Recreational SRV or Soil Leaching Value (SLV). DRO was detected in all four samples collected near ST-1 at concentrations ranging from 57 mg/kg to 460 mg/kg; however, no elevated PID readings, petroleum odors or staining were observed.

- Vicinity of ST-2: DRO was detected in three of the four samples at concentrations ranging from 13 mg/kg to 15 mg/kg; however, no elevated PID readings, petroleum odors or staining were observed. These concentrations are less than the initial sample collected at ST-2 at a depth of 2 to 4 feet bgs in which DRO was detected at a concentration of 23 mg/kg.

- Vicinity of ST-3: In the initial sample collected from ST-3 at a depth of 5 feet bgs, arsenic was detected at a concentration of 21 mg/kg. During the 2006 Phase II ESA, no arsenic was detected at concentrations exceeding the Recreational SRV (i.e., 11 mg/kg) in shallow soil (i.e., 0 to 2 feet bgs) at the initial sampling location and in a 5-foot radius from the initial sampling location.

- Vicinity of TP-3: Arsenic concentrations in all four of the samples exceeded the Recreational SRV, and arsenic concentrations exceeded the SLV in three samples. Concentrations of arsenic detected ranged from 14 mg/kg to 22 mg/kg. DRO was detected in all four samples at concentrations ranging from 32 mg/kg to 240 mg/kg. Gasoline range organics (GRO) was detected in three of the samples at concentrations ranging from 12 mg/kg to 32 mg/kg. No elevated PID readings, petroleum odors or staining were observed in the samples.

**Portion of Site Located North of Maryland Avenue**

In 2006, Braun Intertec conducted a Phase I and Phase II ESA of the "L" shaped parcel along Norpac Road. Based on the results of the Phase I ESA, rail road tracks were historically located at the Site. During the Phase II ESA, three soil borings and seven test pits were advanced at the Site. Soil samples for chemical analyses were collected from all three of the soil borings within the upper 5 feet and from four of the test pits where fill soil with debris was observed. In summary, no elevated concentrations of VOCs, PAHs, PCBs, 8 RCRA metals, DRO or GRO were detected relative to the Residential SRVS and SLVs, where established.

In 2012, Braun Intertec conducted a Phase I and Phase II ESA of the Jackson Street parcels located at 1200 and 1202 Jackson Street. Historically, the 1202 Jackson Street parcel was occupied by a gasoline station from at least 1944 until 1995. A petroleum release was detected at the parcel in 1986 (Leak 1351) and was closed in 1991. Most recently, the 1202 Jackson Street parcel was occupied by used car dealership and detailing garage. The northern parcel located at 1200 Jackson Street has been used for vehicle maintenance and storage since 1955.

During the 2012 Phase II ESA, 12 soil boring were advanced to collect soil, groundwater and/or soil vapor samples for chemical analyses. Based on the results of the Phase II ESA, the following was concluded:

- Between 2.5 feet and 22 feet of fill soil was identified at the Site; thicker occurrences of fill soil were encountered on the eastern and central portions of the Site. The fill soil, which consisted primarily of silty sand, contained debris consisting of ash, slag, wood, and concrete.
- Elevated concentrations of metals including arsenic, barium, lead, and mercury, relative to the Industrial SRVs and/or SLVs, were detected in the fill soil in intervals where ash and cinders were observed in soil borings PP-3, PP-4, PP-7 and PP-8. Ash and cinders were detected at depths between 0.5 and 10 feet bgs. Elevated concentrations of PAHs and DRO also were detected in these intervals.
- Petroleum impacts, as indicated by an elevated PID reading and the detection of petroleum related VOCs and GRO, were detected in shallow soil in soil boring PP-5, which was advanced on the former gas station parcel.
- None of the concentrations of soil vapors detected exceeded 10 times an Industrial ISV in the three soil vapor samples collected near potential building locations.

Tables summarizing the analytical results and figures showing the sampling locations from previous investigations are provided in Appendix B.

# E. 2012 Additional Investigation

Braun Intertec recently conducted an additional investigation of the Site located south of Maryland Avenue in October and December 2012. The objective of the additional investigation was to further evaluate potential impacts in areas of the sanctuary where water features, the trail, utilities, and bridges will be constructed. The results of the 2012 additional investigation are summarized herein, and the data generated during the investigation was incorporated into the RAP Addendum/CCP for Site redevelopment.

## E.1 Scope of Services

To meet the project objective, the following tasks were conducted at the Site as part of the assessment:

- Collect five surface soil samples labeled S-1 thru S-5 and chemically analyze the samples for PAHs.
- Using a hydraulically driven push-probe rig, advanced 20 soil borings designated as P-1, P-3 through P-8, ST-1-E through ST-1-H,TP-3-E and TP-3-F, ST-R-1, STR-2, STR-4 through STR-7 and TP-16-A to evaluate soil for environmental and geotechnical purposes.
- Advanced one boring, designated as STR-3, using a hollow-stem auger drill rig to a depth of 90 feet to evaluate soil for environmental and geotechnical purposes.
- Using a hollow-stem auger rig, advanced five borings designated as Storm 1 through Storm 3 and San 1 and San 2 evaluate soil for geotechnical and field screening purposes only (i.e., no soil samples for chemical analyses were collected).
- Screened soil samples collected from the soil borings for the presence of organic vapors using a PID. Visual and olfactory observations regarding potential contamination also were made and recorded.
- Collected soil samples for chemical analyses from the push probe borings and selected hollow stem auger borings.
- Evaluated data and prepared this report.

Please note, a geotechnical assessment was conducted concurrently with this additional investigation and will be submitted under separate cover.

## E.2 Investigation Methods and Procedures

The fieldwork relating to the investigation was conducted on October 9 and December 10 through 14, 2012.

The soil boring locations and elevations were recorded using Global Positioning System (GPS) technology that uses the MnDOT's permanent GPS Virtual Reference Network. Soil borings locations are shown on Figure 2.

## E.3 Investigation Locations

**Surface Soil Samples**

On October 9, 2012, five surface soil samples were collected for chemical analyses for PAHs. The samples were labeled S-1 through S-5. The samples were collected from the ground surface to a depth of 0.5 foot using a spade that was decontaminated between sampling locations. The sample locations were generally spaced evenly across the Site north to south.

**Soil Borings**

As part of the additional investigation, Braun Intertec, along with our subcontractor STS Enterprises LLC (STS), advanced 20 soil borings using direct push-probe drilling techniques and 6 soil borings using hollow stem auger drilling techniques. The soil borings were advanced to depths between 2 and 90 feet bgs. Please note that P-2 was not advanced due to dense vegetation, which restricted access to the area.

The soil borings were located in the following areas:

- Soil Borings P-1 and P-3 through P-8 were completed in areas where proposed ponds will be constructed where impacts were previously detected.

- Soil borings ST-1-E through ST-1-H, TP-3-E, TP-3-F, and TP-1-16 were completed at shallow depths to evaluate surface soils along the proposed stream.

- Soil Boring STR-1, STR-2, and STR-4 through STR-7 were completed along the proposed stream to

evaluate soils.

- Soil Boring STR-3 was completed at depth near a proposed pedestrian bridge to evaluate soils for environmental and geotechnical purposes.

- Soil Borings Storm 1 through Storm 3 were completed near the northern property boundary to evaluate soils for the proposed storm water sewer.

- Soil borings San 1 and San 2 were completed near the southern portion of the Site to evaluate soils for geotechnical purposes.

Prior to arrival onsite, the drill rigs and sampling equipment were cleaned with a high pressure, hot water sprayer. Between sampling locations, sampling equipment was cleaned with a soap and water scrub followed by a clean water rinse. Upon completion, each soil boring was sealed in accordance with Minnesota Department of Health (MDH) regulations.

## E.4 Soil Classification

The soils encountered in the soil borings were visually and manually classified in the field by an environmental technician using ASTM D 2487 "Unified Soils Classification System" and ASTM D 2488 "Recommended Practice for Visual and Manual Description of Soils." Additionally, soils were classified at the Braun Intertec soils laboratory by a geotechnical engineer using ASTM D 2487 and ASTM D 2488.

Soil boring logs, with descriptions of the various soil strata encountered during the soil boring advancement, are contained in Appendix C. The depths shown as changes between the soil types are approximate. The actual changes may be transitional, and the transition depths are likely to be horizontally variable.

## E.5 Soil Screening

During advancement of the push-probe soil borings, soils were sampled at continuous 5-foot intervals using dedicated polyvinyl chloride (PVC) sample liners until the termination depth of each boring. During advancement of the hollow-stem soil borings, soil samples were collected at 2.5-foot intervals to 30 feet bgs, then at 5-foot intervals to the termination depth of each soil boring. Soil samples retrieved were examined by an environmental technician, who was a licensed asbestos inspector by MDH for unusual staining, odors, and other apparent signs of contamination. In

addition, the soil samples were screened for the presence of organic vapors using a PID. The PID was equipped with a 10.6-electron-volt lamp and calibrated to an isobutylene standard. The PID was used to perform a headspace method of field-analyses, as recommended by the MPCA in Petroleum Remediation Program Guidance Document 4-04 (September 2008).

## E.6 Soil Sampling Procedures

In general, one soil sample from each soil boring or sampling location was collected for chemical analyses except at locations Storm 1 through Storm 3, San 1 and San 2 where only field screening was conducted. If potentially contaminated soil was identified, soil samples were collected for chemical analyses from the interval where potential impacts were identified. If no indications of contamination were encountered in the soil, samples for chemical analyses were collected from depths most likely to have been impacted by past land use or from depths at which soil will be excavated during Site development.

The soil samples were analyzed at the Braun Intertec laboratory for the presence and concentrations of a combination of the following chemical parameters:

- Volatile organic compounds (VOCs) using Environmental Protection Agency (EPA) Method 8260
- PAHs using EPA Method 8270
- The 8 RCRA metals using EPA Methods 6010 and 7471
- DRO using the Wisconsin Department of Natural Resource (WDNR) method
- GRO using the WDNR method
- Lead using the toxicity characteristic leaching procedure (TCLP) – selected samples only where total lead greater than 100 mg/kg were detected
- Sulfide using modified EPA Method 9030 – selected sample only where a rotten egg odor was detected.

## E.7 Investigation Results

### E.7.1 Geologic Conditions

As revealed by the borings performed at the site, the general subsurface profile at this site consist of fill soils over organic deposits and then alluvium (water deposited soil).

**Fill**

Boring Storm-1 was performed through the existing parking lot and encountered bituminous pavement at the surface. The bituminous pavement encountered is 4 inches thick, and it is underlain by an apparent aggregate base layer 6 inches thick.

Many of the borings encountered topsoil or slope dressing fill material at the surface. This material ranges from about 0.8 to 4 feet thick at the boring locations. The topsoil/slope dressing soil typically consists of black to dark brown or silty sand, but also includes some clayey sand, lean clay, and organic clay.

Much of the fill encountered at the boring locations consists of granular material, including silty sand and sand with silt; however, clayey and organic fill soils were also encountered. Debris such as concrete, ash, cinders, coal, brick, clinkers, and glass was often found within the fill. Where encountered, the fill extends to depths of about 2 to 15 feet below the ground surface.

**Swamp Deposits**

At many of the boring locations, organic swamp deposits consisting of peat, organic silt, and organic clay were found below the fill and above the alluvium or within alluvial deposits. Where encountered, these organic soils extend to depths of about 7½ to 30 feet below the surface, corresponding to organic layers ranging from 7 feet to over 19 feet thick. The swamp deposits encountered often contain shells. These swamp deposits are considered weak and compressible.

**Alluvium**

The alluvium (water deposited soil) encountered in the borings includes of sand, sand with silt, silty sand, silt, lean clay, and fat clay. The alluvial deposits encountered at this site contain many lenses and laminations of differing material. In addition, the transition between the alluvial deposits and swamp deposits are gradational.

**Groundwater**

We measured groundwater in each of the standard penetration test borings at depths ranging from about 8 to 19 feet below the ground surface. These depths correspond to groundwater elevations of about 92 to 103½ feet at the north end of the site; 93½ in the middle of the site; and 78½ to 84½ feet at the south end of the site. The groundwater elevation generally appears to slope down toward the south. Groundwater was observed as our standard penetration borings were advanced; however, given the drainage properties and layered profile of the geologic materials encountered, it is likely that insufficient time was available for the groundwater to stabilize to its hydrostatic level.

Soil boring logs are contained in Appendix C.

### E.7.2 Field-Screening Results

No elevated PID readings, odors, staining or debris were observed in the soil borings with the exception of the following:

- In Soil Borings P-1 and P-8, brick and concrete fragments were observed.
- In Soil Boring P-6, soil with cinders, asphalt, and ash were observed.
- In Soil Boring P-7, soil with cinders and coal were observed in fill soil. A strong sulfide odor was observed in the underlying native peat.
- In Soil Borings STR-2, STR-3, STR-6, STR-7, TP-3-E, TP-3-F, and San 1, soil with cinders was observed.
- In Soil Borings Storm1 through Storm 3, brick and concrete were observed.

### E.7.3 Soil Analytical Testing Results

The soil analytical testing results for the shallow soil samples are summarized in Table 1, and the analytical testing results for the soil samples collected from the soil borings are summarized in Table 2. For comparison purposes, the tables also include MPCA Recreational and Industrial SRVs and SLVs. The SRVs and SLVs are allowable risk-based contaminant concentrations established by the MPCA to guide Site investigation and cleanup actions.

TCLP lead analytical results for the following samples P-6 (0-4), P-8 (0-5), STR-4 (0-4), and STR-7 (2.5-5) are summarized in Table 3.

The results of the laboratory analysis indicated:

- Several VOCs were detected above the laboratory method reporting limits (MRLs) in soil samples collected from the Site; however none of the compounds were detected above their respective SRVs or SLVs with the exception of ethylbenzene, which was detected in STR-2 (0-4') at a concentration of 0.18 mg/kg. The SLV for ethylbenzene is 0.17 mg/kg.

- Several PAHs were detected above the laboratory MRLs in soil samples collected from the Site; however, none of the individual compounds were detected above their respective SRVs or SLVs, where established. The calculated benzo(a)pyrene (BaP) equivalent concentration slightly exceeded the Recreational SRV of 2 mg/kg, in one soil sample, P-1 (0-4'), where the BaP equivalent was calculated at a concentration of 2.73 mg/kg .

- DRO was detected at concentrations ranging from 18 mg/kg to 460 mg/kg in 20 of the soil samples collected from the Site. DRO was detected at concentrations exceeding 100 mg/kg in samples P-5 (0-4'), P-8 (0-5'), STR-2 (0-4'), ST-1-G (0-2'), and TP-3-F (0-2'). Currently, there are no established regulatory limits for DRO. However, guidelines do not allow for off-Site reuse of soil with DRO concentrations in excess of 100 mg/kg.

- GRO was detected at a concentration ranging from 13 mg/kg to 27 mg/kg in four of the soil samples collected from the Site. Currently, there are no established regulatory limits for GRO. However, guidelines do not allow for off-Site reuse of soil with GRO concentrations in excess of 100 mg/kg.

- None of the detected concentrations of metals exceeded an established SRV or SLV, with the exception of arsenic, silver, chromium, and lead. Arsenic was detected at concentrations exceeding the Recreational SRV, the Industrial SRV and/or the Tier 1 SLV in nine of the soil samples collected. Silver was detected at a concentration of 4.2 mg/kg in sample STR-4 (0-4) which slightly exceeds the SLV of 3.9 mg/kg for silver. Total chromium was detected at concentrations slightly exceeding the SLV of 18 mg/kg in soil samples P-3 (0-4'), P-6 (5-7.5') and STR-3 (0-4.5'). The concentrations are below the Recreational SRV, but exceeded the Tier 1 SLV for hexavalent chromium. The SLV for hexavalent chromium is 18 mg/kg while the SLV for trivalent chromium is 1,000,000 mg/kg. Because it is unlikely that all, if any, of the chromium detected is hexavalent chromium, chromium is not considered a contaminant of concern. Elevated concentrations of lead relative to the SRVs and/or SLVs were detected in four samples, P-6 (0-4'), P-8 (0-5'), ST-R-4 (0-4'), an ST-R-7 (2.5-5').

- TCLP analytical results indicated lead was below the MRLs for samples P-6 (0-4') and P-8 (0-5') and below the established regulatory levels in samples STR-4 (0-4') and STR-7 (2.5-5').

- Sulfide was not detected in Soil Sample P-7 (13-15') where a rotten egg or sulfide odor was observed.

The laboratory analytical reports and chain-of-custody forms are included in Appendix D.

# F. Response Action Plan

The Site is being redeveloped with a regional and local trail system that will connect to regional trails, and as such, visitor access will largely be limited to the trails and overlook areas. Therefore, as part of the redevelopment, contaminated soil will be excavated only to the extent necessary to allow construction of the new Site improvements, and contaminated soil will be left in place wherever possible. Vegetative cover will be used to the extent possible to limit access to specific areas.

During implementation of the response actions, the methods, procedures, sampling frequencies and soil reuse criteria described in Section F.2 will be used. Work at the site is proposed to be conducted in accordance with the provisions of this RAP/CCP and a Site Safety and Health Plan (SSHP) to be developed and submitted to the MPCA a minimum of one month prior to the initiation of field activities. Full time environmental monitoring will be conducted during excavation activities. It is anticipated that excavated soil meeting the soil reuse criteria described in Section F.2 will be reused in the project as restricted fill. It is understood that reuse of materials contaminated above the Tier 1 SLV or Recreational and/or Industrial SRVs may require the implementation of institutional controls.

## F.1 Proposed Response Actions

Proposed response actions include the following:

- Based on the results from the 2012 Phase II ESA at the Jackson Street parcels, elevated concentrations of carcinogenic PAHs and metals in excess of the Industrial SRVs are associated with fill soil mixed with ash and cinders. Environmental monitoring will be conducted during excavation activities or during removal of the floor slabs, footings and utilities on the Jackson Street parcels. If soil with ash and cinders is excavated, the soil will be segregated from the surrounding soil and disposed of offsite at an appropriately permitted landfill. Based on the results of the 2012 Phase II ESA, it is anticipated that ash impacted soil will be encountered during demolition of the smaller garage located on the 1202 Jackson Street parcel; however, because, grade on the Jackson Street parcels will be generally raised across the Site by up to 12 feet, rather than cut, it is not anticipated that additional ash impacted soil will be encountered and no additional response actions are proposed to address the PAH and metals impacted soil at the Jackson Street parcels.

- No vapor mitigation system is proposed to be installed beneath the visitor building that will be constructed on the Jackson Street parcels. No elevated concentrations of soil vapors with respect to 10x the Industrial ISVs were detected in soil vapor probes SV-2 and SV-3, which were

located in the southwest corner of the 1202 Jackson Street parcel where the visitor building will be located.

- Environmental monitoring will be conducted during removal of scattered debris piles located on the parcel south of Maryland Avenue. The debris will be observed for potential asbestos containing material (ACM) or other debris that could require special handling or management by an environmental technician with asbestos inspector credentials. The debris will either be disposed of offsite or recycled in accordance with MPCA regulations. Following removal of the debris, the soil beneath the debris piles will be observed for indications of contamination. Surface soil samples for PID headspace screening will be collected on a 10 foot by 10 foot grid after the debris pile is removed. If field indications of contamination are encountered, soil samples for chemical analyses using the frequency described in Section F.2.3. Specific parameters will be based on field observations and the types of debris encountered, but given the Site history will likely include the 8 RCRA metals, DRO and GRO. The analytical results along with proposed response actions will be discussed with the MPCA.

- During excavation activities, full time environmental monitoring will be conducted. If soil with ash or cinders is encountered, the soil will be segregated and stockpiled for additional testing for the arsenic and lead, which based on previous investigation results are the contaminants concern for the former rail yard.

- Soil excavated during site redevelopment activities will be reused on site as restricted or unrestricted fill, to the extent possible, in accordance with the criteria provided in Section F.2.4. Several areas requiring fill material during site redevelopment activities are included on Figure 4 with detailed plans and profiles for each area shown on Figures 5 through 9. Further details regarding the proposed soil reuse plan are included in Section F.2.4.

- Based on the previous analytical testing results, additional characterization of soils in the identified excavation areas will be completed prior to commencement of excavation activities. The sampling results will be compared to the Recreational and Industrial SRVs and presented to the MPCA prior to commencement of excavation activities. Soil disposition will be in accordance with the criteria provided in Section F.2.4. The additional characterization will be completed at or near the following locations:

    - **Maryland Wetland.** An elevated concentration of arsenic relative to the Industrial SRV (21 mg/kg) was detected at 5 feet from sample location ST-3. Subsequent surface sampling completed in the vicinity of ST-3 (ST-3a/b/c/d) and at P-3 (0-4') did not reveal concentrations exceeding the Recreational SRV. Construction of the Maryland Wetland will require approximately 8 feet of excavation at maximum depth. Prior to excavation

activities, two test pits will be excavated in the proposed Maryland Wetland area to further evaluate the soils for arsenic impacts. Two soil samples will be collected from each test pit as composite samples for chemical analyses for arsenic with one sample collected from the upper 4 feet and the second sample collected from 4 to 8 feet. The sampling results will be compared to the Recreational and Industrial SRVs and soil disposition will be in accordance with the criteria provided in Section F.2.4.

- **Maryland Pond.** An elevated benzo(a)pyrene (BaP) equivalent (2.73 mg\kg) relative to the Recreational SRV was observed in the upper 4 feet at P-1. Construction of the Maryland Pond will require approximately 8 feet of excavation at maximum depth. Prior to excavation activities, three test pits will be excavated in the proposed Maryland Pond area to further evaluate the PAH impacts with one of the test pits excavated near P-3 to further evaluate the PAH impacts from 4 to 8 feet. One composite soil sample from 4 to 8 feet in the test pit near P-3 and two composite samples from the upper 4 feet and 4 to 8 feet in the remaining test pits will be collected for chemical analyses for PAHs. The sampling results will be compared to the Recreational and Industrial SRVs and soil disposition will be in accordance with the criteria provided in Section F.2.4.

- **Trout Brook (STR-1 to TP-3)**. Prior to excavation activities, one test pit will be excavated within the proposed Trout Brook between STR-1 and TP-3. Construction of the Trout Brook stream will require approximately 6 feet of excavation at maximum depth. Two soil samples will be collected as composite samples for chemical analyses for arsenic from the test pit with one sample collected from the upper 3 feet and the second sample collected from 3 to 6 feet. The sampling results will be compared to the Recreational and Industrial SRVs and soil disposition will be in accordance with the criteria provided in Section F.2.4.

- **Trout Brook (TP-3)**. Elevated concentrations of arsenic relative to either the Recreational or Industrial SRV (14 to 37 mg/kg) are present at and near TP-3 in the upper 2 to 3 feet; a burnt layer also was encountered at this location. Construction of the Trout Brook stream will require approximately 6 feet of excavation at maximum depth. Prior to excavation activities, test pits will be excavated approximately 15 feet north (identified as TP-3N), 15 feet south (TP-3S) and at TP-3 to further evaluate the arsenic impacts prior to the construction of Trout Brook. Two soil samples will be collected from test pits TP-3N and TP-3S for chemical analyses for arsenic with one composite sample collected from the upper 3 feet and the second composite sample collected from 3 to 6 feet. One additional soil sample will be collected from test pit TP-3 from a depth of 3 to 6 feet for chemical analyses for arsenic. The sampling results will be compared to the Recreational and Industrial SRVs and soil disposition will be in accordance with the criteria provided in Section F.2.4. .

- **Trout Brook (TP-3 to STR-4)**. Prior to excavation activities, four test pits will be excavated

within the proposed Trout Brook between TP-3 and STR-4 with the first test pit being excavated 100 feet south of TP-3 and with the southernmost test pit being excavated about 50 feet north of STR-4. Two composite soil samples for chemical analyses for arsenic will be collected from test pits with one sample collected from the upper 3 feet and the second sample collected from 3 to 6 feet. The sampling results will be compared to the Recreational and Industrial SRVs and soil disposition will be in accordance with the criteria provided in Section F.2.4.

- **Trout Brook (STR-4)**. Elevated concentration of arsenic (14 mg\kg) and lead (1400 mg/kg) relative to either the Recreational or Industrial SRVs were detected in soil boring STR-4 in the upper four feet. Prior to excavation activities, test pits will be excavated approximately 15 feet north (identified as TP-R4N), 15 feet south (TP-R4S) and at ST-R4 (TP-R4) to further evaluate the lead and arsenic impacts prior to the construction of Trout Brook. Two composite soil samples will be collected from the upper six feet for chemical analyses for arsenic and lead from each of the test pits TP-R4N and TP-R4S with one sample collected from the upper 4 feet and the second sample collected from 4 to 6 feet. One soil sample will be collected from test pit TP-R4 from a depth of 4 to 6 feet for chemical analyses for arsenic and lead. The sampling results will be compared to the Recreational and Industrial SRVs and soil disposition will be in accordance with the criteria provided in Section F.2.4.
- **Jenks Pond & Wetland (P-6, P-7, P-8 and TP-13)**. Elevated concentrations of arsenic and lead relative to either the Recreational or Industrial SRVs were detected in soil borings P-6, P-7 and P-8 and test pit TP-13. The soil borings and test pit were located in the proposed Jenks Pond and Jenks Wetland. Prior to excavation activities, six test pits will be excavated with four test pits proposed for Jenks Pond and two test pits proposed for Jenks Wetland to further evaluate the lead and arsenic impacts prior construction of the water features. The test pits will be spaced evenly across the footprints for the water features. The pond will require approximately 8 feet of excavation, and wetland will require approximately five feet of excavation. Two composite soil samples will be collected for chemical analyses for arsenic and lead from test pits excavated in the pond with one sample collected from the upper four feet and the second sample collected from 4 to 8 feet. One soil sample will be collected from the test pits excavated in the proposed Jenks Wetland from the upper 5 feet for chemical analyses for arsenic and lead. The sampling results will be compared to the Recreational and Industrial SRVs and soil disposition will be in accordance with the criteria provided in Section F.2.4.
- **Trout Brook (STR-5, STR-7 and TP-16)**. Elevated concentrations of arsenic relative to either the Recreational or Industrial SRVs were detected in soil borings STR-5 and STR-7 and test pit TP-16. The soil borings and test pit were located in the proposed Trout Brook. Prior to excavation activities, six test pits will be excavated within the proposed Trout Brook with the first test pit being excavated 25 feet north of STR-5 and with test pits being excavated

about every 150 linear feet with the southernmost test pit being excavated about 25 feet south of STR-7. Approximately 5 to 6 feet of soil will be excavated to construct Trout Brook. Two soil samples for chemical analyses for arsenic will be collected from test pits with one sample collected from the upper 3 feet and the second sample collected from 3 to 6 feet. The sampling results will be compared to the Recreational and Industrial SRVs and soil disposition will be in accordance with the criteria provided in Section F.2.4.

- The Pond and stream water features that are constructed will be lined with clay to maintain water levels in the features.

- Excavated soil without indications of contamination (i.e, no staining or odors and PID headspace readings less than 10 ppm), the soil will be reused on Site without restriction provided it meets geotechnical requirements. If fill soil without debris is proposed for offsite reuse, it will be segregated and stockpiled so that samples for analytical testing can be collected. The soil samples will be chemically analyzed for VOCs, PAHs, DRO and the 8 RCRA metals. The number of samples analyzed will be in accordance Section F.2.2. The fill soil without debris will be reused offsite provided that it meets the MPCA Best Management Practices criteria for offsite reuse of fill soil. Excess fill soil not meeting the offsite reuse criteria will be transported offsite for disposal at an appropriately permitted landfill.

- No clearing or grubbing or excavation activities are planned on the east side of the existing storm water pond on the south side of the Site. In addition, the trail will run along the west side of the pond. Therefore, no response actions are planned for the east side of the pond where elevated concentrations of contaminants were detected in ST-9, TP-18, and TP-21.

### F.1.2 Dewatering

Groundwater dewatering and dewatering of storm water that accumulates in excavations with exposed contaminated soil may be necessary and proper permits will be obtained prior to discharging If necessary, the groundwater will be treated onsite to remove free product or excess contaminant concentrations prior to discharge.

### F.1.3 Construction Contingency Plan

If unexpected contamination is encountered during excavation activities, the MPCA will be notified, and the CCP will be implemented.

### F.1.4 Imported Soil

Imported soil will be evaluated using the methods and criteria described in Section F.2.e.

## F.2 Methods and Procedures

### F.2.1. Soil Screening

An environmental technician will be on Site during excavation activities. Soils will be observed for the presence of visual and olfactory indications of contamination. Direct olfactory evaluation of contaminated soil is not recommended for safety reasons, but incidental observations will be noted and acted on. The technician will follow MPCA-approved headspace methodology using a PID equipped with a 10.6-electron-volt lamp to monitor soil for the presence of organic vapors. A minimum of one sample for headspace analysis will be collected for every 10 cubic yards of soil removed. Screening results will be documented.

The headspace procedure is used to field-screen organic vapor levels in soils. The procedure consists of half-filling a new quart-sized sealable bag with a soil sample. The bag is quickly closed and headspace development is allowed to proceed for at least 10 minutes. The bag is shaken vigorously for 15 seconds, both at the beginning and the end of headspace development. After headspace development, the PID probe is inserted into the bag to one-half the headspace depth. The highest reading observed on the PID is then recorded.

### F.2.2. Stockpile Procedures

If it becomes necessary to stockpile impacted soils prior to reuse on Site or for off-Site disposal, the soils will be staged on Site in one or more stockpiles limited in size to 500 cubic yards or less. The stockpiles will be numbered, a sketch will be made of each stockpile location, and a description will be made of the type of material and where it originated. Soils from different areas with suspected different contaminants, soils exhibiting different visual or olfactory characteristics, or soils with significantly different PID measurements will be stored separately.

Stockpiled soils will be placed on polyethylene sheeting or other impervious surface and covered with polyethylene sheeting at the end of each workday and they will be secured in place. The stockpiles will be bermed to prevent storm water run-on and/or runoff.

If laboratory analysis of stockpiled soils is required, the number of stockpile samples collected will be in accordance with stockpile sampling requirements of the MPCA Petroleum Remediation Program, specifically:

| Cubic Yards of Soil in Stockpile | Number of Grab Samples |
|---|---|
| <500 | 1 per 100 cubic yards |
| 501-1,000 | 1 per 250 cubic yards |
| 1,001 or more | 1 per 500 cubic yards |

### F.2.3. Confirmation Sampling and Analytical Testing

Confirmation samples are not anticipated to be collected since finished excavation areas will be lined with clay to limit infiltration of water. However, if confirmation sampling is conducted; confirmation soil samples will be collected from the excavation base and sidewalls in the area where indications of contamination were found.

If laboratory analysis of the confirmation samples is needed, the number of soil samples will be collected based on the following:

| Base of Excavation ($ft^2$) | Number of Samples | Sidewalls ($ft^2$) | Number of Samples |
|---|---|---|---|
| <500 | 2 | <500 | 4 |
| 500-1000 | 3 | 500-1000 | 5 |
| 1000-1500 | 4 | 1000-1500 | 6 |
| 1500-2500 | 5 | 1500-2000 | 7 |
| 2500-4000 | 6 | 2000-3000 | 8 |
| 4000-6000 | 7 | 3000-4000 | 9 |
| 6000-8500 | 8 | >4000 | 1 per 45 linear feet |
| 8500-10890 | 9 | | |

### F.2.4. Soil Reuse and/or Disposal

The redevelopment of the Site with will include excavation of several water features including three storm water retention ponds with associated wetland areas and the Trout Brook stream channel (Figure 3). In addition to these excavation areas, there are several areas of the site that will require an extensive amount of fill material (Figure 4). Most notably, the construction of the trailhead area that will include parking and restroom facilities will require approximately 27,000 cubic yards (CY) of fill material to raise the eastern portion of the site approximately 12 feet to finished grade (Figures 8 & 9). The grading plans with cross sections for the trailhead and other fill areas are included as Figures 5 through 9.

The approximate volumes of fill needed for the major identified fill areas are included in the following table:

| Fill Area | Total Fill Needed (CY) | Estimated Volume Available for Use as Restricted Fill (CY)* |
|---|---|---|
| South Fill &Magnolia Wetland Area | 1,700 | 400 |
| Magnolia Pond Fill Area | 3,100 | 1,620 |
| Maryland Pond Fill Area | 5,600 | 3,225 |
| Trailhead Fill Area | 27,000 | 19,200 |

*Estimates were prepared by HR Green and assume 2-feet of clean fill capping restricted fill

Based on the previous analytical testing results, the majority of the impacted soils identified in the excavation areas were below Industrial SRVs. Further characterization of the areas with concentrations exceeding the Recreational and/or Industrial SRVs is planned prior to excavation activities. The collected data will be compared to the Recreational and Industrial SRVs presented to the MPCA prior to commencement of excavation activities. Based on the current data available, decisions regarding onsite reuse will be based on the following criteria:

- Soil will be reused on Site without restriction, provided there are no indications of contamination based on field screening, headspace readings are less than 10 ppm, and contaminant concentrations are less than the Recreational SRVs. In greenspace areas, contamination concentration also will be less than the SLVs
- Impacted soil from excavation areas where contaminant concentrations exceed the Industrial SRV will be reused on Site as restricted fill at the base of the Trailhead Fill area shown on Figures 8 and 9 provided that it meets the following criteria :
  - Is geotechnically suitable
  - PID headspace readings less than 200 ppm
  - Debris content is less than 5 percent (%) by volume
  - Beneath a minimum of 4 feet of restricted fill where contaminant concentrations exceed only the Recreational SRV.

- Impacted soil from excavation areas where contaminant concentrations exceed only the Recreational SRV will be reused on Site as restricted fill in the areas shown on Figure 4 provided that it meets the following criteria :
  - Beneath 2 feet of clean soil (i.e., soil that meets unrestricted use criteria discussed above)
  - Is geotechnically suitable
  - PID headspace readings less than 200 ppm
  - Debris content is less than 5 % by volume.

- Soils containing more than 5% by volume construction debris or soils containing ACM will not be reused on Site and will be disposed of at an appropriately permitted disposal facility.

- Soil that cannot be reused on Site as restricted fill because of space constraints will be transported for offsite disposal.

- Offsite reuse of soil from the Site will be in accordance with the MPCA's Best Management Practices for Off-Site Reuse of Excess Fill from Development Sites and will meet the following criteria: soil will be free from solid waste, will not exhibit field indications of contamination, contaminant concentrations will be less than the Residential SRVs and SLVs and no DRO or GRO greater than 100 mg/kg will be present.

### F.2.5. Soil Import

Fill sources will be considered on a case-by-case basis and evaluated for the potential presence of contaminants in the material. If the fill source is from a site with no environmental concerns, such as native pit run material or from a residential development with no underground storage tanks (USTs) or other environmental concerns, no analytical testing of the material will be conducted.

Acceptance of fill from other sources with potential environmental concerns will be made on a case-by-case basis. As part of the decision making process, the land-use history of the source facility will be evaluated, existing environmental reports will be reviewed, the geotechnical suitability of the material will be assessed, and existing analytical data will be reviewed. If additional analytical testing of the material is deemed warranted after input from the MPCA, samples will be collected at a frequency of at least one sample per 1,000 cubic yards of material. Analytical parameters will be determined based on historic use of the source facility and the Site contaminants of concern. Analytical results will be compared to the Residential SRVs and SLVs. Environmental monitoring of fill soils as they are loaded into trucks from the source facilities will be conducted on a case-by-case basis.

## G. Construction Contingency Plan

In the event indications of contamination or regulated waste are unexpectedly encountered during construction, this CCP will be implemented.

For the purposes of this CCP, indicators of potentially contaminated soil, groundwater or surface water include, but are not limited to the following:

- Odor, including gasoline, diesel, creosote (odor of railroad ties), mothballs, or other chemical-like odor.
- Soil-stained green or black (but not because of organic content), or with dark, oily appearance, or any unusual soil color or texture.
- A rainbow color (sheen) on surface of water or soil.

Indicators of regulated wastes include, but are not limited to the following:

- Cans, bottles, glass, scrap metal, wood (indicators of solid waste and a possible dump)
- Concrete and asphalt rubble (indicators of demolition waste)
- Roofing materials, shingles, siding, vermiculite, floor tiles, any fibrous material (indicators of demolition waste that could contain asbestos, lead or other chemicals)
- Culverts or other pipes with tar-like coating, insulation or transite (indicators of asbestos)
- Ash (ash from burning or regulated materials may contain lead or other chemicals)
- Sandblast residue (could contain lead or other metals)
- Treated wood, including, but limited to products referred to as green-treated, brown-treated and creosote (treated wood disposal is regulated)
- Chemical containers such as storage tanks, drums, filters and other containers (possible sources of chemical contaminants)
- Old basements with intact floor tiles or insulation (could contain asbestos), sumps (could contain chemical waste), waste traps (could contain oily waste) and cesspools (could contain chemical or oily wastes)

## G.1 Notification Requirements

In the event that unexpected contaminated materials or debris are encountered during construction when the environmental consultant is not on Site, work in the area shall cease immediately, and the work area shall be secured. Work outside of the vicinity of the discovery area can continue if conditions remain safe to do so for project personnel and the surrounding community. The contractor shall immediately notify the owner and/or the owner's representative. At the owner's and/or owner's representative's request, the environmental consultant will mobilize to the Site in the event that contamination is encountered. At this time, the soils will be assessed in-situ as part of a preliminary reconnaissance for the presence of contamination using both visual and olfactory indications of

contamination, as well as laboratory analysis.

In the event contaminated materials are encountered during construction, the MPCA project managers will be notified and a release may need to be reported to the State Duty Officer in accordance with Minnesota Statute 115.061.

## G.2 Preliminary Reconnaissance

If contamination or regulated waste is unexpectedly encountered, the environmental consultant will mobilize to the Site to conduct a preliminary reconnaissance. During the preliminary reconnaissance, samples of the potentially impacted soil will be collected from any stockpiles or from the excavation base and sidewalls for headspace screening using a PID using MPCA recommended methodologies.
A minimum of one sample for headspace analysis will be collected for every 10 cubic yards of material removed. Visual and indirect olfactory indications of contamination will be noted. Screening results will be documented, and Site photographs will be taken, as appropriate.

As part of the preliminary reconnaissance, any potentially contaminated soil that is stockpiled will be placed on polyethylene sheeting or other impervious surfaces and covered with polyethylene sheeting that is secured in place. Staging areas for potentially impacted soil or material will be clearly marked.

The results of the preliminary reconnaissance will be provided to the owner and/or the owner's representative. The contractor will not be allowed to continue to work in the area until the type(s) of contamination is identified and an appropriate response action is defined by the owner and/or the owner's environmental representative.

## G.3 Potential Response Actions

In general, after conducting the preliminary reconnaissance and assessing the type of contamination, environmental monitoring will be conducted during excavation of potentially contaminated materials. The results of the environmental monitoring will be used to segregate and stockpile the material not meeting the soil reuse criteria outlined in Section F.2.4. Field methods and procedures, analytical testing and decisions regarding soil disposition will be consistent with those described in Section F.2.

If potential asbestos containing material (ACM) is encountered, no excavation work will be conducted until the results of polarized light microscopy (PLM) testing are available. If ACM is detected, the procedures established in Section G.3.2 will be followed.

Response actions, listed by contaminant/waste type, to manage unidentified contamination that is encountered during construction are detailed below:

### G.3.1. Petroleum-Contaminated Soils

If petroleum-contaminated soils are identified during construction, soils will be segregated and handled in accordance with MPCA Petroleum Remediation Guidance Document 3.01 "Excavation of Petroleum Contaminated soil and Tank Removal Sampling."

### G.3.2. Debris and Asbestos-Containing Materials

In the event that debris suspected of containing asbestos is encountered during earthwork activities, it will be evaluated in-situ by a licensed asbestos inspector for the presence of asbestos by bulk sampling and analysis by PLM. If ACM is encountered, protocol outlined in the July 1999 MPCA *Asbestos Guidance on Excavation Projects* will be followed including implementation of an Emissions Control Plan (ECP). An ECP will be prepared if needed, upon request. In addition, as the debris is excavated and removed, if encountered, it will be properly recycled or soil containing greater than 10% debris will be disposed. ACM will be properly disposed of offsite; no soil containing ACM will be reused on Site based on the criteria outlined in Section F.2.

### G.3.3. Non-Petroleum-Impacted Soil

Soils that exhibit non-petroleum impacts will be segregated, stockpiled, and sampled. The results of the analytical testing will be compared to the reuse criteria in Section F.2.d.

### G.3.4. Storage Tanks or Drums

In the event that drums or other storage containers are encountered during earthwork activities, they will be removed and their condition evaluated by appropriately trained personnel. If the containers are determined to be in poor condition, the materials will be transferred to a new drum that is in good condition. The drums will be placed in a secure location. Containerized materials will be evaluated, tested, and properly disposed.

Soil from the area around the container will be screened for indications of contamination. Potentially impacted soil will be segregated and stockpiled. Soil samples will be collected from stockpiled materials for chemical analyses and confirmation soil samples will be collected from remaining in-place soil.

If a possible UST indicated metal or concrete surface, is encountered during excavation activities, the area around the possible underground structure will be carefully excavated. The underground structure

will be tested to evaluate the depth to bottom or the presence of liquid. If liquid is present, further testing will be conducted to evaluate its contents. Liquid will be removed by pumping prior to removal and disposal of the structure. All UST contents will be handled in accordance with MPCA and OSHA requirements. The UST will be removed by a licensed UST removal contractor and will be completed in accordance with MPCA requirements. Soil surrounding the tank or structure will be monitored for possible impacts and sampled for chemical analyses in accordance with MPCA, Petroleum Remediation Program, Guidance Document #3-01.

## H. Site Health and Safety Plan

A Site Safety and Health Plan (SSHP) for field personnel will be developed and submitted to the MPCA a minimum of one month prior to the initiation of field activities. Site contractors will be provided with information regarding the locations of potential soil contamination, including this RAP/CCP, as they become available. Exclusion zones will be established as applicable and as required by OSHA regulations. Backhoe operators, environmental technicians and other workers within exclusion zones will have had 40-hour HAZWOPER training. Each contractor working within the exclusion zone will be responsible for implementing its own Site-specific health and safety plan.

## I. Schedule

Construction is anticipated to start in late summer 2013 and conclude in summer 2014.

## J. Reporting

Upon completion of construction activities and chemical analyses, a RAP Implementation Report will be prepared documenting methods and results of the soil monitoring activities. The report will be submitted to the MPCA and will request a No Further Action letter and approval of the response actions.

## K. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

# Figures


## Figure 2A

## Site Overview Map

**Braun Environmental Sampling Points**

- Asbestos Sample Location
- Soil Boring with Temporary Well
- Test Pit
- Soil Boring
- 2012 Boring Locations
- 2012 Soil Vapor Probe

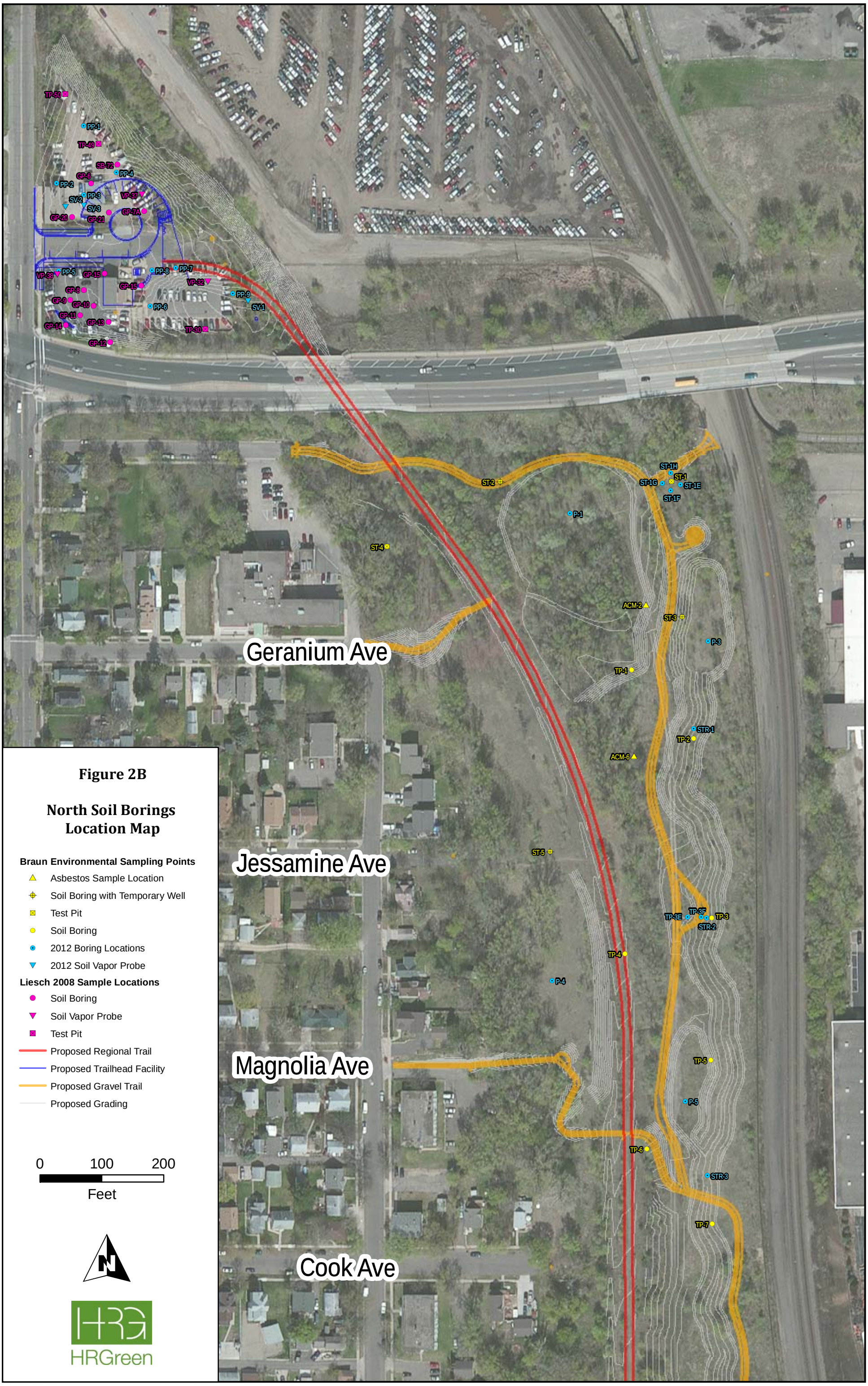
**Liesch 2008 Sample Locations**

- Soil Boring
- Soil Vapor Probe
- Test Pit
- Proposed Trailhead Facility
- Proposed Regional Trail
- Proposed Gravel Trail
- Proposed Grading

0 125 250

Feet

HRGreen




## Figure 2B

## North Soil Borings Location Map

**Braun Environmental Sampling Points**

- Asbestos Sample Location
- Soil Boring with Temporary Well
- Test Pit
- Soil Boring
- 2012 Boring Locations
- 2012 Soil Vapor Probe

**Liesch 2008 Sample Locations**

- Soil Boring
- Soil Vapor Probe
- Test Pit
- Proposed Regional Trail
- Proposed Trailhead Facility
- Proposed Gravel Trail
- Proposed Grading

0 100 200

Feet

HRGreen


## Figure 2C

## South Soil Borings Location Map

**Braun Environmental Sampling Points**

- Asbestos Sample Location
- Soil Boring with Temporary Well
- Test Pit
- Soil Boring
- 2012 Boring Locations
- 2012 Soil Vapor Probe

**Liesch 2008 Sample Locations**

- Soil Boring
- Soil Vapor Probe
- Test Pit
- Proposed Trailhead Facility
- Proposed Regional Trail
- Proposed Gravel Trail
- Proposed Grading

0 100 200

Feet

HRGreen

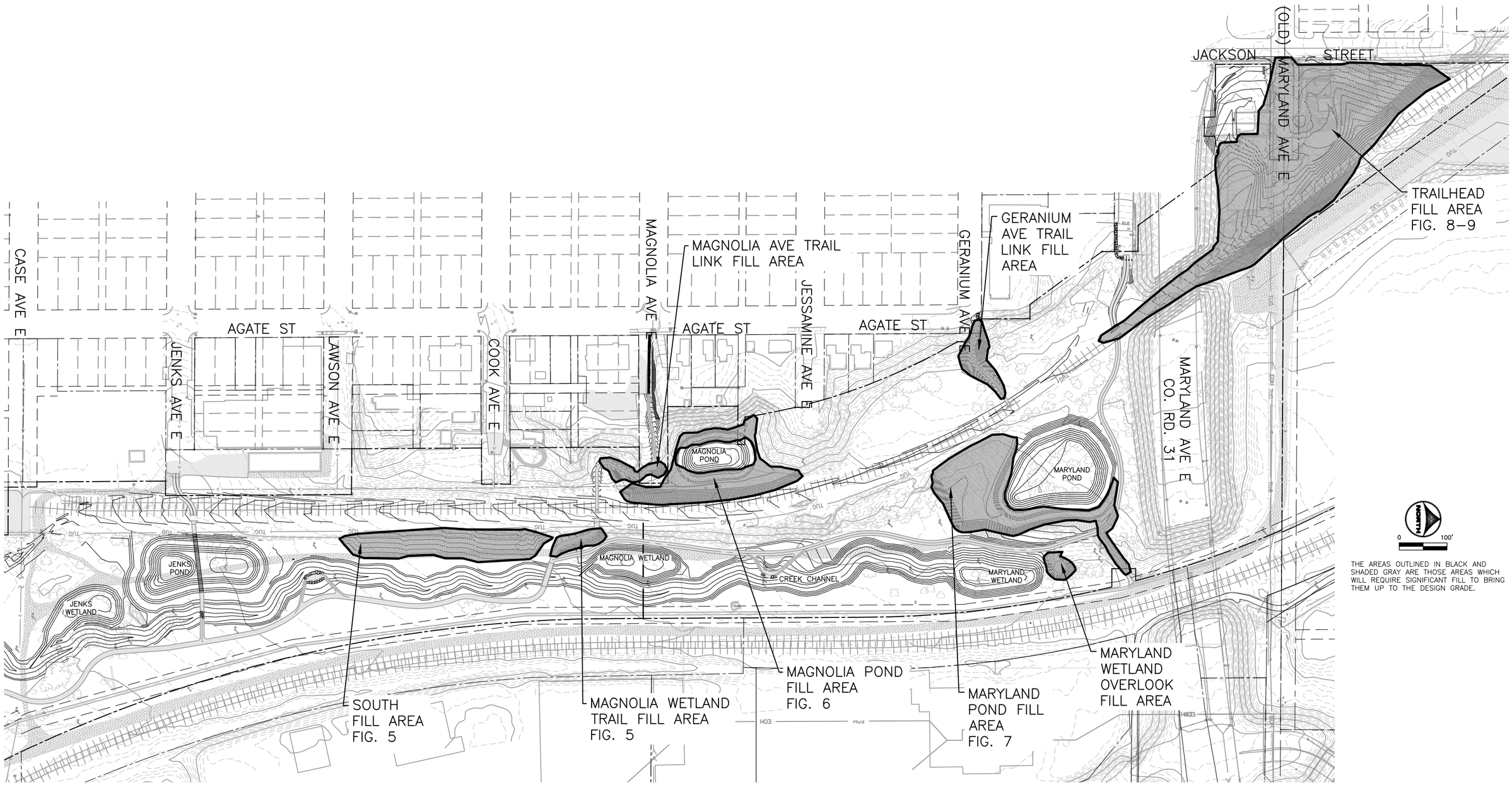
# FIGURE 3
# Trillium Nature Sanctuary & Trout Brook Regional Trail Redevelopment Map

0 305 610
Feet

HRGreen

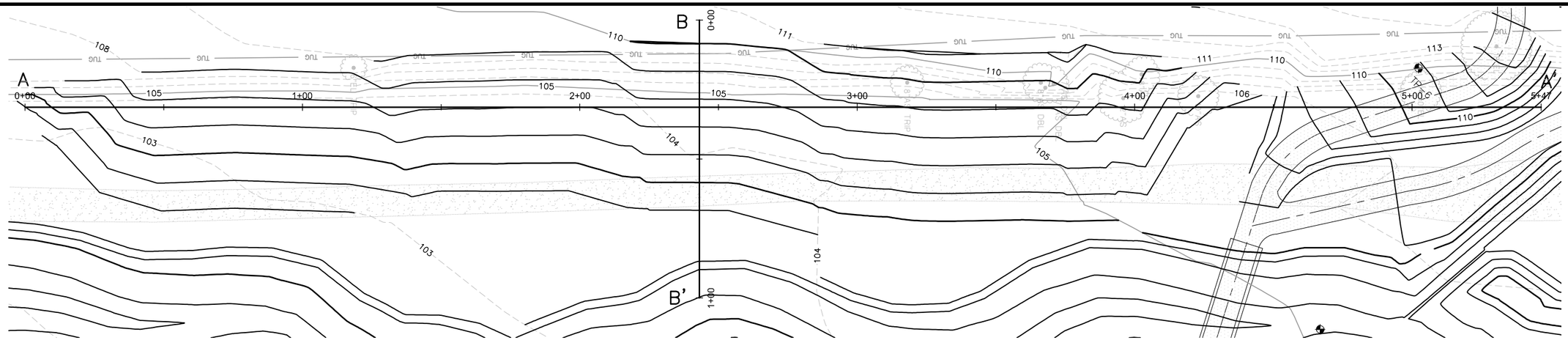
Norpac Rd
Trailhead Area
Maryland Ave
Rose Ave
Maryland Pond
Geranium Ave
Maryland Wetland
Regional Trail
Jessamine Ave
Magnolia Pond
Magnolia Ave
Jackson St
Cook Ave
Magnolia Wetland
Gravel Trail
I-35E
Lawson Ave
Jenks Wetland
Jenks Pond
Jenks Ave
Case Ave
Existing Sims Agate Pond
Sims Ave
York Ave

Model: Prop_022713_Trillium_100per



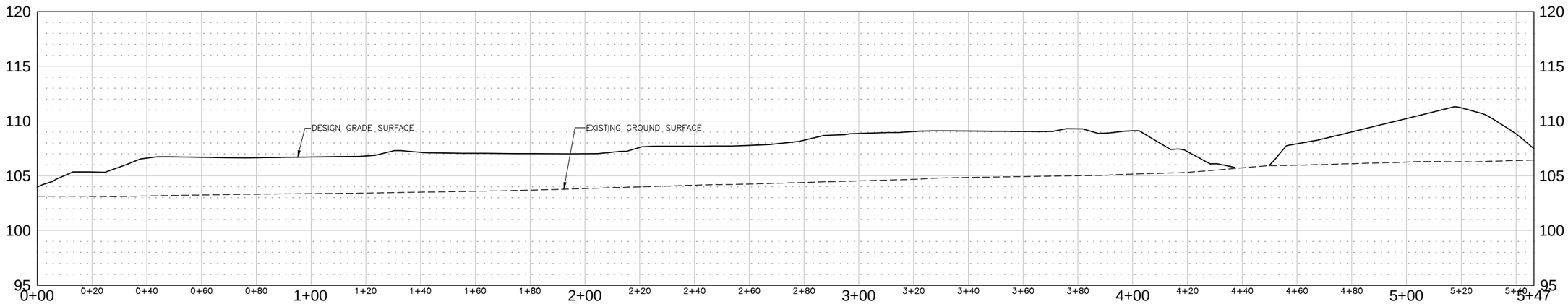

THE AREAS OUTLINED IN BLACK AND SHADED GRAY ARE THOSE AREAS WHICH WILL REQUIRE SIGNIFICANT FILL TO BRING THEM UP TO THE DESIGN GRADE.

| | | | | | |
|---|---|---|---|---|---|
| DRAWN BY: JJC<br>APPROVED: --<br>CAD DATE: 3/12/2013 8:27:11 AM<br>CAD FILE: O:\20110072\Brownfields\CAD-fig\SHEETS\FIG-04.dwg | JOB DATE: 2013<br>JOB NUMBER: 20110072 | | HRGreen HRGreen.com | TRILLIUM NATURE SANCTUARY<br>CITY OF ST. PAUL<br>ST. PAUL, MINNESOTA | BROWNFIELDS<br>OVERVIEW OF FILL AREAS | FIGURE NO.<br>4 |

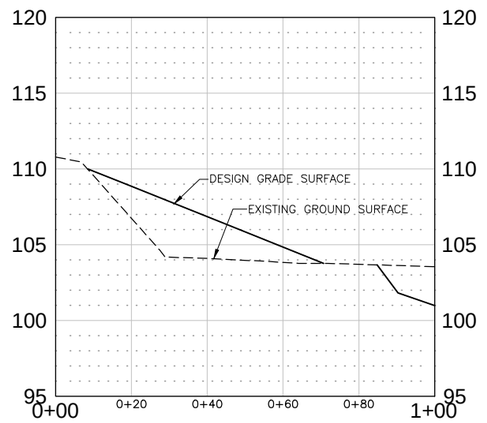



1 PLAN
SOUTH FILL AREA & MAGNOLIA WETLAND TRAIL FILL AREA
SCALE: 1"=20'

NORTH
0 20'



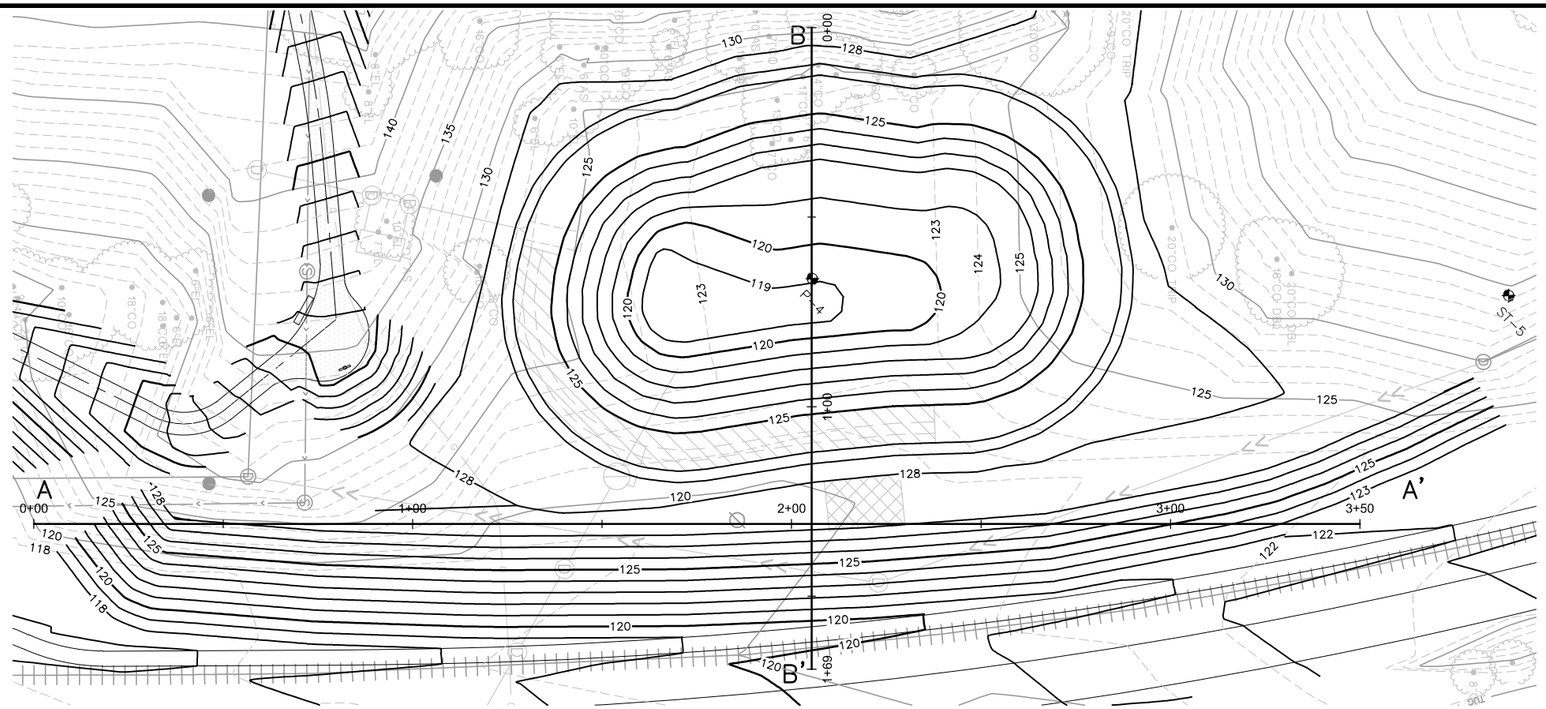

PROFILE A – A'




PROFILE B – B'

2 PROFILES
SOUTH FILL AREA & MAGNOLIA WETLAND TRAIL FILL AREA
SCALE: 1"=20'

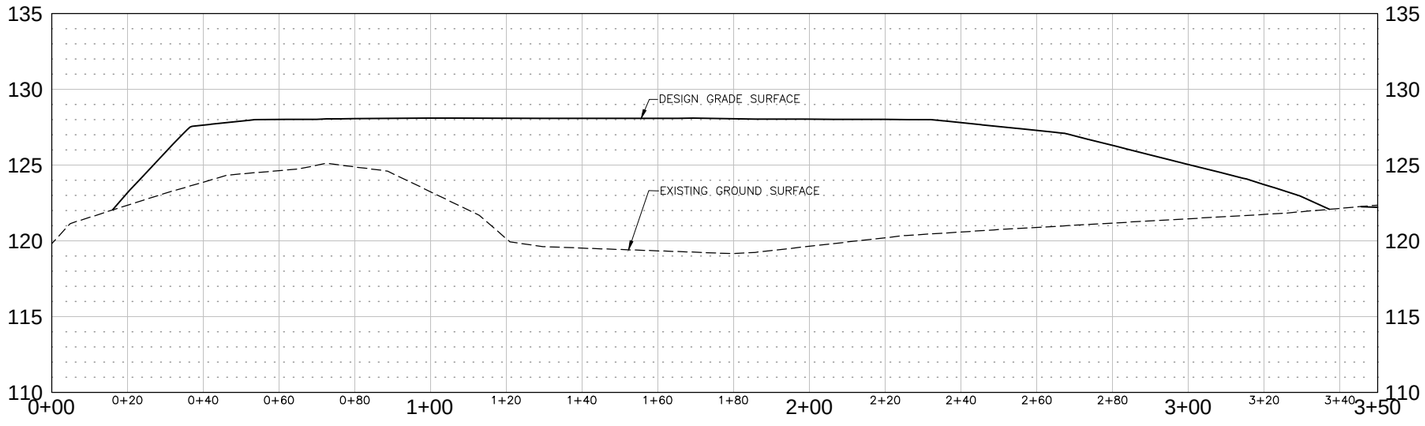
| | | | |
|---|---|---|---|
| DRAWN BY: JJC | JOB DATE: 2013 | HRGreen.com | TRILLIUM NATURE SANCTUARY<br>CITY OF ST. PAUL<br>ST. PAUL, MINNESOTA |
| APPROVED: JJK | JOB NUMBER: 20110072 | | BROWNFIELDS<br>SOUTH & MAGNOLIA WETLAND TRAIL FILL AREAS P&P |
| CAD DATE: 3/11/2013 11:44:51 AM | | | FIGURE NO. 5 |
| CAD FILE: O:\20110072\Brownfields\CAD-fig\SHEETS\FIG-05.dwg | | | |



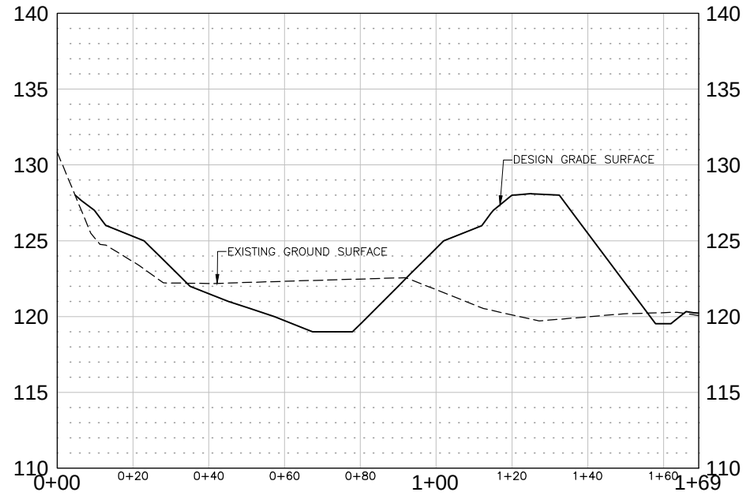

1 PLAN
MAGNOLIA POND FILL AREA
SCALE: 1"=20'

NORTH
0 20'

PROFILE A – A'

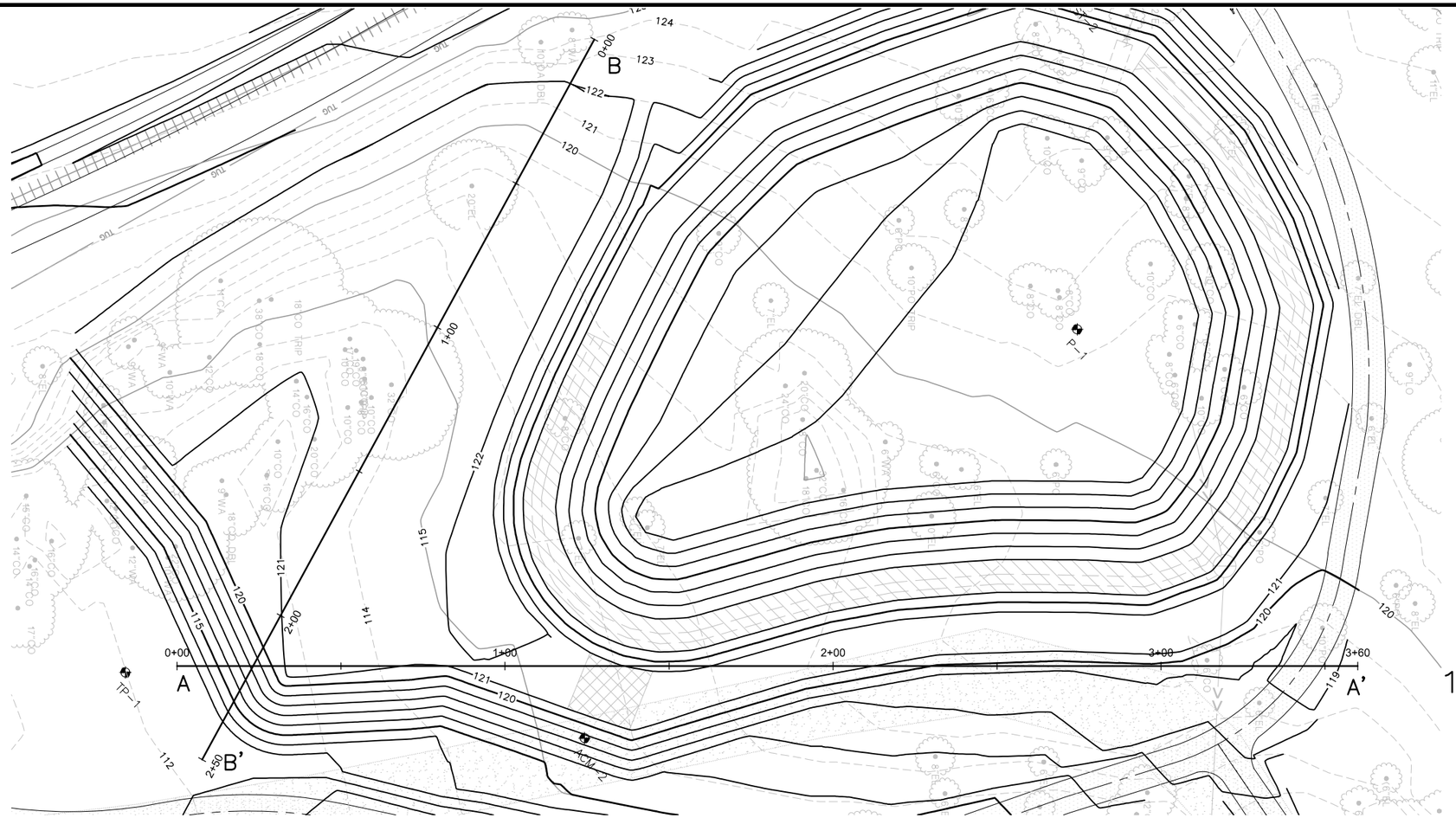



PROFILE B – B'

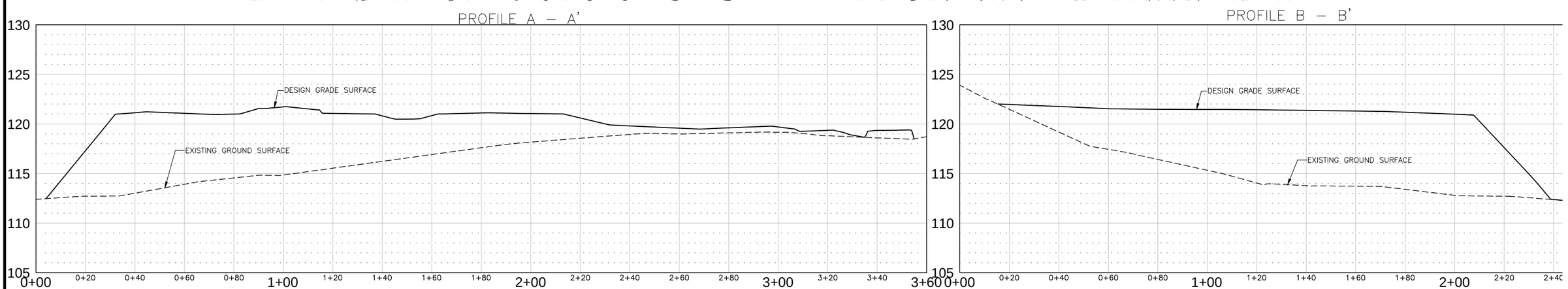



2 PROFILES
MAGNOLIA POND FILL AREA
SCALE: 1"=20'

| | | | |
|---|---|---|---|
| DRAWN BY: JJC | JOB DATE: 2013 | HRGreen HRGreen.com | TRILLIUM NATURE SANCTUARY<br>CITY OF ST. PAUL<br>ST. PAUL, MINNESOTA |
| APPROVED: JJK | JOB NUMBER: 20110072 | | BROWNFIELDS<br>MAGNOLIA POND FILL AREA P&P |
| CAD DATE: 3/11/2013 11:43:43 AM | | | FIGURE NO. 6 |
| CAD FILE: O:\20110072\Brownfields\CAD-fig\SHEETS\FIG-06.dwg | | | |

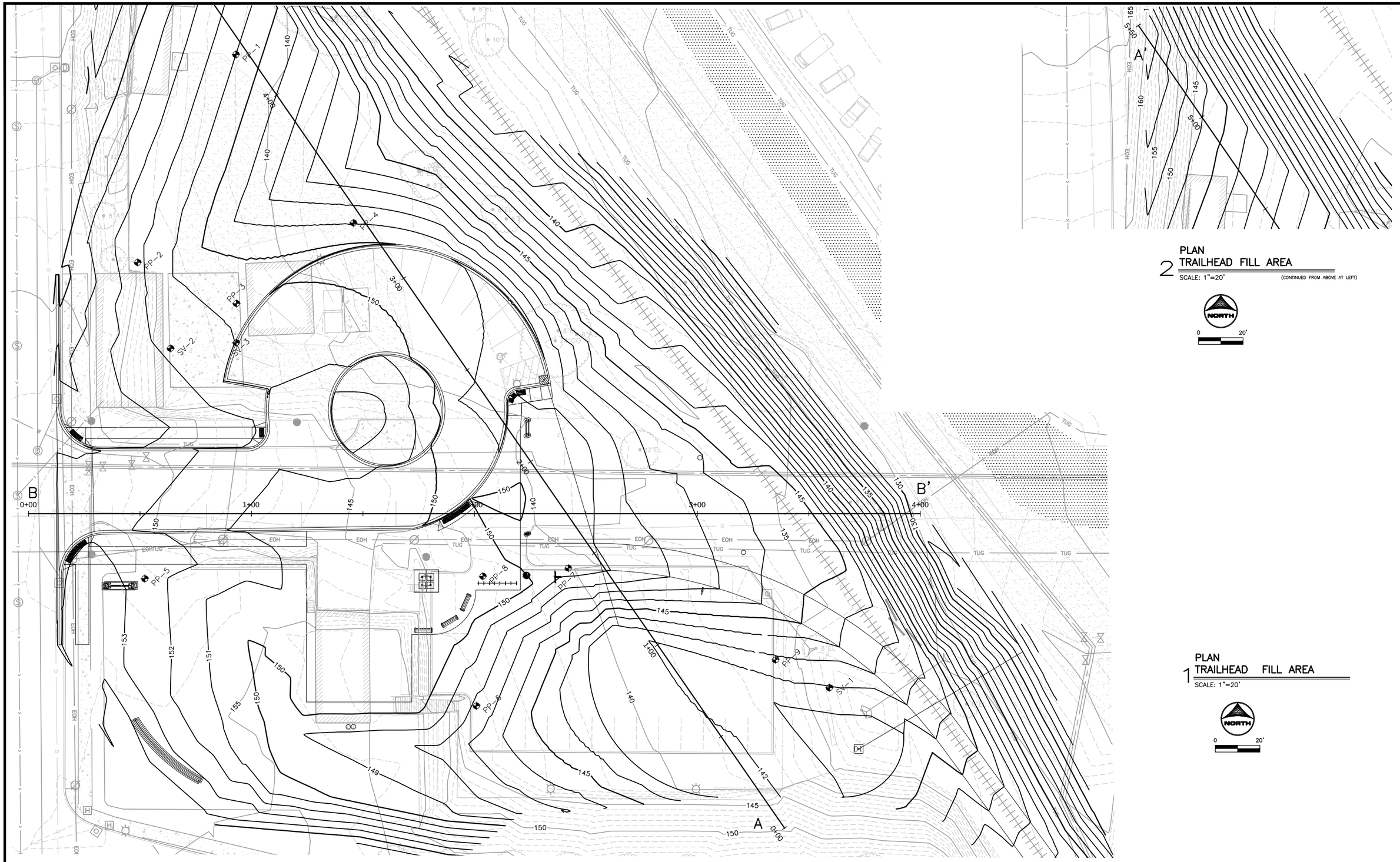



1 PLAN
MARYLAND POND FILL AREA
SCALE: 1"=20'




2 PROFILES
MARYLAND POND FILL AREA
SCALE: 1"=20'

| | | | |
|---|---|---|---|
| DRAWN BY: JJC | JOB DATE: 2013 | HRGreen.com | TRILLIUM NATURE SANCTUARY<br>CITY OF ST. PAUL<br>ST. PAUL, MINNESOTA |
| APPROVED: JJK | JOB NUMBER: 20110072 | | BROWNFIELDS<br>MARYLAND POND FILL AREA P&P |
| CAD DATE: 3/11/2013 11:42:16 AM | | | FIGURE NO. 7 |
| CAD FILE: O:\20110072\Brownfields\CAD-fig\SHEETS\FIG-07.dwg | | | |




2 PLAN
TRAILHEAD FILL AREA
SCALE: 1"=20' (CONTINUED FROM ABOVE AT LEFT)

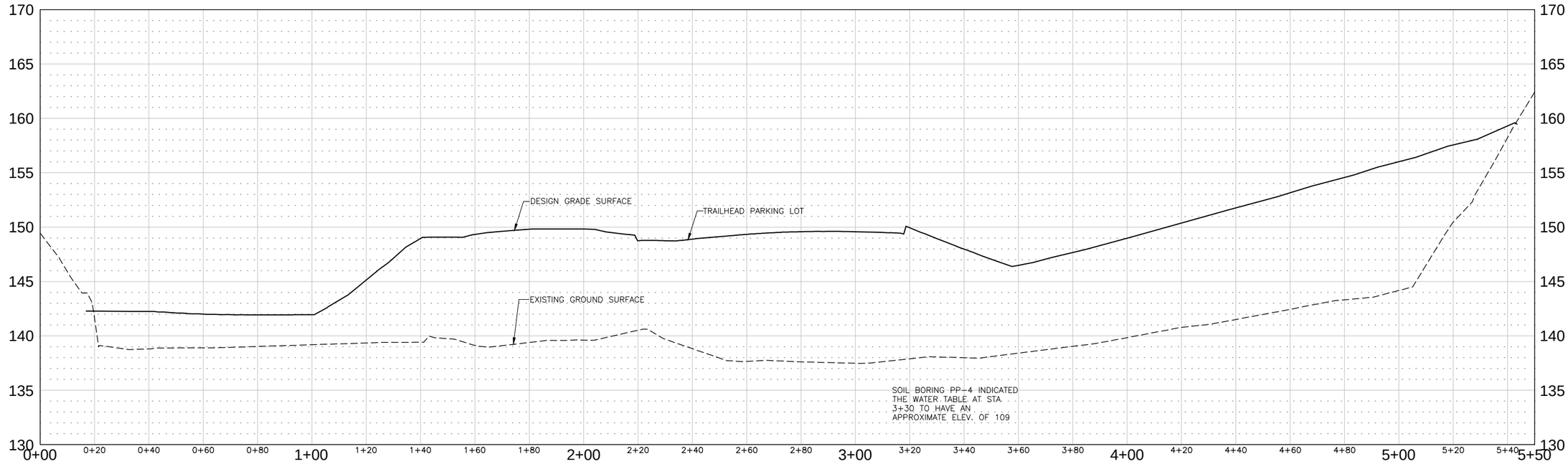
NORTH
0 20'

1 PLAN
TRAILHEAD FILL AREA
SCALE: 1"=20'

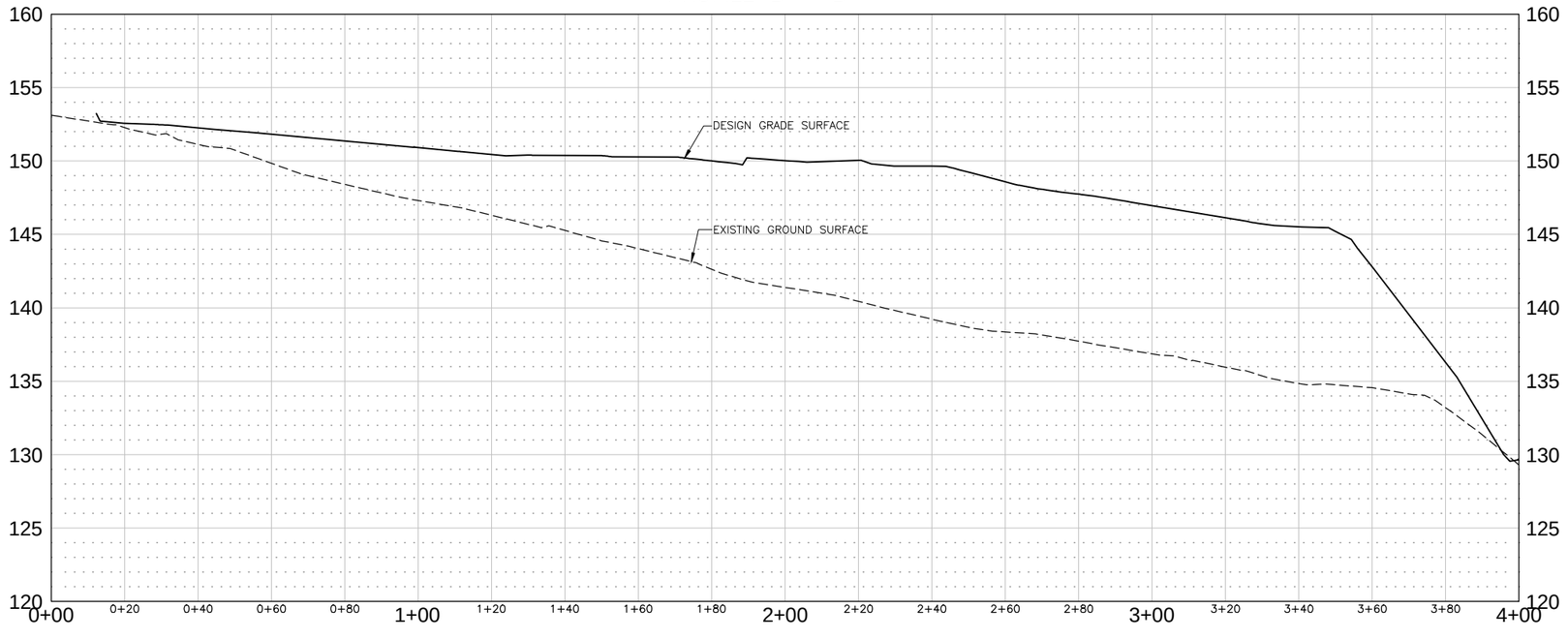
NORTH
0 20'

| | | | |
|---|---|---|---|
| DRAWN BY: JJC | JOB DATE: 2013 | HRGreen HRGreen.com | TRILLIUM NATURE SANCTUARY<br>CITY OF ST. PAUL<br>ST. PAUL, MINNESOTA |
| APPROVED: JJK | JOB NUMBER: 20110072 | | BROWNFIELDS<br>TRAILHEAD FILL AREA PLAN |
| CAD DATE: 3/11/2013 11:40:56 AM | | | FIGURE NO. 8 |
| CAD FILE: O:\20110072\Brownfields\CAD-fig\SHEETS\FIG-08.dwg | | | |

PROFILE A – A'




PROFILE B – B'




1 PROFILES
TRAILHEAD FILL AREA
SCALE: 1"=20'

0 20'

DRAWN BY: JJC JOB DATE: 2013
APPROVED: JJK JOB NUMBER: 20110072
CAD DATE: 3/11/2013 11:39:46 AM
CAD FILE: O:\20110072\Brownfields\CAD-fig\SHEETS\FIG-09.dwg

HRGreen HRGreen.com

TRILLIUM NATURE SANCTUARY
CITY OF ST. PAUL
ST. PAUL, MINNESOTA

BROWNFIELDS
TRAILHEAD FILL AREA PROFILE

FIGURE NO.
9

# Tables

**Table 1**
**Soil Analytical Results - Surface soil Samples**
**Proposed Trillium Nature Sanctuary**
**Saint Paul**
**SP-12-00179A**

| Compound/Parameter | CAS No. | Sample Identifier | | | | | Recreational Soil Reference Value (mg/kg) | Residential Soil Reference Value (mg/kg) | Industrial Soil Reference Value (mg/kg) | Tier I Soil Leaching Value (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **S-1(0-0.5)** | **S-2(0-0.5)** | **S-3(0-0.5)** | **S-4(0-0.5)** | **S-5(0-0.5)** | | | | |
| | | **10/9/2012** | **10/9/2012** | **10/9/2012** | **10/9/2012** | **10/9/2012** | | | | |
| | | **1206172** | **1206172** | **1206172** | **1206172** | **1206172** | | | | |
| **Semivolatile Organic Compounds (mg/kg)** | | | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | <0.68 [2] [3] | **1.7** [2] [3] | **0.72** [2] | <0.69 [2] [3] | <0.67 [2] [3] | 120 | 100 | 369 | NE |
| Acenaphthene | 83-32-9 | <0.68 [2] [3] | <0.84 [2] [3] | <0.13 [2] | <0.69 [2] [3] | <0.67 [2] [3] | 1860 | 1200 | 5260 | 50 |
| Acenaphthylene | 208-96-8 | <0.68 [2] [3] | <0.84 [2] [3] | **0.15** [2] | <0.69 [2] [3] | <0.67 [2] [3] | NE | NE | NE | NE |
| Anthracene | 120-12-7 | <0.68 [2] [3] | <0.84 [2] [3] | **0.15** [2] | <0.69 [2] [3] | <0.67 [2] [3] | 10000 | 7880 | 45400 | 942 |
| Benz(a)anthracene | 56-55-3 | <0.68 [2] [3] | <0.84 [2] [3] | **0.34** [2] | <0.69 [2] [3] | <0.67 [2] [3] | cPah | cPah | cPah | cPah |
| Benzo(a)pyrene | 50-32-8 | <0.68 [2] [3] | <0.84 [2] [3] | **0.27** [2] | <0.69 [2] [3] | <0.67 [2] [3] | cPah | cPah | cPah | cPah |
| Benzo(b)fluoranthene | 205-99-2 | <0.68 [2] [3] | **0.84** [2] [3] | **0.57** [2] | <0.69 [2] [3] | <0.67 [2] [3] | cPah | cPah | cPah | cPah |
| Benzo(g,h,i)perylene | 191-24-2 | <0.68 [2] [3] | <0.84 [2] [3] | **0.16** [2] | <0.69 [2] [3] | <0.67 [2] [3] | NE | NE | NE | NE |
| Benzo(k)fluoranthene | 207-08-9 | <0.68 [2] [3] | <0.84 [2] [3] | **0.36** [2] | <0.69 [2] [3] | <0.67 [2] [3] | cPah | cPah | cPah | cPah |
| Carbazole | 86-74-8 | <1.7 [2] [3] | <2.1 [2] [3] | <0.34 [2] | <1.8 [2] [3] | <1.7 [2] [3] | 720 | 700 | 1310 | NE |
| Chrysene | 218-01-9 | <0.68 [2] [3] | <0.84 [2] [3] | **0.53** [2] | <0.69 [2] [3] | <0.67 [2] [3] | cPah | cPah | cPah | cPah |
| Dibenz(a,h)anthracene | 53-70-3 | <0.68 [2] [3] | <0.84 [2] [3] | <0.13 [2] | <0.69 [2] [3] | <0.67 [2] [3] | cPah | cPah | cPah | cPah |
| Dibenzofuran | 132-64-9 | <0.68 [2] [3] | <0.84 [2] [3] | **0.24** [2] | <0.69 [2] [3] | <0.67 [2] [3] | 130 | 104 | 810 | NE |
| Fluoranthene | 206-44-0 | <0.68 [2] [3] | **1.1** [2] [3] | **0.38** [2] | **1.2** [2] [3] | <0.67 [2] [3] | 1290 | 1080 | 6800 | 295 |
| Fluorene | 86-73-7 | <0.68 [2] [3] | <0.84 [2] [3] | <0.13 [2] | <0.69 [2] [3] | <0.67 [2] [3] | 1200 | 850 | 4120 | 47 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | <0.68 [2] [3] | <0.84 [2] [3] | **0.16** [2] | <0.69 [2] [3] | <0.67 [2] [3] | cPah | cPah | cPah | cPah |
| Naphthalene | 91-20-3 | <0.68 [2] [3] | **1.2** [2] [3] | **0.59** [2] | <0.69 [2] [3] | <0.67 [2] [3] | 24 | 10 | 28 | 7.5 |
| Phenanthrene | 85-01-8 | <0.68 [2] [3] | **1.3** [2] [3] | **0.62** [2] | **0.91** [2] [3] | <0.67 [2] [3] | NE | NE | NE | NE |
| Pyrene | 129-00-0 | <0.68 [2] [3] | **0.98** [2] [3] | **0.35** [2] | **0.87** [2] [3] | <0.67 [2] [3] | 1060 | 890 | 5800 | 272 |
| BaP Equivalent** | | --- | **0.08** | **0.42** | --- | --- | 2 | 2 | 3 | 10.2 |

**Notes:**
[2] See case narrative section for further information.
[3] The method reporting limit (MRL) was raised for one or more analytes; a dilution of the sample was necessary due to high analyte levels and/or matrix interferences.
mg/kg = Milligrams per kilogram.
< = Less than the reporting limit indicated in parentheses.
---- = Not analyzed or calculated for this parameter
NE = Not Established
SRV - Soil Reference Value established by the Minnesota Pollution Control Agency; 1999, revised 2009
SLV - Soil Leaching Value established by the Minnesota Pollution Control Agency; 1999, revised 2005
cPAH = Individual criteria not established. Included in BaP equivalent calculation.
** = Benzo(a)pyrene (BaP) equivalent is calculated based on the concentration and weighted toxicity of carcinogenic PAHs (cPAH); Minnesota Pollution Control Agency, 2002.

**Table 2**
**Soil Analytical Results - Soil Borings**
**Proposed Trillium Nature Sanctuary**
**Saint Paul, Minnesota**
**SP-12-00179B**

| Compound/Parameter | P-1(0-4) 12/12/2012 Fill soil w/concrete 1207511 | P-3(0-4) 12/10/2012 Topsoil & native soil 1207511 | P-4(0-4) 12/12/2012 Topsoil & native soil 1207511 | P-5(0-4) 12/11/2012 Topsoil & native soil 1207511 | P-6(0-4) 12/11/2012 Fill with cinders & ash 1207511 | P-6(5-7.5) 12/11/2012 Fill soil & peat 1207511 | P-7(0-4) 12/11/2012 Fill soil w/cinders and coal 1207511 | P-7(13-15) 12/11/2012 Peat with sulfur odor 1207511 | P-8(0-5) 12/11/2012 Fill soil 1207511 | ST-R-1(0-4) 12/10/2012 Topsoil & native soil 1207511 | ST-R-2(0-4) 12/12/2012 Fill with cinders 1207511 | ST-R-3(0-4.5) 12/13/2012 Fill soil 1207511 | ST-R-4(0-4) 12/11/2012 Topsoil & native soil 1207511 | ST-R-5(0-4) 12/11/2012 Fill soil 1207511 | ST-R-6(0-4) 12/12/2012 Fill soil 1207511 | ST-R-7(2.5-5) 12/11/2012 Fill soil 1207511 | ST-1-E(0-2) 12/10/2012 Fill soil 1207511 | ST-1-F(0-2) 12/10/2012 Fill soil 1207511 | ST-1-G(0-2) 12/10/2012 Fill soil 1207511 | ST-1-H(0-2) 12/10/2012 Fill soil 1207511 | TP-16-A(0-2) 12/12/2012 Fill soil 1207511 | TP-3-E(0-2) 12/12/2012 Fill soil w/cinders 1207511 | TP-3-F(0-2) 12/12/2012 Fill soilw/ cinders 1207511 | Recreational Soil Reference Value (mg/kg) | Industrial Soil Reference Value (mg/kg) | Tier I Soil Leaching Value (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | <0.14 | <0.15 | <0.13 | **0.17** | <0.15 | <0.24 | <0.14 | ---- | <0.13 | <0.13 | **0.32** | <0.15 | <0.14 | <0.13 | <0.14 | <0.14 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 20 | 25 | NE |
| Chlorobenzene | <0.054 | <0.060 | <0.052 | <0.054 | **0.092** | <0.096 | <0.054 | ---- | <0.053 | <0.053 | <0.053 | <0.058 | <0.058 | <0.053 | <0.055 | <0.058 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 23 | 32 | 1.1 |
| Chloroform | <0.054 | <0.060 | <0.052 | <0.054 | <0.060 | <0.096 | <0.054 | ---- | <0.053 | <0.053 | <0.053 | <0.058 | <0.058 | **0.083** | <0.055 | <0.058 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 7 | 4 | 0.17 |
| Ethylbenzene | <0.054 | <0.060 | <0.052 | **0.1** | <0.060 | <0.096 | <0.054 | ---- | <0.053 | <0.053 | 0.18 | <0.058 | <0.058 | <0.053 | <0.055 | <0.058 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 200 | 200 | 4.7 |
| m,p-Xylenes | <0.11 | <0.12 | <0.10 | **0.29** | <0.12 | <0.19 | **0.11** | ---- | **0.2** | <0.11 | **0.47** | <0.12 | <0.12 | **0.11** | <0.11 | <0.12 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 110 [a] | 130 [a] | 45 [a] |
| Naphthalene | <0.14 | <0.15 | <0.13 | **0.36** | <0.15 | <0.24 | **0.17** | ---- | **0.27** | <0.13 | **0.51** | <0.15 | <0.14 | **0.19** | <0.14 | <0.14 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 24 | 28 | 7.5 |
| n-Propylbenzene | <0.14 | <0.15 | <0.13 | <0.14 | <0.15 | <0.24 | <0.14 | ---- | <0.13 | <0.13 | **0.16** | <0.15 | <0.14 | <0.13 | <0.14 | <0.14 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 70 | 93 | NE |
| o-Xylene | <0.054 | <0.060 | <0.052 | **0.25** | **0.079** | <0.096 | **0.1** | ---- | **0.18** | <0.053 | **0.32** | **0.08** | <0.058 | **0.1** | <0.055 | <0.058 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 110 [a] | 130 [a] | 45 [a] |
| Toluene | <0.054 | <0.060 | <0.052 | **0.18** | **0.074** | <0.096 | **0.11** | ---- | **0.17** | <0.053 | **0.29** | **0.081** | <0.058 | **0.11** | <0.055 | <0.058 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 260 | 305 | 6.4 |
| **Semivolatile Organic Compounds (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | <0.14 | <0.16 | <0.13 | **1.9** | **1.8** | <0.25 [15] | **0.81** | ---- | **0.59** | <0.14 | **1.3** | **0.45** | **0.77** | **0.5** | <0.14 | **0.45** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 120 | 369 | NE |
| Acenaphthene | **0.24** | <0.16 | <0.13 | <0.14 | <0.15 | <0.25 [15] | <0.14 | ---- | <0.14 | <0.14 | <0.14 | <0.15 | <0.15 | <0.14 | <0.14 | <0.15 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1860 | 5260 | 50 |
| Acenaphthylene | <0.14 | <0.16 | <0.13 | <0.14 | <0.15 | <0.25 [15] | <0.14 | ---- | **0.15** | <0.14 | <0.14 | <0.15 | <0.15 | **0.14** | <0.14 | <0.15 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | NE | NE | NE |
| Anthracene | **0.64** | <0.16 | <0.13 | <0.14 | <0.15 | <0.25 [15] | <0.14 | ---- | **0.17** | <0.14 | <0.14 | <0.15 | <0.15 | <0.14 | <0.14 | <0.15 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 10000 | 45400 | 942 |
| Benz[a]anthracene | **2** | <0.16 | <0.13 | **0.36** | **0.28** | <0.25 [15] | **0.36** | ---- | **0.22** | <0.14 | **0.18** | <0.15 | **0.34** | **0.35** | <0.14 | **0.36** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | cPah | cPah | cPah |
| Benzo(a)pyrene | **1.9** | <0.16 | <0.13 | **0.3** | **0.18** | <0.25 [15] | **0.3** | ---- | **0.16** | <0.14 | **0.17** | <0.15 | **0.26** | **0.3** | <0.14 | **0.28** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | cPah | cPah | cPah |
| Benzo(b)fluoranthene | **1.7** | <0.16 | <0.13 | **0.46** | **0.32** | <0.25 [15] | **0.39** | ---- | **0.33** | <0.14 | **0.25** | **0.16** | **0.25** | **0.4** | <0.14 | **0.39** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | cPah | cPah | cPah |
| Benzo(g,h,i)perylene | **0.88** | <0.16 | <0.13 | **0.21** | <0.15 | <0.25 [15] | **0.16** | ---- | **0.38** | <0.14 | **0.24** | <0.15 | **0.18** | **0.29** | **0.19** | **0.26** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | NE | NE | NE |
| Benzo(k)fluoranthene | **1.7** | <0.16 | <0.13 | **0.29** | **0.23** | <0.25 [15] | **0.29** | ---- | **0.19** | <0.14 | **0.19** | <0.15 | **0.24** | **0.33** | <0.14 | **0.24** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | cPah | cPah | cPah |
| Chrysene | **1.8** | <0.16 | <0.13 | **0.49** | **0.34** | <0.25 [15] | **0.41** | ---- | **0.28** | <0.14 | **0.26** | **0.19** | **0.33** | **0.55** | <0.14 | **0.51** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | cPah | cPah | cPah |
| Dibenz(a,h)anthracene | **0.32** | <0.16 | <0.13 | <0.14 | <0.15 | <0.25 [15] | <0.14 | ---- | <0.14 | <0.14 | <0.14 | <0.15 | <0.15 | <0.14 | <0.14 | <0.15 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | cPah | cPah | cPah |
| Dibenzofuran | **0.22** | <0.16 | <0.13 | **0.38** | **0.4** | <0.25 [15] | **0.23** | ---- | **0.18** | <0.14 | **0.34** | <0.15 | **0.2** | **0.16** | <0.14 | **0.16** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 130 | 810 | NE |
| Fluoranthene | **4.9** | <0.16 | <0.13 | **0.66** | **0.38** | **0.52** [15] | **0.52** | ---- | **0.29** | <0.14 | **0.32** | **0.2** | **0.46** | **0.96** | <0.14 | **0.47** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1290 | 6800 | 295 |
| Fluorene | **0.26** | <0.16 | <0.13 | <0.14 | <0.15 | <0.25 [15] | <0.14 | ---- | <0.14 | <0.14 | <0.14 | <0.15 | <0.15 | <0.14 | <0.14 | <0.15 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1200 | 4120 | 47 |
| Indeno(1,2,3-cd)pyrene | **0.88** | <0.16 | <0.13 | **0.18** | <0.15 | <0.25 [15] | **0.14** | ---- | **0.27** | <0.14 | **0.2** | <0.15 | **0.16** | **0.26** | <0.14 | **0.2** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | cPah | cPah | cPah |
| Naphthalene | **0.26** | <0.16 | <0.13 | **1.6** | **1.4** | <0.25 [15] | **0.65** | ---- | **0.49** | <0.14 | **0.85** | **0.35** | **0.55** | **0.49** | <0.14 | **0.38** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 24 | 28 | 7.5 |
| Phenanthrene | **3.4** | <0.16 | <0.13 | **0.99** | **1** | **0.4** [15] | **0.62** | ---- | **0.45** | <0.14 | **0.78** | **0.34** | **0.46** | **1.2** | <0.14 | **0.48** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | NE | NE | NE |
| Pyrene | **3.1** | <0.16 | <0.13 | **0.42** | **0.3** | <0.25 [15] | **0.39** | ---- | **0.22** | <0.14 | **0.22** | <0.15 | **0.42** | **0.84** | <0.14 | **0.45** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1060 | 5800 | 272 |
| BaP Equivalent** | **2.73** | --- | --- | **0.43** | **0.27** | --- | **0.42** | ---- | **0.26** | --- | **0.25** | **0.02** | **0.36** | **0.44** | --- | **0.40** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 2 | 3 | 10.2 |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Diesel Range Organics (DRO) | **92** [9] | **21** [9] | <8.7 [9] | **100** [18] [9] | **73** [9] | **46** [9] | **69** [9] | ---- | **140** [18] [9] | <8.6 [9] | **120** [9] | **27** [9] | **27** [9] | **54** [9] | **40** [9] | **43** [15] [9] | **18** [9] | **24** [9] | **460** [15] [17] [18] [9] | **640** [11] [15] [17] [18] [9] | **29** [9] | **78** [9] | **180** [18] [9] | NE | NE | NE |
| Gasoline Range Organics (GRO) | <11 [8] | <12 [8] | <10 | **19** [7] | <12 [8] | <19 | <11 [8] | ---- | **14** [7] | <11 | **13** [8] | <12 [8] | <12 [8] | <11 [7] | <11 | <12 [7] | <10 [8] | <11 [8] | <11 [8] | <11 [8] | <11 [8] | <11 [8] | **27** [7] | NE | NE | NE |
| **Metals (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | **5.2** | **6.6** | <1.9 | **12** | **14** | **21** | **18** | ---- | **9.8** | **2.2** | **6.9** | **8.9** | **14** | **16** | **2.9** | **17** | **3** | **5.6** | **2.3** | **3.4** | **3.1** | **15** | **15** | 11 | 20 | 15.1 |
| Barium | **87** | **110** | **24** | **120** | **100** | **110** | **110** | ---- | **110** | **33** | **61** | **110** | **78** | **62** | **60** | **92** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1100 | 18000 | 842 |
| Cadmium | <0.49 | <0.55 | <0.48 | <1.0 [12] | **0.68** | <0.96 | <1.0 [12] | ---- | <0.93 [12] | <0.53 | <0.53 | <1.0 [12] | **0.64** | <0.53 | <0.48 | **1.1** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 35 | 200 | 4.4 |
| Chromium | **15** | **22** | **7.2** | **17** | **13** | **20** | **16** | ---- | **14** | **12** | **13** | **26** | **14** | **12** | **13** | **14** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 120 [c] | 650 [c] | 18 [c] |
| Lead | **120** | **34** | **3.4** | **150** | **430** | **6.4** | **260** | ---- | **310** | **5.7** | **98** | **47** | **1400** | **84** | **41** | **300** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 300 | 700 | 525 |
| Mercury | **0.31** | **0.027** | **0.024** | **0.075** | **0.63** | <0.18 | **0.16** | ---- | **0.91** | <0.019 | **0.073** | **0.08** | **0.19** | **0.053** | **0.094** | **0.092** | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1.2 | 1.5 | 1.6 |
| Selenium | <2.0 | <2.2 | <1.9 | <4.0 [12] | <2.1 | **7.5** | <4.0 [12] | ---- | <3.7 [12] | <2.1 | <2.1 | <4.1 [12] | <2.2 | <2.1 | <1.9 | <2.0 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 200 | 1300 | 1.5 |
| Silver | <0.49 | <0.55 | <0.48 | <1.0 [12] | **0.64** | <0.96 | <1.0 [12] | ---- | <0.93 [12] | <0.53 | <0.53 | <1.0 [12] | **4.2** | <0.53 | <0.48 | <0.51 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 200 | 1300 | 3.9 |
| **Other Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sulfide, total | ---- | ---- | ---- | ---- | ---- | ---- | ---- | <10 [16] [6] | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | | | |

**Notes:**

[6] Midwest Laboratories is not certifed for regualtory samples in Minnesota.

[7] The sample chromatogram indicates the presence of lower and higher boiling hydrocarbons than expected in the gasoline range chromatogram.

[8] The sample chromatogram indicates the presence of higher boiling hydrocarbons than expected in the gasoline range chromatogram.

[9] The sample chromatogram indicates the presence of lower and higher boiling hydrocarbons than expected in the diesel range chromatogram.

[11] The relative percent difference (RPD) was outside of laboratory control limits for the sample and sample duplicate (DUP).

[12] The sample was diluted due to the presence of high levels of non-target analytes resulting in elevated reporting limits.

[15] One or more surrogate recoveries reported with this sample analysis are outside of the laboratory control limits.

[16] This analysis was performed by a subcontract laboratory.

[17] The method reporting limits (MRLs) are elevated due to adjustments of the sample preparation amounts. This was necessary because of the sample matrix.

[18] The method reporting limit (MRL) was raised for one or more analytes; a dilution of the sample was necessary due to high analyte levels and/or matrix interferences.

mg/kg = Milligrams per kilogram.

NE = Not Established

SRV - Soil Reference Value established by the Minnesota Pollution Control Agency; 1999, revised 2009

SLV - Soil Leaching Value established by the Minnesota Pollution Control Agency; 1999, revised 2005

cPAH = Individual criteria not established. Included in BaP equivalent calculation.

** = Benzo(a)pyrene (BaP) equivalent is calculated based on the concentration and weighted toxicity of carcinogenic PAHs (cPAH); Minnesota Pollution Control Agency, 2002.

[a] = Criteria for mixture of o, m and p-xylenes.

[b] = Criteria for 4-Methylphenol

[c] = Criteria for hexavalent chromium.

**Table 3**
**Toxicity Characteristic Leaching Procedure Results**
**Trillium Nature Sanctuary**
**Saint Paul, Minnesota**
**SP-12-00179B**

| Compound/Parameter | Sample Identifier | | | | Regulatory Level (mg/L) |
|---|---|---|---|---|---|
| | **P-6(0-4)** | **P-8(0-5)** | **ST-R-4(0-4)** | **ST-R-7(2.5-5)** | |
| | **12/11/2012** | **12/11/2012** | **12/11/2012** | **12/11/2012** | |
| | **1207740** | **1207740** | **1207740** | **1207740** | |
| **Toxicity Characteristic Leaching Procedure (TCLP) - Metals (mg/L)** | | | | | |
| Lead | <0.20 [2] | <0.20 [2] | **1.8** | **0.21** | 5 |
| | | | | | |

**Notes:**
[2] The sample was diluted due to the presence of high levels of non-target analytes resulting in elevated reporting limits.
mg/L = Milligrams per liter.
< = Less than the reporting limit indicated in parentheses.
TCLP = Toxicity Characteristic Leaching Procedure
Regulatory Level for Maximum Concentration of Contaminants for the Toxicity Characteristic (mg/L) from 40 CFR 261.24

# Appendix A

# Previous Investigation Results


**PROPOSED PUSH PROBE BORING LOCATION**

**PROPOSED SOIL VAPOR SAMPLE LOCATION**

LIESCH TEST PIT (2008)

LIESCH SOIL BORING (2008)

LIESCH SOIL VAPOR PROBE (2008)

APPROXIMATE LOCATION OF FORMER STRUCTURE

30' 0 60'

SCALE: 1"= 60'

# SITE MAP AND INVESTIGATION LOCATIONS

WORK PLAN FOR PHASE II ENVIRONMENTAL SITE ASSESSMENT
PROPOSED TRILLIUM NATURE SANCTUARY
1200 AND 1202 JACKSON STREET
ST. PAUL, MINNESOTA


BRAUN INTERTEC
11001 Hampshire Avenue So.
Minneapolis, MN 55438
PH. (952) 995-2000
FAX (952) 995-2020


Base Dwg Provided By:

Project No: SP1200179A

Drawing No: SP1200179

| | |
|---|---|
| Scale: | 1"= 60' |
| Drawn By: | JAG |
| Date Drawn: | 10/4/12 |
| Checked By: | JAF |
| Last Modified: | 10/5/12 |

Sheet: of | Fig:

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**Table 1**
**Soil Analytical Results**
**Proposed Trillium Nature Sanctuary**
**1200 and 1202 Jackson Street, Saint Paul**
**SP-12-00179A**

| | Sample Identifier | | | | | | | | | | Recreational Soil Reference Value (mg/kg) | Residential Soil Reference Value (mg/kg) | Industrial Soil Reference Value (mg/kg) | Tier I Soil Leaching Value (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PP-1(0.5-2.5) | PP-2(0.5-2.5) | PP-3(0.5-2.5) | PP-4(5.0-7.5) | PP-5(0.5-2.5) | PP-6(0.5-2.5) | PP-7(5.0-7.5) | PP-8(7.5-10) | PP-9(2.5-5.0) | Trip Blank | | | | |
| | 11/16/2012 | 11/16/2012 | 11/16/2012 | 11/15/2012 | 11/15/2012 | 11/15/2012 | 11/16/2012 | 11/15/2012 | 11/15/2012 | 11/16/2012 | | | | |
| | 1207078 | 1207078 | 1207078 | 1207040 | 1207040 | 1207040 | 1207078 | 1207040 | 1207040 | 1207078 | | | | |
| Compound/Parameter | Fill soil. PID=0 ppm | Fill soil. PID=0 ppm | Fill soil w/ash. PID=0 | Fill soil w/ash&debris. PID =0 | Fill soil. PID=234.7 | Fill soil w/debris. PID=0 | Fill soil w/ash&slag. PID=0 | Fill soil w/ash, slag & metal. PID=0 | Fill soil w/debris. | | | | | |
| **Volatile Organic Compounds (mg/kg)** | | | | | | | | | | | | | | |
| 1,2,4-Trimethylbenzene | <0.13 | <0.13 | <0.14 | <0.17 | **3.1** | <0.14 | <0.16 | <0.16 | <0.14 | <0.12 | 20 | 8 | 25 | NE |
| 1,3,5-Trimethylbenzene | <0.13 | <0.13 | <0.14 | <0.17 | **1.5** | <0.14 | <0.16 | <0.16 | <0.14 | <0.12 | 8 | 3 | 10 | NE |
| 4-Isopropyltoluene | <0.054 | <0.052 | <0.057 | <0.068 | **0.13** | <0.055 | <0.063 | <0.062 | <0.055 | <0.050 | NE | NE | NE | NE |
| **Semivolatile Organic Compounds (mg/kg)** | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | <0.14 | <0.13 | **0.86** | <0.88 [16] | **0.64** | <0.71 [12] [16] | <0.24 [13] | <0.16 [12] | **0.25** | ---- | 120 | 100 | 369 | NE |
| Acenaphthene | <0.14 | <0.13 | **1.1** | **2.4** [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | <0.16 [12] | **0.63** | ---- | 1860 | 1200 | 5260 | 50 |
| Acenaphthylene | **0.29** | <0.13 | <0.18 | <0.88 [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | <0.16 [12] | <0.14 | ---- | NE | NE | NE | NE |
| Anthracene | <0.14 | <0.13 | **2.3** | **5.1** [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | <0.16 [12] | **1.9** | ---- | 10000 | 7880 | 45400 | 942 |
| Benz(a)anthracene | <0.14 | <0.13 | **4.6** | **13** [16] | **0.14** | <0.71 [12] [16] | <0.24 [13] | **0.35** [12] | **4.2** | ---- | cPah | cPah | cPah | cPah |
| Benzo(a)pyrene | <0.14 | <0.13 | **3.2** | **10** [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | **0.3** [12] | **3.3** | ---- | cPah | cPah | cPah | cPah |
| Benzo(b)fluoranthene | <0.14 | <0.13 | **3.1** | **10** [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | **0.34** [12] | **3.1** | ---- | cPah | cPah | cPah | cPah |
| Benzo(g,h,i)perylene | <0.14 | <0.13 | **1.3** | **4.6** [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | **0.19** [12] | **1.2** | ---- | NE | NE | NE | NE |
| Benzo(k)fluoranthene | <0.14 | <0.13 | **2.8** | **8.4** [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | **0.26** [12] | **2.9** | ---- | cPah | cPah | cPah | cPah |
| Carbazole | <0.36 | <0.34 | **1.8** | **3** [16] | <0.35 | <1.8 [12] [16] | <0.60 [13] | <0.41 [12] | **0.95** | ---- | 720 | 700 | 1310 | NE |
| Chrysene | **0.16** | <0.13 | **4.1** | **12** [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | **0.44** [12] | **3.8** | ---- | cPah | cPah | cPah | cPah |
| Dibenz(a,h)anthracene | <0.14 | <0.13 | **0.56** | <0.88 [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | <0.16 [12] | <0.14 | ---- | cPah | cPah | cPah | cPah |
| Dibenzofuran | <0.14 | <0.13 | **1.1** | **1.4** [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | <0.16 [12] | **0.51** | ---- | 130 | 104 | 810 | NE |
| Fluoranthene | **0.21** | <0.13 | **9.7** [14] | **24** [16] | **0.43** | <0.71 [12] [16] | <0.24 [13] | **0.5** [12] | **9.2** [14] | ---- | 1290 | 1080 | 6800 | 295 |
| Fluorene | <0.14 | <0.13 | **1.5** | **2** [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | <0.16 [12] | **0.81** | ---- | 1200 | 850 | 4120 | 47 |
| Indeno(1,2,3-cd)pyrene | <0.14 | <0.13 | **1.3** | **4.7** [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | <0.16 [12] | **1.3** | ---- | cPah | cPah | cPah | cPah |
| Naphthalene | **0.79** | <0.13 | **2** | **1.8** [16] | <0.14 | <0.71 [12] [16] | <0.24 [13] | <0.16 [12] | **0.47** | ---- | 24 | 10 | 28 | 7.5 |
| Phenanthrene | **0.31** | <0.13 | **12** [14] | **21** [16] | **0.24** | <0.71 [12] [16] | <0.24 [13] | **0.8** [12] | **8.4** [14] | ---- | NE | NE | NE | NE |
| Pyrene | **0.24** | <0.13 | **7.3** | **23** [16] | **0.32** | <0.71 [12] [16] | <0.24 [13] | **0.32** [12] | **8.8** [14] | ---- | 1060 | 890 | 5800 | 272 |
| BaP Equivalent** | **0.002** | --- | **4.73** | **13.73** | **0.01** | --- | --- | **0.40** | **4.49** | ---- | 2 | 2 | 3 | 10.2 |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | |
| Diesel Range Organics (DRO) | <9.0 [3] | <8.4 [3] | **51** [3] | **540** [14] [3] | **56** [3] [9] | **45** [3] | **42** [3] | **200** [14] [3] | **190** [14] [4] | ---- | NE | NE | NE | NE |
| Gasoline Range Organics (GRO) | <11 | <10 | <11 [1] | <14 [2] | **160** [14] [2] | <11 | <13 | <12 | <11 [2] | ---- | NE | NE | NE | NE |
| **Metals (mg/kg)** | | | | | | | | | | | | | | |
| Arsenic | **2.5** | <1.8 | **7.2** | <5.0 [10] | <3.7 [10] | **3.9** | **24** | **28** | **3.2** | ---- | 11 | 9 | 20 | 15.1 |
| Barium | **56** | **16** | **160** | **820** | **27** | **82** | **1900** | **710** | **61** | ---- | 1,100 | 1,100 | 18,000 | 842 |
| Cadmium | <0.54 | <0.44 | **0.83** | **4.8** | <0.93 [10] | **5.5** | **2.8** | <3.0 [10] | <0.48 | ---- | 35 | 25 | 200 | 4.4 |
| Chromium | **19** | **14** | **18** | **31** | **21** | **21** | **63** | **44** | **17** | ---- | 120 [c] | 87 [c] | 650 [c] | 18 [c] |
| Lead | **6.9** | **4.3** | **200** | **14,000** | **3.6** | **72** | **2100** | **570** | **120** | ---- | 300 | 300 | 700 | 525 |
| Mercury | <0.022 | <0.020 | **0.15** | **0.82** | <0.020 | **0.078** | **0.2** | **0.067** | **0.057** | ---- | 1.2 | 0.5 | 1.5 | 1.6 |
| Selenium | <2.2 | <1.8 | <2.2 | <5.0 [10] | <3.7 [10] | <2.0 | <4.8 [10] | <12 [10] | <1.9 | ---- | 200 | 160 | 1300 | 1.5 |
| Silver | <0.54 | <0.44 | <0.55 | <1.2 [10] | <0.93 [10] | <0.49 | <1.2 [10] | <3.0 [10] | <0.48 | ---- | 200 | 160 | 1300 | 3.9 |

**Notes:**

[1] The sample chromatogram indicates the presence of lower boiling hydrocarbons than expected in the gasoline range chromatogram.

[2] The sample chromatogram indicates the presence of higher boiling hydrocarbons than expected in the gasoline range chromatogram.

[3] The sample chromatogram indicates the presence of lower and higher boiling hydrocarbons than expected in the diesel range chromatogram.

[4] The sample chromatogram indicates the presence of higher boiling hydrocarbons than expected in the diesel range chromatogram.

[9] The relative percent difference (RPD) was outside of laboratory control limits for the sample and sample duplicate (DUP).

[10] The sample was diluted due to the presence of high levels of non-target analytes resulting in elevated reporting limits.

[12] One or more surrogate recoveries reported with this sample analysis are outside of the laboratory control limits.

[13] The method reporting limits (MRLs) are elevated due to adjustments of the sample preparation amounts. This was necessary because of the sample matrix.

[14] The method reporting limit (MRL) was raised for one or more analytes; a dilution of the sample was necessary due to high analyte levels and/or matrix interferences.

[16] The method reporting limit (MRL) is elevated because a dilution was required due to the presence of a sample matrix interference with the internal standard.

mg/kg = Milligrams per kilogram.

< = Less than the reporting limit indicated in parentheses.

---- = Not analyzed or calculated for this parameter

NE = Not Established

SRV - Soil Reference Value established by the Minnesota Pollution Control Agency; 1999, revised 2009

SLV - Soil Leaching Value established by the Minnesota Pollution Control Agency; 1999, revised 2005

cPAH = Individual criteria not established. Included in BaP equivalent calculation.

** = Benzo(a)pyrene (BaP) equivalent is calculated based on the concentration and weighted toxicity of carcinogenic PAHs (cPAH); Minnesota Pollution Control Agency, 2002.

[c] = Criteria for hexavalent chromium.

**Table 2**
**Groundwater Analytical Results**
**Proposed Trillium Nature Sanctuary**
**1200 and 1202 Jackson Street, Saint Paul**
**SP-12-00179A**

| Compound/Parameter | Sample Identifier | | Drinking Water Criteria (ug/L) |
|---|---|---|---|
| | **PP-4W** | **PP-9W** | |
| | **11/15/2012** | **11/15/2012** | |
| | **1207040** | **1207040** | |
| **Volatile Organic Compounds (ug/L)** | | | |
| | ND | ND | |
| **Total Petroleum Hydrocarbons (ug/L)** | | | |
| Diesel Range Organics (DRO) | **150** [10] [13] [3] [6] | **230** [10] [13] [3] [7] | NE |
| Gasoline Range Organics (GRO) | <200 [13] [5] | <200 [13] | NE |
| | | | |

**Notes:**

[3] The sample chromatogram indicates the presence of higher boiling hydrocarbons than expected in the diesel range chromatogram.

[5] The sample pH was 3; this is above the method specified limit (pH<2).

[6] The sample pH was 6; this is above the method specified limit (pH<2).

[7] The sample pH was 7; this is above the method specified limit (pH<2).

[10] See case narrative section for further information.

[13] The method reporting limits (MRLs) were raised due to reduced sample volume as a result of high sample sediment content.

ug/L = Micrograms per liter.

< = Less than the reporting limit indicated in parentheses.

---- = Not analyzed or calculated for this parameter

NE =Not Established

Drinking Water Criteria from Minnesota Pollution Control Agency Risk Based Site Evaluation Process Groundwater Guidance Document, Revised 08/2010.

**Table 3**
**Soil Vapor Analytical Results**
**Proposed Trillium Nature Sanctuary**
**1200 and 1202 Jackson Street, Saint Paul**
**SP-12-00179A**

| Compound/Parameter | Sample Identifier | | | Industrial ISV ($ug/m^3$) | Industrial 10X ISV ($ug/m^3$) |
|---|---|---|---|---|---|
| | **SV-1(4-6)** | **SV-2(4-6)** | **SV-3(3-6)** | | |
| | **11/16/2012** | **11/16/2012** | **11/16/2012** | | |
| | **1207079** | **1207079** | **1207079** | | |
| **Tentatively Identified Compounds - Volatile Compounds ($ug/m^3$)** | | | | | |
| 1-Chloro-3-methylbutane | **46** [3] [4] | ---- | ---- | | |
| 2-Methylbutane | **26** [3] [4] | ---- | ---- | | |
| 3,5,5-Trimethyl-1-hexene | **80** [3] [4] | ---- | ---- | | |
| Pentane | **49** [3] [4] | ---- | ---- | | |
| Unknown analyte | **240** [3] [4] [5] | **430** [3] [4] [5] | **460** [3] [4] [5] | | |
| **Volatile Organic Compounds ($ug/m^3$)** | | | | | |
| 1,1,1-Trichloroethane | <2.50 | **3.81** | **11.3** | 10000 | 100000 |
| 1,3-Butadiene | **1.71** | **2.28** | **3.38** | 1 | 10 |
| 2-Butanone (MEK) | **9.63** | **6.74** | **9.19** | 10000 | 100000 |
| 2-Propanol | **6.86** | <1.19 | <1.24 | 20000 | 200000 |
| 4-Methyl-2-pentanone | **2.1** | <1.84 | <1.92 | 8000 | 80000 |
| Acetone | **59.7** | **19.4** | **32.8** | 87000 | 870000 |
| Benzene | **3.67** | <2.98 | <3.11 | 13 | 130 |
| Carbon disulfide | **7.03** | **1.69** | <1.46 | 2000 | 20000 |
| Dichlorodifluoromethane | **3.94** | **30** | **445** | 600 | 6000 |
| Ethanol | **18.3** | **4.64** | <3.73 | 42000 | 420000 |
| Ethyl Acetate | **18** | <1.62 | **3.43** | 8000 | 80000 |
| n-Heptane | **40.1** | <1.84 | <1.92 | NE | NE |
| n-Hexane | **113** | **2.92** | **3.36** | 6000 | 60000 |
| Propylene | **213** | **31.8** | **48.5** | 8000 | 80000 |
| Tetrachloroethene | <3.00 | **48.5** | <3.17 | 60 | 600 |
| Toluene | **3.5** | **4.03** | **2.84** | 10000 | 100000 |
| Trichlorofluoromethane | <2.58 | **10.4** | **135** | 2000 | 20000 |

**Notes:**

[3] Compounds were tentatively identified by comparison to the NIST (NBS) database of mass spectra. These identifications represent the best fit obtained from the database search, subject to the interpretation of the analyst.

[4] Concentrations are estimated values calculated relative to the closest eluting internal standard using peak areas from the total ion chromatogram and a relative response factor of one.

[5] The reported value for the unknown analyte is based on a molecular weight of 100 because the actual molecular weight is not known.

$ug/m^3$ = Micrograms per cubic meter.

< = Less than the reporting limit indicated in parentheses.

---- = Not analyzed or calculated for this parameter

NE = Not Established

Intrusion Screening Values (ISVs) for the Minnsota Pollution Control Agency Petroleum Remediation Program, October 2010

BRAUN INTERTEC

# SAMPLE LOCATION MAP
## PHASE II ENVIRONMENTAL SITE ASSESSMENT
## SAINT PAUL PORT AUTHORITY – TRILLIUM SITE
## ST. PAUL, MINNESOTA

APPROXIMATE GRADED AREA
PROPOSED ROUTE FOR RESTORED TROUT BROOK
PROPOSED CREEK OUTLET TO WETLAND
ACTIVE RAILROAD TRACKS
ABANDONED RAILROAD TRACKS
CREATED WETLANDS
MODERNISTIC DIE CUTTING
TILSEN CONTAINER COMPANY
HWY 36-E

ST-1 ST-2 ST-3 ST-4 ST-5 ST-6 ST-7 ST-8 ST-9
TP-1 TP-2 TP-3 TP-4 TP-5 TP-6 TP-7 TP-8 TP-9 TP-10 TP-11 TP-12 TP-13 TP-14 TP-15 TP-16 TP-17 TP-18 TP-19 TP-20 TP-21
ACM-1 ACM-2 ACM-3 ACM-4 ACM-5 ACM-6

SOIL BORING WITH TEMPORARY WELL

SOIL BORING

TEST PIT

ASBESTOS SAMPLE LOCATION

N

250' 0 500'

SCALE 1"= 500'

| | | | |
|---|---|---|---|
| INT | | DATE | 11-6-03 |
| DRAWN BY: | JAG | | |
| APP'D BY: | JAF | | 12-15-03 |
| JOB NO. | CMXX-03-0099 | SHEET | OF |
| DWG. NO. | MX30099A | | |
| SCALE | 1"= 500' | | |

FIGURE NO. 2

**Table 1**
**Soil Analytical Results**
**Trillium Site**
**St. Paul, Minnesota**
**Project CMXX-03-0099**

| Compound/Parameter | CAS No. | Sample Identifier ST-1 (10') 11/11/2003 | ST-2 (2-4') 11/12/2003 | ST-3 (5') 11/13/2003 | ST-4 (10') 11/11/2003 | ST-5 (10') 11/12/2003 | ST-6 (10') 11/11/2003 | ST-7 (7.5') 11/13/2003 | ST-8 (10') 11/11/2003 | ST-9 (7.5') 11/13/2003 | Recreational Soil Reference Value (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds (mg/kg)** | | | | | | | | | | | |
| Toluene | 108-88-3 | **0.064** | < 0.050 | < 0.050 | < 0.072 | < 0.050 | < 0.050 | < 0.050 | < 0.080 | < 0.050 | 260 |
| **Polynuclear Aromatic Hydrocarbons (mg/kg)** | | | | | | | | | | | |
| Acenaphthene | 83-32-9 | < 0.066 | < 0.33 | < 0.067 | < 0.066 | < 0.066 | < 0.066 | < 0.066 | < 0.10 | < 0.065 | 1,860 |
| Benzo(a)anthracene | 56-55-3 | **0.07** | < 0.33 | < 0.067 | **0.07** | < 0.066 | < 0.066 | < 0.066 | < 0.10 | < 0.065 | *** |
| Benzo(b)fluoranthene | 205-99-2 | **0.08** | < 0.33 | < 0.067 | < 0.066 | < 0.066 | < 0.066 | < 0.066 | < 0.10 | < 0.065 | *** |
| Benzo(g,h,i)perylene | 191-24-2 | **0.08** | < 0.33 | < 0.067 | **0.07** | < 0.066 | < 0.066 | < 0.066 | < 0.10 | < 0.065 | NE |
| Benzo(a)pyrene | 50-32-8 | **0.08** | < 0.33 | < 0.067 | **0.07** | < 0.066 | < 0.066 | < 0.066 | < 0.10 | < 0.065 | *** |
| Chrysene | 218-01-9 | **0.1** | < 0.33 | < 0.067 | **0.12** | < 0.066 | < 0.066 | < 0.066 | < 0.10 | < 0.065 | *** |
| Dibenzofuran | 132-64-9 | **0.08** | < 0.33 | < 0.067 | < 0.066 | < 0.066 | < 0.066 | < 0.066 | < 0.10 | < 0.065 | 130 |
| Fluoranthene | 206-44-0 | **0.13** | **0.36** | < 0.067 | < 0.066 | < 0.066 | < 0.066 | **0.07** | < 0.10 | **0.1** | 1,290 |
| 2-Methylnaphthalene | 91-57-6 | **0.34** | < 0.33 | < 0.067 | < 0.066 | < 0.066 | < 0.066 | < 0.066 | < 0.10 | < 0.065 | NE |
| Naphthalene | 91-20-3 | **0.26** | < 0.33 | < 0.067 | < 0.066 | < 0.066 | < 0.066 | < 0.066 | < 0.10 | < 0.065 | 24 |
| Phenanthrene | 85-01-8 | **0.24** | < 0.33 | < 0.067 | < 0.066 | < 0.066 | < 0.066 | < 0.066 | < 0.10 | < 0.065 | NE |
| Pyrene | 129-00-0 | **0.13** | **0.37** | < 0.067 | **0.07** | < 0.066 | < 0.066 | < 0.066 | < 0.10 | **0.08** | 1060 |
| BaP Equivalent** | | **0.146** | **0.651** | **0.132** | **0.135** | **0.13** | **0.13** | **0.13** | **0.197** | **0.128** | 2 |
| **Polychlorinated Biphenyls (PCBs) (mg/kg)** | | | | | | | | | | | |
| Total PCBs | 1336-36-3 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.4 |
| **Metals (mg/kg)** | | | | | | | | | | | |
| Arsenic, Total | 7440-38-2 | **24** | < 10 | **21** | < 10 | < 10 | < 10 | < 10 | < 10 | **22** | 12 |
| Barium, Total | 7440-41-7 | **1,000** | **80** | **80** | **34** | **50** | **27** | **21** | **17** | **100** | 1,200 |
| Cadmium, Total | 7440-43-9 | < 1.2 | < 0.60 | < 1.2 | < 0.60 | **0.96** | < 0.60 | < 0.60 | < 0.60 | < 1.2 | 40 |
| Chromium, Total | 16065-83-1 | < 10 | **8.6** | **22** | **8.9** | **8** | **8.5** | **7.4** | < 5.0 | **20** | 80 * |
| Lead, Total | 7439-92-1 | < 7.4 | **98** | < 7.4 | **19** | **46** | < 3.7 | **3.9** | < 3.7 | **33** | 400 |
| Mercury, Total | 7439-97-6 | < 0.020 | **0.08** | < 0.020 | < 0.020 | < 0.020 | < 0.020 | < 0.020 | < 0.020 | **0.02** | 1.5 |
| Selenium, Total | 7782-49-2 | < 32 | < 16 | < 32 | < 16 | < 16 | < 16 | < 16 | < 16 | < 32 | 200 |
| Silver, Total | 7440-22-4 | < 2.0 | < 1.0 | < 2.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 2.0 | 200 |
| **Other Parameters (mg/kg)** | | | | | | | | | | | |
| Gasoline Range Organics | | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | NE |
| Diesel Range Organics | | **63** | **23** | < 10 | < 10 | < 12 | < 10 | < 10 | **74** | < 12 | NE |

**Notes:**
mg/kg = Milligrams per kilogram.
< - Compound/parameter was not detected above the laboratory reporting limit indicated.
NE =Not Established
ND = Not detected above the laboratory reporting limit.
SRV - 1999 Soil Reference Value eastablished by the Minnesota Pollution Control Agency.
* Standard for hexavalent chromium is provided
** Benzo(a)pyrene (BaP) equivalent is a calculated value using the 2002 equivalent update formula and is based on the weighted concentration and toxicity of the following compounds: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, debenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene.
*** Individual standard not established, compound included in calculation of BaP equivalent.
Shaded cells indicate a SRV exceedance.

**Table 2**
**Test Pit Analytical Results**
**Trillium Site**
**St. Paul, Minnesota**
**Project CMXX-03-0099**

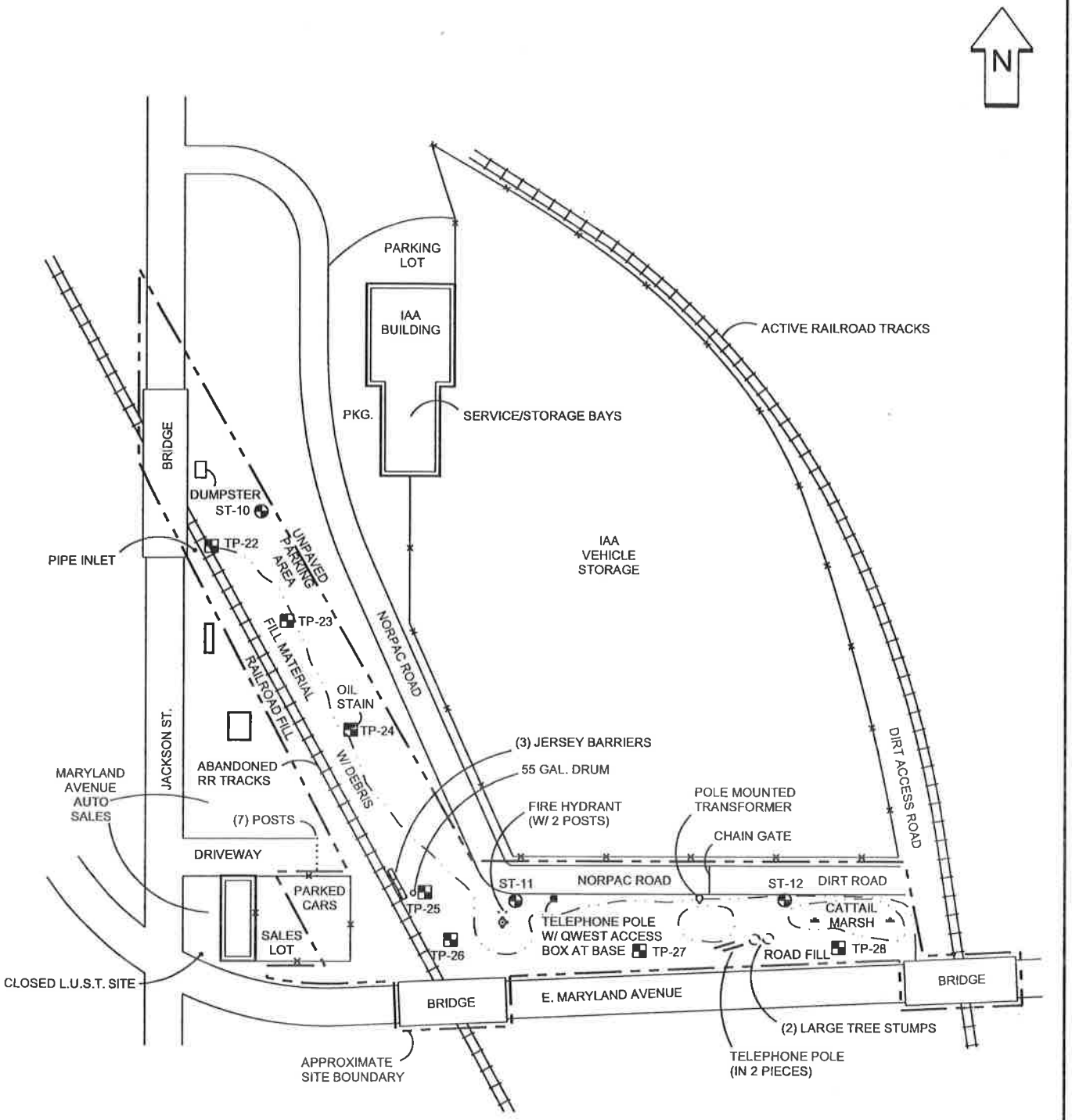
| Compound/Parameter | CAS No. | Sample Identifier: TP-2 (7-14') 11/14/2003 | TP-3 (2'-3') 11/14/2003 | TP-6 (13'-16') 11/18/2003 | TP-7 (10-16') 11/14/2003 | TP-8 (8'-12') 11/14/2003 | TP-13 (2'-5') 11/18/2003 | TP-15 (5'-9') 11/18/2003 | TP-16 (3'-8') 11/14/2003 | TP-17 (1'-4') 11/14/2003 | TP-18 (4'-7') 11/18/2003 | TP-21 (0'-4') 11/18/2003 | Recreational Soil Reference Value (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds (mg/kg)** | | | | | | | | | | | | | |
| Benzene | 71-43-2 | < 0.050 | **0.24** | < 0.070 | < 0.050 | < 0.050 | < 0.050 | < 0.060 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | 3 |
| Ethyl Benzene | 100-41-4 | < 0.050 | **0.2** | < 0.070 | < 0.050 | < 0.050 | < 0.050 | < 0.060 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | 200 |
| Isopropylbenzene (cumene) | 98-82-8 | < 0.050 | **0.12** | < 0.070 | < 0.050 | < 0.050 | < 0.050 | < 0.060 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | 74 |
| Naphthalene | 91-20-3 | < 0.050 | **0.67** | < 0.070 | < 0.050 | < 0.050 | **0.054** | < 0.060 | **0.2** | < 0.050 | < 0.050 | **0.17** | 24 |
| n-Propylbenzene | 103-65-1 | < 0.050 | **0.14** | < 0.070 | < 0.050 | < 0.050 | < 0.050 | < 0.060 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | 70 |
| Toluene | 108-88-3 | < 0.050 | **1.4** | < 0.070 | < 0.050 | < 0.050 | < 0.050 | < 0.060 | **0.16** | < 0.050 | < 0.050 | **0.07** | 260 |
| 1,2,4-Trimethylbenzene | 95-63-6 | < 0.050 | **0.45** | < 0.070 | < 0.050 | < 0.050 | < 0.050 | < 0.060 | **0.073** | < 0.050 | < 0.050 | **0.05** | 5 |
| 1,3,5-Trimethylbenzene | 108-67-8 | < 0.050 | **0.11** | < 0.070 | < 0.050 | < 0.050 | < 0.050 | < 0.060 | < 0.050 | < 0.050 | < 0.050 | < 0.050 | 9 |
| m,p-Xylenes | 108-38-3/106-42-3 | < 0.050 | **1.2** | < 0.070 | < 0.050 | < 0.050 | < 0.050 | < 0.060 | **0.15** | < 0.050 | < 0.050 | **0.073** | 248 |
| o-Xylene | 95-47-6 | < 0.050 | **0.66** | < 0.070 | < 0.050 | < 0.050 | < 0.050 | < 0.060 | **0.11** | < 0.050 | < 0.050 | **0.056** | 248 |
| **Polynuclear Aromatic Hydrocarbons (mg/kg)** | | | | | | | | | | | | | |
| Acenaphthylene | 208-96-8 | < 0.098 | < 0.066 | < 0.066 | < 0.10 | < 0.066 | < 0.067 | < 0.064 | < 0.066 | < 0.33 | < 0.066 | **0.09** | NE |
| Anthracene | 120-12-7 | < 0.098 | **0.08** | < 0.066 | < 0.10 | < 0.066 | < 0.067 | < 0.064 | **0.1** | < 0.33 | < 0.066 | **0.14** | 10,000 |
| Benzo(a)anthracene | 56-55-3 | < 0.098 | **0.2** | < 0.066 | < 0.10 | < 0.066 | **0.22** | < 0.064 | **0.18** | < 0.33 | < 0.066 | **0.33** | *** |
| Benzo(b)fluoranthene | 205-99-2 | < 0.098 | **0.2** | < 0.066 | < 0.10 | < 0.066 | **0.2** | < 0.064 | **0.23** | < 0.33 | < 0.066 | **0.36** | *** |
| Benzo(k)fluoranthene | 207-08-9 | < 0.098 | **0.15** | < 0.066 | < 0.10 | < 0.066 | **0.17** | < 0.064 | **0.16** | < 0.33 | < 0.066 | **0.3** | *** |
| Benzo(g,h,i)perylene | 191-24-2 | < 0.098 | **0.13** | < 0.066 | < 0.10 | < 0.066 | **0.15** | < 0.064 | **0.16** | < 0.33 | < 0.066 | **0.09** | NE |
| Benzo(a)pyrene | 50-32-8 | < 0.098 | **0.2** | < 0.066 | < 0.10 | < 0.066 | **0.23** | < 0.064 | **0.17** | < 0.33 | < 0.066 | **0.28** | *** |
| Chrysene | 218-01-9 | < 0.098 | **0.3** | < 0.066 | < 0.10 | < 0.066 | **0.24** | < 0.064 | **0.26** | < 0.33 | < 0.066 | **0.39** | *** |
| Dibenzofuran | 132-64-9 | < 0.098 | **0.27** | < 0.066 | < 0.10 | < 0.066 | **0.08** | < 0.064 | **0.12** | < 0.33 | < 0.066 | **0.13** | 130 |
| Fluoranthene | 206-44-0 | < 0.098 | **0.34** | < 0.066 | < 0.10 | < 0.066 | **0.36** | < 0.064 | **0.36** | < 0.33 | **0.08** | **0.39** | 1,290 |
| Fluorene | 86-73-7 | < 0.098 | < 0.066 | < 0.066 | < 0.10 | < 0.066 | < 0.067 | < 0.064 | < 0.066 | < 0.33 | < 0.066 | **0.1** | 1200 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | < 0.098 | **0.11** | < 0.066 | < 0.10 | < 0.066 | **0.14** | < 0.064 | **0.16** | < 0.33 | < 0.066 | **0.1** | *** |
| 2-Methylnaphthalene | 91-57-6 | < 0.098 | **1** | < 0.066 | < 0.10 | < 0.066 | **0.28** | < 0.064 | **0.36** | < 0.33 | < 0.066 | **0.27** | NE |
| Naphthalene | 91-20-3 | < 0.098 | **0.71** | < 0.066 | < 0.10 | < 0.066 | **0.19** | < 0.064 | **0.33** | < 0.33 | < 0.066 | **0.28** | 24 |
| Phenanthrene | 85-01-8 | < 0.098 | **0.74** | < 0.066 | < 0.10 | < 0.066 | **0.33** | < 0.064 | **0.39** | < 0.33 | **0.09** | **0.46** | NE |
| Pyrene | 129-00-0 | < 0.098 | **0.32** | < 0.066 | < 0.10 | < 0.066 | **0.37** | < 0.064 | **0.3** | < 0.33 | **0.07** | **0.38** | 1060 |
| BaP Equivalent** | | **0.193** | **0.306** | **0.13** | **0.197** | **0.13** | **0.343** | **0.126** | **0.283** | **0.651** | **0.13** | **0.43** | 2 |
| **Polychlorinated Biphenyls (PCBs) (mg/kg)** | | | | | | | | | | | | | |
| PCB 1260 | | < 0.14 | < 0.14 | < 0.14 | < 0.14 | < 0.14 | < 0.14 | < 0.14 | < 0.14 | < 0.14 | < 0.14 | **0.2** | NE |
| Total PCBs | 1336-36-3 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | **0.2** | 1.4 |
| **Metals (mg/kg)** | | | | | | | | | | | | | |
| Arsenic, Total | 7440-38-2 | < 10 | **37** | < 10 | < 10 | **10** | **16** | < 10 | **39** | < 10 | < 10 | **17** | 12 |
| Barium, Total | 7440-41-7 | **43** | **77** | **23** | **58** | **50** | **69** | **170** | **86** | **59** | **36** | **110** | 1,200 |
| Cadmium, Total | 7440-43-9 | < 0.60 | **1.8** | < 0.60 | < 0.60 | < 0.60 | < 0.60 | < 0.60 | < 1.2 | < 0.60 | < 0.60 | < 0.60 | 40 |
| Chromium, Total | 16065-83-1 | **9.4** | **11** | **8.4** | **11** | **14** | **8.5** | **8.3** | **14** | **8** | **7.4** | **11** | 80 * |
| Lead, Total | 7439-92-1 | **4.6** | **150** | < 3.7 | **4.4** | **3.8** | **110** | < 3.7 | **200** | **37** | **380** | **320** | 400 |
| Mercury, Total | 7439-97-6 | < 0.020 | **0.06** | < 0.020 | < 0.020 | **0.02** | **0.42** | < 0.020 | **0.2** | 0.06 | **13** | **0.32** | 1.5 |
| Selenium, Total | 7782-49-2 | < 16 | < 32 | < 16 | < 16 | < 16 | < 16 | < 16 | < 32 | < 16 | < 16 | < 16 | 200 |
| Silver, Total | 7440-22-4 | < 1.0 | < 2.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 2.0 | < 1.0 | < 1.0 | < 1.0 | 200 |
| **Other Parameters (mg/kg)** | | | | | | | | | | | | | |
| Gasoline Range Organics | | < 10 | **13** | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | **28** | NE |
| Diesel Range Organics | | < 10 | **70** | < 10 | < 10 | < 10 | **36** | < 10 | **110** | **11** | **44** | **2,200** | NE |

**Notes:**
mg/kg = Milligrams per kilogram.
< - Compound/parameter was not detected above the laboratory reporting limit indicated.
NE =Not Established
ND = Not detected above the laboratory reporting limit.
SRV - 1999 Soil Reference Value eastablished by the Minnesota Pollution Control Agency.
* Standard for hexavalent chromium is provided
** Benzo(a)pyrene (BaP) equivalent is a calculated value using the 2002 equivalent update formula and is based on the weighted concentration and toxicity of the following compounds: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, debenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene.
*** Individual standard not established, compound included in calculation of BaP equivalent.
Shaded cells indicate a SRV exceedance.

**Table 3**
**Groundwater Analytical Results**
**Trillium Site**
**St. Paul, Minnesota**
**Project CMXX-03-0099**

| Compound/Parameter | CAS No. | Sample Identifier | | | | | Health Risk Limit (ug/l) |
|---|---|---|---|---|---|---|---|
| | | **ST-2W** | **ST-3W** | **ST-5W** | **ST-7W** | **ST-9W** | |
| | | **11/12/2003** | **11/13/2003** | **11/12/2003** | **11/13/2003** | **11/13/2003** | |
| **Volatile Organic Compounds (ug/l )** | | | | | | | |
| Chloroform | 67-66-3 | < 2.0 | < 2.0 | **16** | < 2.0 | < 2.0 | 60 |
| 1,1-Dichloroethane | 75-34-3 | < 2.0 | < 2.0 | < 2.0 | **2.2** | < 2.0 | 70 |
| 1,1,1-Trichloroethane | 71-55-6 | < 2.0 | < 2.0 | < 2.0 | **7.4** | < 2.0 | 600 |
| **Polynuclear Aromatic Hydrocarbons (PAHs) (ug/l)** | | | | | | | |
| Total PAHs | | ND | ND | ND | ND | ND | NE |
| **Metals (ug/l)** | | | | | | | |
| Arsenic, Dissolved | 7440-38-2 | < 360 | **1.7** | < 360 | **1.3** | **4.5** | NE (10) |
| Barium, Dissolved | 7440-41-7 | **570** | **58** | **89** | **180** | **100** | 2,000 |
| Cadmium, Dissolved | 7440-43-9 | < 20 | < 0.13 | < 20 | < 0.13 | < 0.13 | 4 |
| Chromium, Total Dissolved | 16065-83-1 | < 60 | < 0.53 | < 60 | **0.55** | < 0.53 | 100* |
| Lead, Dissolved | 7439-92-1 | < 180 | < 0.30 | < 180 | < 0.30 | **0.35** | NE |
| Mercury, Dissolved | 7439-97-6 | < 0.2 | < 0.20 | < 0.2 | < 0.2 | < 0.20 | NE (2) |
| Selenium, Dissolved | 7782-49-2 | < 600 | **1.4** | < 600 | **5.8** | < 0.50 | 30 |
| Silver, Dissolved | 7440-22-4 | < 40 | < 1.0 | < 40 | < 1.0 | < 1.0 | 30 |
| **Other Parameters (ug/l)** | | | | | | | |
| Gasoline Range Organics | | < 100 | < 200 | < 100 | < 200 | < 100 | NE |
| Diesel Range Organics | | **110** [a] | < 100 | < 100 | < 100 | < 100 | NE |

**Notes:**
ug/l = Micrograms per liter.
< - Compound/parameter was not detected above the laboratory reporting limit indicated.
NE =Not Established
ND = Not Detected above the laboratory reporting limit.
When no HRL is established, Maximum Contaminant Level established by US EPA is provided in parenthesis or a Health Based Value is provided in bold italics.
HRL - January 2001 Health Risk Limit established by the Minnesota Department of Health.
* Standard for hexavalent chromium is provided
[a] The sample chromatogram indicates the presence of higher boiling hydrocarbons than expected in a diesel range chromatogram.




PROPOSED SOIL BORING LOCATION

PROPOSED TEST PIT LOCATION

BRAUN INTERTEC

NORTH TRILLIUM SITE MAP
PHASE II ENVIRONMENTAL SITE ASSESSMENT
TRILLIUM SITE – NORTH OF MARYLAND AVENUE
ST. PAUL, MINNESOTA

| INT | REVISION | SHEET |
|---|---|---|
| DRAWN BY: JAG | 7-19-04 | |
| APP'D BY: JAF | 4-26-05 | OF |
| JOB NO. BL0402948 | | |
| DWG. NO. BL0402948 | | FIGURE NO. |
| SCALE NONE | | 2 |

**Table 1**
**Soil Analytical Results**
**BL-04-02948**
**St. Paul , Minnesota**
**North Trillium Site**

| Compound/Parameter | CAS No. | ST-10 @ 5' 03/07/2005 | ST-11 @ 5' 03/07/2005 | ST-12 @ 5' 03/07/2005 | TP-23 6' 03/31/2005 | TP-24 5' 03/31/2005 | TP-26 2' 03/31/2005 | TP-28 @ 4' 03/09/2005 | Recreational Soil Reference Value (mg/kg) | Tier I Soil Leaching Value (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds (mg/kg)** | | | | | | | | | | |
| Naphthalene | 91-20-3 | <(0.053) | **0.067** | <(0.061) | <(0.059) | <(0.056) | <(0.053) | <(0.060) | 24 | 7.5 |
| **Semivolatile Organic Compounds (mg/kg)** | | | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | <(0.071) | **0.12** | **0.14** | < (0.079) | <(0.073) | <(0.35)[7] | <(0.080) | 120 | NE |
| Anthracene | 120-12-7 | **0.32** | <(0.088) | <(0.082) | **0.14** | <(0.073) | <(0.35)[7] | <(0.080) | 10,000 | 942 |
| Benz(a)anthracene | 56-55-3 | **0.74** | <(0.088) | <(0.082) | **0.33** | **0.19** | <(0.35)[7] | <(0.080) | *** | *** |
| Benzo(a)pyrene | 50-32-8 | **0.75** | <(0.088) | **0.089** | **0.39** | **0.27** | <(0.35)[7] | <(0.080) | *** | *** |
| Benzo(b)fluoranthene | 205-99-2 | **0.49** | <(0.088) | **0.087** | **0.26** | **0.16** | <(0.35)[7] | <(0.080) | *** | *** |
| Benzo(g,h,i)perylene | 191-24-2 | **0.29** | <(0.088) | <(0.082) | **0.19** | **0.16** | <(0.35)[7] | <(0.080) | NE | NE |
| Benzo(k)fluoranthene | 207-08-9 | **0.66** | <(0.088) | <(0.082) | **0.26** | **0.19** | <(0.35)[7] | <(0.080) | *** | *** |
| Chrysene | 218-01-9 | **0.73** | <(0.088) | **0.11** | **0.3** | **0.14** | <(0.35)[7] | <(0.080) | *** | *** |
| Dibenz(a,h)anthracene | 53-70-3 | <(0.071) | <(0.088) | <(0.082) | **0.22** | **0.19** | <(0.35)[7] | <(0.080) | *** | *** |
| Fluoranthene | 206-44-0 | **1.2** | **0.12** | **0.19** | **0.62** | **0.33** | <(0.35)[7] | <(0.080) | 1,290 | 295 |
| Fluorene | 86-73-7 | <(0.071) | <(0.088) | <(0.082) | **0.2** | **0.16** | <(0.35)[7] | <(0.080) | 1,200 | 47 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | **0.33** | <(0.088) | <(0.082) | **0.25** | **0.21** | <(0.35)[7] | <(0.080) | *** | *** |
| Naphthalene | 91-20-3 | <(0.071) | **0.11** | <(0.082) | < (0.079) | <(0.073) | <(0.35)[7] | <(0.080) | 10 | 7.5 |
| Phenanthrene | 85-01-8 | **0.52** | **0.14** | **0.19** | **0.65** | **0.15** | <(0.35)[7] | <(0.080) | NE | NE |
| Pyrene | 129-00-0 | **0.95** | <(0.088) | **0.14** | **0.67** | **0.26** | <(0.35)[7] | <(0.080) | 1,060 | 272 |
| BaP Equivalent** | | 1.02 | 0.17 | 0.17 | 0.63 | 0.45 | 0.69 | 0.16 | 2 | 10.2 |
| **Polychlorinated Biphenyls (mg/kg)** | | | | | | | | | | |
| Total PCBs | | ND | ND | ND | ND | ND | ND | ND | 1.4 | 2.1 |
| **Metals (mg/kg)** | | | | | | | | | | |
| Arsenic, Total | 7440-38-2 | **1.8** | **5.9** | **3.8** | **5** | **3.3** | **1.3** | **3** | 5 | 15.1 |
| Barium, Total | 7440-39-3 | **24** | **98** | **110** | **86** | **54** | **15** | **36** | 1,200 | 842 |
| Cadmium, Total | 7440-43-9 | <(0.53) | <(0.64) | <(0.58) | < 0.59 | < 0.56 | < 0.53 | <(0.53) | 35 | 4.4 |
| Chromium, Total | 7440-47-3 | **17** | **15** | **14** | **18** | **25** | **8.9** | **11** | 120 | 18 |
| Lead, Total | 7439-92-1 | **3** | **46** | **63** | **61** | **6.9** | **1.5** | **8.4** | 300 | 525 |
| Mercury, Total | 7439-97-6 | **0.025** | **0.065** | **0.048** | **0.46** | **0.029** | <(0.021) | **0.029** | 1.2 | 1.6 |
| Selenium, Total | 7782-49-2 | <(1.1) | <(1.3) | <(1.2) | < 1.2 | < 1.1 | <(1.1) | <(1.1) | 200 | 1.5 |
| Silver, Total | 7440-22-4 | <(0.53) | <(0.64) | <(0.58) | <(0.56) | <(0.54) | <(0.53) | <(0.53) | 200 | 3.9 |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | |
| Diesel Range Organics (DRO) | | <(9.1) | **35** [2] [6] | **47** [2] | **64**[3] [6] | **24**[2] [4] [6] | <(10)[6] | <(10) | NE | NE |
| Gasoline Range Organics (GRO) | | <(11) | <(13) | <(12) | < (13) | < (11) | < (11) | <(12) | NE | NE |

**Notes:**

[2] The sample chromatogram indicates the presence of lower and higher boiling hydrocarbons than expected in the diesel range chromatogram.

[3] The sample chromatogram indicates the presence of higher boiling hydrocarbons than expected in the diesel range chromatogram.

[4] The relative percent difference (RPD) was outside of laboratory control limits.

[6] See case narrative section for further information.

[7] The method reporting limit (MRL) was raised for one or more analytes; a dilution of the sample was necessary due to high analyte levels and/or matrix interferences.

mg/kg = Milligrams per kilogram.

< - Compound/parameter was not detected above the laboratory reporting limit indicated.

NE =Not Established

SRV - 2005 Soil Reference Value eastablished by the Minnesota Pollution Control Agency.

SLV - 2005 Soil Leaching Value established by the Minnesota Pollution Control Agency.

* Standard for hexavalent chromium is provided

** Benzo(a)pyrene (BaP) equivalent is a calculated value using the 2002 equivalent update formula and is based on the weighted concentration and toxicity of certain carcinogenic PAHs.

*** Individual standard not established, compound included in calculation of BaP equivalent.

**Table 2**
**Soil Analytical Results**
**BL-04-02948**
**St Paul, Minnesota**
**South Trillium Site**

| Compound/Parameter | Sample Identifier & Depth | ST-1 (10') | ST-1A (0-2') | ST-1B (0-2') | ST-1C (0-2') | ST-1D (0-2') | ST-2 (2-4') | ST-2A (0-2') | ST-2B (0-2') | ST-2C (0-2') | ST-2D (0-2') | Recreational Soil Reference Value (mg/kg) | Tier I Soil Leaching Value (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction from initial location | NA | NA | 5' N | 5' SE | 5' SW | NA | NA | 5' N | 5' SE | 5' SW | | |
| | Date Collected | 11/11/03 | 3/8/05 | 3/8/05 | 3/8/05 | 3/8/05 | 11/12/03 | 3/8/05 | 3/8/05 | 3/8/05 | 3/8/05 | | |
| **Metals (mg/kg)** | | | | | | | | | | | | | |
| Arsenic, Total | | 24 | 1.6 | 1.6 | 1.9 | 1.6 | < (10) | - | - | - | - | 5 | 15.1 |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | |
| Diesel Range Extractables (DRE) | | - | - | - | - | - | - | - | - | - | 14 [4] [5] | NE | NE |
| Diesel Range Organics (DRO) | | 63 | 460 [2] | 200 [2] | 57 [2] | 460 [2] | 23 | 13 [4] | <(9.6) [4] | 15 [4] | - | NE | NE |
| Gasoline Range Organics (GRO) | | < (10) | - | - | - | - | < (10) | - | - | - | - | NE | NE |

| Compound/Parameter | Sample Identifier & Depth | ST-3 (5') | ST-3A (0-2') | ST-3B (0-2') | ST-3C (0-2') | ST-3D (0-2') | TP-3 (2-3') | TP-3A (0-2') | TP-3B (0-2') | TP-3C (0-2') | TP-3D (0-2') | Recreational Soil Reference Value (mg/kg) | Tier I Soil Leaching Value (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction from initial location | NA | NA | 5' N | 5' SE | 5' SW | NA | NA | 5' N | 5' SE | 5' SW | | |
| | Date Collected | 11/13/03 | 3/8/05 | 3/8/05 | 3/8/05 | 3/8/05 | 11/14/03 | 3/8/05 | 3/8/05 | 3/8/05 | 3/8/05 | | |
| **Metals (mg/kg)** | | | | | | | | | | | | | |
| Arsenic, Total | | 21 | 4.5 | 8.1 | 7.2 | 5.2 | 37 | 20 | 21 | 14 | 22 | 5 | 15.1 |
| **Total Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | |
| Diesel Range Extractables (DRE) | | - | - | - | - | - | - | - | - | - | - | NE | NE |
| Diesel Range Organics (DRO) | | < (10) | - | - | - | - | 70 | 99 [2] | 100 [2] | 32 [2] | 240 [2] | NE | NE |
| Gasoline Range Organics (GRO) | | < (10) | - | - | - | - | 13 | 32 [3] | <(13) [6] | 12 [3] | 14 [3] | NE | NE |

**Notes:**
mg/kg = Milligrams per kilogram.
< - Compound/parameter was not detected above the laboratory reporting limit indicated.
NE =Not Established
SRV - 2005 Soil Reference Value eastablished by the Minnesota Pollution Control Agency.
SLV - 2005 Soil Leaching Value established by the Minnesota Pollution Control Agency.
[2] The sample chromatogram indicates the presence of lower and higher boiling hydrocarbons than expected in the diesel range chromatogram.
[3] The sample chromatogram indicates the presence of higher boiling hydrocarbons than expected in the gasoline range chromatogram.
[5] The sample weight exceeded the maximum weight specification for the DRO method; however, the results are reported as DRE.
[6] Methanol was not added to the soil at the time of collection as per method specifications

**Table 3**
**Groundwater Analytical Results**
**BL-04-02948**
**St Paul, Minnesota**
**North Trillium Site**

| Compound/Parameter | CAS No. | ST-10 | ST-11 | ST-12 | Health Risk Limit (ug/l) |
|---|---|---|---|---|---|
| | | 03/07/2005 | 03/07/2005 | 03/07/2005 | |
| **Semivolatile Organic Compounds (ug/L)** | | | | | |
| Acenaphthene | 83-32-9 | <(2.1) | **2.6** | <(2.1) | 400 |
| Phenanthrene | 85-01-8 | <(2.1) | **3** | <(2.1) | NE |
| **Metals (ug/L)** | | | | | |
| Arsenic, Dissolved | 7440-38-2 | **1** | **4.3** | **5.7** | NE (10) |
| Barium, Dissolved | 7440-39-3 | **260** | **940** | **470** | 2000 |
| Cadmium, Dissolved | 7440-43-9 | <(0.16) | <(0.16) | <(0.16) | 4 |
| Chromium, Dissolved | 7440-47-3 | <(0.53) | <(0.53) | <(0.53) | 100* |
| Lead, Dissolved | 7439-92-1 | <(0.30) | <(0.30) | <(0.30) | NE |
| Mercury, Total | 7439-97-6 | <(0.20) | <(0.20) | <(0.20) | NE (2) |
| Selenium, Dissolved | 7782-49-2 | <(3.6) | <(3.6) | <(3.6) | 30 |
| Silver, Dissolved | 7440-22-4 | <(0.24) | <(0.24) | <(0.24) | 30 |
| **Total Petroleum Hydrocarbons (ug/L)** | | | | | |
| Diesel Range Organics (DRO) | | <(130) [1] | <(120) [1] | <(150) [1] | NE |
| Gasoline Range Organics (GRO) | | <(200) [2] | <(200) [2] | <(200) [2] | NE |

**Notes:**
ug/l = Micrograms per liter.
< - Compound/parameter was not detected above the laboratory reporting limit indicated.
NE =Not Established
When no HRL is established, Maximum Contaminant Level established by US EPA is provided in parenthesis or a Health Based Value is provided in bold
HRL - January 2001 Health Risk Limit established by the Minnesota Department of Health.
* Standard for hexavalent chromium is provided
[1] - The sample pH was 7; this is above the method specified limit (pH<2)
[2] - The reporting limits were raised due to reduced sample volume as a result of higher sediment content

# Appendix B

# Soil Boring Logs

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **P-1**

LOCATION: N: 167621.2 E: 575142.4
See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/12/12** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 121.2 | 0.0 | | | | | | |
| | | FILL | FILL: Clayey Sand, with Gravel and roots, dark brown and black. | | | 0.0 | Soil sample for chemical analysis collected from 0 to 4 feet. |
| 118.7 | 2.5 | | | | | | |
| | | FILL | Fill: Concrete, gray. | | | 0.0 | |
| 117.7 | 3.5 | | | | | | |
| | | FILL | FILL: Lean Clay, dark brown, moist. | | | | |
| 116.7 | 4.5 | | | | | | |
| | | FILL | FILL: Peat, black, moist. | | | 0.0 | |
| 113.7 | 7.5 | | | | | | |
| | | FILL | FILL: Lean Clay, with Gravel, dark brown and black, moist. | | | 0.0 | |
| | | | | | | 0.0 | |
| 108.7 | 12.5 | | | | | | |
| | | FILL | FILL: Lean Clay, with concrete fragment, dark brown and gray, moist. | | | 0.0 | |
| 106.2 | 15.0 | | | | | | |
| | | | END OF BORING.<br><br>Boring then backfilled. | | | | |

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **P-3**

LOCATION: N: 167411.8 E: 575368.1
See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/10/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 109.8 | 0.0 | SM | SILTY SAND, fine-grained, dark brown, moist. (Topsoil) | | | 0.0 | Soil sample for chemical analysis collected from 0 to 4 feet. |
| 107.3 | 2.5 | CL | LEAN CLAY, with fine-grained Sand lense, trace roots, mottled brown and gray, moist. (Alluvium) | | | 0.0 | |
| 104.8 | 5.0 | CL | LEAN CLAY, with Fat Clay lenses and fine-grained Sand laminations, gray and brown, moist. (Alluvium) | | | 0.0 | |
| 102.3 | 7.5 | ML | SILT, with fine-grained Sand lenses, brown, moist. (Alluvium) | | | 0.0 | |
| 99.8 | 10.0 | CH | FAT CLAY, brown, moist to wet. (Alluvium) | | | 0.0 | |
| | | | | | | 0.0 | |
| 94.8 | 15.0 | | Medium-grained, brown, Poorly Graded Sand layer about 14 1/2 feet. | | | | |
| | | | END OF BORING. | | | | |
| | | | Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **P-4**

LOCATION: N: 166861.2 E: 575115.6
See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/12/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 122.1 | 0.0 | SP-SM | POORLY GRADED SAND with SILT, fine- to medium-grained, trace Gravel, brown, moist. (Alluvium) | | | 0.0 | Soil sample for chemical analysis collected from 0 to 4 feet. |
| 119.6 | 2.5 | SP | POORLY GRADED SAND, fine- to medium-grained, trace Gravel, light brown, moist. (Alluvium) | | | 0.0 | |
| 117.1 | 5.0 | SP | POORLY GRADED SAND, fine- to coarse-grained, with Silt lenses, trace Gravel, moist. (Alluvium) | | | 0.0 | |
| 114.6 | 7.5 | SP-SM | POORLY GRADED SAND with SILT, fine-grained, with Silt lenses and laminations, trace Gravel, light brown, moist. (Alluvium) | | | 0.0 | |
| 112.1 | 10.0 | | END OF BORING.<br><br>Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **P-5**

LOCATION: N: 166665.1 E: 575331.2
See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/11/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 106.5 | 0.0 | SM | SILTY SAND, fine-grained, black, moist. (Topsoil) | | | 0.0 | Soil sample for chemical analysis collected from 0 to 4 feet. |
| 104.0 | 2.5 | SP-SM | POORLY GRADED SAND with SILT, fine- to medium-grained, trace Gravel, brown, moist. (Alluvium) | | | 0.0 | |
| 101.5 | 5.0 | SP-SM | POORLY GRADED SAND with SILT, fine- to medium-grained, with Silt and Lean Clay lenses, trace Gravel, brown to brown and gray mottled, moist. (Alluvium) | | | 0.0 | |
| | | | | | | 0.0 | |
| 96.5 | 10.0 | | END OF BORING. Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **P-6**

LOCATION: N: 165836.4 E: 575342.1
See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/11/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 99.5 | 0.0 | FILL | FILL: Silty Sand, fine-grained, ash and/or cinders at 2 1/2 and 4 feet, black, moist. | | | 0.0 | Soil sample for chemical analysis collected from 0 to 4 feet. |
| | | | | | | 0.0 | |
| 95.5 | 4.0 | FILL | FILL: Poorly Graded Sand with Silt, fine- to medium-grained, with Gravel, brown, dry. | | | | |
| 94.5 | 5.0 | PT | SAPRIC PEAT, black, moist. (Swamp Deposit) | | | 0.0 | Soil sample for chemical analysis collected from 5 to 7 1/2 feet. |
| 92.0 | 7.5 | OL | ORGANIC SILT, with roots and wood, dark gray to light gray, moist. (Swamp Deposit) | | | 0.0 | |
| 89.5 | 10.0 | OL | ORGANIC CLAY, with roots, brown, moist. (Swamp Deposit) | | | 0.0 | |
| 87.0 | 12.5 | CL | LEAN CLAY, with Silt lenses, gray, moist. (Alluvium) | | | 0.0 | |
| 85.5 | 14.0 | SP-SM | POORLY GRADED SAND with SILT, fine- to coarse-grained, with Gravel, brown, wet. (Alluvium) | | | | |
| 84.5 | 15.0 | | END OF BORING. Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **P-7**

LOCATION: N: 165732.8 E: 575350.7
See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/11/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 98.3 | 0.0 | | | | | | |
| | | FILL | FILL: Silty Sand, fine-grained, with Gravel, black, moist. | | | 0.0 | Soil sample for chemical analysis collected from 0 to 4 feet. |
| 95.8 | 2.5 | | | | | | |
| | | FILL | FILL: Silty Sand, fine-grained, with Gravel, cinders and coal, black to dark brown, moist. | | | 0.0 | |
| | | | | | | 0.0 | |
| 91.8 | 6.5 | | | | | | |
| | | SP-SM | POORLY GRADED SAND with SILT, fine-grained, some Silt and Lean Clay, brown, moist. (Fill or Alluvium) | | | 0.0 | |
| 89.8 | 8.5 | | | | | | |
| | | PT | HEMIC PEAT, black to dark brown, moist. (Swamp Deposit) | | | 0.0 | |
| | | | | | | 0.0 | |
| 85.8 | 12.5 | | | | | | |
| | | PT | SAPRIC PEAT, dark brown, moist. (Swamp Deposit) Rotten egg odor from 13-15 feet. | | | 0.0 | Soil sample for chemical analysis collected from 13 to 15 feet. |
| 83.3 | 15.0 | | Trace shells about 14 1/2 feet. | | | 0.0 | |
| | | | END OF BORING. | | | | |
| | | | Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **P-8**

LOCATION: N: 165554.1 E: 575427.7
See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/10/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 97.4 | 0.0 | FILL | FILL: Silty Sand, fine-grained, trace Gravel, black, moist. | | | 0.0 | Soil sample for chemical analysis collected from 0 to 5 feet. |
| 94.9 | 2.5 | FILL | FILL: Silty Sand, fine-grained, trace Gravel, brown, dark brown and black. | | | 0.0 | |
| 92.4 | 5.0 | SM | SILTY SAND, fine- to medium-grained, trace Gravel, brown, moist. (Alluvium) | | | 0.0 | |
| 89.4 | 8.0 | | END OF BORING. Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **SAN-1**

LOCATION: N: 165399.3 E: 575511.3
See attached sketch.

DRILLER: STS | METHOD: 3 1/4" HSA, Autohammer | DATE: **12/12/12** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | MC % | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 96.0 | 0.0 | | | | | | |
| 95.0 | 1.0 | FILL | FILL: Lean Clay, slightly organic, with roots, black, moist. (Topsoil Fill) | 19 | | | |
| | | FILL | FILL: Silty Sand, fine-grained, trace Gravel, with pieces of brick, cinders and clinkers, dark brown and brown, moist. | 23 | | | |
| 90.0 | 6.0 | SP | POORLY GRADED SAND, fine- to medium-grained, with gray Lean Clay inclusions, trace Gravel, mottled brown, moist, loose. (Alluvium or Fill) | 9 | | | |
| | | | | 8 | | | |
| 86.0 | 10.0 | | Fine-grained Silt lenses below 9 feet. | | | | |
| | | PT | HEMIC PEAT, black, moist, soft. (Swamp Deposit) | 5 | | 143 | OC=37% |
| 82.0 | 14.0 | | | 3 | | 260 | OC=51% |
| | | OL | ORGANIC SILT, with shells, black, moist to wet, very loose. (Swamp Deposit) | WH | | 124 | OC=12% |
| 78.5 | 17.5 | | | | ▽ | | |
| | | OH | ORGANIC SILT, with Peat lenses, trace shells, black to 20 feet then dark gray, wet to moist, very loose. (Swamp Deposit) | 4 | ▼ | 141 | LL=81 PI=10 |
| | | | | 2 | | 104 | OC=12% |
| 73.5 | 22.5 | OH | ORGANIC SILT, with shells, gray, moist, very loose. (Swamp Deposit) | 2 | | 93 | LL=80 PI=12 |
| 71.0 | 25.0 | ML | SILT, with Organic Clay lenses and fine-grained Sand laminations, gray, moist, very loose. (Swamp Deposit/Alluvium) | 2 | | 26 | LL=24 PI=3 |
| 68.0 | 28.0 | ML | SANDY SILT, with Organic Clay lenses and trace shells to 30 feet, brownish gray, wet to 30 feet then waterbearing, loose. (Swamp Deposit/Alluvium) | 6 | | 44 | OC=3% |
| | | | | 2 | | 25 | |

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **SAN-1 (cont.)**

LOCATION: N: 165399.3 E: 575511.3
See attached sketch.

DRILLER: STS | METHOD: 3 1/4" HSA, Autohammer | DATE: **12/12/12** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | MC % | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 64.0 | 32.0 | | | | | | |
| 63.0 | 33.0 | ML | SILT, with fine-grained Sand lenses, grayish brown, wet, loose. (Alluvium) | 9 | | 23 | |
| 58.0 | 38.0 | SP | POORLY GRADED SAND, fine- to coarse-grained, trace Gravel, brown, wet, medium dense. (Alluvium) | 12 | | | **Water observed at a depth of 17 1/2 feet with 17 1/2 feet of hollow-stem auger in the ground after split-spoon to 19 1/2 feet. Water observed at a depth of 19 feet with 28 feet of hollow-stem auger in the ground after split-spoon to 30 feet. Switched to mud rotary drilling method at the 28-foot depth. Boring grouted. |
| | | | | 14 | | | |
| 48.0 | 48.0 | SP | POORLY GRADED SAND, fine- to medium-grained, with Silt lenses, brown, moist, medium dense to dense. | 16 | | | |
| | | | Possible Cobbles at 53 feet. | 27* | | | * No sample recovery. |
| | | | | 20 | | | |
| 36.0 | 60.0 | | END OF BORING.** | | | | |

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **SAN-2**

LOCATION: N: 165399.4 E: 575639.4
See attached sketch.

DRILLER: STS | METHOD: 3 1/4" HSA, Autohammer | DATE: **12/13/12** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | MC % | Tests or Notes |
|---|---|---|---|---|---|---|---|---|
| 94.1 | 0.0 | | | | | | | |
| 93.3 | 0.8 | FILL | FILL: Silty Sand, fine-grained, trace roots, black, moist. (Topsoil Fill) | 18 | | 0.0 | | |
| | | FILL | FILL: Silty Sand, fine-grained, brown to dark gray, moist. Trace Gravel below 2 1/2 feet. | 20 | | 0.0 | | |
| 89.1 | 5.0 | FILL | FILL: Clayey Sand, trace Gravel, dark gray, moist. | 10 | | 0.0 | | |
| | | | Black Silt inclusions about 7 1/2 feet. | 4 | ▼ | 0.0 | | |
| 84.1 | 10.0 | SP-SM | POORLY GRADED SAND with SILT and GRAVEL, fine- to coarse-grained, dark gray, waterbearing, loose. (Alluvium or Fill) | 4 | | 0.0 | | |
| | | | | 10* | | 0.0 | | * No sample recovery. |
| 79.1 | 15.0 | PT | SAPRIC PEAT, with shells, black, moist, rather soft to soft. (Swamp Deposit) | 4 | | 0.0 | 122 | OC=15% |
| | | | | 2 | | 0.0 | 153 | OC=18% |
| 74.1 | 20.0 | PT | HEMIC PEAT, trace shells, black, moist, soft. (Swamp Deposit) | 2 | | 0.0 | 175 | OC=26% |
| 71.6 | 22.5 | OH | ORGANIC SILT, black, moist, very loose. (Swamp Deposit) | 3 | | 0.0 | 135 | LL=115 PI=7 |
| 69.1 | 25.0 | OH | ORGANIC SILT, trace shells, dark gray, moist, very loose to loose. (Swamp Deposit) | 2 | | 0.0 | 104 | OC=12% |
| | | | Fine Sand lense at 28 1/2 feet. | 6 | | 0.0 | 95 | LL=85 PI=11 |
| 64.1 | 30.0 | SM | SILTY SAND, fine-grained, with Silt lenses, gray, wet, medium dense. (Alluvium) | 11 | | 0.0 | | |

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **SAN-2 (cont.)**
LOCATION: N: 165399.4 E: 575639.4
See attached sketch.

DRILLER: STS | METHOD: 3 1/4" HSA, Autohammer | DATE: **12/13/12** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | MC % | Tests or Notes |
|---|---|---|---|---|---|---|---|---|
| 62.1 | 32.0 | | | | | | | |
| | | | SILTY SAND, fine-grained, with Silt lenses, gray, wet, medium dense. (Alluvium) *(continued)* | | | | | |
| 59.1 | 35.0 | | | | | | | |
| | | ML | SILT, with fine-grained brown Sand lenses, trace roots, gray, wet, medium dense. (Alluvium) | 13 | | 0.0 | | |
| 54.1 | 40.0 | | | | | | | |
| | | ML | SILT, with coarse-grained brown Sand lenses, gray, wet, loose. (Alluvium) | 7 | | 0.0 | | |
| 49.1 | 45.0 | | | | | | | |
| | | SP-SM | POORLY GRADED SAND with SILT, fine- to medium-grained, with Silt lenses, with Gravel, brown, wet, medium dense. (Alluvium) | 19 | | 0.0 | | |
| 44.1 | 50.0 | | | | | | | |
| | | SP | POORLY GRADED SAND, fine- to coarse-grained, with Gravel, brown, wet, medium dense. (Alluvium) | 16 | | 0.0 | | **Water observed at a depth of 9 1/2 feet when rechecked after 10 minutes with 10 feet of hollow-stem auger in the ground after split-spoon to 12 feet. |
| | | | | 20 | | 0.0 | | Switched to mud rotary drilling method at 30 feet. |
| | | | Silt lenses below 58 feet. | 16 | | 0.0 | | Boring grouted. |
| 34.1 | 60.0 | | | | | | | |
| | | | END OF BORING.** | | | | | |

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST1-E**

LOCATION: N: 167665.2 E: 575323.1
See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/10/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 109.6 | 0.0 | | | | | | |
| | | FILL | FILL: Silty Sand, fine- to medium-grained, some Gravel, brown and dark brown, moist. (Fill or Topsoil) | | | 0.0 | Soil sample for chemical analysis collected from 0 to 2 feet. |
| 107.6 | 2.0 | | END OF BORING.<br><br>Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST1-F**

LOCATION: N: 167655.7 E: 575307.3
See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/10/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 111.9 | 0.0 | | | | | | |
| 110.9 | 1.0 | FILL | FILL: Silty Sand, fine-grained, trace Gravel and roots, dark brown, moist. (Fill or Topsoil) | | | 0.0 | Soil sample for chemical analysis collected from 0 to 2 feet. |
| 109.9 | 2.0 | FILL | FILL: Silt, trace Gravel and roots, brown, moist. (Fill or Topsoil) | | | | |
| | | | END OF BORING. | | | | |
| | | | Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST1-G**

LOCATION: N: 167667.9 E: 575294.0
See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/10/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 115.5 | 0.0 | FILL | FILL: Silty Sand, fine- to medium-grained, with some fine-grained brown Sand, with Gravel, dark brown, moist. | | | 0.0 | Soil sample for chemical analysis collected from 0 to 2 feet. |
| 113.5 | 2.0 | | (Fill or Topsoil) | | | | |
| | | | END OF BORING. | | | | |
| | | | Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST1-H**

LOCATION: N: 167683.7 E: 575307.2
See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/10/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 114.1 | 0.0 | | | | | | |
| | | FILL | FILL: Silty Sand, fine-grained, with Gravel, dark brown, moist. (Fill or Topsoil) | | | 0.0 | Soil sample for chemical analysis collected from 0 to 2 feet. |
| 112.1 | 2.0 | | END OF BORING. Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **Storm-1**

LOCATION: N: 168451.0 E: 575272.3 See attached sketch.

DRILLER: STS | METHOD: 3 1/4" HSA, Autohammer | DATE: **12/14/12** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | MC % | Tests or Notes |
|---|---|---|---|---|---|---|---|---|
| 109.6 | 0.0 | | | | | | | |
| 108.8 | 0.8 | PAV | 4 inches of bituminous over 6 inches of aggregate base. | | | 0.0 | | |
| 107.6 | 2.0 | FILL | FILL: Silty Sand, fine- to medium-grained, with Gravel, brown, frozen. | | | | | |
| 104.6 | 5.0 | FILL | FILL: Lean Clay with Sand, trace Gravel, piece of brick, brown, moist. | 6 | | 0.0 | | |
| 102.1 | 7.5 | FILL | FILL: Silty Sand, fine- to medium-grained, with Lean Clay inclusions, trace Gravel, brown, moist. | 12 | | 0.0 | | |
| 97.6 | 12.0 | FILL | FILL: Silty Sand, fine-grained, with Gravel, pieces of brick and concrete, grayish brown, moist to 11.8 feet then wet. | 12 | | 0.0 | | |
| | | | | 14 | ▽ | 0.0 | | |
| 91.6 | 18.0 | OL | ORGANIC SILT, trace Gravel, dark gray and black, moist, very loose.<br>Note: Sapric Peat and Organic Clay inclusions below 14 feet.<br>(Swamp Deposit or Fill) | 2 | | 0.0 | 19 | LL=33<br>PI=5 |
| | | | | 7 | | 0.0 | 19 | OC=4% |
| 89.6 | 20.0 | OL | ORGANIC SILT, trace roots, gray, wet, very loose.<br>(Swamp Deposit) | 4 | | 0.0 | 43 | LL=41<br>PI=5 |
| 86.6 | 23.0 | OL | ORGANIC SILT, with fine Sand lenses, trace roots, gray, wet, very loose.<br>(Swamp Deposit) | 2 | | 0.0 | 64 | LL=48<br>PI=6 |
| 84.6 | 25.0 | SP-SM | POORLY GRADED SAND with SILT, fine- to medium-grained, grayish brown, waterbearing, loose.<br>(Alluvium) | 5 | | 0.0 | | |
| 82.1 | 27.5 | OL | ORGANIC SILT, with shells, dark gray, wet, loose.<br>(Swamp Deposit) | 7 | | 0.0 | 36 | OC=2% |
| 79.6 | 30.0 | OL | ORGANIC CLAY, with shells, gray and dark brown, moist, soft.<br>(Swamp Deposit) | 2 | | 0.0 | 53 | OC=6% |
| | | CL | LEAN CLAY, with Fat Clay, Silt and fine-grained Sand laminations, gray, moist, soft to rather soft.<br>(Alluvium) | 3 | | 0.0 | 28 | LL=30<br>PI=12 |

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **Storm-1 (cont.)**

LOCATION: N: 168451.0 E: 575272.3 See attached sketch.

DRILLER: STS | METHOD: 3 1/4" HSA, Autohammer | DATE: **12/14/12** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | MC % | Tests or Notes |
|---|---|---|---|---|---|---|---|---|
| 77.6 | 32.0 | | LEAN CLAY, with Fat Clay, Silt and fine-grained Sand laminations, gray, moist, soft to rather soft. (Alluvium) *(continued)* | 4 | | 0.0 | 28 | LL=24 PI=7 |
| 74.6 | 35.0 | | END OF BORING. | | | | | |
| | | | Water observed at a depth of 11.8 feet with 12 feet of hollow-stem auger in the ground after split-spoon to 14 1/2 feet. | | | | | |
| | | | Water added below the 25-foot depth. | | | | | |
| | | | Boring grouted. | | | | | |

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **Storm-2**

LOCATION: N: 168117.6 E: 575377.0 See attached sketch.

DRILLER: STS | METHOD: 3 1/4" HSA, Autohammer | DATE: **12/14/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | MC % | Tests or Notes |
|---|---|---|---|---|---|---|---|---|
| 111.2 | 0.0 | | | | | | | |
| 110.9 | 0.3 | FILL | FILL: Organic Clay, with roots, black, moist. (Topsoil Fill) | 4 | | 0.0 | | |
| | | FILL | FILL: Clayey Sand, with roots to about 2 feet, dark brown, moist. | 15 | | 0.0 | | |
| 106.2 | 5.0 | FILL | FILL: Silty Sand, fine- to medium-grained, with Gravel, pieces of glass and brick, brown, moist. | 18 | | 0.0 | | |
| | | | | 12 | | 0.0 | | |
| 101.2 | 10.0 | SM | SILTY SAND, fine-grained, trace roots, grayish brown to black, moist, loose. (Alluvium or Fill) | 10 | | 0.0 | | |
| 98.2 | 13.0 | PT | SAPRIC PEAT, black, moist, soft. (Swamp Deposit) | 2 | | 0.0 | 197 | OC=63% |
| 96.2 | 15.0 | PT | HEMIC PEAT, black, moist, rather stiff. (Swamp Deposit) | 9 | | 0.0 | 334 | OC=88% |
| 93.2 | 18.0 | OL | ORGANIC SILT (Marl), trace roots and shells, light gray, loose. (Swamp Deposit) | 6 | ▽ | 0.0 | 73 | LL=50 PI=4 |
| 91.2 | 20.0 | | END OF BORING. Water observed at a depth of 19 feet with 18 feet of hollow-stem auger in the ground after split-spoon to 20 feet. Boring grouted. | | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **Storm-3**

LOCATION: N: 168007.4 E: 575262.5 See attached sketch.

DRILLER: STS | METHOD: 3 1/4" HSA, Autohammer | DATE: **12/14/12** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | MC % | Tests or Notes |
|---|---|---|---|---|---|---|---|---|
| 111.4 | 0.0 | | | | | | | |
| | | FILL | FILL: Silty Sand with Gravel, fine- to medium-grained, with pieces of concrete, frozen. | | | 0.0 | | |
| 109.4 | 2.0 | | | | | | | |
| | | FILL | FILL: Silty Sand, fine-grained, with Gravel, brown, moist to wet. | 25 | | 0.0 | | |
| | | | Silt and Lean Clay inclusions and piece of brick below 5 feet | 72* | | 0.0 | | * Pushed rock. |
| 103.4 | 8.0 | | | | ▼ | | | |
| | | PT | SAPRIC PEAT, trace Gravel and shells, moist, rather soft. (Swamp Deposit or Fill) | 4 | | 0.0 | 38 | OC=11% |
| 100.9 | 10.5 | | | | ▽ | | | |
| | | OL | ORGANIC CLAY, with brown, fine- to medium-grained Sand inclusions, trace roots, dark gray, moist, soft. (Swamp Deposit or Fill) | 3 | | 0.0 | 34 | OC=6% |
| 99.4 | 12.0 | | | | | | | |
| | | SM | SILTY SAND, fine- to medium-grained, with Gravel, grayish brown, loose. (Alluvium or Fill) | 8 | | 0.0 | | |
| 96.4 | 15.0 | | | | | | | |
| | | PT | HEMIC PEAT, black, moist, rather soft. (Swamp Deposit) | 5 | | 0.0 | 344 | OC=88% |
| 92.4 | 19.0 | | | 5 | | 0.0 | 331 | OC=84% |
| | | PT | SAPRIC PEAT, black, moist, rather soft to medium. (Swamp Deposit) | 7 | | 0.0 | 230 | OC=56% |
| 89.4 | 22.0 | | | | | | | |
| | | OH | ORGANIC SILT, with fine Sand lenses, trace shells, gray, wet, loose. (Swamp Deposit) | 6 | | 0.0 | 128 | LL=112 PI=19 |
| 86.4 | 25.0 | | Peat lense about 24 feet. | | | | | |
| | | | END OF BORING. | | | | | |
| | | | Water observed at a depth of 10 1/2 feet with 10 feet of hollow-stem auger in the ground after split-spoon to 12 feet. | | | | | |
| | | | Water came up to a depth of 8 feet when checked after 15 mintues with 10 feet of hollow-stem auger in the ground after split-spoon to 12 feet. | | | | | |
| | | | Boring grouted. | | | | | |

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST-R-1**

LOCATION: N: 167269.6 E: 575344.7 See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/10/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 110.0 | 0.0 | | | | | | |
| | | SM | SILTY SAND, fine- to medium-grained, brown and dark brown, moist. (Topsoil) | | | 0.0 | Soil sample for chemical analysis collected from 0 to 4 feet. |
| 107.5 | 2.5 | | | | | | |
| | | SP-SM | POORLY GRADED SAND with SILT, fine- to medium-grained, with gray Silt and Lean Clay lenses and laminations, brown, moist. (Alluvium) | | | 0.0 | |
| 105.0 | 5.0 | | | | | | |
| | | ML | SILT, with gray fine-grained Sand laminations, brown, moist. (Alluvium) | | | 0.0 | |
| 102.5 | 7.5 | | | | | | |
| | | CH | FAT CLAY, with fine-grained Sand and Silt laminations, grayish brown, moist. (Alluvium) | | | 0.0 | |
| 100.0 | 10.0 | | | | | | |
| | | | END OF BORING. Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\STPAUL\2012\00179B.GPJ BRAUN_V8_CURRENT.GDT 2/22/13 15:29

BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST-R-2**

LOCATION: N: 166962.8 E: 575365.5 See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/12/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 108.0 | 0.0 | FILL | FILL: Silty Sand, fine- to medium-grained, with Gravel, roots and cinders, black, moist. | | | 0.0 | Soil sample for chemical analysis collected from 0 to 4 feet. |
| 105.5 | 2.5 | SP-SM | POORLY GRADED SAND with SILT, fine- to medium-grained, with Silt and Silty Sand lenses, trace Gravel, brown mottled, moist. (Alluvium) | | | 0.0 | |
| 103.0 | 5.0 | SP-SM | POORLY GRADED SAND with SILT, fine-grained, with Silt and Silty Sand lenses, brown, moist. (Alluvium) | | | 0.0 | |
| 101.0 | 7.0 | CH | FAT CLAY, with Silt lenses, gray, moist. (Alluvium) | | | | |
| 100.0 | 8.0 | | END OF BORING. Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST-R-3**

LOCATION: N: 166544.6 E: 575367.1 See attached sketch.

DRILLER: STS | METHOD: 3 1/4" HSA, Autohammer | DATE: **12/13/13** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | MC % | Tests or Notes |
|---|---|---|---|---|---|---|---|---|
| 104.6 | 0.0 | | | | | | | |
| 104.1 | 0.5 | FILL | FILL: Organic Clay, with roots, black, moist. (Topsoil Fill) | 8 | | 0.0 | | Soil sample for chemical analysis collected from 0 to 4 1/2 feet. |
| | | FILL | FILL: Sandy Lean Clay, with cinders, brown, moist. | | | | | |
| 101.6 | 3.0 | FILL | FILL: Clayey Sand, with Gravel, dark brown, dark gray and black, moist. | 18 | | 0.0 | | |
| 98.6 | 6.0 | SM | SILTY SAND, with Gravel, fine- to coarse-grained, brown, moist, medium dense. (Alluvium) | 15 | | 0.0 | | |
| 97.1 | 7.5 | SP-SM | POORLY GRADED SAND with SILT, fine- to medium-grained, with Silt and coarse-grained Sand lenses, trace Gravel, brown mottled, moist, dense. (Alluvium) | 19 | | 0.0 | | |
| 94.6 | 10.0 | ML | SILT, with brown Sand lenses, trace organics, grayish brown, moist to wet, loose. (Alluvium) | 10 | ▼ ▽ | 0.0 | 20 | |
| 90.6 | 14.0 | | Fat Clay lenses and laminations about 13 feet. | 6 | | 0.0 | 25 | |
| 89.1 | 15.5 | SP | POORLY GRADED SAND, medium- to coarse-grained, brown, wet, loose. (Alluvium) | | | | | |
| 87.1 | 17.5 | ML | SILT, with Fat Clay lenses, trace organics, gray, wet, very loose. (Alluvium) | 4 | | 0.0 | 26 | OC=1% |
| | | CL | LEAN CLAY, with fine-grained Sand lenses, with Flat Clay and Silt laminations, gray, wet, soft. (Alluvium) | 3 | | 0.0 | 27 | LL=23 PI=5 |
| 82.1 | 22.5 | | Trace organics below 20 feet. | 3 | | 0.0 | 27 | OC=1% |
| 78.6 | 26.0 | ML | SILT, with Organic Clay, Fat Clay and fine-grained Sand laminations, gray, wet, very loose to medium dense. (Alluvium) | 3 | | 0.0 | 28 | OC=2% |
| 76.6 | 28.0 | SP | POORLY GRADED SAND, with fine- to medium-grained Fat Clay lenses, brown, wet, medium dense. (Alluvium) | 15 | | 0.0 | | |
| 74.6 | 30.0 | CL | LEAN CLAY, with Fat Clay and with fine-grained Sand laminations, gray, moist, rather soft. (Alluvium) | 4 | | 0.0 | 29 | LL=31 PI=13 |
| | | SM | SILTY SAND, fine- to coarse-grained, with Gravel, reddish brown, moist, loose. (Alluvium) | 10 | | | | |

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST-R-3 (cont.)**

LOCATION: N: 166544.6 E: 575367.1 See attached sketch.

DRILLER: STS | METHOD: 3 1/4" HSA, Autohammer | DATE: **12/13/13** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | MC % | Tests or Notes |
|---|---|---|---|---|---|---|---|---|
| 72.6 | 32.0 | | SILTY SAND, fine- to coarse-grained, with Gravel, reddish brown, moist, loose. (Alluvium) *(continued)* | | | | | |
| 69.6 | 35.0 | CL | LEAN CLAY, with Fat Clay, Silt and fine-grained Sand laminations, gray, moist, rather soft to medium. (Alluvium) | 4 | | | 28 | LL=31 PI=13 |
| | | | | 7 | | | 26 | |
| 62.1 | 42.5 | SP | POORLY GRADED SAND, fine- to medium-grained, with Gravel, brown, wet, medium dense. (Alluvium) | 18 | | | | |
| | | | Gravelly and/or possible Cobbles below 50 feet. | 26* | | | | * No sample recovery. |
| | | | | 30* | | | | * No sample recovery. |
| 44.6 | 60.0 | SP-SM | POORLY GRADED SAND with SILT, fine- to coarse-grained, with Gravel, brown, waterbearing, medium dense. (Alluvium) Cobbles and possible Boulders below 62 feet. | 13 | | | | |

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST-R-3 (cont.)**

LOCATION: N: 166544.6 E: 575367.1 See attached sketch.

DRILLER: STS | METHOD: 3 1/4" HSA, Autohammer | DATE: **12/13/13** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | MC % | Tests or Notes |
|---|---|---|---|---|---|---|---|---|
| 40.6 | 64.0 | | | | | | | |
| 39.6 | 65.0 | GP | POORLY GRADED GRAVEL with SAND, brown, waterbearing, dense. (Alluvium) | 38 | | | | |
| 34.6 | 70.0 | SP | POORLY GRADED SAND, fine- to medium-grained, brown, wet, very dense. (Alluvium) | 90 | | | | |
| 29.6 | 75.0 | SP-SM | POORLY GRADED SAND with SILT, fine-grained, grayish brown, wet, very dense. (Alluvium) | 80 | | | | |
| 24.6 | 80.0 | SM | SILTY SAND, fine-grained, with medium- to coarse-grained Sand and Silt lenses, with Gravel, grayish brown, moist, very dense. (Alluvium) | 50/4" | | | | **Water observed at a depth of 11.9 feet with 10 feet of hollow-stem auger in the ground after split-spoon to 12 feet. |
| | | | | 102/9" | | | | Water came up to a depth of 10.9 feet when checked after 15 minutes with 10 feet of hollow-stem auger in the ground after split-spoon to 12 feet. |
| | | | | 105 | | | | |
| 14.6 | 90.0 | | END OF BORING.** | | | | | Switched to mud rotary drilling method at the 36-foot depth. Boring grouted. |

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST-R-4**

LOCATION: N: 166065.3 E: 575361.0 See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/11/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 101.6 | 0.0 | | | | | | |
| | | SM | SILTY SAND, dark brown to brown, moist. (Topsoil) | | | 0.0 | Soil sample for chemical analysis collected from 0 to 4 feet. |
| 99.6 | 2.0 | | | | | | |
| | | SP-SM | POORLY GRADED SAND with SILT, fine- to medium-grained, with Organic Clay layer, with Gravel, trace roots, dark brown to black, moist. (Alluvium) | | | 0.0 | |
| 97.6 | 4.0 | | | | | | |
| | | CL | LEAN CLAY, with reddish brown Fat Clay lenses, brown and gray mottled, moist. (Alluvium) | | | 0.0 | |
| 94.6 | 7.0 | | | | | | |
| | | CL | LEAN CLAY, with gray Silt laminations, brown, moist. (Alluvium) | | | 0.0 | |
| 92.6 | 9.0 | | | | | | |
| | | | END OF BORING. Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST-R-5**

LOCATION: N: 165606.6 E: 575507.2 See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/10/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 96.0 | 0.0 | FILL | FILL: Silty Sand, some Gravel, black, moist. | | | 0.0 | Soil sample for chemical analysis collected from 0 to 4 feet. |
| 94.0 | 2.0 | FILL | FILL: Silty Sand, fine-grained, some Gravel, brown, moist. | | | 0.0 | |
| 92.0 | 4.0 | FILL | FILL: Silty Sand, fine-grained, dark brown, moist. | | | 0.0 | |
| 90.0 | 6.0 | | END OF BORING.<br><br>Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST-R-6**

LOCATION: N: 165292.3 E: 575575.0 See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/12/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 93.6 | 0.0 | FILL | FILL: Poorly Graded Sand with Silt, fine-grained, with Gravel, brown, moist. | | | 0.0 | Soil sample for chemical analysis collected from 0 to 4 feet. |
| 90.6 | 3.0 | | | | | 0.0 | |
| 89.6 | 4.0 | FILL | FILL: Silty Sand, fine- to medium-grained, dark brown to black, moist. | | | | |
| 88.6 | 5.0 | FILL | FILL: Poorly Graded Sand, fine- to coarse-grained, with Gravel and concrete, brown, moist. | | | | |
| 87.6 | 6.0 | FILL | FILL: Lean Clay, grayish brown, moist. | | | 0.0 | |
| 85.6 | 8.0 | FILL | FILL: Silty Sand, fine-grained, with cinders, black and brown to dark brown, moist. | | | | |
| | | | END OF BORING.<br><br>Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **ST-R-7**

LOCATION: N: 165114.4 E: 575581.8 See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/10/12** | SCALE: **1" = 4'**

(See Descriptive Terminology sheet for explanation of abbreviations)

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 92.0 | 0.0 | | | | | | |
| | | FILL | FILL: Poorly Graded Sand, fine-grained, light brown, moist. | | | 0.0 | |
| 89.5 | 2.5 | | | | | | |
| | | FILL | FILL: Silty Sand, fine- to medium-grained, dark brown to black, moist. | | | 0.0 | Soil sample for chemical analysis collected from 2 1/2 to 5 feet. |
| 87.0 | 5.0 | | | | | | |
| 86.0 | 6.0 | FILL | FILL: Poorly Graded Sand with Silt, fine- to medium-grained, dark brown to black, moist. | | | 0.0 | |
| 85.0 | 7.0 | FILL | FILL: Clayey Sand, with Gravel, brown and dark brown, moist. | | | | |
| 84.0 | 8.0 | FILL | FILL: Poorly Graded Sand with Silt, fine- to coarse-grained, with Lean Clay, dark brown and brown, wet. | | | | |
| | | | END OF BORING. | | | | |
| | | | Boring then backfilled. | | | | |

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **TP-16-A**

LOCATION: N: 165307.8 E: 575589.9 See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/12/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 93.6 | 0.0 | FILL | FILL: Silty Sand, with Gravel and roots, black, moist. (Fill or Topsoil) | | | 0.0 | Soil sample for chemical analysis collected from 0 to 2 feet. |
| 91.6 | 2.0 | | END OF BORING.<br><br>Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **TP-3-E**

LOCATION: N: 166964.2 E: 575334.9 See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/12/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 108.6 | 0.0 | FILL | FILL: Silty Sand, fine- to medium-grained, with Gravel and cinders, dark brown and black, moist. | | | 0.0 | Soil sample for chemical analysis collected from 0 to 2 feet. |
| 106.6 | 2.0 | | END OF BORING.<br><br>Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

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BRAUN INTERTEC

# LOG OF BORING

**Braun Project SP-12-00179B**
**ADDITIONAL SOIL SAMPLING**
**Trillium Nature Sanctuary Acquisition**
**South of Maryland Avenue**
**St. Paul, Minnesota**

BORING: **TP-3-F**

LOCATION: N: 166963.8 E: 575356.6 See attached sketch.

DRILLER: R. Peterson | METHOD: Geoprobe | DATE: **12/12/12** | SCALE: **1" = 4'**

| Elev. feet | Depth feet | Symbol | Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908) | BPF | WL | PID ppm | Tests or Notes |
|---|---|---|---|---|---|---|---|
| 108.1 | 0.0 | | | | | | |
| | | FILL | FILL: Silty Sand, fine- to medium-grained, with Gravel and cinders, black, moist. | | | 0.0 | Soil sample for chemical analysis collected from 0 to 2 feet. |
| 106.6 | 1.5 | | | | | | |
| 106.1 | 2.0 | FILL | FILL: Silty Sand, fine- to medium-grained, brown, moist. | | | | |
| | | | END OF BORING. | | | | |
| | | | Boring then backfilled. | | | | |

(See Descriptive Terminology sheet for explanation of abbreviations)

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