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Landmark Environmental LLC

Phase II Environmental Investigation Report

219 and 223 1st Avenue Southwest
Rochester, Minnesota

Prepared for
The City of Rochester

March 2007

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Phase II Environmental Investigation Report
219 and 223 1st Avenue Southwest
Rochester, Minnesota
January, 2007

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Section 1: Introduction

This Phase II Environmental Investigation report ("Report") was prepared on behalf of the City of Rochester. (hereafter referred to as "the City") by Landmark Environmental, LLC ("Landmark"). The Report provides results of a Phase II Environmental Investigation ("Phase II Investigation") conducted on December 28 and 29, 2006 with respect to two parcels located at 219 and 223 1st Avenue South in Rochester, Minnesota ("the Property"), as shown on Figure 1. The Report also provides the results of a Geotechnical Investigation prepared by McGhie Betts, Inc. with respect to the Property. The scope of work for the Phase II Investigation was based on the findings included in the Phase I Environmental Property Assessment (ESA) Report for the parcel located at 219 1st Avenue South and dated October, 2006 and the Phase I ESA for the parcel located at 223 1st Avenue South and dated October, 2006. Both Phase I ESAs were prepared by Landmark on behalf of the City. The Phase II Investigation was conducted in general accordance with Minnesota Pollution Control Agency ("MPCA") Voluntary Investigation and Cleanup ("VIC") Program guidelines. Phase II Investigation locations are shown on Figure 2 and the scope of work included the following tasks:

- Prepare a Site Safety Plan, hire a drilling subcontractor, and coordinate a utility meet at the Property prior to conducting the fieldwork.

- Collect and field-screen soil samples from 6 geotechnical borings that were installed by McGhie Betts, Inc. of Rochester using a hollow-stem auger drill rig for analysis of Resource Conservation and Recovery Act ("RCRA") metals and polynuclear aromatic hydrocarbons ("PAHs").

- Collect and field screen soil samples from 4 Geoprobe borings, installed by Mobile Environmental Sampling and Analysis ("MESA") for analysis of RCRA metals and PAHs. The Geoprobe borings were advanced in addition to the geotechnical borings to provide adequate spatial distribution for the evaluation of fill material that may be encountered during future redevelopment activities.

- Collect groundwater samples from 3 of the geotechnical borings for analysis of volatile organic compounds ("VOCs"). One of the borings was located on the 219 parcel and two of the borings were located on the 223 parcel.

- Collect and field screen soil samples during the installation of 6 soil-gas borings that were installed by MESA on or around the perimeter of the Property using a Geoprobe drill rig for analysis of RCRA metals and PAHs.

- Collect soil gas samples from the six soil gas vapor borings. After MESA completed the six soil-gas borings as permanent vapor monitoring points, Landmark collected one vapor sample from each vapor monitoring point with a Summa canister for VOC analysis by Environmental Protection Agency ("EPA") Method TO-15.

- In accordance with Minnesota Department of Health ("MDH") requirements, seal all borings upon completion of the fieldwork.

The Phase II Investigation was conducted in preparation for the City to purchase and redevelop the Property for future use as a bio-science technology facility including a commercial office

building and parking ramp. The Phase II Investigation was also conducted in preparation for the City to obtain regulatory assurances and liability protections from the MPCA and to provide the basis to determine response actions costs.

The parcel located at 219 1st Avenue SW is currently owned by Rochester DC LLC, a Delaware limited liability company and the parcel located at 223 1st Avenue SW is currently owned by the Mayo Clinic Rochester, a Minnesota non-profit corporation. Both parcels comprise the Property and are currently used as surface parking lots.

219 1st Avenue Parcel

The 219 parcel consists of 14,300 square feet of land that historically supported two dry cleaning facilities; historical structures were demolished prior to the construction of the current parking lot. The historical activities likely involved the use of hazardous substances and/or petroleum products, including the common dry cleaning solvent tetrachoroethylene (PCE). Based on previous environmental investigations, response actions (RAs) have been conducted to address reported releases of PCE at the Property on this parcel since 2000. The RAs currently involve the operation of a dual phase soil and groundwater collection and treatment system.

The general Property vicinity has been developed since prior to 1884 for residential/commercial use. A number of these commercial operations involved the use of hazardous substances and/or petroleum compounds and were the sites of leaking underground storage tanks and documented releases of VOCs.

The following recognized environmental conditions (RECs) were identified in the Phase I ESA for the 219 parcel:

- Historic use of the 219 parcel as a commercial dry cleaning facility involving the use of PCE; analytical sample results from previous investigations and remediation activities indicating detected concentrations of PCE in soil and water samples from the Property; and the presence of a dual phase remediation system present at the Property to remove PCE in soil and groundwater at the Property.

- Documented releases of VOCs to the soil and groundwater have been reported at nearby properties. As a result, and due to the complex geology and the presence of supply/pump-out wells on the Property and in the vicinity of the Property, the releases from the nearby properties have the potential for impacting groundwater beneath the Property.

- Prior to construction of the current surface parking lot, the Property supported commercial structures. Portions of the building foundations may not have been removed during demolition and may still be present. In addition, demolition debris or fill from unknown sources may have been used to fill the basements of these former structures following demolition. The potential exists for buried foundations associated with former Property structures and/or demolition debris or fill from an unknown source to have been used as backfill for basement areas of former structures.

As stated, a dual phase remediation system is currently operated on the 219 parcel by DPRA, Inc. ("DPRA") on behalf of the 219 parcel owner, Sunstone Hotel Investors, Inc. The 219 parcel is enrolled in the MPCA VIC Program as VP#12560. Details of the dual phase remediation system construction and operation are included in the *Implementation Report, Dual Phase Extraction System Installation and Start-up, Former Dry Cleaners, 219 First Avenue SW, Rochester, Minnesota* ("DPRA Report"), prepared by DPRA and dated July 2006. In addition, the DPRA

Report summarizes the results of four soil gas samples, labeled SG-1 through SG-4, that were collected around the perimeter of the 219 parcel on November 9, 2005. PCE was reported in each soil-gas sample. SG-2 was collected from a boring located north of the 219 parcel and PCE was reported at 2.2 ug/m3, which is below the MPCA VIC program Industrial-Commercial Intrusion Screening Values ("I/CISVs") of 14 ug/m^3. PCE concentrations in SG-1, SG-3 and SG-4 ranged from 480 ug/m^3 to 520 ug/m^3. No other VOCs were reported above the I/CISVs.

Based on the results of the remedial system operation and the soil gas sample results, the DPRA Report recommended that "permanent soil gas points (should be installed) adjacent to the surrounding buildings to monitor soil gas concentrations in these areas". In addition, the DPRA Report recommended that a soil gas sample should be collected from each monitoring point for analysis of VOCs by EPA Method TO-15.

Based on the review of the DPRA Report, the MPCA VIC program project manager, Mr. Ed Olson, requested that DPRA submit a Workplan to conduct the installation of vapor points and collect additional soil-gas samples. DPRA submitted the *Status Update and Work Plan, Former Dry Cleaners, 219 First Avenue Southwest, Rochester, Minnesota* ("DPRA Work Plan"), to Mr. Olson on December 4, 2006. The DPRA Work Plan recommended the installation of six soil gas points at locations around the perimeter of the Property. DPRA recommended two rounds of soil gas sampling, immediately after the installation of the soil gas points and then six months after the first sampling event. To date, the MPCA has not prepared a written response to the DPRA Work Plan.

223 1st Avenue SW Parcel

The 223 parcel consists of approximately 4,300 square feet of land that historically was used as a stable and later as a hotel and then as the Lawler Movie Theatre; historical structures were demolished prior to the construction of the current surface parking lot. The general Property vicinity has been developed since prior to 1884 for residential/commercial use. These historical activities likely did not involve the use of significant quantities of hazardous substances and/or petroleum products. As stated, DPRA collected soil gas samples in November 2005 at four locations. Sample SG-1 was located on the south side of the 223 parcel and PCE was reported at 520 micrograms per cubic meter (ug/m^3). No other previous environmental investigation has reportedly been conducted on the 223 parcel.

The following RECs were identified in the Phase I ESA for the 223 parcel:

- Documented release of PCE in a soil gas sample has been reported on the Property.

- Documented releases of volatile organic compounds (VOCs), including PCE, to the soil, soil gas and groundwater on the adjacent former dry cleaning site (219 1st Avenue SW). A dual phase remediation system is in operation at the site and soil vapor sampling is proposed for properties surrounding the site, including the Property. A monitoring well located at the Property boundary indicates elevated levels of PCE in groundwater. The releases from the adjacent former dry cleaning site and other VOC releases on nearby properties have the potential for impacting groundwater beneath the Property.

- Prior to construction of the current surface parking lot, the Property supported commercial structures. Portions of the building foundations may not have been removed during demolition and may still be present. In addition, demolition debris or fill from unknown sources may have been used to fill the basements of these former structures

following demolition. The potential exists for buried foundations associated with former Property structures and/or demolition debris or fill from an unknown source to have been used as backfill for basement areas of former structures.

Section 3: Phase II Investigation Scope and Methods

The Phase II Investigation was conducted to coincide with a Geotechnical Investigation for the Property. Six geotechnical soil borings were advanced by McGhei and Betts at the locations shown on Figure 2. The geotechnical borings are labeled GB-1 through GB-6 and were placed at locations across the Property to provide geotechnical data for future structural building considerations. Landmark collected soil samples from the geotechnical borings to evaluate the quality of fill material for soil management purposes during redevelopment. Soil samples were collected using standard split-spoon sampling techniques according to the Landmark Standard Operating Procedures ("SOPs"), which are included in Appendix A. The *Geotechnical Report*, prepared by McGhie and Betts, Inc in January 2007 is included in Appendix B. Phase II Investigation location rationale and a summary of samples submitted to Pace Analytical ("Pace") are listed in Table 1.

Each geotechnical boring met refusal on limestone bedrock at depths ranging from approximately 13- to 17 feet below ground surface ("bgs"). Upon refusal, McGhie and Betts advanced a diamond core rotary drill bit through the hollow-stem augers into the limestone to predetermined depths. Based on the water levels observed in the monitoring wells located on the 219 parcel, groundwater occurs within the limestone at approximately 18- to 20 feet bgs.

At locations GB-3, GB-4 and GB-5, Landmark collected groundwater samples from the geotechnical borings for VOC analysis. Upon completion of the borings, McGhie Betts left the hollow-stem augers in the boring so that the unconsolidated soil above bedrock would not slough into the boring. Landmark purged groundwater from the open hole with a 1.5-inch diameter submersible pump, positioned at 20 feet bgs at each location. Approximately 25 gallons of water was purged from each boring prior to sampling. Groundwater was sampled with disposable polyethylene bailers according to Landmark's SOPs. Groundwater samples are labeled according to location (i.e. GB-3, GB-4 and GB-5). Landmark collected a duplicate groundwater sample (labeled DUP-GW) at location GB-4. Landmark SOPs for decontamination were implemented to insure that no cross-contamination occurred between groundwater sampling locations.

In additional to the geotechnical borings, MESA advanced four Geoprobe borings labeled LGP-1 through LGP-4 and six soil-gas borings labeled LSG-1 through LSG-6 at the locations shown on Figure 2. LSG-1 through LSG-6 were completed as permanent vapor monitoring points. After sampling soil to depths between 6 and 8 feet bgs, a 6-slot, 0.5-foot long, 0.25-inch inner diameter stainless steel screen was attached to polyethylene tubing and positioned from 6- to 8 feet bgs in each boring. The boring was then backfilled with two feet of #30 Red Flynt sand. Bentonite chips were placed above the sand pack from 4- to 6 feet bgs and the chips were hydrated in place. The boring annulus was sealed with a bentonite slurry from 0.5- to 4 feet bgs and all vapor monitoring points were completed with a flush-mount concrete pad and locking well cap as shown in photos in Appendix C. Because the area in the vicinity of LSG-6 had a large amount of buried demolition debris, the Geoprobe could not be advanced deeper than 2 feet bgs. Therefore, the hollow stem auger drill rig was advanced to 8 feet bgs at this location, the boring was backfilled with #30 Red Flynt sand and redrilled by MESA to 8 feet bgs prior to constructing the vapor monitoring point. All permanent vapor monitoring points were completed according to MPCA guidelines. A schematic of each vapor monitoring points is included in the boring logs in Appendix D.

Landmark provided on-site personnel to field screen and collect soil samples from the six geotechnical borings, the four Geoprobe borings and the six soil-gas borings. Soil samples were

collected and screened in the field for the presence of observable contamination (e.g., odor, discoloration, volatile organic headspace concentrations using a photoionization detector equipped with an 11.7 eV bulb, and sheen) according to Landmark's SOPs, which are included in Appendix A. Field screening results are listed on the boring logs in Appendix D.

Soil samples were collected from the borings to provide an overall evaluation of the soil and fill material across the Property, based on the potential for excavation for the planned redevelopment. Accordingly, the Phase II Investigation assessed representative analytical soil quality for the uppermost 14 feet of soil at the Property. Soil samples were submitted for laboratory analysis to provide: (1) representative data for discrete zones or types of potential contamination identified in the field; (2) representative data for a range of visible contamination as determined by field screening (for laboratory correlation with field screening results); and (3) areally and vertically representative coverage to facilitate overall evaluation of the soil and fill materials with regard to impacts that cannot be associated with visible contamination.

Soil samples were collected at 2-foot intervals using standard split-spoon sampling techniques with the hollow stem auger drill rig and at 4-foot intervals with the Geoprobe. Selected soil samples were submitted to Pace for laboratory analysis of PAHs and RCRA metals. Soil samples were labeled according to the boring location and the depth from which the sample was collected. For example, sample GB-2/2-4 was a sample collected from geotechnical boring GB-2 from 2- to 4-feet bgs. Table 1 lists the Phase II Investigation location rationale, the depth of fill material, and analytical parameters for each soil sample submitted for laboratory analysis. Based on field screening results, no soil samples were submitted to the laboratory for VOCs, polychlorinated biphenyls (PCBs) or diesel range organics (DRO).

The Landmark soil gas monitoring points are labeled LSG-1 through LSG-6 and are located around the perimeter of the Property as shown on Figure 2. Upon completion of each soil gas monitoring point, Landmark collected a soil gas sample after purging 3 volumes of air from each point with a "hand vacuum pump" to insure that the subsequent air sample was representative of sub-surface conditions. PID readings were measure before and after purging 3 volumes of air and after sample collection. No elevated PID readings were measured at any of the locations. Grab samples were collected at each location with a 5 liter Summa canister provided by Pace according to the Landmark SOPs included in Appendix A.

Both parcels are used as parking lots and are paved with asphalt. Fill material, comprised of sand, silt and gravel or various combinations of these materials was observed at each boring to depths ranging from 1- to 12 feet bgs. Fill material beneath the 219 parcel consisted of brown, medium-grained sand that was poorly graded. This fill material was observed above a 4-inch-thick concrete slab at all locations across the 219 parcel at a depth of 9- to 12 feet bgs. Approximately 2- to 3 feet of sandy gravel and weathered bedrock was observed beneath the concrete slab. This material is likely native.

Fill material on the 223 parcel is more varied than the 219 parcel and contained demolition debris. Fill material in the eastern portion of the 223 parcel contained sandy silt and clay with gravel. The fill material in the central and western portion of the 223 parcel was comprised of various combinations of sand with silt and/or gravel. Concrete demolition material was encountered at borings LSG-2. Concrete demolition material was encountered at LGP-4 and the Geoprobe could not be advanced deeper than 2 feet bgs. MESA attempted to advance the Geoprobe at three locations in the vicinity of GB-5 for the installation of LSG-6 and encountered refusal on concrete and demolition debris. Therefore, as stated, the LSG-6 vapor monitoring point was installed in GB-5 after McGhie Betts drilled through the debris. As listed on the LSG-6/GB-5 boring log, concrete and rebar debris as well as a seat cushion, fabric and springs (likely from the Lawler Movie Theater), was mixed in with the sand, silt and gravel fill material to 7 feet bgs, and concrete debris was observed to 12.5 feet bgs. Figure 3 shows the location of the cross sections and the field sketches provided as Figures 3a and 3b show cross-sectional views of the lithology beneath the Property.

Field screening results did not indicate the presence of contamination related to hazardous substances or petroleum compounds in any of the soil samples collected during the Phase II Investigation. No elevated headspace readings were observed. No odors, sheens or other visual indications of contamination were evident in any of the borings on the Property. Except for the concrete slab encountered below fill material at depths ranging from 9- to 12 feet bgs on the 219 parcel, no buried demolition debris was encountered in the northern portion of the Property. Demolition debris including concrete, wood, bricks, old movie theater seats, etc was observed in borings across the 223 parcel, especially in the western portion of this parcel. No apparent asbestos containing material (ACM) was encountered.

Soil Analytical Results

As listed in Table 1, 18 soil samples and 3 groundwater samples were submitted to Pace for laboratory analysis. All soil samples were analyzed for RCRA metals and PAHs. Because no elevated headspace readings were measured and no field screening indications of petroleum or other potential impacts were observed, the samples were not submitted to Pace for VOC, PCB or DRO analysis. Three duplicate soil samples were collected. Sample DUP-1 was split with sample GB-6/7-9, sample DUP-2 was split with sample LGP-1/2-4, and sample DUP-3 was split with sample LGP-4/0-2. Table 1 lists the location rationale and sample depth, the depth of fill material at each location and the specific analytical parameters for each sample. The Phase II Investigation locations are shown on Figure 2.

Table 2 lists detected RCRA metals and PAH concentrations in soil samples. Table 2 also lists the MPCA Residential Soil Reference Values (RSRVs) and the Commercial/Industrial Soil Reference Values (C/ISRVs) for comparison purposes. The benzo(a)pyrene equivalent (BaP) concentrations were calculated for detected PAHs. As listed in Table 2, all RCRA metals were

reported below the respective RSRVs, except for arsenic concentrations in two of the soil samples. Trace concentrations of PAHs were reported in 3 soil samples and the BaP equivalent was calculated at 0.0 milligrams per kilogram (mg/kg) in each of these samples. The BaP equivalent was reported above the RSRV and C/ISRV in only one soil sample. The following items list the locations where arsenic or PAH concentrations were reported above the RSRV and C/ISRV. The laboratory analytical report from Pace is included in Appendix E.

- Arsenic was reported at 10.2 mg/kg in sample GB-3/2-4 and at 8.1 mg/kg in sample GB-5/4.5-6.5. These arsenic concentrations are above the RSRV of 5 mg/kg, but below the C/ISRV of 20 mg/kg.

- The BaP equivalent was calculated at 12.7 mg/kg in sample LGP-4/0-2, which is above the RSRV of 2 mg/kg and the C/ISRV of 3 mg/kg. This concentration was confirmed in sample DUP-3, where the BaP equivalent was calculated at 10.4 mg/kg.

Groundwater Analytical Results

The three groundwater samples were analyzed for VOCs and groundwater sample DUP-GW was split with sample GB-4. Sample GB-4 was located on the 219 parcel and sample GB-3 and GB-5 were located on the 223 parcel. Past investigations and groundwater monitoring on the 219 parcel indicate that groundwater flows east beneath the Property. Table 3 lists the detected parameters as well as the MDH Health Risk Limits (HRLs) for drinking water for comparison purposes. The following items summarize groundwater sample analytical results:

- Boring GB-3 was located along the northwestern boundary of the 223 parcel. No field screening indications of contamination, including elevated headspace readings, were observed in soil samples collected at this location and all detected PAHs and RCRA metals were reported below the MPCA RSRV in the two soil samples submitted to Pace. Groundwater was encountered at approximately 18 feet bgs and sample GB-3 did not have any field screening indications (e.g. odor/sheen) of contamination. Of the six VOCs reported in the sample, only benzene, which was detected 13.8 micrograms per liter (ug/L), was reported above the MDH HRL of 10 ug/L. All other VOCs, including PCE, were reported well below the MDH HRL. Table 3 lists detected VOCs in groundwater samples and the corresponding MDH HRLs.

- Boring GB-4 was located along the southeastern boundary of the 219 parcel. Fill material was observed above a concrete slab at 11 feet bgs and no PAHs or RCRA metals were reported above the RSRVs in sample GB-4/12-14, which was collected from native material above bedrock. Groundwater was encountered at 18 feet bgs and sample GB-4 did not have any field screening indications (e.g. odor/sheen) of contamination. Ten VOCs were reported in the sample and PCE was reported at 997 ug/L. This concentration is above the MDH HRL of 7 ug/L. These results were confirmed in sample DUP-GW as PCE was reported at 989 ug/L. No other VOCs were reported above the MDH HRLs. Table 3 lists detected VOCs in groundwater samples and the corresponding MDH HRLs.

- Boring GB-5 was located in the southwestern portion of the 223 parcel. As stated, fill material and buried demolition debris were observed to approximately 15 feet bgs and no PAHs or RCRA metals were reported above the RSRVs in sample GB-5/4.5-

6.5. No field screening indications of contamination, including elevated headspace readings, were observed in soil samples collected at this location. Groundwater was encountered at 17 feet bgs and sample GB-5 did not have any field screening indications (e.g. odor/sheen) of contamination. Five VOCs were reported in the sample and all VOC concentrations were reported below MDH HRLs. Table 3 lists detected VOCs in groundwater samples and the corresponding MDH HRLs.

Soil Gas Analytical Results

On November 9, 2005, DPRA collected four soil gas samples around the perimeter of the 219 parcel. The DPRA soil gas sample locations are labeled SG-1 through SG-4 and are shown on Figure 2. PCE was reported in each soil-gas sample. SG-2 was collected from a boring located north of the 219 parcel and PCE was reported at 2.2 ug/m^3, which is below the MPCA VIC program Industrial-Commercial Intrusion Screening Values ("I/CISVs") of 14 ug/m^3. PCE concentrations in SG-1, SG-3 and SG-4 were all reported above the MPCA I/CISVs and ranged from 480 ug/m^3 to 520 ug/m^3. No other VOCs were reported above the I/CISVs.

The six Landmark soil gas samples were analyzed for VOCs by EPA Method TO-15. Table 4 lists the detected soil gas VOCs as well as the updated RISVs and I/CISVs listed in the MPCA VIC Guidance Document #1.02, *Vapor Intrusion at VIC Sites, MPCA Draft Screening Values for Vapor Intrusion Risk Evaluation*, dated June 2006. Table 4 also lists the MDH Background Ranges for VOCs for comparison purposes. VOCs were reported in each soil gas sample. The following items list the sample results for VOCs exceeding the MPCA RISVs and/or I/CISVs:

- Soil gas vapor monitoring point LSG-1 is located along the southern boundary of the 223 parcel. Two VOCs were reported above the I/CISV. Benzene was reported at 15.7 ug/m^3, which is above the I/CISV of 1.3- to 4.5 ug/m^3 and chloroform was reported at 10.4 ug/m^3, which is above the I/CISV of 2 ug/m^3. The benzene concentration is within the background range of 2- to 30 ug/m^3, and the MDH does not list a background range for chloroform.

- Soil gas vapor monitoring point LSG-2 is also located along the southern boundary of the 223 parcel. Three VOCs were reported above the I/CISV. Benzene was reported at 27.9 ug/m^3, which is above the I/CISV of 1.3- to 4.5 ug/m^3, 1,2,4-trimethylbenzene was reported at 13.4 ug/m^3, which is above the I/CISV of 9 ug/m^3 and PCE was reported at 45.3 ug/m^3, which is above the I/CISV of 14 ug/m^3. The benzene concentration is within the background range of 2- to 30 ug/m^3 and the concentration of PCE is above the MDH background range of 1.7- to 4.8 ug/m^3. The MDH does not list a background range for 1,2,4-trimethylbenzene

- Soil gas vapor monitoring point LSG-3 is located in the alley northwest of the 219 parcel. Benzene was reported at 3.0 ug/m^3, which is within the listed I/CISV range of 1.3- to 4.5 ug/m^3 as well as the background range of 2- to 30 ug/m^3. The concentration of 1,2,4-trimethylbenzene was reported at 9.9 ug/m^3, which is slightly above the I/CISV of 9 ug/m^3. The MDH does not list a background range for 1,2,4-trimethylbenzene.

- Soil gas vapor monitoring point LSG-4 is located in the parking lot north of the east-west orientated alley north of the 219 parcel. Benzene was reported at 3.0 ug/m^3, which is within the listed I/CISV range of 1.3- to 4.5 ug/m^3 as well as the background range of 2- to 30 ug/m^3.

- Soil gas vapor monitoring point LSG-5 is located along the northern boundary of the 219 parcel. Three VOCs were reported above the I/CISV. Benzene was reported at 38.8 ug/m^3, which is above the I/CISV of 1.3- to 4.5 ug/m^3, 1,2,4-trimethylbenzene was reported at 13.4 ug/m^3, which is above the I/CISV of 9 ug/m^3 and PCE was reported at 56.9 ug/m^3, which is above the I/CISV of 14 ug/m^3. The benzene concentration is above the MDH background range of 2- to 30 ug/m^3, and the concentration of PCE is above the MDH background range of 1.7- to 4.8 ug/m^3. The MDH does not list a background range for 1,2,4-trimethylbenzene.

- Soil gas vapor monitoring point LSG-6 is located along the southwest boundary of the 223 parcel. Two VOCs were reported above the I/CISV. Benzene was reported at 15.5 ug/m^3, which is above the I/CISV of 1.3- to 4.5 ug/m^3 and PCE was reported at 43.3 ug/m^3, which is above the I/CISV of 14 ug/m^3. The benzene concentration is within the MDH background range of 2- to 30 ug/m^3, and the concentration of PCE is above the MDH background range of 1.7- to 4.8 ug/m^3.

Section 5: Conclusions and Recommendations

Based on the results of the Phase II Investigation, fill material was encountered throughout the Property to depths ranging from 10- to 15 feet bgs. Bedrock was encountered at the six geotechnical borings at depths ranging from 13- to 17 feet bgs. Fill material on the 219 parcel consists of poorly graded sand that has been placed above a concrete slab at approximately 10 feet bgs. No construction debris or demolition debris was encountered in the six borings located on the 219 parcel. Fill material on the 223 parcel is more varied and contained construction demolition debris. In the eastern portion of the 223 parcel, sandy silt and clay with gravel was encountered. In the central and western portions of the 223 parcel, demolition debris consisting of concrete, bricks, movie theater seats, and wood was mixed with sand, silt and gravel from 10- to 15 feet bgs.

All RCRA metals and detected PAHs were reported below the MPCA RSRVs in soil samples collected on the 219 parcel. On the 223 parcel, arsenic was reported above the RSRV of 5.0 mg/kg in soil sample GB-3/2-4 (10.2 mg/kg) and GB-5/4.5-6.5 (8.1 mg/kg). In sample LGP-4/0-2, which was collected on the 223 parcel, the BaP equivalent was calculated at 12.7 mg/kg, which is above the RSRV of 2.0 mg/kg as well as the C/ISRV of 3.0 mg/kg. This result was confirmed in sample DUP-3, where the BaP equivalent was calculated at 10.4 mg/kg.

Groundwater occurs within limestone bedrock at approximately 18 feet bgs. Historical drycleaning operations on the 219 parcel resulted in the release of PCE to the soil and groundwater. A dual-phase remediation system operates on the 219 parcel to capture VOC-impacted groundwater. VOC impacts to groundwater on the 219 parcel were confirmed during this Phase II Investigation in the groundwater sample collected at GB-4. Additionally, VOC impacts to groundwater were identified on the 223 parcel in samples collected at GB-3 and GB-5.

Benzene and 1,2,4-trimethylbenzene concentrations reported in the soil gas samples likely represent background levels. However, VOC concentrations were reported above the C/ISVs at four locations including chloroform (at LSG-1) and PCE (at LSG-2, LSG-5 and LSG-6). These concentrations may represent a potential vapor intrusion risk to surrounding properties.

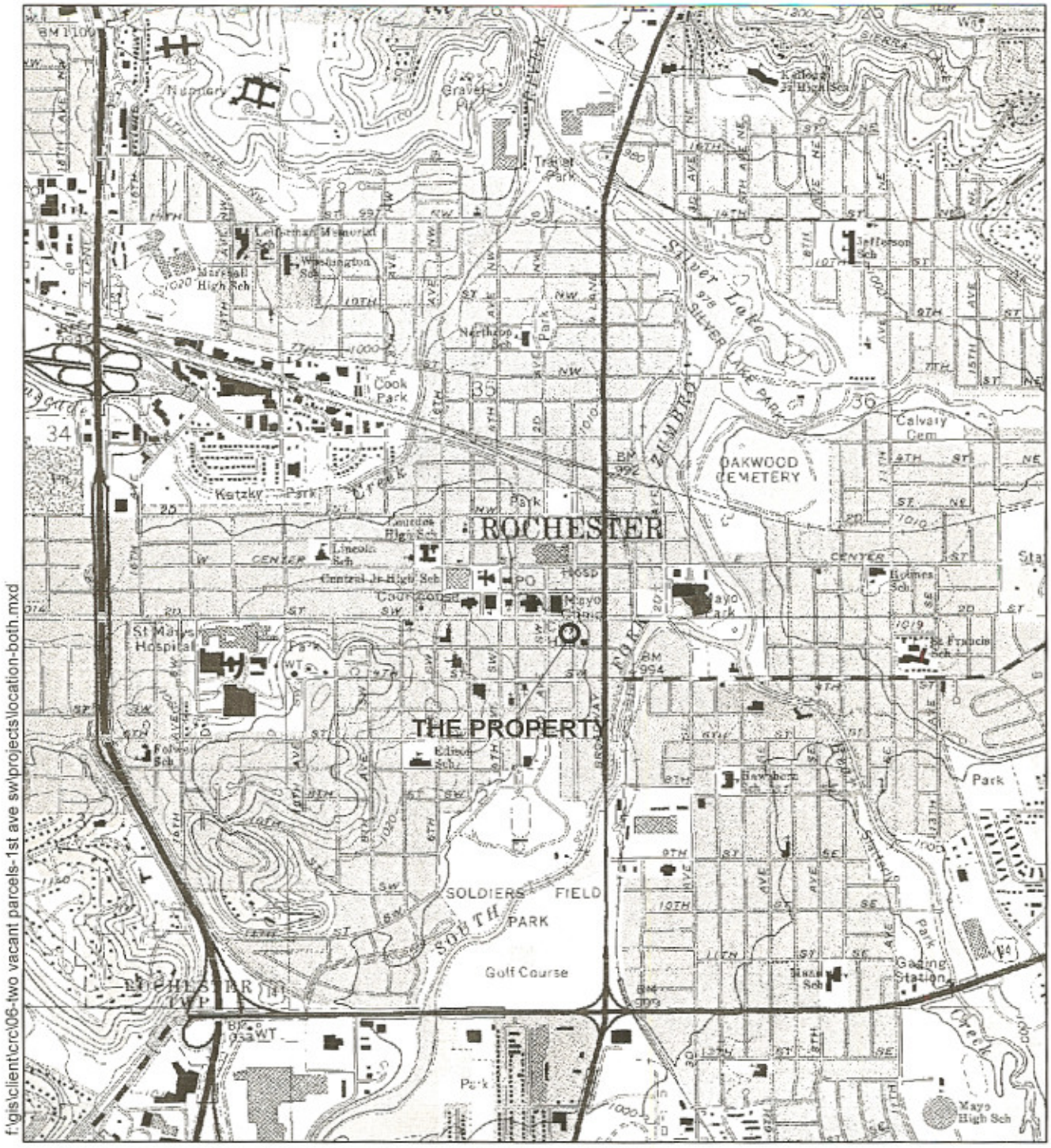
The planned future use of the Property is to construct a bio-science technology facility which will include a commercial office building and parking ramp. Based on the results of this Phase II Investigation and previous investigations, RAs to address soil, vapor and groundwater impacts are warranted. Landmark recommends the following:

- Landmark recommends that the City submit an application to the MPCA VIC Program, submit the Phase I ESA Reports and this Phase II Investigation Report for review and approval, and request that the VIC Program issue a No Association Determination. Based on the results of the Investigation, Landmark recommends that the City request that the MPCA VIC Program issue a No Association Determination for the reported arsenic- and PAH- contaminated soil that exceeds the RSRVs or the C/ISRV on the 223 parcel, which were identified in this Phase II Investigation Report. Likewise, Landmark recommends that the City request that the MPCA VIC Program issue a No Association Determination for documented historical VOC-contaminated soil on the 219 parcel. Finally, Landmark recommends that the City request that the MPCA issue a No Association Determination for VOC-impacted soil gas vapors at and groundwater beneath both parcels.

- Landmark recommends that a Voluntary Response Action Plan (VRAP) be prepared, based on the results of the Phase II Investigation and the planned future use of the Property, and submit the VRAP to the MPCA for review and approval. The VRAP will detail specific RAs that will be taken to protect public health and the environment. First, the existing dual phase remediation system will be removed and reconstructed. In addition, soil excavated on the Property as part of the proposed redevelopment will need to be managed according to that MPCA-approved VRAP. Based on the screening criteria and contaminants screened for, impacted soil exceeding the C/ISRV will be managed on-site or excavated and transported off-site to a permitted RCRA Subtitle D landfill. Finally, a vapor barrier and venting system will be constructed under the proposed building. The details of the vapor response actions should be included in the VRAP.

- Landmark recommends that an Environmental Contingency Plan (ECP) be prepared and submitted to the VIC Program for review and approval for the entire redevelopment area. The purpose of the ECP is to address conditions that are unexpectedly encountered during the implementation of the VRAP and redevelopment.

Figures



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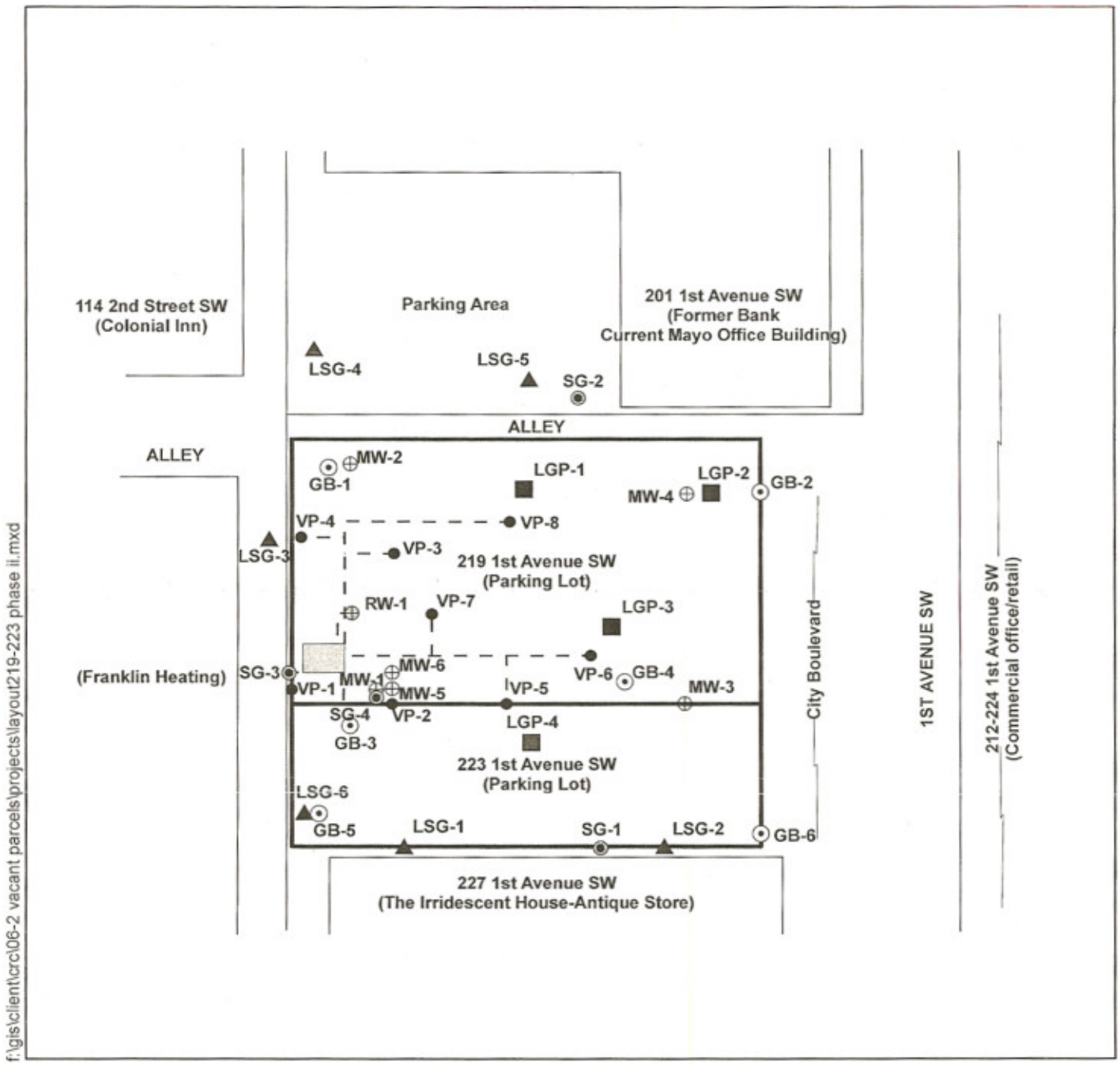
Source: Rochester, Minnesota Topographic Quadrangle, 7.5-Minute Series

FIGURE 1

PROPERTY LOCATION MAP
219 and 223 1ST Avenue Southwest
Rochester, Minnesota



LEGEND

- Property Line

Previous Investigation/Remediation Locations

- Remediation Building
- Lateral Piping
- Monitoring Well
- Recovery Well
- Vapor Port
- Previous Soil Gas Probe

2006 Phase II Investigation Locations

- Landmark Soil Gas Vapor Point
- Landmark Geoprobe
- Geotechnical Boring (groundwater samples collected at GB-3, -4, and -5)

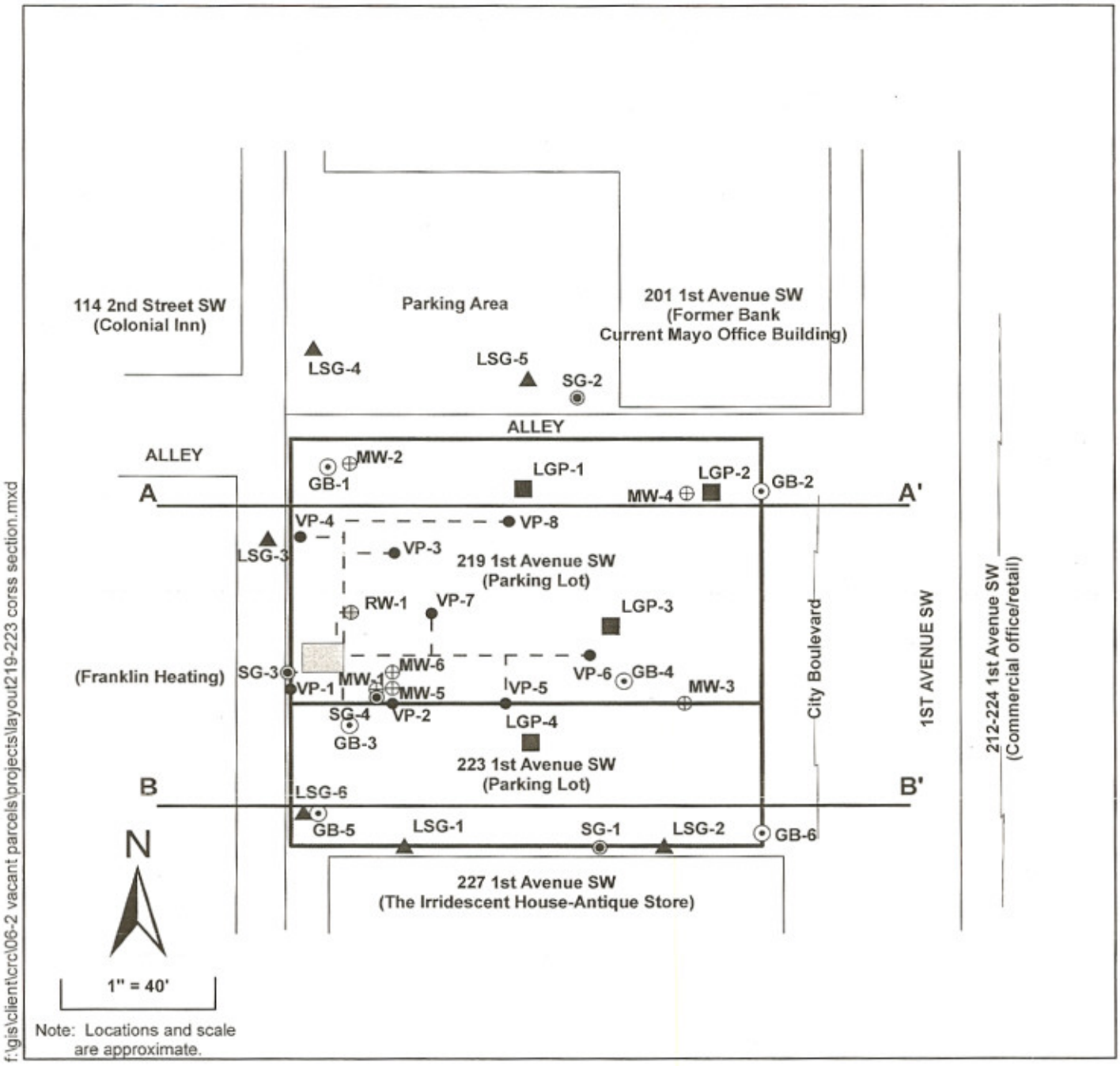
N

1" = 40'

Note: Locations and scale are approximate.

FIGURE 2

PROPERTY LAYOUT MAP
WITH INVESTIGATION LOCATIONS
219-223 1st Avenue SW
Rochester, Minnesota



LEGEND

- Property Line

Previous Investigation/
Remediation Locations

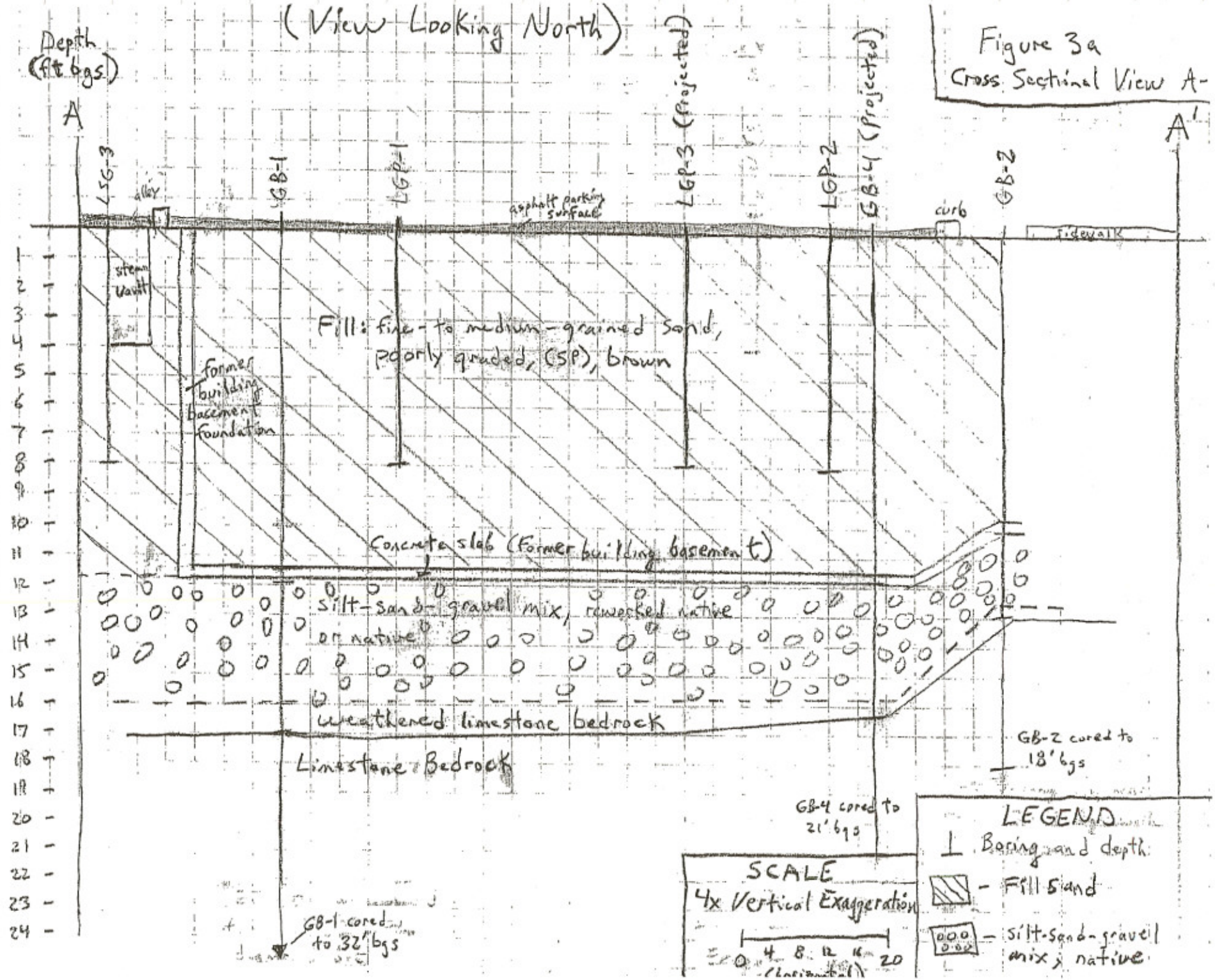
- Remediation Building
- Lateral Piping
- Monitoring Well
- Recovery Well
- Vapor Port
- Previous Soil Gas Probe

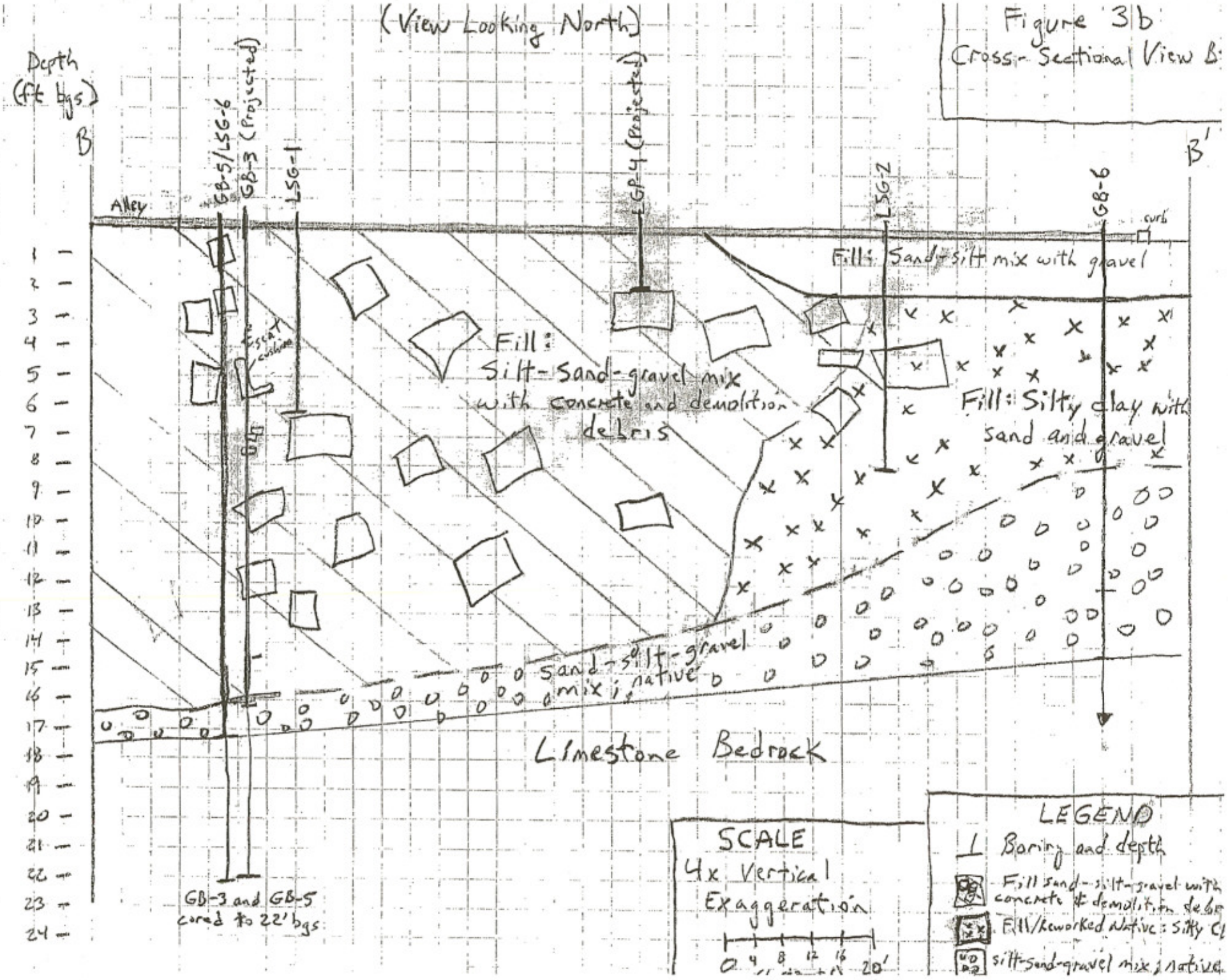
2006 Phase II Investigation Locations

- Landmark Soil Gas Vapor Point
- Landmark Geoprobe
- Geotechnical Boring
  (groundwater samples collected at GB-3, -4, and -5)
- A–A' Cross-Section Location

FIGURE 3

LOCATION OF CROSS-SECTIONS
219-223 1st Avenue SW
Rochester, Minnesota


(View Looking North)
Figure 3a
Cross Sectional View A-A'
Depth (ft bgs)
A
A'
LSG-3
alley
GB-1
LGP-1
asphalt parking surface
LGP-3 (Projected)
LGP-2
GB-4 (Projected)
curb
GB-2
sidewalk
steam vault
former building basement foundation
Fill: fine- to medium-grained sand, poorly graded, (SP), brown
Concrete slab (Former building basement)
silt-sand-gravel mix, reworked native or native
weathered limestone bedrock
Limestone Bedrock
GB-2 cored to 18' bgs
GB-4 cored to 21' bgs
GB-1 cored to 32' bgs
SCALE
4x Vertical Exaggeration
0 4 8 12 16 20
LEGEND
Boring and depth
Fill Sand
silt-sand-gravel mix, native


(View Looking North)
Figure 3b
Cross-Sectional View B-
Depth (ft bgs)
B
B'
Alley
GB-5/LSG-6
GB-3 (Projected)
LSG-1
GP-4 (Projected)
LSG-2
GB-6
curb
Fill: Sandy silt mix with gravel
Fill: Silt-sand-gravel mix with concrete and demolition debris
Fill: Silty clay with sand and gravel
sand-silt-gravel mix native
Limestone Bedrock
GB-3 and GB-5 cored to 22' bgs
SCALE
4x Vertical Exaggeration
0 4 8 12 16 20'
LEGEND
Boring and depth
Fill sand-silt-gravel with concrete & demolition debr
Fill/reworked native: Silty Cl
silt-sand-gravel mix / native

Tables

Table 1
Boring Location Rationale and Analytical Summary
219 and 223 1st Avenue SW
Rochester, Minnesota

Location Name	Depth (ft bgs)	Boring Location and Depth of Fill Material	Sample ID/Depth and Analytical Parameters
GB-1		Geotechnical boring located in northwest corner of Property on 219 parcel. Fill material observed to 11.5 feet bgs above concrete slab	Soil samples GB-1/4.5-6.5 and GB-1/12-14 collected for PAHs and RCRA metals
GB-2		Geotechnical boring located in northeast corner of Property on 219 parcel. Fill material observed to 9.5 feet bgs, above concrete slab	Soil sample GB-2/2-4 collected for PAHs and RCRA metals
GB-3		Geotechnical boring located in middle-western portion of Property on 223 parcel. Fill material observed to 12 feet bgs	Soil samples GB-3/2-4 and GB-3/12-13.5 collected for PAHs and RCRA metals Groundwater sample GB-3 collected for VOCs
GB-4		Geotechnical boring located in middle-eastern portion of Property on 219 parcel. Fill material observed to 10.5 feet bgs above concrete slab	Soil sample GB-4/12-14 collected for PAHs and RCRA metals Groundwater sample GB-4 and DUP-GW collected for VOCs
GB-5/LSG-6		Geotechnical boring located in southwestern portion of Property on 223 parcel. Fill material observed to approximately 16 feet bgs. Also, LSG-6 installed in boring after backfilling with sand.	Soil sample GB-5/0-2 collected for RCRA metals and PAHs Groundwater sample GB-5 collected for VOCs Vapor sample LSG-6 collected for VOCs
GB-6		Geotechnical boring located in southeastern portion of Property on 223 parcel. Fill material/reworked native observed to approximately 12 feet bgs	Soil sample GB-6/7-9 and split sample DUP-1 collected for RCRA metals and PAHs
LGP-1		Boring located in central portion of 219 parcel. Fill material to boring terminus at 8 feet bgs	Soil sample LGP-1/2-4 and split sample DUP-2 collected for RCRA metals and PAHs
LGP-2		Boring located in eastern portion of 219 parcel. Fill material to boring terminus at 8 feet bgs	Soil sample LGP-2/0-2 collected for RCRA metals and PAHs
LGP-3		Boring located in south-central portion of 219 parcel. Fill material to boring terminus at 8 feet bgs	Soil samples LGP-3/2-4 and LGP-3/6-8 collected for RCRA metals and PAHs
LGP-4		Boring located in north-central portion of 223 parcel. Geoprobe refusal at 2 feet bgs on concrete. Fill material to 2 feet bgs	Soil sample LGP-4/0-2 and split sample DUP-3 collected for RCRA metals and PAHs
LSG-1		Boring located along southern Property boundary and converted into permanent vapor monitoring point. Fill material to boring terminus at 6.5 feet bgs	Soil sample LSG-1/2-4 collected for RCRA metals and PAHs and vapor sample LSG-1 collected for VOCs
LSG-2		Boring located along southern Property boundary and converted into permanent vapor monitoring point. Fill material to boring terminus at 8 feet bgs	Soil sample LSG-2/0-2 collected for RCRA metals and PAHs and vapor sample LSG-2 collected for VOCs
LSG-3		Boring located northwest of Property boundary in alley and converted into permanent vapor monitoring point. Fill material to boring terminus at 8 feet bgs	Vapor sample LSG-3 collected for VOCs
LSG-4		Boring located northwest of boundary in parking lot and converted into permanent vapor monitoring point. Fill material to boring terminus at 6 feet bgs	Vapor sample LSG-4 collected for VOCs
LSG-5		Boring located north of Property boundary and converted into permanent vapor monitoring point. Fill material to boring terminus at 8 feet bgs	Vapor sample LSG-5 collected for VOCs
LSG-6		Boring located along southwestern Property boundary and converted into permanent vapor monitoring point. Fill material to boring terminus at 8 feet bgs	Vapor sample LSG-6 collected for VOCs

Table 2
Analytical Soil Sampling Results - Detected Parameters
219 and 223 First Ave S
Rochester, MN
(results in mg/kg)

Sample Name	Residential	Industrial	GB-1	GB-1	GB-2	GB-3	GB-3	GB-4
Sample Modifier	Tier 1	Tier 2	Soil	Soil	Soil	Soil	Soil	Soil
Sample Depth (ft)[1]	SRV	SRV	4.5-6.5	12-14	2-4	2-4	12-13.5	12-14
Laboratory			PACE	PACE	PACE	PACE	PACE	PACE
Date			29-Dec-06	29-Dec-06	29-Dec-06	28-Dec-06	28-Dec-06	29-Dec-06
Parameter	mg/kg	mg/kg						
Metals								
Mercury	0.5	1.5	0.36	0.046	ND	0.051	ND	ND
Arsenic	5	20	ND	ND	ND	10.2	ND	4.9
Barium	1200	180000	63.5	75.2	18.9	41.6	56.6	175
Cadmium	25	200	0.12	0.15	0.059	0.19	0.20	0.43
Chromium	87	680	4.1	13.5	4.4	7.3	15.2	15.5
Lead	300	700	49.3	11.4	4.3	33.5	6.7	6.5
Selenium	160	1300	ND	1.1	ND	ND	ND	ND
Silver	160	1300	ND	ND	ND	ND	ND	ND
Polynuclear Aromatic Hydrocarbons								
Anthracene	7,880	45,400	ND	ND	ND	ND	ND	ND
Acenaphthene	1,200	5,260	ND	ND	ND	ND	ND	ND
Acenaphthylene	NS	NS	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ns	ns	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND
Chrysene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND
Fluoranthene	1080	6800	ND	ND	ND	0.52	ND	ND
Fluorene	850	4,120	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND
Naphthalene	10	28	ND	ND	ND	ND	ND	ND
Phenanthrene	NS	NS	ND	ND	ND	ND	ND	ND
Pyrene	890	5,800	ND	ND	ND	0.55	ND	ND
B(a)P Equivalent	2.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 2
Analytical Soil Sampling Results - Detected Parameters
219 and 223 First Ave S
Rochester, MN
(results in mg/kg)

Sample Name	Residential	Industrial	GB-5	GB-6	DUP-1	DUP-2	LGP-1	LGP-2	LGP-3
Sample Modifier	Tier 1	Tier 2	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Sample Depth (ft)[1]	SRV	SRV	4.5-6.5	7-9	(GB-6/7-9)	(LGP-1/2-4)	2-4	4-6	6-8
Laboratory			PACE	PACE	PACE	PACE	PACE	PACE	PACE
Date			29-Dec-06	28-Dec-06	28-Dec-06	29-Dec-06	29-Dec-06	29-Dec-06	29-Dec-06
Parameter	mg/kg	mg/kg							
Metals									
Mercury	0.5	1.5	0.041	ND	ND	ND	ND	ND	0.022
Arsenic	5	20	8.1	ND	ND	0.56	ND	ND	0.50
Barium	1200	180000	34.2	32.2	31.3	37.8	33.0	30.1	71.1
Cadmium	25	200	0.16	ND	ND	0.11	0.085	0.88	0.13
Chromium	87	680	17.6	34.2	15.7	8.5	5.9	7.5	8.8
Lead	300	700	9.9	7.6	8.2	8.7	7.2	6.0	8.9
Selenium	160	1300	ND	ND	ND	ND	0.83	ND	ND
Silver	160	1300	0.83	ND	ND	ND	ND	ND	ND
Polynuclear Aromatic Hydrocarbons									
Anthracene	7,880	45,400	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	1,200	5,260	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	NS	NS	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ns	ns	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND	ND
Chrysene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	1080	6800	1.97	ND	ND	ND	ND	ND	ND
Fluorene	850	4,120	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND	ND	ND
Naphthalene	10	28	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	NS	NS	1.87	ND	ND	ND	ND	ND	ND
Pyrene	890	5,800	1.79	ND	ND	ND	ND	ND	ND
B(a)P Equivalent	2.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 2
Analytical Soil Sampling Results - Detected Parameters
219 and 223 First Ave S
Rochester, MN
(results in mg/kg)

Sample Name	Residential	Industrial	LGP-4	DUP-3	LSG-1	LSG-2	LGP-3
Sample Modifier	Tier 1	Tier 2	Soil	Soil	Soil	Soil	Soil
Sample Depth (ft)[1]	SRV	SRV	0-2	(LGP-4/0-2)	2-4	0-2	2-4
Laboratory			PACE	PACE	PACE	PACE	PACE
Date			29-Dec-06	29-Dec-06	28-Dec-06	28-Dec-06	29-Dec-06
Parameter	mg/kg	mg/kg					
Metals							
Mercury	0.5	1.5	0.30	0.15	0.027	0.24	ND
Arsenic	5	20	1.2	ND	ND	ND	0.73
Barium	1200	180000	121	139	72.8	102	27.3
Cadmium	25	200	15.7	3.5	0.24	0.16	0.085
Chromium	87	680	14.3	10.2	10.5	14.1	7.8
Lead	300	700	82.8	47.2	12.6	29.4	4.4
Selenium	160	1300	ND	0.89	0.84	1.1	0.87
Silver	160	1300	ND	ND	ND	ND	ND
Polynuclear Aromatic Hydrocarbons							
Anthracene	7,880	45,400	9.11	6.06	ND	ND	ND
Acenaphthene	1,200	5,260	2.83	ND	ND	ND	ND
Acenaphthylene	NS	NS	ND	ND	ND	ND	ND
Benzo(a)anthracene	see B(a)P eq.[2]	see B(a)P eq.[2]	12.70	9.50	ND	ND	ND
Benzo(a)pyrene	see B(a)P eq.[2]	see B(a)P eq.[2]	9.17	7.62	ND	ND	ND
Benzo(b)fluoranthene	see B(a)P eq.[2]	see B(a)P eq.[2]	12.00	9.88	ND	ND	ND
Benzo(g,h,i)perylene	ns	ns	4.06	3.47	ND	ND	ND
Benzo(k)fluoranthene	see B(a)P eq.[2]	see B(a)P eq.[2]	5.30	4.04	ND	ND	ND
Chrysene	see B(a)P eq.[2]	see B(a)P eq.[2]	13.00	9.57	ND	ND	ND
Dibenz(a,h)anthracene	see B(a)P eq.[2]	see B(a)P eq.[2]	ND	ND	ND	ND	ND
Fluoranthene	1080	6300	27.00	20.20	ND	ND	ND
Fluorene	850	4,120	3.65	2.46	ND	ND	ND
Indeno(1,2,3-cd)pyrene	see B(a)P eq.[2]	see B(a)P eq.[2]	4.12	3.41	ND	ND	ND
Naphthalene	10	28	3.11	ND	ND	ND	ND
Phenanthrene	NS	NS	27.80	18.70	ND	ND	ND
Pyrene	890	5,800	22.40	17.40	ND	0.39	ND
B(a)P Equivalent	2.0	3.0	12.7	10.4	0.0	0.0	0.0

Table 3
Analytical Groundwater Sampling Summary -Detected Parameters
(results in ug/L)

Sample Name Sample Date Sample Depth Laboratory Name Laboratory Type Parameter = Volatile Organic Compounds	Minnesota Department of Health HRLs	GB-3 29-Dec-06 PACE Fixed	GB-4 29-Dec-06 PACE Fixed	GB-5 29-Dec-06 PACE Fixed	DUP 29-Dec-06 (GB-4) PACE Fixed
Acetone	700	ND	11.9	14.6	11.4
Benzene	10	**13.8**	8.4	ND	9.0
Bromodichloromethane	ns	ND	1.1	ND	1.1
2-Butanone	ns	13.1	15.6	12.3	5.5
Chloroethane	280	ND	2.1	ND	2.3
Chloroform	60	1.6	2.1	2.5	2.2
Dibromochloromethane	ns	2.6	2.9	2.7	3.1
Tetrachloroethene	7	2.2	**997**	ND	**989**
Toluene	1,000	2.9	4.7	1.3	4.7
1,1,2-Trichlorotrifluoroethane	200000	ND	62.0	ND	65.4

Footnotes:
concentrations listed in ug/L
HRL = Health Risk Limit
na=not analyzed
ns=no standard

Table 4
Analytical Soil Gas Sampling Results - Detected Parameters
219 and 223 First Ave S
Rochester, MN
(ug/m3)

Screening Criteria Compound	MPCA RISV Intrusion ug/m³	MPCA I/CISC Intrusion ug/m³	RSV noncancer ug/m³	I/CSV noncancer ug/m³	MDH Background Range ug/m³	LSG-1 Grab 29-Dec-06 ug/m³	LSG-2 Grab 29-Dec-06 ug/m³	LSG-3 Grab 29-Dec-06 ug/m³	LSG-4 Grab 29-Dec-06 ug/m³
Acetone	*350*	**511**	350	511	ns	24.5	45.5	61.1	64.8
Benzene	*1.3-4.5*	**1.3 - 4.5**	ns	ns	2-30	**15.7**	**27.9**	**3.0**	**3.0**
2-Butanone (MEK)	*5000*	**7300**	5000	7300	ns	ND	6.2	9.0	14.7
Carbon disulfide	*700*	**1022**	700	1022	ns	ND	3.6	ND	27.7
Chloroform	*1*	**2**	300	438	ns	**10.4**	ND	ND	ND
Chloroethane	*ns*	**ns**	ns	ns	ns	ND	ND	ND	23.6
Chloromethane	*24*	**41**	90	131	ns	ND	0.76	1.1	ND
Cyclohexane	*6000*	**8760**	6000	8760	ns	1.8	ND	ND	3.0
Dichlorodifluoromethane	*200*	**292**	200	292	ns	5.2	3.4	3.3	5.5
Dichlorotetrafluoroethane	*ns*	**ns**	ns	ns	ns	ND	ND	ND	ND
Ethyl acetate	*3200*	**4672**	3200	4672	ns	ND	ND	ND	26.3
Ethylbenzene	*22*	**37**	1000	1460	0.62-10.5	3.0	6.8	3.2	ND
4-Ethyltoluene	*ns*	**ns**	ns	ns	ns	ND	8.2	6.3	ND
n-Hexane	*700*	**1022**	700	1022	ns	2.6	20.6	ND	6.3
Methylene chloride	*52*	**87**	400	584	ns	2.8	4.7	3.1	1.9
Propylene	*3000*	**4380**	3000	4380	ND	21.4	8.7	3.5	12.7
Tetrachloroethylene	*8*	**14**	ns	ns	1.7-4.8	3.2	**45.3**	2.6	ND
Tetrahydrofuran	*ns*	**ns**	ns	ns	ns	ND	6.3	ND	ND
Toluene	*400*	**400**	ns	ns	2.6-91	19.8	66.9	9.1	1.6
Trichlorofluoromethane	*700*	**1022**	700	1022	ns	20.1	ND	1.6	14.5
1,2,4-Trimethylbenzene	*6*	**9**	6	9	ns	4.0	**13.4**	**9.9**	ND
Vinyl acetate	*200*	**292**	200	292	ns	ND	ND	2.8	ND
Xylenes	*100*	**146**	100	146	10-47	15.5	35.8	20.4	ND

RISV = Residential Intrusion Screening Value (exceedence shown in *italics*)
I/CISV = Industrial/Commercial Intrusion Screening Value (exceedence shown in **bold**)
RSV = Residential Screening Value (noncancer)
I/CSV = Industrial Screening Value (noncancer)
ns = No Standard
ND = No Detection

Table 4
Analytical Soil Gas Sampling Results - Detected Parameters
219 and 223 First Ave S
Rochester, MN
(ug/m3)

Screening Criteria Compound	MPCA RISV Intrusion ug/m³	MPCA I/CISC Intrusion ug/m³	RSV noncancer ug/m³	I/CSV noncancer ug/m³	MDH Background Range ug/m³	LSG-5 Grab 29-Dec-06 ug/m³	LSG-6 Grab 29-Dec-06 ug/m³
Acetone	*350*	**511**	350	511	ns	ND	ND
Benzene	*1.3-4.5*	**1.3 - 4.5**	ns	ns	2-30	**38.8**	**15.5**
2-Butanone (MEK)	*5000*	**7300**	5000	7300	ns	ND	ND
Carbon disulfide	*700*	**1022**	700	1022	ns	362 E	2.1
Chloroform	*1*	**2**	300	438	ns	ND	ND
Chloroethane	*ns*	**ns**	ns	ns	ns	270 E	2.1
Chloromethane	*24*	**41**	90	131	ns	ND	1.3
Cyclohexane	*6000*	**8760**	6000	8760	ns	ND	ND
Dichlorodifluoromethane	*200*	**292**	200	292	ns	ND	3.6
Dichlorotetrafluoroethane	*ns*	**ns**	ns	ns	ns	3.6	ND
Ethyl acetate	*3200*	**4672**	3200	4672	ns	17.3	ND
Ethylbenzene	*22*	**37**	1000	1460	0.62-10.5	6.3	6.7
4-Ethyltoluene	*ns*	**ns**	ns	ns	ns	7.7	4.8
n-Hexane	*700*	**1022**	700	1022	ns	51.6	12.6
Methylene chloride	*52*	**87**	400	584	ns	ND	ND
Propylene	*3000*	**4380**	3000	4380	ND	21.9	3.3
Tetrachloroethylene	*8*	**14**	ns	ns	1.7-4.8	**56.9**	**43.4**
Tetrahydrofuran	*ns*	**ns**	ns	ns	ns	17.6	ND
Toluene	*400*	**400**	ns	ns	2.6-91	74.4	57.3
Trichlorofluoromethane	*700*	**1022**	700	1022	ns	ND	ND
1,2,4-Trimethylbenzene	*6*	**9**	6	9	ns	**12.3**	5.0
Vinyl acetate	*200*	**292**	200	292	ns	ND	ND
Xylenes	*100*	**146**	100	146	10-47	31.8	32.7

RISV = Residential Intrusion Screening Value (exceedence shown in *italics*)
I/CISV = Industrial/Commercial Intrusion Screening Value (exceedence shown in **bold**)
RSV = Residential Screening Value (noncancer)
I/CSV = Industrial Screening Value (noncancer)
ns = No Standard
ND = No Detection

Appendix A
Landmark SOPs

Field Screening Procedure: Bag Headspace Procedure
Soil Sample Collection and Analysis

This document was taken from the MPCA's Risk Based Site Characterization and Sampling Guidance, Working Draft, September 16, 1998, Soil Sample Collection and Analysis Fact Sheet #3.22, July 1996

This fact sheet provides procedures for field screening of petroleum contaminated soil and collection and laboratory analysis of soil samples.

Field Screening Procedure

Minnesota Pollution Control Agency (MPCA) staff recommends the polyethylene bag headspace method described below as the field procedure for characterization of soil contamination.

Use photoionization detectors (PIDs) with 10.2 eV (+/-) or greater lamp source, or flame ionization detectors (FIDs). Perform PID or FID instrument calibration of site and at least daily to yield "total organic vapors" in volume parts per million (ppm) of a benzene equivalent. Follow the manufacturer's instructions for operation, maintenance, and calibration of the instrument. Keep calibration records. MPCA staff reserve the right to request these records.

Use a self-sealing quart-size polyethylene freezer bag. Half-fill the bag with the sample to be screened so the volume ratio of soil to air is equal then immediately seal it. Manually break up the soil clumps within the bag. *Note:* Soil collected from a split spoon should be transferred to the bag immediately after opening the split spoon; soil collected from an excavation or soil pile should be collected from freshly exposed surfaces.

Allow headspace development for at least 10 minutes. Vigorously shake bags for 15 seconds both at the beginning and end of the headspace development period. Headspace development decreases with temperature. When temperatures are below the operating range of the instrument perform headspace development and analysis in a heated vehicle or building. Record the ambient temperature during headspace screening. *Complete headspace analysis within approximately 20 minutes of sample collection.*

Following headspace development introduce the instrument sampling probe through a small opening in the bag to a point about one-half of the headspace depth. Keep the probe free of water droplets and soil particles. (Syringe withdrawal of a headspace sample and injection to an instrument probe or septum-fitting inlet is acceptable, provide the method accuracy is proven by means of test gas standard.)

Record the highest meter response. Maximum response usually occurs within about two seconds. Erratic meter response may occur at high organic vapor concentrations or if moisture is present. Note any erratic headspace data.

Standard Operating Procedure for
Soil Sample Collection Tools Decontamination

A variety of samplers (split-spoon, split-spoon with brass liners, piston sampler, backhoe, or shovel) may be used to retrieve soil from sampling locations. Depending on the analysis to be conducted on the soil sample, the soil sample will either be sealed within the sampler (e.g., collecting volatile samples) or the soil sample will be transferred to laboratory-supplied containers. The equipment required to transfer the soil from the sampler to the laboratory-supplied sample containers includes: stainless-steel spoons or scoops and the appropriate personal protective equipment necessary for collection and handling of soil samples as described in the Project Health and Safety Plan.

Decontamination Procedures

All soil sampling equipment will be carefully cleaned before and during soil sampling. All sampling tools including split-spoon, stainless-steel spoons and scoops will be cleaned before use and between samples in the following manner:

1. Clean in a tap water and trisodium phosphate (TSP) solution, using a brush if necessary to remove particulate matter and films.

2. Rinse three times with tap water.

3. Rinse three times with deionized water.

4. Inspect equipment and repeat procedure if any residual soil or visible contaminants are present.

Standard Operating Procedure for Soil Sample Collection

A variety of samplers (split-spoon sampler, split-spoon sampler with brass liners, piston sampler, backhoe, or shovel) may be used to retrieve soil from sampling locations. Depending on the analysis to be conducted on the soil sample, the soil sample will either be sealed within the sampler (e.g., collecting volatile samples) or the soil sample will be transferred to laboratory-supplied containers. The equipment required to transfer the soil from the sampler to the laboratory-supplied sample containers includes: stainless steel spoons or scoops and the appropriate personal protective equipment necessary for collection and handling of soil samples as described in the Project Health and Safety Plan.

All soil sampling equipment will be carefully cleaned before and during soil sampling. All sampling tools including split-spoons, stainless steel spoons and scoops will be cleaned before use and between samples in the following manner: (1) clean with tap water and TSP, using a brush if necessary to remove particulate matter and films; (2) rinse three times with tap water; and (3) rinse three times with deionized water. To prevent sample cross-contamination, the sampler will discard the outer pair of sample gloves and put on a new pair between each sample event.

Upon retrieving the soil sample from the interval or location as described above, the sampler should collect the volatile organic compound sample first to reduce the chance for volatilization. Subsequent sample parameters should be collected in order of decreasing volatility. The remaining soil from the sample interval or location should be adequately mixed to provide the laboratory with the most representative aliquot possible.

Collecting Volatile Organic Samples

Soil samples will be collected for analysis by either a drilling apparatus equipped with a split-spoon, core split spoon sampler or by hand excavation. Because the laboratory requires 25 grams of soil for volatile organic compound (VOC) analysis, calibration of the field sampling scale used to measure the 25 grams of soil must be confirmed. The VOC sample containers are pre-weighed by the laboratory and the weight of each VOC sample container should be displayed on the sample label. Therefore, the weight of each container should be confirmed to within 2 grams as measured with the field sampling scale prior to sample collection.

The following procedure applies to soil samples retrieved with a drilling apparatus equipped with a split-spoon sampler or core split spoon with liners (if Encore® sampler is used skip to next section):

1. Open the split-spoon sampler.

2. Open a representative liner containing soil.

3. Using a stainless-steel spoon, place 25 grams (maximum) of soil in a laboratory-provided sample container containing methanol (avoid splashing the methanol). A representative sample of the soil type should be weighed in advance to determine the volume of soil necessary to achieve the 25 grams to be placed in the sample container.

4. Wipe the jar lip and screw threads to remove soil and provide a good sealing surface, and immediately screw on the lid.

5. Cool the sample to approximately 4°C immediately after collection.

The following procedure applies to the collection of hand-excavated soil samples:

1. Dig to the desired sampling interval, exposing fresh soil surface to sample.

2. Collect a large sample on a shovel or in a bucket auger and bring it to the surface or collect the sample directly from the fresh soil surface.

3. Using a stainless-steel spoon, place 25 grams (maximum) of soil in a laboratory-provided sample container containing methanol (avoid splashing the methanol). A representative sample of the soil type should be weighed in advance to determine the volume of soil necessary to achieve the 25 grams to be placed in the sample container.

4. Wipe the jar lip and screw threads to remove soil and provide a good sealing surface, and immediately screw on the lid.

5. Cool the sample to approximately 4°C immediately after collection

Collecting Volatile Organic Samples with the Encore® Sampler

Soil samples will be collected for analysis by either a drilling apparatus equipped with a split-spoon sampler, core sampler or by hand excavation.

The following procedure applies to soil samples retrieved with a drilling apparatus equipped with a split-spoon sampler, core sampler or hand excavation with the Encore® sampler:

1. Open the split-spoon sampler.

2. Open a representative liner containing soil.

3. Collect a large sample on a shovel or in a bucket auger and bring it to the surface or collect the sample directly from the fresh soil surface.

4. Hold the Encore® coring body and push plunger down until small o-ring rests against tabs to ensure the plunger moves freely.

5. Depress locking lever on T-Handle. Place coring body plunger end first into the open end of the T- Handle, aligning the slots on the coring body with the locking pins in the T-Handle. Twist coring body clockwise to lock pins in slots. Check to insure sampler is locked in place.

6. Turn T-handle with T-up and coring body down. This positions the plunger bottom flush with bottom of coring body. Using T-Handle, push sampler into soil until coring body is completely full. When full the small o-ring will be centered in the T-Handle viewing hole. Remove excess soil from the coring body exterior.

7. Cap the coring body while it is still on the T-Handle. Push and twist cap over bottom until grooves on locking arms seat over ridge on coring body. Remove from T-Handle, lock plunger

by rotating extended plunger rod fully counterclockwise until wings rest firmly against tabs, and attach label.

8. Cool the sample to approximately 4°C immediately after collection.

Collecting Semivolatile Organic Samples

Soil samples will be collected for analysis by either a drilling rig equipped with a split-spoon sampler, core split spoon sampler or by hand excavation.

The following procedure applies to soil samples retrieved with a drilling rig equipped with a split-spoon sampler or core split spoon with brass liners:

1. Open the split-spoon sampler.

2. Select a representative brass liner filled completely with soil.

3. Wrap the ends of the brass liners with heavy-duty aluminum foil, taking care to not piece the foil. Tape the foil to the brass liner with duct tape to ensure a seal. Cover the ends of the liner with plastic caps or duct tape to fully protect the foil.

4. Cool the sample to approximately 4°C immediately after collection.

The following procedure applies to the collection of hand-excavated soil samples:

1. Dig to the desired sampling interval, exposing fresh soil surface to sample.

2. Collect a large sample on a shovel or in a bucket auger and bring it to the surface or collect the sample directly from the fresh soil surface.

3. Using a stainless-steel spoon, pack the soil into 4-ounce sample jars.

4. Wipe the jar lip and screw threads to remove soil and provide a good sealing surface, and immediately screw on the lid.

5. Cool the sample to approximately 4°C immediately after collection.

Collecting Metals and Cyanide Samples

1. The metals and cyanide soil samples will be collected from hand samples or core split spoon samples and placed into a laboratory-supplied, 8-ounce, wide-mouth glass jar.

2. The sample containers will be filled to at least three-quarters full using a stainless-steel spoon or scoop.

3. Cool the sample to approximately 4°C immediately after collection.

Sample Storage

Immediately after samples are collected, they will be placed in a cooler containing ice or ice packs. Samples will be kept cold (approximately 4°C) until receipt at the laboratory, where they are to be stored in a refrigerated area. All samples will be kept secured to prevent tampering. The coolers will be sealed with signed and dated tamper-proof tape. If sample coolers are left in a vehicle or field office for temporary storage, the area will be locked and secured.

Standard Operating Procedures for the Decontamination of Monitoring Well Sampling Equipment

Purpose

All sampling-related equipment including pumps, meters, and materials coming into contact with actual sampling equipment or with sampling personnel will be decontaminated as described below. Bailers, protective gear, and filtration devices will be discarded after one use. Stainless steel bailers are used once and returned to an independent laboratory for decontamination.

Responsibilities

The field technicians are responsible for decontamination in the field at each individual sampling point. Decontamination will be performed before sampling and after working at each sampling point. All equipment will be handled in a manner that minimizes cross-contamination between points. After cleaning, the equipment will be visibly inspected to detect any residues or other substances that may exist after normal cleaning. If inspection reveals that decontamination was insufficient, the decontamination procedures will be repeated.

Procedures For Monitoring Well Equipment

Equipment will be decontaminated in the following manner:

1. Equipment that does **not** contact sample water or the inside of the well:

    a. Rinse with clean control water.

    b. Inspect for remaining particles or surface film and repeat cleaning and rinse procedures if necessary.

2. Equipment that contacts sample water or the inside of the well:

    a. Clean (inside and outside where possible) with an Alconox/clean-water solution applied with a scrub brush made of inert materials.

    b. Rinse with clean control water.

    c. Inspect for remaining particles or surface film and repeat cleaning and rinse procedures if necessary.

    d. Shake off remaining water and allow to air dry.

The internal surfaces of pumps and tubing that cannot be adequately cleaned by the above methods alone will also be cleaned by circulating decontamination fluids through them. The fluids will be circulated through this equipment in the order shown above. Special care will be exercised to ensure that the "rinse" fluids will be circulated in sufficient quantities to completely flush out contaminants and detergents.

When transporting or storing equipment after cleaning, the equipment will be protected in a manner that minimizes the potential for contamination.

Standard Operating Procedures for Purging Groundwater Wells

Purpose

To describe the techniques used in the purging of groundwater wells.

Applicability

These procedures apply to the purging of groundwater wells for sampling with regard to the techniques used.

Definitions

Well purging is the removal of a known volume of water from a well so sampling can occur. This removal can be achieved by using two techniques: (1) without in-place plumbing; or (2) with in-place plumbing.

Drawdown: the lowering of the static water level due to the removal of the groundwater.

Note: See SOP for definition of static water level.

References

Groundwater Sampling Guidelines by MPCA

Discussion

Purging of a groundwater well is an important factor in the sampling process. It prepares the well by removing required volumes of water (according to the sampling plan) prior to sampling. The purging is needed to stabilize the well to allow for representative sample collection.

Responsibilities

The environmental technician(s) are responsible for the purging of groundwater from a well.

Procedure

Well Purging

Without In-place Pumping:

a. Bailer

1. Put on gloves for skin protection.

2. Remove foil from bailer top (stainless steel), bailer body (stainless steel), and check valve (Teflon).

3. Connect all three parts together. It may be possible to connect additional bailer body pieces together, increasing the volume removed with each lowering of the bailer.

4. Attach assembly to the downrigger cable (stainless steel) with a crimp (aluminum).

5. Release the downrigger brake and lower bailer slowly into the well to avoid stirring up the water, thus increasing turbidity.

6. Stop the bailer in the top section of the water column, allow it to fill.

7. Engage the brake and begin to crank the downrigger handle, thus bringing the bailer up.

8. Empty the water collected from the bailer into a measuring bucket.

9. Continue the process, until the correct volume of water has been purged and the well has stabilized.
   Note: See SOP for well stabilization testing.

10. Cut the downrigger cable from the bailer after purging is finished.

11. Place used top, bailer, and check valve in a dirty bailer cooler to be cleaned.
    Note: If a disposable bailer was used, it cannot be reused and must be disposed of.

b. Bailer (H)—bailer hose

1. Put on gloves to protect skin.

2. Remove foil from bailer (stainless steel) and check valve (Teflon).

3. Connect these two parts together and connect them to a 40-foot suction hose.
   Note: Bailer (H) can only be used on wells with total well depths of approximately 40 feet or less.

4. Lower the hose and bailer into the well until the bailer is partially submerged below the static water level.
   Note: If well goes dry, the bailer needs to be on the bottom of the well (due to drawdown).

5. Begin to surge the hose up and down; the result will be water pumping out of the well from the suction hose.

6. Collect purged water in a measuring bucket.

7. Continue to purge until the desired amount is purged or the well goes dry (see monitoring plan for volumes required to be purged).

8. Remove hose from well, put bailer and check valve in dirty bailer cooler, rinse hose with distilled water.

c. Bailer (C)—centrifugal pumps used in conjunction with Bailer (H). **Note**: this is used only if the riser diameter is too small and/or there is a bent riser unable to accommodate a 2-inch submersible pump.

1. Put on gloves to protect skin.

2. Remove foil from the bailer (stainless steel) and check valve (Teflon), connect together.

3. Connect this apparatus to a 40- or 60-foot suction hose (whichever is needed to reach the desired purging depth).

4. Lower the bailer and suction hose into the well (bailer first) until the bailer is about 2 feet into the water.
   Note: The drawdown of the well must be considered.

5. Connect suction hose to the intake of the centrifugal pump (make sure connection is tight to prevent leaks).

6. Start pump:
   Step 1: turn pump switch to "on"
   Step 2: pull the recoil rope

7. Set pumping flow rate with check valve (located on the pump), it must be wide open for bailer (C).

8. Begin surging the hose up and down.

9. Collect purged water in the measuring bucket.

10. Continue surging hose while centrifugal pump runs until desired purge volume is achieved (according to the monitoring plan) or the well goes dry.

11. Remove the hose and bailer from the well; disconnect the hose from the pump.

12. Rinse the hose with distilled water and put the bailer check valve into the dirty bailer cooler.

13. Discharge purged water from pump by releasing drain plug (bottom of the pump). Rinse pump.

d. Centrifugal Pump

1. Put on gloves to protect skin.

2. Remove foil from bailer (stainless steel) and check valve (Teflon); connect together.

3. Connect bailer assembly to a 40-foot suction hose.
   Note: Centrifugal pumps will not pump at depths greater than 30 feet without surging (bailer [C]).

4. Submerge the bailer assembly with attached hose about 2 feet into the static groundwater.

5. Screw the other end of the hose onto the intake of centrifugal pump (make sure the connection is tight to ensure suction).

6. Prime the pump by pouring water into the priming water filler cap.

7. Start centrifugal pump:
   Step 1: turn pump on by the switch on the side of the pump
   Step 2: pull recoil rope to start pump

8. Surge hose to get the water up.

9. Continue priming until the water pumps by itself.

10. Adjust flow (with check valve located on discharge of the pump) to desired flow rate.

11. Check flow rate with the measurement bucket (in gpm).
    Note: If flow rates are under 1 gpm, the centrifugal pump should not be used.

12. Continue pumping until desired purge volumes are achieved.

13. Remove bailer and hose from well, turn off pump and disconnect the hose from the intake.

14. Disconnect bailer from the hose, put the bailer and check valve into the dirty bailer cooler; rinse the hose with distilled water.

15. Discharge purged water from pump by unscrewing the drain plug (bottom of the pumps); rinse pump.

e. Peristaltic Pump

1. Cut tubing to desired length.
2. Connect tubing to pump head, leaving 1 to 2 feet for discharge line.
3. Lower tubing into the well water (1 to 2 feet below surface).
4. Turn on pump and set speed at the desired rate of flow.
5. When purging is complete, remove hose and discard. Do not use for sampling. Peristaltic pumps have low pumping rates and can only pull water from 20 feet.

f. 4-inch Submersible Pump

1. Put on gloves to protect skin.
2. Place submersible pulley holder on the well casing.
3. Wrap chains (pulley holder) around the well casing, connect chains to holder and tighten chain (should be snug).
4. Place pulley apparatus (big black pipe with pulleys on the top) into the hole in the pulley holder.
5. Tighten the wing screw on the pulley holder to hold the pulley apparatus.
6. Place the winch on the winch holding bracket located in the middle of the pulley apparatus.
7. Place winch cable through the eye bolt and pulleys on the top of the pulley apparatus.
8. Attach submersible pump to the winch cable (make sure winch brake is on).
   Note: Submersible pump must be put into a well with a diameter of 4 inches or larger.
9. Attach purging hose to the pipe connected on the top submersible pump.
   Note: Either a 40- or 60-foot hose can be used, or both, whichever is appropriate.
10. Lower the submersible pump slowly into the well by cranking the winch handle.
11. Lower pump until it is completely submersed into the water and engage winch brake.
    Note: It can usually be lowered 5 to 6 feet under the water, unless draw-down in the well occurs.
12. Remove foil from discharge check valve and pipe; connect together.
13. Connect check valve and pipe to the end of the suction hose.
14. Connect the pump to the generator with an extension cord.
15. Start the generator:
    Step 1: turn switch to start
    Step 2: put choke on
    Step 3: pull recoil rope
    Step 4: let generator idle until it is running smooth
16. Turn on power (which is located on the front of the generator).
    Note: Submersible should be running; if not, turn off the generator and check connections.
17. Adjust flow rate to desired rate with the discharge check valve.
18. Measure the flow rate with the measuring bucket (gpm).

19. Turn off the generator after desired purge volume has been achieved.

20. Begin to crank up the submersible pump with the winch.
    Note: This process takes two people: one to pull on the hose and another to crank the winch. The technician must be especially careful not to let the hose and wire get under or on the side of the pump.

21. Disconnect and disassemble all of the submersible pump apparatus; rinse accordingly.

f. 2-Inch Submersible Pump

1. Put on gloves to protect skin.

2. Attach hose reel onto well casing.

3. Loosen retainer pins from pump holder and place in well.

4. Loosen retainer pins from hose reel and lower pump with reel handle to desired depth (about 2 feet below static water level).

5. Connecting hoses and power cords:
   Step 1: connect discharge hose to hose reel
   Step 2: connect (110, 220 volt) controller power patch cord to hose reel
   Step 3: connect controller power cord to appropriate 110, 220 receptacle on generator

6. Start the generator:
   Step 1: turn switch to start
   Step 2: put choke on
   Step 3: pull recoil rope
   Step 4: let generator idle until it is running smoothly

7. Turn on AC switch if applicable

8. Turn controller switch on (make sure LCD display reads zero before setting flow rate), adjust the flow rate with the speed control knob to desired rate.

9. Measure the flow rate with the measuring bucket (gpm).
   Note: Submersible pump should be running; if not, turn off the generator and check connections.

10. Shut down system after desired purge volume has been achieved:
    Step 1: turn controller switch off and turn speed control to zero
    Step 2: turn off AC switch
    Step 3: turn off generator
    Step 4: disconnect controller power patch cord from generator
    Step 5: disconnect controller power patch cord from hose reel
    Step 6: disconnect discharge hose from hose reel

11. Unlock retainer pin and reel up the hose and submersible pump and lock into pump holder.

12. Rinse the hose and pump with distilled water.

With In-place Plumbing

a. **Dedicated pumps** are submersible pumps that are permanently installed in a well.

1. Put on gloves to protect skin.

2. Start the generator:
   Step 1: turn switch to "on"
   Step 2: turn on choke
   Step 3: pull recoil rope
   Step 4: let generator idle until it is running smooth

3. Connect the pump to the generator with an extension cord.

4. Connect the pipe, elbow, and valve to the discharge pipe of the submersible pump (located at the top of the well).

5. Turn on power from the generator to the pump.
   Note: If the pump does not start, check the connection from the generator to the pump.

6. When water flows from discharge of the pump, adjust the flow according to desired flow rate (using the discharge check valve).

7. Use measuring bucket to determine the appropriate flow rate (gpm).

8. After the appropriate purge volume is achieved. Sample collection can occur (before shutting off the generator and pump).

9. Turn off the generator.

10. Disconnect all of the appropriate connections and take the pipe, elbow, and valve off.
    Note: Each dedicated pump has its own pipe, elbow, and valve. These pieces are left at each well.

Documentation

The technician(s) will document the procedures used in purging wells on the field log data sheet.

Standard Operating Procedure for Groundwater Sample Collection by Bailer

Once the water level and well depth measurements have been taken and the well has been purged and allowed to stabilize, the sampler can begin groundwater sampling. The following procedure applies to groundwater sample collection:

1. A laboratory-cleaned bailer with a Teflon check valve is attached to a ladder and downrigger by stainless steel or Teflon-coated wire.

2. The bailer is lowered into the top of the water column.

3. When the bailer is filled, it is removed from the well, and the water is poured into the appropriate sample container. VOC samples will be collected first.

Collecting Volatile Samples

1. Samples to be analyzed for volatile organics will be collected in three 40-ml vials with Teflon-lined septum caps and preserved with four drops of hydrochloric acid to reduce the pH to less than 2.

   Once each day of a sampling event, a duplicate sample will be collected and field checked with a pH indicator strip to assess the pH of the sample. If the pH is greater than 2, the laboratory will be instructed to reduce the holding time of that day's samples to the 7-day holding period used for unpreserved samples.

2. The check valve should be slightly opened to allow a slow stream of water to run into the 40-ml vial. The vial should be held at an angle while filling to prevent water from falling directly to the bottom of the container and becoming overly disturbed. While holding the vial vertically, add the water sample until a small meniscus forms on the top of the sample container. The check valve should not come in contact with the sample container to prevent accidental sample contamination.

3. There should be no headspace present in the vial. If a headspace is noted, the sample will be discarded and a new sample taken.

4. These samples will be cooled to approximately 4°C.

Collecting Semivolatile Samples

1. Samples to be analyzed for semivolatile organics will be collected in a 1-gallon amber glass jar with a Teflon-lined septum cap.

2. These samples will be cooled to approximately 4°C.

Collecting Metals Samples

1. Samples to be analyzed for metals will be collected in a 1-liter polyethylene jar with a polyethylene-lined closure.

2. These samples will be preserved in the field with a 50 percent solution of nitric acid to reduce the pH of the sample to less than 2.

Collecting Phenol Samples

1. Samples to be analyzed for phenol will be collected in a 1-liter glass jar.

2. These samples will be preserved in the field with sulfuric acid to reduce the pH of the sample to less than 2 and cooled to approximately 4°C.

Collecting Total Petroleum Hydrocarbon (TPH) Samples

1. Samples to be analyzed for TPH will be collected in a 1-liter glass jar with a Teflon-lined septum cap.

2. These samples will be cooled to approximately 4°C.

Collecting Cyanide Samples

1. Groundwater samples to be analyzed for cyanide will be collected in a 1-liter polyethylene container with a polyethylene cap.

2. These samples will be preserved in the field with sodium hydroxide to pH greater than 12 and cooled to approximately 4°C.

Collecting General Chemistry Samples

1. Samples to be analyzed for calcium, magnesium, sodium, potassium, sulfate, chloride, carbonate, and bicarbonate will be collected in 1-liter plastic jars.

2. These samples will be cooled to approximately 4°C.

Collecting Quality Control Samples

The effectiveness of the sample handling techniques is monitored by collecting both preserved and unpreserved field blank samples.

Masked duplicate samples will be collected to measure relative sampling precision. Ten percent of all samples collected are collected in duplicate. These samples are collected at the same time using

the same procedures, equipment, and types of containers as the required samples. They are also preserved in the same manner and submitted for the same analyses as the required samples.

Trip blanks are most commonly used when sampling for volatile organic compounds. Their purpose is to determine if contamination has occurred as a result of improper sample container cleaning, contaminated blank source water, sample contamination during storage and transport due to exposure to volatile organics, or other environmental conditions during sampling. Trip blanks are prepared prior to the sampling events by the laboratory providing the sample containers. The water will be free of contaminants. The trip blanks are sealed, labeled appropriately, and transported to the field in the same containers as the sample vials. These blanks are not opened in the field. They are transferred to the ice chest designated for volatile sample storage and transport and accompany the samples to the analytical laboratory.

Equipment blanks are used to evaluate the effects of onsite equipment contaminants. Their purpose is to determine if contamination has occurred as a result of improper equipment cleaning. Equipment blanks are prepared onsite by pouring laboratory-grade DI water through decontaminated sample collection equipment (bailer or pump) and collecting the rinsate in a sample container. The equipment blanks will be handled in the same manner as the sample group for which they are intended (i.e., blanks will be stored and transported with the sample group).

Some general considerations will be taken into account when planning and conducting sampling operations. The sampler will take into consideration the required sample volumes, sample holding times, sample handling, and special precautions for trace contaminant sampling.

The volume of the sample obtained should be sufficient to perform all required analyses with an additional amount collected to satisfy the needs for quality control, split samples, or repeat examinations. The Laboratory Coordinator should be consulted for any specific volume requirements. Multiple sample containers are always required for volatile organic compound (VOC) analyses.

The elapsed time between sample collection and initiation of each laboratory analysis will fall within a prescribed time frame. After collection, all samples should be handled as few times as possible. Samplers should use extreme care to ensure that samples are not contaminated. If samples are placed in an ice chest, samplers should ensure that melted ice cannot cause sample containers to become submerged, as this may result in cross-contamination. Plastic bags, such as Ziplock bags, should be used when small sample containers (e.g., VOC vials) are placed in ice chests to prevent cross-contamination.

Some compounds can be detected in the parts per billion and/or parts per trillion range. Extreme care will be taken to prevent cross-contamination of these samples. A clean pair of new, disposable gloves will be worn for each sample location. Sample containers for source samples or samples suspected of containing high concentrations of contaminants are placed in separate plastic bags and coolers immediately after collecting, preserving and tagging. Sample collection activities will proceed progressively from the least contaminated area to the most contaminated area (when known).

Standard Operating Procedures for the Collection of Groundwater Samples

Purpose

To describe the collection of groundwater samples from monitoring wells using bailers.

Applicability

This procedure applies to the collection of groundwater samples by the environmental technician(s).

References

Ground Water Sampling Guidelines by MPCA.

Discussion

Monitoring wells may either be installed permanently or temporarily. They are constructed for the collection of groundwater samples. Monitoring wells have a wide variety of diameters. Groundwater samples might also be collected out of a pit or a drilled hole.

Responsibilities

The technician(s) are responsible for the groundwater sampling at monitoring wells, residential wells, and residential systems.

Procedure

- Groundwater Sampling (done after purging the groundwater well adequately; see SOP for well stabilization and purging groundwater wells).

  a. Monitoring wells (permanent or temporary)

     1. Put on sampling gloves to protect the sample and skin.

        Note: New sampling gloves are needed for each well. Never reuse old gloves.

     2. Prepare sampling containers by filling out the label with the following information:

        - Project number
        - Location sampled
        - Individual collecting the samples
        - Date and time of sample collection

- Sample analysis (if required by the lab)

Note: Use an indelible permanent pen to avoid ink bleeding (Pilot permanent SC-UF).

3. Set up sampling apparatus to hold downrigger.

   - Ladder assembly —put the downrigger on the downrigger plate on the top of the ladder.
   - Well casing assembly—the downrigger is already connected to the assembly. Place the assembly on the well casing (use the slot in the assembly) and tighten the assembly to the well casing.

4. Remove foil from the top of the clean stainless steel bailer or unwrap the top of the new disposable polyethylene bailer.

5. Connect the downrigger cable to the bailer top.

   Note: This connection is done with a crimp:

   Step 1: Thread crimp onto the downrigger cable
   Step 2: Run cable through the bailer top
   Step 3: Insert cable through the crimp again
   Step 4: Make a loop and run the cable through the crimp for the final time.

6. Remove foil from the body of the clean stainless steel and the check valve (Teflon) or completely unwrap the disposable polyethylene bailer.

7. Connect these two parts of the stainless steel bailer together, screw these pieces into the bailer top.

8. Place bailer into the well; release the downrigger brake.

9. Apply pressure to the spool of the downrigger to ensure a slow descent.

10. Lower the bailer slowly into the water column.

    Note: Make sure not to stir up the water with the bailer, thus volatizing the samples.

11. Keep the bailer in the top portion of the water column when collecting the sample.

12. Engage the brake and crank downrigger handle to retrieve the bailer out of the well.

13. Remove cap from the first sample container.

14. Fill appropriate sampling container (do not overfill).

15. Continue the process until all sampling containers are filled.

16. After all of the samples are collected, place the samples in a sampling cooler with ice. Make sure caps are tightly secured.

17. Disassemble the sampling apparatus.

    Step 1: Cut downrigger cable (about 1 foot above the bailer)
    Step 2: Dismantle bailer assembly
    Step 3: Place stainless steel bailer parts into a dirty bailer cooler (cooler is then sent to lab for decontamination of bailers). Properly disposal of disposable bailers.

18. After sampling is completed, clean sampling apparatus with distilled water.

Documentation

The technician(s) will document the groundwater sampling events on field log data sheets, field log cover sheets, and field log data reports.

Standard Operating Procedures for the Collection of Quality Control Samples

Purpose

To describe the procedures used in the collection of quality control samples (masked duplicate samples, trip blanks, field blanks, and equipment blanks).

Applicability

This procedure applies to sample handling techniques used by both the technician(s) and the laboratory in regards to quality control.

Definitions

- Masked Duplicate Sample. **This is the collection of a sample at the same time the original sample is being collected. Both samples are collected, preserved, and analyzed exactly the same. This is done to check laboratory and sampling precision.**

- **Trip Blank**. Is a water blank free of any contaminants, prepared prior to sampling events by the laboratory providing the sampling containers. The purpose of the trip blank is to determine if contamination has occurred from:

    1. Improper sampling container cleaning.

    2. Contaminated blank source water.

    3. Sample contamination during storage and transportation due to exposure to contaminants.

    4. Other environmental conditions during sampling.

- Field Blank. **A sample container prepared onsite by filling it with deionized (DI) water (supplied by laboratory). These blanks are used to evaluate:**

    1. The effects of onsite environmental contaminants.

    2. The purity of reagents used as preservative or additives.

    3. General sample container filling/collecting techniques.

- Equipment Blank. **A sample collected from the laboratory-grade DI water rinse water. The water is rinsed on or through sampling equipment. The rinse water is collected for analysis. These blanks are used to determine:**

    1. The effectiveness of field cleaning procedures.

2. Any sources of contamination in a trip blank.

References

Groundwater and Surface Water Sampling Procedures by Landmark Environmental

Discussion

Each time a sampling event occurs, some form of quality control measures must be taken.

Responsibilities

The sampling technician(s) are responsible for the accurate collection of quality control samples. The laboratory is responsible for the accurate set up and analysis of quality control samples.

Procedure

Quality Control Samples

a. Masked duplicate sample:

1. Collect samples by rotating sampling containers from original sample to the mask (using the same exact methods for both).

2. Preserve, store, and transport the masked duplicate sample in the same manner as the original sample.

3. Submit the masked duplicate sample to the laboratory for the same analysis as the original sample.

Note: Ten percent of all samples are collected in duplicate (mask).

b. Trip blank:

1. Trip blanks are sealed prior to sampling (prepared by the laboratory doing the analysis).

2. Transport trip blanks to the site in the sample storage cooler.

3. Trip blanks are not to be opened in the field.

4. Transport trip blanks back to the laboratory in the sample storage cooler.

5. The trip blanks should be listed on the chain-of-custody along with the other samples and the analysis required. (Generally, VOCs are the only requirement for trip blanks).

Note: Labeling of all sample blank containers follow the SOP for the collection of groundwater samples.

c. Field blank:

1. Get the appropriate sampling containers and desired amount (analyte-free) water from the laboratory. (Generally, field blanks are taken for each parameter.)

2. Prepare field blanks onsite by filling sample containers with the (analyte-free) water.

3. Seal the field blank sample containers and store with other samples collected (should be handled exactly the same).

   Note: One field blank should be prepared per day or at a frequency of 10 percent of the samples per sampling event, whichever is greater.

4. Transport all of the samples to the laboratory for analysis. The analysis on both field blanks and samples should be exactly the same.

d. Equipment Blank:

Bailer blank:

1. Laboratory-grade DI water should be used.

2. Pour DI water into a clean bailer.

3. Pour DI water into the appropriate sampling containers.

4. Store and transport the equipment blank with the appropriate samples for laboratory analysis.

Filtered equipment blank:

1. Laboratory-grade DI water should be used.

2. Pour DI water into the groundwater sampling filter.

3. Begin filtering (as described in the standard operating procedure for filtering groundwater samples).

4. After filtering is completed, pour water into the appropriate sampling container.

5. Store and transport the equipment blank with the appropriate samples for laboratory analysis.

Note: The filtered equipment blank is usually conducted for filtered metals samples.

Documentation

The quality control samples are documented on the chain-of-custody record and the field log data sheet. The technician(s) are required to document any such quality control samples.

Standard Operating Procedures for Groundwater Sample Storage

Purpose

To describe how groundwater samples are stored after collection.

Applicability

These procedures apply to the care and storage of samples after collection.

References

Quality Assurance Manual: Groundwater and Surface Water Sampling Procedures by Landmark Environmental.

Discussion

The procedure of storing samples is done in the field, prior to shipping or delivery.

Responsibilities

The environmental technician(s) are responsible for the care and storage of groundwater samples collected.

Procedure

1. Place groundwater samples as soon as possible in a cooler containing ice or ice packs.
2. Samples must be kept cold (4°C) at all times until delivery to the laboratory.

   Note: Samples may have to be stored indoors in winter to prevent freezing.
3. Samples must be secure to prevent tampering with or loss of samples.
4. Vehicle doors must be locked if samples are unattended in the vehicle.

SOIL GAS WELL INSTALLATION AND SAMPLING
STANDARD OPERATING PROCEDURE

PREPARED: June 22, 2004

1.0 OBJECTIVE

The objective of this procedure is to install and collect field measurements from sample soil gas well.

2.0 BACKGROUND

2.1 Definitions

Drill: A soil probe machine or hand powered that utilizes percussion or auger techniques to advance small diameter sampling tools into the subsurface to produce a hole for the construction of a soil gas well. And may be used for collecting soil or ground water samples.

Screen: The bottom portion of the gas well which is slotted or perforated and through which the sample is drawn.

Riser Pipe: The solid portion of the gas well above the screen. The top of the riser pipe is equipped with a gas cock to close the gas well between sampling events.

Stick up: The portion of the riser pipe exposed above the ground surface.

Sand pack: Sand with grain size compatible with soils and screen size, such as #30 Red Flint brand, installed in the annulus between screen and walls of borehole.

Seal: Bentonite powder or chips or pellets, hydrated with water. The seal is placed in the annulus between the borehole and the riser pipe to seal the screen from the atmosphere.

Landfill gas meter: A field meter such as a Landtech brand, model GEM 500 or GEM 2000 or GA-90 configured to test for methane, oxygen, and other gasses such as carbon monoxide, carbon dioxide, and hydrogen sulfide. The meter is equipped with an internal pump. The meter is attached to the gas well to draw and analyze a soil gas sample.

2.2 Gas Well Installation

The drill is used to advance a borehole to the design depth. The screen and riser are placed to the bottom of the borehole. The typical depth is 4-feet with one foot of stick up (5-foot riser with bottom 1.5 – foot screen) Sand pack is installed in the annulus between the screen and the walls of the borehole to a depth of ½-foot above the screen. The bentonite seal is placed above the sand pack to the ground surface (not less than 1-foot of bentonite). Bentonite slurry is preferred if sampling is to take place with in two days of installation.

3.0 Soil Gas Sampling

Equipment and methods required for successfully recovering and measuring soil gas samples using the landfill gas meter.

a. Attach the Landfill gas meter to the gas cock at the top of the gas well using tight fitting silicone tubing.

b. Open the gas cock and turn on the landfill gas meter pump.

c. Wait for meter readings to stabilize and record readings.

d. Remove the tubing from the gas cock and note if the soil gas well is under pressure (it will make a blowing sound) a wetted finger can detect low flows.

e. Close gas cock and allow meter to purge until ambient air readings have stabilized before moving to next sample location.

Standard Operating Procedures for Transporting Samples to the Laboratory

Purpose

To describe the procedures necessary for personal delivery or shipment of samples to analytical laboratories.

Applicability

This procedure applies to the transportation of ground and surface water samples to the appropriate laboratory.

Definitions

Environmental Samples. Water samples not regulated by the U.S. Department of Transportation.

Hazardous Material. Regulations for packing, marking, labeling, and shipping of hazardous materials are governed by the U.S. DOT.

References

Quality Assurance Manual: Groundwater and Surface Water Sampling Procedures, Landmark Environmental; Procedures for Ground Water Monitoring: MPCA Guidelines, January 1983.

Discussion

Maintaining proper sample temperatures (4°C) and delivering samples to the laboratory within 24 to 48 hours are primary concerns.

Responsibilities

The environmental technician(s) shall ensure the security, temperature, and packaging of water samples during shipment.

Procedure

Packaging of Groundwater Samples. Place samples in an ice cooler, pack glass containers to avoid breakage. (Note: Bubble-wrap is the preferred packing material.) Add enough ice to maintain a constant temperature at 4°C until the samples arrive at the laboratory. Fill out the chain-of-custody completely and include required copies with the samples (see Standard Operating Procedure for chain-of-custody record).

Personal Delivery. The samples are delivered to the laboratory by the sampling technician(s). The chain-of-custody record is signed and dated by the laboratory representative.

Local Courier. The same procedures are followed as above; i.e., the chain-of-custody record is signed and dated and the top two copies are sent with the samples. The ice cooler is then secured with strapping tape and a courier form is filled out for the designated laboratory. The cooler is then left in the services area for pickup.

Overnight Courier. Follow the procedures above, replacing the courier form with the Federal Express form. Date, project number, type of delivery desired, weight, and number of coolers should be included.

Account for all samples before shipping and compare to the chain of custody (see Standard Operating Procedure for chain-of-custody record).

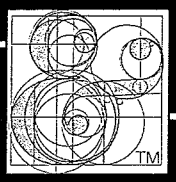
QA/QC

Ship samples during times when the laboratory will be able to accept and quickly analyze them. Avoid sending samples during holidays and weekends.

Record

Copies of the chain-of-custody, Federal Express forms, and sample analysis are copied and included in site files and reports. This is all documented by the sampling technician(s).

Appendix B
McGhie Betts Geotechnical Report

McGhie

Betts, Inc.
Rochester
Minnesota

Land Surveying
Urban - Land Planning
Consulting - Civil Engineering
Geotechnical Engineering
Construction Material Testing
Landscape Architecture

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Established 1946
Equal Opportunity Employer

GEOTECHNICAL REPORT

for

Proposed MN Bio Business Center
1st Avenue and 3rd Street SW
Rochester, Minnesota

MBI #2698/6644
JANUARY 2007

GEOTECHNICAL REPORT

for

Proposed MN Bio Business Center
1st Avenue and 3rd Street SW
Rochester, Minnesota

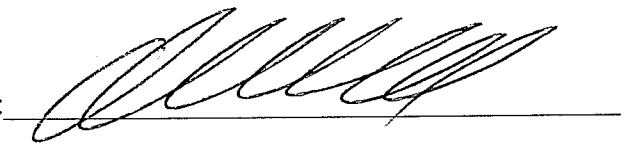
Prepared For:

Landmark Environmental LLC
Mr. Ken Haberman
2042 West 98th Street
Bloomington MN 55431

Prepared by:

McGhie & Betts, Inc.
1648 Third Avenue SE
Rochester, MN 55904
(507) 289-3919

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Name: David L. Morrill Signature: 

Date: 11/09/07 License #: 12713

McGhie Betts, Inc.

Rochester
Minnesota

Land Surveying
Urban - Land Planning
Consulting - Civil Engineering
Geotechnical Engineering
Construction Material Testing
Landscape Architecture

January 9, 2007

Landmark Environmental LLC
Mr. Ken Haberman
2042 West 98th Street
Bloomington MN 55431

Re: Preliminary Geotechnical Report
Proposed MN Business Center
1st Avenue and 3rd Street SW
Rochester MN
MBI#2698/6644

Dear Mr. Haberman:

In accordance with your authorization, McGhie & Betts, Inc. has conducted a subsurface exploration program for the referenced project. We are sending you two copies of our report. Additional copies are being sent as noted below.

If you have any questions concerning this report or we can be of further assistance, please contact us.

Very truly yours,

McGHIE & BETTS, INC.

David L. Morrill, P.E.

DLM/b

Pc: Roger Nelson, HGA
Doug Knott, City of Rochester

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e-mail. mbi@mcghiebetts.com

TABLE OF CONTENTS

INTRODUCTION

Purpose

It is McGhie & Betts' understanding this report is to be used in connection with the future construction of the Minnesota Bio Business Center on property west of First Avenue SW and north of Third Street SW in Rochester, Minnesota. This stated purpose was a significant factor in determining the scope and level of service provided. Should the report's purpose change, the report immediately ceases to be valid and use of it without McGhie & Betts' prior review and written authorization shall be at the user's sole risk.

Scope of Services

In accordance with the authorization of Mr. Ken Haberman with Landmark Environmental, LLC, McGhie & Betts has completed a subsurface exploration and prepared a geotechnical report for the referenced site. Our authorized scope of work has been limited to:

1. Putting down six (6) test borings.
2. Review of available project information.
3. Providing a geotechnical report containing the results of the field tests completed to date and a review of the subsurface conditions including geotechnical conclusions and opinions regarding:

    A. Site Soil Properties
    B. Foundation Systems
    C. Earthwork
    D. Cold Weather Construction
    E. Floor Slab Support
    F. De-Watering

Our work program for accomplishment of the above objectives included putting down six (6) test borings, complete rock coring at all boring locations, reviewing the project information and observing the recovered soil samples. This report will describe our field observations, present the results of the field and laboratory tests, and provide you with our engineering recommendations.

SITE CONDITIONS

Surface Conditions

The site of our exploration is along the west side of First Avenue SW in Rochester, Minnesota. This site is about one-quarter of a city block. The south edge of the site extends to Third Street SW.

The site is currently a paved parking lot. Immediately south of the site is an existing commercial building. Access to the site is by an alley from First Street SW. Surface elevations are at or near street grade.

Subsurface Conditions

The subsurface conditions encountered by the test borings are illustrated on the attached boring logs. The depths and thicknesses of the subsurface strata indicated on the boring logs were generalized from the drilling results. The transition between materials is approximate and is usually far more gradual than shown. Information on actual subsurface conditions exists only at the specific locations indicated and is relevant only to the time exploration was performed. Subsurface conditions and groundwater levels at other locations may differ from conditions found at the indicated locations. Note, too, that these conditions may change over time. These stratification lines were used for our analytical purposes and, unless specifically stated otherwise, should not be used as a basis of design or construction cost estimates.

Profiles of the borings show fill material extending to a depth of about 10 to 12 feet underlain with a layer of coarse alluvial sand, overlying the Shakopee Limestone. The fill material contained a mixture of soil types and miscellaneous debris. Bituminous paving was found at the surface of all borings. It should be noted that many of the borings found pieces of fabric, steel wire, and other building debris within the upper layers of fill. At several locations, a concrete slab was found at a depth of 10 to 12 feet below grade. It is likely the slab is the floor of a building that previously occupied the site.

The natural soils underlying the fill consisted of a coarse alluvial sand. The sand is medium to fine grained and generally medium dense. Sand thickness was only two to five feet.

The predominant subsurface conditions and all boring locations were the underlying Shakopee Limestone. The weathered surface of the limestone was encountered at depths of up to 12 to 15 feet below grade. Portions of the limestone were penetrated with soil sampling equipment. All borings obstructed on limestone and hard rock coring was performed. Core depths of five to fifteen feet were obtained at boring locations. Recoveries were all above 90%, typical of a fairly competent limestone formation. All borings terminated within the Shakopee Formation.

Groundwater

Groundwater level readings were taken in the exploratory borings. The data obtained was reviewed and is discussed in the text of this report. Note that groundwater levels may fluctuate due to seasonal variations, rainfalls and/or other factors not evident at the time of measurement.

Water was not found down to the surface of the limestone bedrock by this exploration. The coarse alluvial soils found beneath the fill were moist to wet; however, subsurface water was not present. The presence of subsurface water within the Shakopee Formation would have been obscured by the fluids used to advance the boring. A more extended observation period would be required in order to more accurately define the subsurface water conditions at this site.

PROJECT INFORMATION

McGhie & Betts has developed preliminary foundation recommendations for this project. When the architect and/or structural engineer develops additional information about final design column loadings, building configuration, or other significant factors, the preliminary recommendations presented herein may no longer apply. McGhie & Betts must be made aware of the revised or additional information in order to evaluate the preliminary recommendations for continued applicability and to recommend additional exploration work.

We understand the building proposed for this site will be constructed in phases. When completed the structures will be fourteen stories in height. It is expected that the structures will be constructed of cast in place concrete and steel framing. Final foundation loads are estimated at about 2000 kps for columns and wall loadings of up to 4 kips/l.f.

The first phase will construct the initial nine (9) floors. We expect the main floor will be at about street level. It is not expected that there will be any below grade floors. Loadings for the initial phase will be at about 1300 kps for column loads.

ENGINEERING REVIEW

Discussion

The following sections of this report include comments related to issues such as excavation, de-watering, lateral support, foundation construction, earthwork, and related geotechnical aspects of the proposed construction. The recommendations contained herein are not intended to dictate construction methods or sequences. Instead, they are furnished solely to help designers identify potential problems related to foundation and earthwork construction plans and specifications, based upon findings derived from sampling.

The results of the subsurface exploration indicate fill overlying soft, coarse alluvial sands, underlain with the Shakopee Limestone at depths of 12' to 15'. For the structure proposed consideration must be given to the fill and alluvial soils. These soils are soft, sensitive to construction activity, and are compressible. Removal of the fill for pavement and floor supporting recommended. Foundations will need to be placed upon the Shakopee Limestone for the loading proposed.

The results of our exploration and past experience indicates subsurface water control will be required. In areas where below grade portions of the structure are placed or where improved subsurface drainage is required, installation of subsurface tile lines will be required.

SOIL PROPERTIES

Compressibility

The alluvial soils and fill material found at this site are considered compressible. These soils can consolidate under the weight of moderate foundation or floor loads, or where fill is placed to raise the site

to grade. Design of the site and selection of a foundation system should take these properties into account. The consolidation of these soils can also be expected to occur over a considerable length of time.

Frost Susceptibility

The fill soils found at this site are frost susceptible. The presence of these soil types suggest frost heaving can occur.

Drainage Properties

The fill and weathered limestone found at this site would generally be considered poorly draining. Draining of these materials by tile lines or other means is generally required where subsurface water control is critical.

Design Parameters

You have requested various soil constraints for use in the project design. Table #1 presents the recommended parameters for the conditions at this site.

TABLE #1

Soil Type	Geologic Origin	Typical Thickness (ft)	Typical N-Value	Unit Wt Dry (pcf)	Equivalent Fluid Pressure			Angel of Internal Friction	Ff – Soil to Conc.	K (pci)	R	OSHA Soil Type	Recommended Bearing Capacity (psf)
					Ka pcf	Ko pcf	Kp pcf						
Mixture	Fill	10-15	0-15	105	55	120	230	20	0	0	0	C	0
Sand, Fine Grained	Alluvium	2-4	4-19	115	30	45	390	34	0.45	150	30	C	2000

CONCLUSIONS & RECOMMENDATIONS

General

The project information indicates heavy foundation loads for the structure proposed. The alluvial and weathered limestone at this site are capable of supporting light to moderate foundation loads. Our past experience indicates the structure proposed would need to be supported on the underlying Shakopee Limestone. This bedrock can typically support loads of up to 25 tsf (50 ksf). Most of the similar structures in the down town area are supported upon the Shakopee Limestone.

Our recommendation will be directed to this foundation option, however, we are available to discuss other options if you wish. A spread footing option will be discussed for placement of foundation directed on the underlying limestone. Other options could be considered for transferring loads to the limestone. We are available to discuss these other foundation systems.

Spread Footing on Rock

Foundation excavation depths of 12 to 15 feet should reach the Shakopee Formation. Based upon the limited exploration completed at this site, it is our opinion loads up to 25 tons per square foot could be supported by the underlying bedrock. You should be aware, however that bearing upon the Shakopee Limestone does include a risk of unforeseen work being required at the time of construction.

We suggest when a 25 ton bearing is used that the foundation installation include drilling probe holes into the bedrock to check the rock quality and to determine the presence of any voids or soil filled pockets. These probes should be drilled by the contractor to a minimum of 10' into the bedrock and be placed at a spacing of no more than 25' on center. The drilling as well as the finished probes should be checked by a qualified technician to determine the rock quality and observe for voids or soil pockets. All probes should be grouted shut after checking.

The Shakopee Formation can exhibit cracks, voids, loose zones or other features which are unsuitable for support of high foundation loads. Where these features are present, it is often necessary to perform hard rock excavation to extend footings, complete pressure grouting to fill voids or other corrective procedures.

At this site, foundation bearing on rock could consist of either spread footings placed directly upon the underlying rock by open excavations or drilled piers. This selection can best be determined by the final foundation elevations related to the bedrock depth. You should be aware that either method may require rock excavation.

We suggest if drilled piers are used, a straight shaft design is employed. This design accommodates extension of the pier into rock when poor rock is found and also allows for removal of obstructions, such as slabs and pieces of weathered limestone. We also recommend the piers include a 6" socket into the limestone. Often, surficial weathering of the bedrock is found and this 6" socket removes the weathered rock from within the bearing area to expose the sound bedrock.

Floor Slab Support

Preparation of the floor area should include removal of all fill. We suggest all new fill placed beneath the floor slabs be compacted to a minimum of 95% of ASTM D698. In our judgment, placement of a granular fill beneath the slabs should improve the subgrade conditions for construction. We suggest the fill material be a pit-run sand and gravel containing less than 5% passing the #200 sieve and less than 40% passing the #40 sieve. Subgrade modules for slab design is included in Table #1. A vapor barrier should be placed beneath slabs where floor coverings are planned.

Existing Fill

The existing fill at the site may contain material that could affect its disposal. Our observations did indicate the presence of building debris and only a small sampling was performed. It has been our experience from similar sites that once contained buildings a risk is present in excavating the old fill. Material such as asbestos containing products could be left from demolition and contaminated the fill material, creating the need for special excavation and disposal of the material.

Rock Anchors

I understand this construction may require the installation of temporary sheeting for excavations and possibly a permanent tiebacks system for support retaining walls. Typically, tiebacks in the downtown area consist of prestressed rock anchors that extend downward into the underlying Shakopee Limestone. Rock is found at about 45' below the ground surface at this site.

For design of this system, the ultimate bond strength between the Shakopee Limestone and the anchoring system must be estimated. My suggestion is to use an ultimate bond strength of 200 psi for the limestone grout bond. I also recommend that adequate factor safety be used to reduce this for a working stress. Typically a factor of safety of about 4 is used for long term installation.

For guidance on installation of the anchors, you can refer to the post tension institute recommendations for a rock anchor installation as well as for proof and performance testing of the anchors. This publication provides an outline for the project specifications as well as design parameters for anchors.

Subsurface Water Control

Results of our recent borings did not encounter any subsurface water; however, it is my opinion that adequate subsurface water control measures must be provided for the construction proposed. I recommend that any below grade perimeter walls be waterproofed and backfilled with a clean granular soil. The soil should contain less than 5% passing the #200 sieve and less than 40% sieve. A perimeter tile line should also be placed at the base of the granular fill to collect water and outletted to a sump or outfall.

I also suggest subdrain be placed beneath the lower floor and the tunnels. Also, a layer of clean sand or washed rock should be placed beneath the floors. All subdrain must be outletted to a sump or outfall.

At this time, I am unable to estimate the amount of water that would be collected in the system. A more detailed study of the groundwater conditions at this site would be needed. It is possible that fluctuations of the nearby Zumbro River could affect the subsurface water levels. An estimate of the highest groundwater level as well as the proper method of protection is beyond the scope of this exploration. Additional information would be needed to provide further comments.

Cold Weather Construction

It is our understanding that construction may occur on this site during the winter months. It is our recommendation that all frozen soils be removed from the areas to be filled and that no frozen soils be placed as fill. All fill placed for foundation support should be protected against freezing temperatures. This includes protecting all foundation work from freezing temperatures and providing non-frozen backfill. Proper precautions should also be taken to prevent frost penetration beneath the foundations following construction.

Perimeter footings for heated structures should be placed a sufficient depth for protection against frost penetration. Current code requirements suggest footing depths of at least 42" for heated structures. We would recommend that this depth be increased to at least 72" where unheated portions of the structures are proposed such as entryways, isolated exterior columns or other non-heated spaces. In the areas where frost penetration and heaving is a concern, we suggest removing the upper frost suspectable soils and placing a clean granular fill. The fill contains less than 5% passing #200 sieve and less than 40% passing the #40 sieve. The fill material should be drained by tile lines.

Earthwork

The owner and the contractor should make themselves aware of and become familiar with applicable local, state and federal safety regulations, including current OSHA excavation and trench safety standards. Construction site safety generally is the sole responsibility of the contractor. The contractor shall also be solely responsible for the means, methods, techniques, and sequences of construction operations. McGhie & Betts is providing the following information solely as a service to our Client. Under no circumstance should McGhie & Betts' provision of the following information be construed to mean that McGhie & Betts is assuming responsibility for construction site safety or the contractor's activities; such responsibility is not implied nor should it be inferred.

Many geologic materials deteriorate rapidly upon exposure to air or water after excavation. Unless otherwise specifically indicated in this report, walls and floors of excavations must be protected from rain, water, and freezing temperatures throughout the course of construction.

Where utilities are to be placed, we suggest careful selection of the backfill material. Where settlement is not critical, such as in lawn areas or where future construction is not proposed, reuse of the on-site soils may be suitable. We do suggest that these soils be placed and compacted with normal compactive efforts and as a guide, we suggest compaction be to 90% of the Standard Proctor in these non-critical areas.

Where trench compaction is critical, such as beneath pavement areas, within building areas, and sidewalk and curb areas, careful selection of the back fill material will be required. It is possible that portions of the upper clayey soil types may be suitable for use, however, proper weather conditions will be needed for discing and drying of these soils. In most cases, these soils should be replaced with a granular soil. We suggest backfill materials comply with current Mn/DOT granular backfill standards. Compaction of all fill within paved areas should be to 95% within 3 feet of final grade and increased to 98% in the upper 3'. Within building areas, we would suggest a granular soil be used for most excavations.

CONSTRUCTION

Site Observations

The soil conditions illustrated on the attached boring logs are indicative of the conditions only at the boring locations. For this reason, we recommend that all completed excavations at this site be observed by a soils engineer prior to fill placement or construction of any foundation elements. These observations would be necessary to judge if all unsuitable materials have been removed from within the planned construction area and an appropriate degree of lateral oversize has been provided.

Testing

We suggest a representative number of field density tests be taken in all engineered fill placed to aid in judging its suitability. We suggest that at least one density test be performed for every 2,500 square feet of engineered fill placed, for every 2 feet of fill depth. Any proposed fill material should be submitted to the laboratory for testing to verify compliance with our recommendations and project specifications.

Performance of the engineered fill and backfill at this site is dependent upon all unsuitable soils being removed prior to fill placement and that adequate compaction is maintained as the fill is placed. We

suggest that all excavations be observed by a qualified soil engineer or technician prior to fill placement and that density testing be performed within the fill material.

Excavation and fill placement should extend laterally beyond the edges of all foundations 1 1/2 foot for each 1 foot of fill placed beneath the foundations. All exterior wall backfill should be capped with a layer of clay and sloped to provide a positive surface drainage away from the structures.

If any fill is placed below the normal water level or on saturated soils, a clean free-draining sand with less than 40% passing the #40 sieve and 5% passing the #200 sieve should be used for fill. We also suggest the initial lift of fill be of sufficient depth to minimize disturbance of the natural soils during compaction.

Plan Review

We recommend the owner retain McGhie & Betts to perform a review of final design drawings and specifications to help assure that the geotechnical engineering report has not been misinterpreted. We also suggest that additional exploration be completed prior to final foundation design.

EXPLORATION LIMITATIONS

All reports, logs, field data, notes, laboratory test data, calculations, estimates and other documents prepared by McGhie & Betts are instruments of service and as such shall remain the property of McGhie & Betts. McGhie & Betts has endeavored to conduct the services identified herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions as this project. No other representation, express or implied, is included or intended in this document

APPENDIX A

LOCATION SKETCH & LOGS OF TEST BORINGS

NOTICE TO REPORT USERS
BORING LOG INFORMATION

Subsurface Profiles

The subsurface stratification lines on the graphic representation of the test borings shows an approximate boundary between soil types or rock. The transition between materials is approximate and is usually far more gradual than shown. Estimating excavation depths, soil volumes and other computations relying on the subsurface strata may not be possible to any degree of accuracy.

Water Level

McGhie & Betts took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of this report. The groundwater level may fluctuate due to seasonal variations caused by precipitation, snowmelt, rainfalls, construction or remediation activities, and/or other factors not evident at the time of measurement.

The actual determination of the subsurface water level is an interpretative process. Subsurface water level may not be accurately depicted by the levels indicated on the boring logs. Normally, a subsurface exploration obtains general information regarding subsurface features for design purposes. An accurate determination of subsurface water levels is not possible with a typical scope of work. The use of the subsurface water level information provided for estimating purposes or other site review can present a moderate to high risk of error.

The following information is obtained in the field and noted under "Water Level Measurements" at the bottom of the log.

Sampled Depth - The lowest depth of soil sampling at the time a water level measurement is taken.

Casing Depth - The depth to the bottom of the casing or hollow-stem auger at the time of water level measurement.

Cave-In Depth - The depth at which the measuring tape slopes in the bore hole.

Water Level - The point in the bore hole at which free-standing water is encountered by a measuring tape dropped from the surface inside the casing.

Drilling Fluid Level - Similar to the water level, except the liquid in the bore hole is a drilling fluid.

Obstruction Depths

Obstructions and/or obstruction depths may be noted on the boring logs. Obstruction indicates the sampling equipment encountered resistance to penetration. It must be realized that continuation of drilling, the use of other drilling equipment, or further exploration may provide information other than that depicted on the logs. The correlation of obstruction depths on the log with construction features such as rock excavation, foundation depths, or buried debris cannot normally be determined with any degree of accuracy. For example, penetration of weathered rock by soil sampling equipment may not correlate with removal by certain types of construction equipment. Using this information for estimating purposes often results in a high degree of misinterpretation.

Accurately identifying the obstruction or estimating depths where hard rock is present over the site requires a scope of service beyond the normal geotechnical exploration program. The risk of using the information noted on the boring logs for estimating purposes must be understood.

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES
ASTM Designation: D 2487
(Based on Unified Soil Classification System)

SOIL ENGINEERING

			Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]	Soil Classification: Group Symbol	Soil Classification: Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3^E$	SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OL	Organic clay[K,L,M,N] Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OH	Organic clay[K,L,M,P]
					Organic silt[K,L,M,O]
Highly organic soils Fibric Peat > 67% Fibers		Primarily organic matter, dark in color, and organic odor Hemic Peat 33%-67% Fibers		PT	Peat Sapric Peat < 33% Fibers

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name

[C] Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains $\geq$ 15% sand, add "with sand" to group name

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM

[H] If fines are organic, add "with organic fines" to group name

[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains $\geq$ 30% plus no. 200, predominantly sand add "sandy" to to group name

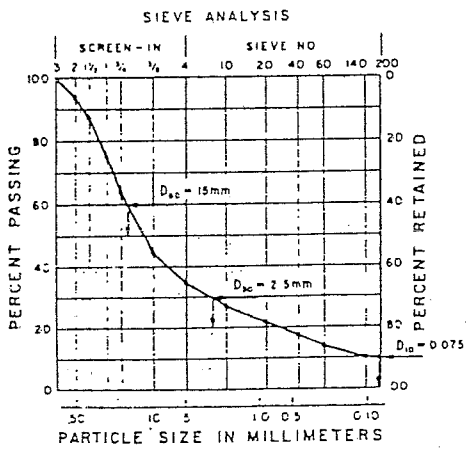
[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name

[N] PI $\geq$ 4 and plots on or above "A" line.

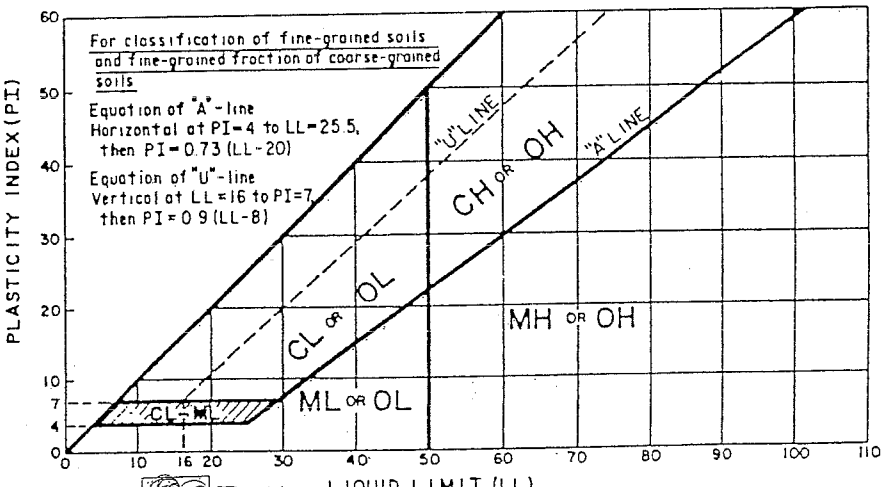
[O] PI < 4 or plots below "A" line

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line



$C_u = \frac{D_{60}}{D_{10}} = \frac{15}{0.075} = 200$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = \frac{(2.5)^2}{0.075 \times 15} = 5.6$



McGhie Consulting Engineers — Betts, Inc. Land Surveyors — Planners

LOG OF TEST BORING

PROJECT: Proposed MN Bio Business Center
LOCATION: Rochester Minnesota

CLIENT/MBI #: 2698/6644
BORING NUMBER: PB1

DEPTH (FEET)	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 1004.1	USCS	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC	DD	LL	PL	Qu/RQD
0	Fill, Mostly Silty Sand, a Little Lean Clay, a Few Pieces of Brick, Brown, Dark Brown (Asphalt and Crushed Rock @ Grade) a 4" Slab of Concrete @ 11.5'		Fill			1	HSA					
3				7		2	SB					
6				13		3	SB					
9				9		4	SB					
12	Sand with a Little Gravel, Fine to Medium Grained, Brown, Moist, Very Loose	SP	Coarse Alluvium	4		5	SB					
15	Weathered Limestone, Reddish Brown [Textural Classification: Sandy Lean Clay with Pieces of Limestone, Very Soft]		Shakopee Formation			6	SB					
18	Limestone, Gray, Sandy Limestone 17' to 17.5', a Little Vuggy to 22.0', Light Gray from 22' to 32'					7	NQ					
21												
24				99%		8	NQ					RQD =52
27												
30						9	NQ					
33	END OF BORING											
36												
39												
42												

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	BAILED DEPTHS
12/28/06	3:45	16.5	17.0	--	None	

START: 12/28/06
END: 12/29/06

METHOD
3 1/4" HSA 0 - 17.0'
NQ 17.0' - 32.0'

CREW CHIEF
R. Smith

McGhie & Betts, Inc.

LOG OF TEST BORING

PROJECT: Proposed MN Bio Business Center
LOCATION: Rochester Minnesota

CLIENT/MBI #: 2698/6644
BORING NUMBER: PB2

DEPTH (FEET)	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 1002.0	USCS	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC	DD	LL	PL	Qu/RQD
0	Fill, Mostly Silty Sand, Brown, Dark Brown (Asphalt and Crushed Rock @ Grade) 4" Slab of Concrete @ 9.5'		Fill			1	HSA					
3				6		2	SB					
6				4		3	SB					
9				2		4	SB					
	Weathered Limestone, Reddish Brown [Textural Classification: Silt with Pieces of Limestone, Very Dense]		Shakopee Formation	50/.1		5	SB					
12				50/.3		6	SB					
	Limestone, Gray, a Few Layers of Chert @ 16.0' and Laminations of Sandy Limestone			99%		7	NQ					RQD =57
15												
18	END OF BORING											
21												
24												
27												
30												
33												
36												
39												
42												

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	BAILED DEPTHS
12/28/06	2:00	12.8	13.0	--	None	

START: 12/28/06 END: 12/30/06

METHOD	CREW CHIEF
3 1/4" HSA 0 - 13.0'	R. Smith
NQ 13.0' - 18.0'	

McGhie & Betts, Inc.

LOG OF TEST BORING

PROJECT: Proposed MN Bio Business Center
LOCATION: Rochester Minnesota

CLIENT/MBI #: 2698/6644
BORING NUMBER: PB3

DEPTH (FEET)	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 1004.9	USCS	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC	DD	LL	PL	Qu/RQD
0	Fill, Mostly Silty Sand with Pieces of Concrete, Brick, Fabric, Foam Rubber and Wire, Brown, Dark Brown (Asphalt and Crushed Limestone @ Grade)					1	HSA					
3				13		2	SB					
6				3		3	SB					
9				*		4	SB					
12				2		5	SB					
15	Sand with Silt and with Gravel, Medium to Fine Grained, Brown, Moist, Loose	SP-SM	Coarse Alluvium	8		6	SB					
18	Limestone, Gray, a Lavine full of Shaley Limestone @ 18.0', a Little Vuggy		Shakopee Formation	7		7	SB					
21				95		8	NQ					RQD =69
24	END OF BORING											
27	*NOTE: Weight of Hammer											
30												
33												
36												
39												
42												

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	BAILED DEPTHS
12/28/06	10:45	16.0	16.7	--	None	

START: 12/28/06
END: 12/29/06

METHOD: 3 1/4" HSA 0 - 16.7'
NQ 17.0' - 22.0'

CREW CHIEF: R. Smith

McGhie & Betts, Inc.

LOG OF TEST BORING

PROJECT: Proposed MN Bio Business Center
LOCATION: Rochester Minnesota

CLIENT/MBI #: 2698/6644
BORING NUMBER: PB4

DEPTH (FEET)	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 1003.2	USCS	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC	DD	LL	PL	Qu/RQD
0	Fill, Mostly Silty Sand, a Few Bricks and Pieces of Concrete, Brown, Dark Brown (Asphalt and Crushed Rock @ Grade) a 4" Slab of Concrete @ 10.0'		Fill	10		1	SB					
3				15		2	SB					
6				11		3	SB					
9				50/.3		4	SB					
12	Sand with a Little Gravel, Medium to Fine Grained, Brown, Moist, Medium Dense	SP	Coarse Alluvium	5		5	SB					
15				19		6	SB					
18	Limestone, Gray, a Few Laminations of Sandy Limestone @ 18.0' and Shaley Limestone @ 20.5'		Shakopee Formation	94		7	NQ					RQD =66
21	END OF BORING											
24												
27												
30												
33												
36												
39												
42												

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	BAILED DEPTHS
12/28/06	3:00	13.5	15.8	--	None	

START: 12/28/06
END: 12/29/06

METHOD: 3 1/4" HSA 0 - 15.8'; NQ 15.8' - 20.8'

CREW CHIEF: R. Smith

McGhie & Betts, Inc.

LOG OF TEST BORING

PROJECT: Proposed MN Bio Business Center
LOCATION: Rochester Minnesota

CLIENT/MBI #: 2698/6644
BORING NUMBER: PB5

DEPTH (FEET)	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 1004.9	USCS	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC	DD	LL	PL	Qu/RQD
0	Fill, a Mixture of Silty Sand, Pieces of Brick, Slabs of Concrete, Pieces of Fabric, Foam Rubber, Steel Wire, Brown, Dark Brown (Asphalt and Crushed Rock @ Grade), 8" Slab of Concrete @ 12.0'		Fill			1	HSA					
3						2	HSA					
				4		3	SB					
6												
				2		4	SB					
9												
				5		5	SB					
12												
	Sand with a Little Gravel, Fine to Medium Grained, Brown, Moist, Medium Dense to Very Loose	SP	Coarse Alluvium	24		6	SB					
15				4		7	SB					
	Weathered Limestone, Reddish Brown [Textural Classification: Silty Sand with Pieces of Limestone, Moist, Very Loose]		Shakopee Formation									
18	Limestone, Light Gray to Gray, a Lamination of Shaley Limestone @ 20.0', a Little Vuggy			93%		8	NQ					RQD =57
21												
	END OF BORING											
24												
27												
30												
33												
36												
39												
42												

START: 12/28/06 END: 12/29/06

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	BAILED DEPTHS
12/28/06	11:45	16.5	17.4	--	None	

METHOD: 3 1/4" HSA 0 - 17.4'; NQ 17.4' - 22.4'

CREW CHIEF: R. Smith

McGhie & Betts, Inc.

LOG OF TEST BORING

PROJECT: Proposed MN Bio Business Center
LOCATION: Rochester Minnesota

CLIENT/MBI #: 2698/6644
BORING NUMBER: PB6

DEPTH (FEET)	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 1002.5	USCS	GEOLOGIC ORIGIN	N or CR	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC	DD	LL	PL	Qu/RQD
0	Fill, Mostly Lean Clay, a Little Silty Sand, a Few Pieces of Brick, Brown, Dark Brown, Gray (Asphalt and Crushed Rock @ Grade)		Fill			1	HSA					
3				6		2	SB					
6				11		3	SB					
9				17		4	SB					
12				9		5	SB					
	Weathered Limestone, Reddish Brown [Textural Classification: Sandy Silt with Pieces of Limestone, Moist, Dense to Very Dense]		Shakopee Formation	39		6	SB					
15	Limestone, Light Gray to Gray to Light Gray, a Little Vuggy @ 20.0', a Lens of Shaley Limestone @ 23.0' and a Layer of Shaley Limestone @ 27.0' to 27.5'			50/.1		7	SB					
18						8	NQ					
21				93%		9	NQ					RQD =49
24												
27						10	NQ					
30	END OF BORING											
33												
36												
39												
42												

WATER LEVEL MEASUREMENTS

START: 12/28/06 END: 12/30/06

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	BAILED DEPTHS	METHOD	CREW CHIEF
12/28/06	9:50	14.6	14.6	--	None		3 1/4" HSA 0 - 14.6'	R. Smith
							NQ 14.6' - 29.6'	

McGhie & Betts, Inc.

SYMBOLS AND TERMINOLOGY ON TEST BORING LOG

SYMBOLS

Drilling and Sampling

Symbol	Description
HSA	3-1/4" I.D. hollow stem auger
_FA	4", 6" or 10" diameter flight auger
_HA	2", 4" or 6" hand auger
_DC	2-1/2", 4", 5" or 6" steel drive casing
_RC	Size A, B or N rotary casing
PD	Pipe drill or cleanout tube
CS	Continuous split barrel sampling
DM	Drilling mud
JW	Jetting water
SB	2" O.D. split barrel sampling
_L	2-1/2" or 3-1/2" O.D. SB liner sample
_T	2" or 3" thin walled tube sample
3TP	3" thin walled tube using pitcher sampler
_TO	2" or 3" thin walled tube using Osterberg sampler
W	Wash sample
B	Bag sample
P	Test pit sample
_Q	BQ, NQ, or PQ wireline system
_X	AX, BX or NX double tube barrel
N	Standard penetration test, blows per foot
CR	Core recovery, percent
WL	Water level
▼	Water level
NMR	No measurement recorded, primarily due to presence of drilling or coring fluid

Laboratory Testing

Symbol	Description
W	Water content, % (ASTM** D2216)
D	Dry density, pcf
LL	Liquid limit (ASTM D 4318)
PL	Plastic limit (ASTM D 4318)
	-- Inserts in Last Column (Qu or RQD)--
Qu	Unconfined compressive strength, psf (ASTM D 2166)
Pq	Penetrometer reading, tsf (ASTM D 1558)
Ta	Torvane reading, tsf
G	Specific gravity (ASTM D 854)
SL	Shrinkage limits (ASTM D 4427)
OC	Organic content – Combustion method (ASTM D 2974)
SP	Swell pressure, tsf (ASTM D 4546)
PS	Percent swell under pressure (ASTM D 4546)
FS	Free swell, % (ASTM D 4546)
SS	Shrink, swell, % (ASTM D 4546)
PH	Hydrogen ion content – Meter Method (ASTM D 4972)
SC	Sulfate content, parts/million or mg/l
CC	Chloride content, parts/million or mg/l
C*	One dimensional consolidation (ASTM D 2435)
Qc*	Triaxial compression (ASTM D 2850 and D 4767)
D.S.*	Direct shear (ASTM D 3080)
K*	Coefficient of permeability, cm/sec (ASTM D 2434)
P*	Pinhole Test (ASTM D 4647)
DH*	Double hydrometer (ASTM D 4221)
MA*	Particle size analysis (ASTM D 422)
R	Laboratory electrical resistivity, ohm-cm (ASTM G 57)
E*	Pressuremeter deformation modulus, tsf (ASTM D 4719)
PM*	Pressuremeter test (ASTM D 4719)
VS*	Field vane shear
IR*	Infiltrometer test (ASTM D 3385)
RQD	Rock quality designation, percent
*	Results shown on attached data sheet or graph
**	ASTM designates American Society for Testing and Materials

TERMINOLOGY

Particle Sizes

Type	Size Range
Boulders	> 12"
Cobbles	3" – 12"
Coarse gravel	¾" – 3"
Fine gravel	#4 sieve – ¾"
Coarse Sand	#4 - #10 sieve
Medium Sand	#10 - #40 sieve
Fine Sand	#40 - #200 sieve
Silt	100% passing #200 and > 0.005 mm
Clay	100% passing #200 and < 0.005 mm

Soil Layering and Moisture

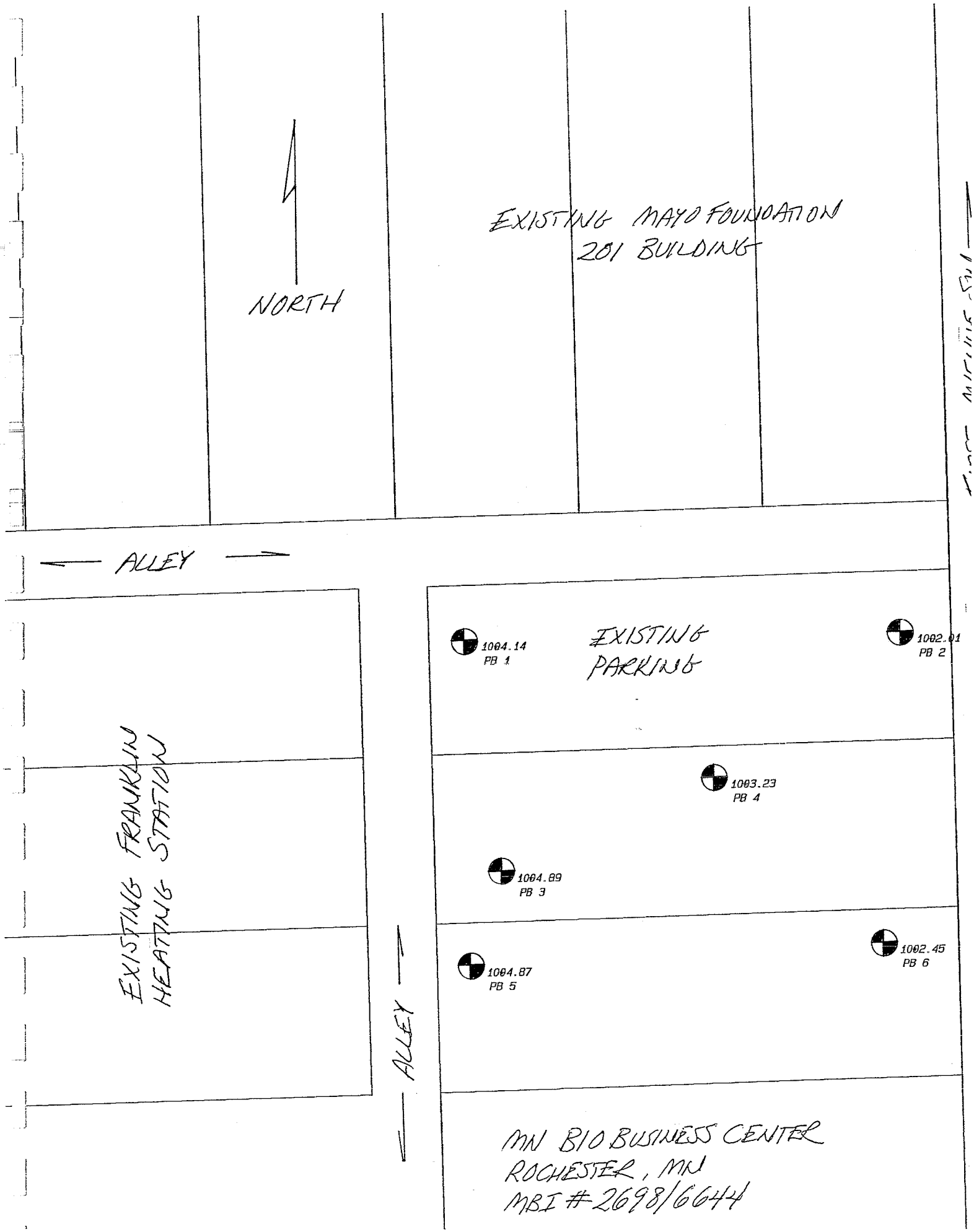
Term	Visual Observation
Lamination	Up to ¼" thick stratum
Varved	Alternating laminations of any combination of clay, silt, fine sand or colors
Lenses	Small pockets of different soils in a soil mass
Stratified	Alternating layers of varying materials or colors
Layer	¼" to 12" thick stratum
Dry	Powdery, no noticeable water
Moist	Damp, below saturation
Waterbearing	Pervious soil below water
Wet	Saturated, above liquid limit

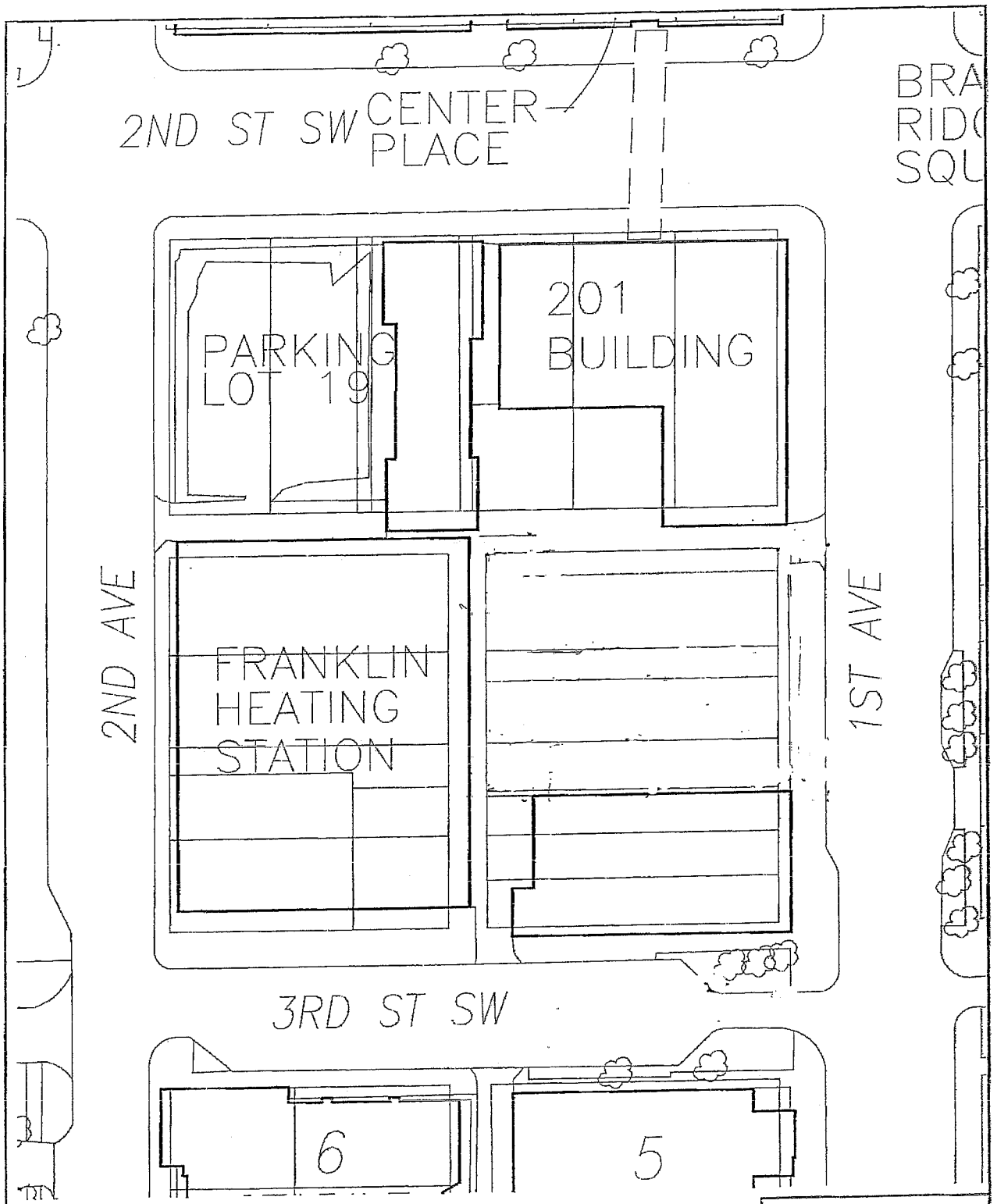
Gravel Content

Coarse-Grained Soils		Fine-Grained Soils	
% Gravel	Description	% Gravel	Description
2-15	A little gravel	<5	Trace of gravel
16-49	With gravel	5 –15	A little gravel
		16-30	With gravel
		31-49	Gravelly

Standard Penetration Resistance

Cohesionless Soils		Cohesive Soils	
N-Valve	Relative Density	N-Value	Consistency
0-4	Very loose	0-4	Very soft
5-10	Loose	5-8	Soft
11-30	Medium dense	9-15	Firm
31-50	Dense	16-30	Hard
>50	Very dense	>30	Very Hard


NORTH
EXISTING MAYO FOUNDATION
201 BUILDING
ALLEY
1004.14
PB 1
EXISTING
PARKING
1002.91
PB 2
1003.23
PB 4
1004.89
PB 3
1002.45
PB 6
1004.87
PB 5
EXISTING FRANKLIN
HEATING STATION
ALLEY
MN BIO BUSINESS CENTER
ROCHESTER, MN
MBI #2698/6644



SUGGESTED SOIL BORING LOCATIONS

HGA
Architecture | Engineering | Planning
Hammel, Green and Abrahamson, Inc.
202 1st Avenue SW - Suite 200
Rochester, Minnesota USA 55902-3129
Telephone 507.281.8600 Facsimile 507.281.8588

COMM. NO.	1009-018-00
SCALE	1/64"=1'-0"
DATE	NOV 13 2006
DRAWN	TS

MN BIO BUSINESS CENTER

ROCHESTER MN

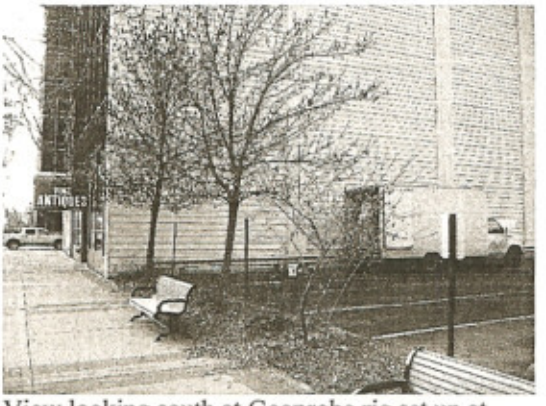
SK1

Appendix C
Photo Log

Photo Log
Phase II Soil and Groundwater Investigation
Rochester, Minnesota
December 28 and 29, 2006

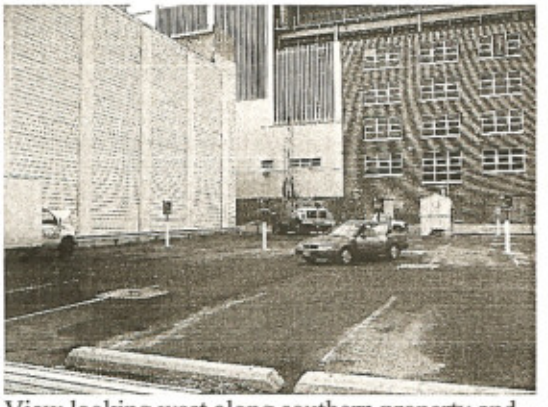
View looking east with drill rig set up on location GB-5

View looking west at drill rig set up on GB-1



View looking south at Geoprobe rig set up at location LSG-2

View looking north with drill rig set up on GB-2

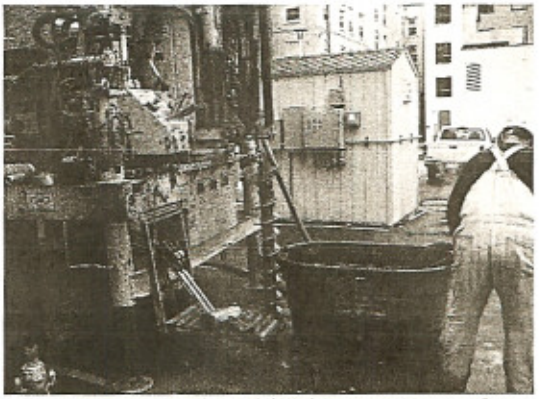


View looking west along southern property and southern portion of northern property

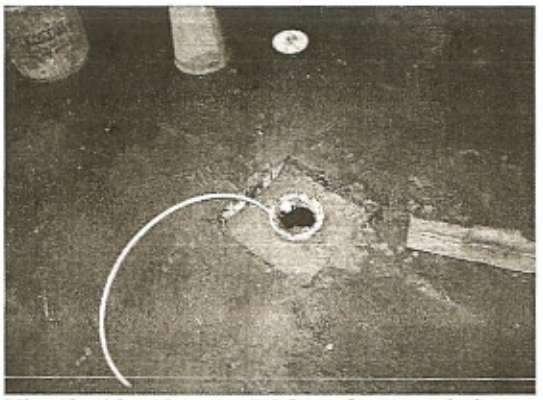
View looking west at northern property with Geoprobe rig set up on LSG-3 in alley

Photo Log
Phase II Soil and Groundwater Investigation
Rochester, Minnesota
December 28 and 29, 2006

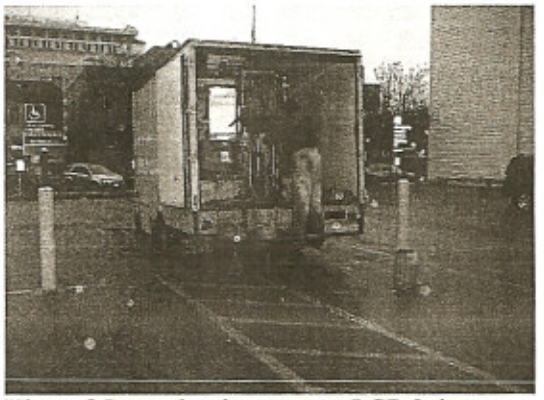
View of limestone core from location GB-4



View looking north at drill rig set up on southern property at location GB-3. Note remedial system shed in background.



View looking down at LSG-4 after completion of vapor monitoring point flush-mount pad



View of Geoprobe rig set up on LGP-3, in central portion of northern property.

View looking east along property north of alley with LSG-4 in foreground and LSG-5 in background, next to electrical boxes

Appendix D
Boring Logs

PROJECT NUMBER CRC-06 HOLE NO. LGP-1

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET 1 OF 1 SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: Geoprobe	
DRILLING AGENCY: MESA	ELEV. OF GROUNDWATER: NA	
NAME OF DRILLER(S): Dave R	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 8'	SIGNATURE OF INSPECTOR: Daniel Mullin	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
		asphalt parking lot		NA	
		sandy silt beneath asphalt	4/4		
	1	fine- to medium-grained sand, poorly graded, brown, fill			
	2				
0.3	3	→ silty fine-grained sandy light brown, poorly graded, fill			Sample LGP-1/2-4 collect Dup-2 split
	4				
	5		4/4		
	6				
0.3	7	clayey silt with fine-grained sand, brown, fill			Sample LGP-1/6-8
	8	TD @ 8			

PROJECT NUMBER CRC-06 HOLE NO. LGP-2

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET 1 OF 1 SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: Geoprobe	
DRILLING AGENCY: MESA	ELEV. OF GROUNDWATER: NA	
NAME OF DRILLER(S): Dave R	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 8'	SIGNATURE OF INSPECTOR: Jennifer Mullin	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
	0	asphalt parking lot		NA	
		Fill - sand and gravel, Class 5, yellowish brown	4/4		sample LGP-2/0-2
0.3	1	Fill: medium-grained sand, poorly graded, brown			
	2				
	3				
	4				
		clayey silt with sand, firm, brown, fill			sample LGP-2/4-6
	5		4/4		
0.3		Fill: medium-grained sand, poorly graded, brown			
	6				
	7				
	8	TD @ 8'			

PROJECT NUMBER CRE-06 HOLE NO. LGP-3

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET OF SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: Geoprobe	
DRILLING AGENCY: MESA	ELEV. OF GROUNDWATER: NA	
NAME OF DRILLER(S): Dave R	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 8'	SIGNATURE OF INSPECTOR: Jennifer Mullen	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
		asphalt parking lot	4/4	NA	
		Fill: sand & gravel, Class 5, yellowish brown			sample LGP-3 /3/2-4
0.3	1	Fill: medium-grained sand, poorly graded, brown			
	2				
	3				
	4	clayey silt with sand, firm, brown, fill	4/4		
	5	Fill: medium-grained sand, poorly graded, fill			
	6				sample LGP-3/6-8
0.3	7				
	8	TDC 8'			

PROJECT NUMBER CRC-06 HOLE NO. LGP-4

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET OF SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: Geoprobe	
DRILLING AGENCY: MESA	ELEV. OF GROUNDWATER: NA	
NAME OF DRILLER(S): Dave R	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 2'	SIGNATURE OF INSPECTOR: Gerald Mullin	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
		asphalt	2/2	NA	Sample LGP-4/0-2 collect DUP-3 split
		glass S sand & gravel, yellowish brown, fill			
0.3	1	silt, sand, gravel mix, grayish brown, fill			
	2	TD on concrete debris @ 2'			

PROJECT NUMBER CRC-06- HOLE NO. LSG-1

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET OF SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: Geoprobe	
DRILLING AGENCY: MESA	ELEV. OF GROUNDWATER: NA	
NAME OF DRILLER(S): Dave R	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 6.5'	SIGNATURE OF INSPECTOR: Mendel > Mullin	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	Vapor point ~~RECOVERY~~ (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
		parking lot		NA	
0.3	1	sand-silt-gravel mix, gray, fill			Sample LSG-1/2-4
	2	→ dark gray, mostly silt @2'			bentonite slurry
	3				poly tubing
0.3	4				8 mesh bentonite Sample LSG-1/4-6
	5	→ bricks and concrete at 5'			Red Flint #30
	6				stainless steel, 0.0057 inches Sl screen from 5.5'-6.0' bgs
		TDE 6.5 on concrete slab			

PROJECT NUMBER CRC-06 HOLE NO. LSG-2

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET OF SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: Geoprobe	
DRILLING AGENCY: MESA	ELEV. OF GROUNDWATER: NA	
NAME OF DRILLER(S): Dave R	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 8'	SIGNATURE OF INSPECTOR: Gerald T. Mullin	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	~~Vapor point RECOVERY~~ (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
	0	asphalt parking lot		NA	
0.3	1	sandy silt with gravel and trace clay, dark gray, fill, very moist wet			sample LSG-2/0-2
	2				Bentonite slurry from 0-4'
	3				poly tubing
	4	concrete @ 4' (drilled through) clayey silt with some pebbles, lean, gray, stiff			sample LSG-2/4-6
0.3	5	→ oxidation staining @ 6.5'			Bentonite mesh from 4-6
	6				#30 Red Flynt Sand @ 6-8'
	7				screen @ 7.5-8', 5-slot
	8	TD = 8.0'			

PROJECT NUMBER CRC-06 HOLE NO. LSG-3

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET 1 OF 1 SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: Geoprobe	
DRILLING AGENCY: MESA	ELEV. OF GROUNDWATER: NA	
NAME OF DRILLER(S): Dave R	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 8'	SIGNATURE OF INSPECTOR: Dwight Hallin	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	Vapor Point RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
	0	Asphalt alley surface			
		Fill: medium-grained sand, poorly graded, brown			
	1				Bentonite slurry from 0-4'
	2	as above			Sample LSG-3/2-4
0.3	3				poly tubing
		as above			
	4				Bentonite mesh from 4-6
	5	as above, medium- to coarse-grained sand, fill			
	6				#30 red flint sand from 6-8' Sample LGP-3/6-8
0.3	7				
	8	TOB 8'			screened 2.5-8', 5-slot

PROJECT NUMBER CRC-06 HOLE NO. LSG-4

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET 1 OF 1 SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: Geoprobe	
DRILLING AGENCY: MESA	ELEV. OF GROUNDWATER: NA	
NAME OF DRILLER(S): Dave R	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 6'	SIGNATURE OF INSPECTOR: [illegible]	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
	0	asphalt		NA	
		Fill: medium-grained sand, poorly graded, brown			sample LSG-4/2-4
	1				bentonite slurry from 0-2
	2				
0.3	3				bentonite mesh from 2-4'
	4	white chalk powder			insulation for steam pipes? Sample white powder
					poly tubing Sample LSG-4/4-6
	5				
0.3		gravel with bricks, no recovery			screen @ 5.5-6, 5-slot
	6	Refusal @ 6'			
	7				
	8				

PROJECT NUMBER CRC-06 HOLE NO. LSG-5

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET 1 OF 1 SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: Geoprobe	
DRILLING AGENCY: MESA	ELEV. OF GROUNDWATER: NA	
NAME OF DRILLER(S): Dave R	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 8'	SIGNATURE OF INSPECTOR: Jerald Mullin	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	Vapor point RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
		asphalt parking lot		NA	
		sand and gravel fill			
	1				
	2	clayey silt with gravel, dark gray, fill			bentonite slurry from 0-4'
					Sample LSG-5/2-4
0.3	3				poly tubing
	4	silty sand with gravel and trace clay, brown			bentonite mesh from 4-6'
	5				
	6				#30 Red Flynt Sand from 6-8'
					Sample LSG-5/6-8
0.3	7				screen @ 7.5-8, 5-slot
	8	TD @ 8'			

PROJECT NUMBER CRC-06 HOLE NO. GB-5/LSG-6

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET OF SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: 3¼ ID HSA	
DRILLING AGENCY: McGhie & Betts	ELEV. OF GROUNDWATER: ~18'	
NAME OF DRILLER(S): Ross Smith	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 22'	SIGNATURE OF INSPECTOR: Gerald Miller	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	Vapor probe RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
	0	parking lot			
0.3		silt-sand-gravel mix with concrete and rebar debris, gray			bentonite slurry from 0-4'
	2	→ as above, more concrete			poly tubing
	4				bentonite fresh from 4-6' sample GB-5/4.5-6.5
0.3		as above			#30 Red Flint sand from 6-8'
	6				
	8	7-9: no recovery, bricks and some wood debris			screened from 7.5-8'
	10	9.5-11: no recovery, bricks, concrete, wood debris			
	12	concrete slab @ 12.5			sample GB-5/12.5
0.3		sand with gravel mixed with chunks of concrete			
	14				
		→ as above, less concrete, more sand			
	16	weathered rock @ 16.5			
		TD @ 17.3 on limestone with HSA			
		→ core to 22' bgs			

PROJECT NUMBER CRC-06 HOLE NO. GB-1

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET OF SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: 3¼" ID HSA	
DRILLING AGENCY: McCall Retts	ELEV. OF GROUNDWATER: NM	
NAME OF DRILLER(S): Ross Smith	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 32'	SIGNATURE OF INSPECTOR: Jerald Mullins	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
	0	asphalt parking lot	see report	see report	
		Fill: medium-grained sand, poorly graded, brown			
	2				
	4				Sample GB-1/4.5-6.5
0.3	6	Fill: silty fine-grained sand, some clay, brown			
		Fill: fine grained sand, poorly graded, yellowish brown			
	8				
	10				
	12	concrete slab			
		sandy gravel, oxidization staining brown with orange, loose, some clayey silt @ 13.5'-15'			Sample GB-1/12-14
0.3	14				
		→ very moist and clayey gravel @ 15'			
	16				
		TD @ 17 on Limestone with HSA			
	18	→ core to 32'			

PROJECT NUMBER CRC-06 HOLE NO. GB-2

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET 1 OF 1 SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: 3¼" I.D. HSA	
DRILLING AGENCY: McGhei Betts	ELEV. OF GROUNDWATER: NM	
NAME OF DRILLER(S): Ross Smith	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 18'	SIGNATURE OF INSPECTOR: Jerald Mullin	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
	0	Black dirt next to sidewalk	see report	see report	
		Fill: Fine- to medium-grained sand, light brown, very moist			
	2				sample GB-2/2-4
0.3	4				
		→ as above, some cobbles			
	6	→ as above			
	8	as above, no cobbles			sample GB-2/7-9
0.3		concrete slab @ 9.5			
	10	sand-silt-gravel mix, oxidization staining			
	12				
		TD @ 13' on limestone with HSA			
	14				
	16	→ core to 18'			

PROJECT NUMBER CRC-06 HOLE NO. GB-3

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET 1 OF 1 SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: 3¼" I.D. HSA	
DRILLING AGENCY: McGhee & Betts	ELEV. OF GROUNDWATER: ~18' bgs	
NAME OF DRILLER(S): Ross Smith	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 22'	SIGNATURE OF INSPECTOR: Jerrold J Mullin	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
		parking lot	see report	see report	
0.3	2	Fill: silt-sand-gravel, dark gray			Sample GB-3/2-4
	4	void @ 2-3' bgs and then bricks & some municipal garbage (plastic)			
	6	no recovery - seat cusion & red cloth with other debris from 5-11'			
	8	0.3' recovery from 9.5-11.5' (seat cusion and spring			
	10				Sample GB-3/12-13.5'
0.3	12	sandy silt with some gravel, oxidation staining			
	14	as above with some limestone cobbles			
	16	weathered rock @ 16.4'			
		TD @ 16.7 on limestone with HSA			
		core to 22'			

PROJECT NUMBER CRC-06 HOLE NO. GB-4

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET OF SHEETS
PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: 3¼" ID HSA	
DRILLING AGENCY: McGhee Betts	ELEV. OF GROUNDWATER: ~18'	
NAME OF DRILLER(S): Ross Smith	ELEVATION OF GROUND: NM	
TOTAL DEPTH OF HOLE: 21'	SIGNATURE OF INSPECTOR: Jerald Mullin	

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
	0	asphalt parking lot	see report	see report	
		Fill: medium-grained sand, poorly graded, brown			
	2				Sample GB-4/4.5-6.5
	4				
0.3	6	Fill: silty fine-grained sand with clay, strong brown			
	8	Fill: fine- to medium-grained sand, poorly graded, brown			
	10				
		concrete slab			
	12	silt-sand-gravel mix, brown with oxidation staining			Sample GB-4/12-14
0.3	14				
	16				
		TD on Limestone @ 16.2' with HSA			
		core to 21'			

PROJECT NUMBER CRR-06 HOLE NO. GB-6

DRILLING LOG	LANDMARK ENVIRONMENTAL, LLC.	SHEET 1 OF 1 SHEETS

PROJECT NAME: 219/223 1st Ave S	DRILL TYPE, & SIZE OF BIT: 3¼" ID HSA
DRILLING AGENCY: McGhee & Betts	ELEV. OF GROUNDWATER: NM
NAME OF DRILLER(S): Ross	ELEVATION OF GROUND: NM
TOTAL DEPTH OF HOLE: 29'	SIGNATURE OF INSPECTOR: Scott Miller

PPM PID	DEPTH (FT)	CLASSIFICATION / DESCRIPTION OF MATERIALS	RECOVERY (FT)	BLOWS PER 6-INCHES	REMARKS OR OBSERVATIONS
	0	parking lot	see report	see report	
		silty sand with gravel, fill			
	2				sample GB-6/2-4
0.3		Fill: silty clay, lean, some coarse sand, grayish brown			
	4				
	6				
		→ orange oxidation staining below 7' bgs			
	8				
0.3					sample GB-6/7-9 DUP-1 split
	10				
	12				
		weathered limestone			
	14				
		Rock/Refusal @ 14.6 with HSA			
		core to 29'			

Appendix E
Pace Analytical Report

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
1700 Elm Street, Suite 200
Minneapolis, MN 55414
Phone: (612)607-1700
Fax: (612)607-6444

January 16, 2007

Mr. Jerry Mullin
Landmark Environmental
2042 West 98th Street
Bloomington, MN 55431

RE: Project: LANDMARK ENV.
Pace Project No.: 1044301

Dear Mr. Mullin:
Enclosed are the analytical results for sample(s) received by the laboratory on January 02, 2007. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Seth Jacobson

seth.jacobson@pacelabs.com
Project Manager

Illinois Certification #: 200011
Iowa Certification #: 368
Minnesota Certification #: 027-053-137
Wisconsin Certification #: 999407970

Enclosures

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
1700 Elm Street, Suite 200
Minneapolis, MN 55414
Phone: (612)607-1700
Fax: (612)607-6444

PROJECT NARRATIVE

Project: LANDMARK ENV.
Pace Project No.: 1044301

Method: **TO-15**
Description: TO15 MSV AIR
Client: Landmark Environmental
Date: January 16, 2007

General Information:
6 samples were analyzed for TO-15. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

K7: The sample was analyzed within the recommended holding time but had QC failures. The reported results were analyzed outside the recommended holding time and confirmed the original analysis.

- LSG-1 (Lab ID: 1044301001)
- LSG-2 (Lab ID: 1044301002)
- LSG-3 (Lab ID: 1044301003)
- LSG-4 (Lab ID: 1044301004)
- LSG-5 (Lab ID: 1044301005)
- LSG-6 (Lab ID: 1044301006)

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

QC Batch: AIR/5059

IC: The initial calibration for this compound was outside of method control limits. The result is estimated.

- BLANK (Lab ID: 302092)
  - Ethyl acetate
  - cis-1,2-Dichloroethene
- DUP (Lab ID: 302336)
  - Ethyl acetate
  - cis-1,2-Dichloroethene
- DUP (Lab ID: 302337)
  - Ethyl acetate
  - cis-1,2-Dichloroethene
- LCS (Lab ID: 302093)
  - cis-1,2-Dichloroethene
  - cis-1,3-Dichloropropene
- LSG-1 (Lab ID: 1044301001)
  - Ethyl acetate
  - cis-1,2-Dichloroethene
- LSG-2 (Lab ID: 1044301002)
  - Ethyl acetate
  - cis-1,2-Dichloroethene
- LSG-3 (Lab ID: 1044301003)
  - Ethyl acetate
  - cis-1,2-Dichloroethene
- LSG-4 (Lab ID: 1044301004)
  - Ethyl acetate
  - cis-1,2-Dichloroethene
- LSG-5 (Lab ID: 1044301005)
  - Ethyl acetate

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1700 Elm Street, Suite 200
Minneapolis, MN 55414
Phone: (612)607-1700
Fax: (612)607-6444

PROJECT NARRATIVE

Project: LANDMARK ENV.
Pace Project No.: 1044301

Method: **TO-15**
Description: TO15 MSV AIR
Client: Landmark Environmental
Date: January 16, 2007

QC Batch: AIR/5059

IC: The initial calibration for this compound was outside of method control limits. The result is estimated.

- LSG-5 (Lab ID: 1044301005)
  - cis-1,2-Dichloroethene
- LSG-6 (Lab ID: 1044301006)
  - Ethyl acetate
  - cis-1,2-Dichloroethene

SS: This analyte did not meet the secondary source verification criteria for the initial calibration. The reported result should be considered an estimated value.

- DUP (Lab ID: 302336)
  - Tetrahydrofuran
- DUP (Lab ID: 302337)
  - Chloromethane
  - Tetrahydrofuran
- LCS (Lab ID: 302093)
  - Chloroethane
  - Chloromethane
  - Tetrahydrofuran
- LSG-2 (Lab ID: 1044301002)
  - Chloromethane
  - Tetrahydrofuran
- LSG-3 (Lab ID: 1044301003)
  - Chloromethane
- LSG-4 (Lab ID: 1044301004)
  - Chloroethane
- LSG-5 (Lab ID: 1044301005)
  - Tetrahydrofuran
- LSG-6 (Lab ID: 1044301006)
  - Chloroethane
  - Chloromethane

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

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Pace Analytical Services, Inc.
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Minneapolis, MN 55414
Phone: (612)607-1700
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PROJECT NARRATIVE

Project: LANDMARK ENV.
Pace Project No.: 1044301

Method: TO-15
Description: TO15 MSV AIR
Client: Landmark Environmental
Date: January 16, 2007

QC Batch: AIR/5059

L3: Analyte recovery in the laboratory control sample (LCS) exceeded QC limits. Analyte presence below reporting limits in associated samples. Results unaffected by high bias.

- LCS (Lab ID: 302093)
  - 1,3-Butadiene
  - Bromomethane
  - Dichlorotetrafluoroethane
  - Vinyl chloride

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

QC Batch: AIR/5059

D6: The relative percent difference (RPD) between the sample and sample duplicate exceeded laboratory control limits.

- DUP (Lab ID: 302336)
  - Trichlorofluoromethane
- DUP (Lab ID: 302337)
  - Chloroform
  - Ethyl acetate

Additional Comments:

Workorder Comments:

All sample analyses were completed on a DB5 column. 500 cc of sample was concentrated using an Entech 7000/7100 sample concentration system.

Sample Comments:

K3: The Total Hydrocarbon (THC) pattern is evenly distributed throughout the chromatogram (before and after toluene).

- LSG-1 (Lab ID: 1044301001)
- LSG-2 (Lab ID: 1044301002)
- LSG-3 (Lab ID: 1044301003)

K1: The Total Hydrocarbon (THC) pattern occured in the first half of the chromatogram (before toluene).

- LSG-4 (Lab ID: 1044301004)
- LSG-5 (Lab ID: 1044301005)

K3: The Total Hydrocarbon (THC) pattern is evenly distributed throughout the chromatogram (before and after toluene).

- LSG-6 (Lab ID: 1044301006)

Analyte Comments:

QC Batch: AIR/5059

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- LSG-5 (Lab ID: 1044301005)
  - Carbon disulfide

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- LSG-5 (Lab ID: 1044301005)
  - Chloroethane

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PROJECT NARRATIVE

Project: LANDMARK ENV.
Pace Project No.: 1044301

Method: **TO-15**
Description: TO15 MSV AIR
Client: Landmark Environmental
Date: January 16, 2007

This data package has been reviewed for quality and completeness and is approved for release.

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SAMPLE SUMMARY

Project: LANDMARK ENV.
Pace Project No.: 1044301

Lab ID	Sample ID	Matrix	Date Collected	Date Received
1044301001	LSG-1	Air	12/29/06 00:00	01/02/07 16:25
1044301002	LSG-2	Air	12/29/06 00:00	01/02/07 16:25
1044301003	LSG-3	Air	12/29/06 00:00	01/02/07 16:25
1044301004	LSG-4	Air	12/29/06 00:00	01/02/07 16:25
1044301005	LSG-5	Air	12/29/06 00:00	01/02/07 16:25
1044301006	LSG-6	Air	12/29/06 00:00	01/02/07 16:25

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SAMPLE ANALYTE COUNT

Project: LANDMARK ENV.
Pace Project No.: 1044301

Lab ID	Sample ID	Method	Analytes Reported
1044301001	**LSG-1**	TO-15	58
1044301002	**LSG-2**	TO-15	58
1044301003	**LSG-3**	TO-15	58
1044301004	**LSG-4**	TO-15	58
1044301005	**LSG-5**	TO-15	58
1044301006	**LSG-6**	TO-15	58

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ANALYTICAL RESULTS

Project: LANDMARK ENV.
Pace Project No.: 1044301

Sample: LSG-1 **Lab ID: 1044301001** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
Acetone	**24.5**	ug/m3	0.64	1.34		01/16/07 01:27	67-64-1	
Benzene	**15.7**	ug/m3	0.87	1.34		01/16/07 01:27	71-43-2	
Bromodichloromethane	ND	ug/m3	1.9	1.34		01/16/07 01:27	75-27-4	
Bromoform	ND	ug/m3	2.8	1.34		01/16/07 01:27	75-25-2	
Bromomethane	ND	ug/m3	1.1	1.34		01/16/07 01:27	74-83-9	
1,3-Butadiene	ND	ug/m3	0.60	1.34		01/16/07 01:27	106-99-0	
2-Butanone (MEK)	ND	ug/m3	0.80	1.34		01/16/07 01:27	78-93-3	
Carbon disulfide	ND	ug/m3	0.84	1.34		01/16/07 01:27	75-15-0	
Carbon tetrachloride	ND	ug/m3	1.7	1.34		01/16/07 01:27	56-23-5	
Chlorobenzene	ND	ug/m3	1.3	1.34		01/16/07 01:27	108-90-7	
Chloroethane	ND	ug/m3	0.72	1.34		01/16/07 01:27	75-00-3	
Chloroform	**10.4**	ug/m3	1.3	1.34		01/16/07 01:27	67-66-3	
Chloromethane	ND	ug/m3	0.56	1.34		01/16/07 01:27	74-87-3	
Cyclohexane	**1.8**	ug/m3	0.91	1.34		01/16/07 01:27	110-82-7	
Dibromochloromethane	ND	ug/m3	2.3	1.34		01/16/07 01:27	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	2.1	1.34		01/16/07 01:27	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	1.6	1.34		01/16/07 01:27	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	1.6	1.34		01/16/07 01:27	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	1.6	1.34		01/16/07 01:27	106-46-7	
Dichlorodifluoromethane	**5.2**	ug/m3	1.3	1.34		01/16/07 01:27	75-71-8	
1,1-Dichloroethane	ND	ug/m3	1.1	1.34		01/16/07 01:27	75-34-3	
1,2-Dichloroethane	ND	ug/m3	1.1	1.34		01/16/07 01:27	107-06-2	
1,1-Dichloroethene	ND	ug/m3	1.1	1.34		01/16/07 01:27	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	1.1	1.34		01/16/07 01:27	156-59-2	IC
trans-1,2-Dichloroethene	ND	ug/m3	1.1	1.34		01/16/07 01:27	156-60-5	
1,2-Dichloropropane	ND	ug/m3	1.3	1.34		01/16/07 01:27	78-87-5	
cis-1,3-Dichloropropene	ND	ug/m3	1.2	1.34		01/16/07 01:27	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	1.2	1.34		01/16/07 01:27	10061-02-6	
Dichlorotetrafluoroethane	ND	ug/m3	1.9	1.34		01/16/07 01:27	76-14-2	
Ethyl acetate	ND	ug/m3	0.98	1.34		01/16/07 01:27	141-78-6	IC
Ethylbenzene	**3.0**	ug/m3	1.2	1.34		01/16/07 01:27	100-41-4	
4-Ethyltoluene	ND	ug/m3	3.4	1.34		01/16/07 01:27	622-96-8	
n-Heptane	ND	ug/m3	1.1	1.34		01/16/07 01:27	142-82-5	
Hexachloro-1,3-butadiene	ND	ug/m3	2.9	1.34		01/16/07 01:27	87-68-3	
n-Hexane	**2.6**	ug/m3	0.96	1.34		01/16/07 01:27	110-54-3	
2-Hexanone	ND	ug/m3	1.1	1.34		01/16/07 01:27	591-78-6	
Methylene Chloride	**2.8**	ug/m3	0.95	1.34		01/16/07 01:27	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	1.1	1.34		01/16/07 01:27	108-10-1	
Methyl-tert-butyl ether	ND	ug/m3	0.98	1.34		01/16/07 01:27	1634-04-4	
Naphthalene	ND	ug/m3	3.6	1.34		01/16/07 01:27	91-20-3	
Propylene	**21.4**	ug/m3	0.47	1.34		01/16/07 01:27	115-07-1	
Styrene	ND	ug/m3	1.2	1.34		01/16/07 01:27	100-42-5	
1,1,2,2-Tetrachloroethane	ND	ug/m3	1.9	1.34		01/16/07 01:27	79-34-5	
Tetrachloroethene	**3.2**	ug/m3	1.9	1.34		01/16/07 01:27	127-18-4	
Tetrahydrofuran	ND	ug/m3	0.80	1.34		01/16/07 01:27	109-99-9	
Toluene	**19.8**	ug/m3	1.0	1.34		01/16/07 01:27	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/m3	1.3	1.34		01/16/07 01:27	120-82-1	

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ANALYTICAL RESULTS

Project: LANDMARK ENV.
Pace Project No.: 1044301

Sample: LSG-1 **Lab ID: 1044301001** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
1,1,1-Trichloroethane	ND	ug/m3	1.5	1.34		01/16/07 01:27	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	1.5	1.34		01/16/07 01:27	79-00-5	
Trichloroethene	ND	ug/m3	1.5	1.34		01/16/07 01:27	79-01-6	
Trichlorofluoromethane	**20.1**	ug/m3	1.5	1.34		01/16/07 01:27	75-69-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	2.1	1.34		01/16/07 01:27	76-13-1	
1,2,4-Trimethylbenzene	**4.0**	ug/m3	3.4	1.34		01/16/07 01:27	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	3.4	1.34		01/16/07 01:27	108-67-8	
Vinyl acetate	ND	ug/m3	0.95	1.34		01/16/07 01:27	108-05-4	
Vinyl chloride	ND	ug/m3	0.70	1.34		01/16/07 01:27	75-01-4	
m&p-Xylene	**11.4**	ug/m3	2.4	1.34		01/16/07 01:27	1330-20-7	
o-Xylene	**4.1**	ug/m3	1.2	1.34		01/16/07 01:27	95-47-6	

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ANALYTICAL RESULTS

Project: LANDMARK ENV.
Pace Project No.: 1044301

Sample: LSG-2 **Lab ID: 1044301002** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
Acetone	**45.5**	ug/m3	0.60	1.25		01/16/07 02:02	67-64-1	
Benzene	**27.9**	ug/m3	0.81	1.25		01/16/07 02:02	71-43-2	
Bromodichloromethane	ND	ug/m3	1.8	1.25		01/16/07 02:02	75-27-4	
Bromoform	ND	ug/m3	2.6	1.25		01/16/07 02:02	75-25-2	
Bromomethane	ND	ug/m3	0.99	1.25		01/16/07 02:02	74-83-9	
1,3-Butadiene	ND	ug/m3	0.56	1.25		01/16/07 02:02	106-99-0	
2-Butanone (MEK)	**6.2**	ug/m3	0.75	1.25		01/16/07 02:02	78-93-3	
Carbon disulfide	**3.6**	ug/m3	0.79	1.25		01/16/07 02:02	75-15-0	
Carbon tetrachloride	ND	ug/m3	1.6	1.25		01/16/07 02:02	56-23-5	
Chlorobenzene	ND	ug/m3	1.2	1.25		01/16/07 02:02	108-90-7	
Chloroethane	ND	ug/m3	0.68	1.25		01/16/07 02:02	75-00-3	
Chloroform	ND	ug/m3	1.2	1.25		01/16/07 02:02	67-66-3	
Chloromethane	**0.76**	ug/m3	0.52	1.25		01/16/07 02:02	74-87-3	SS
Cyclohexane	ND	ug/m3	0.85	1.25		01/16/07 02:02	110-82-7	
Dibromochloromethane	ND	ug/m3	2.1	1.25		01/16/07 02:02	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	2.0	1.25		01/16/07 02:02	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	1.5	1.25		01/16/07 02:02	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	1.5	1.25		01/16/07 02:02	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	1.5	1.25		01/16/07 02:02	106-46-7	
Dichlorodifluoromethane	**3.4**	ug/m3	1.2	1.25		01/16/07 02:02	75-71-8	
1,1-Dichloroethane	ND	ug/m3	1.0	1.25		01/16/07 02:02	75-34-3	
1,2-Dichloroethane	ND	ug/m3	1.0	1.25		01/16/07 02:02	107-06-2	
1,1-Dichloroethene	ND	ug/m3	1.0	1.25		01/16/07 02:02	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	1.0	1.25		01/16/07 02:02	156-59-2	IC
trans-1,2-Dichloroethene	ND	ug/m3	1.0	1.25		01/16/07 02:02	156-60-5	
1,2-Dichloropropane	ND	ug/m3	1.2	1.25		01/16/07 02:02	78-87-5	
cis-1,3-Dichloropropene	ND	ug/m3	1.2	1.25		01/16/07 02:02	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	1.2	1.25		01/16/07 02:02	10061-02-6	
Dichlorotetrafluoroethane	ND	ug/m3	1.8	1.25		01/16/07 02:02	76-14-2	
Ethyl acetate	ND	ug/m3	0.91	1.25		01/16/07 02:02	141-78-6	IC
Ethylbenzene	**6.8**	ug/m3	1.1	1.25		01/16/07 02:02	100-41-4	
4-Ethyltoluene	**8.2**	ug/m3	3.1	1.25		01/16/07 02:02	622-96-8	
n-Heptane	ND	ug/m3	1.0	1.25		01/16/07 02:02	142-82-5	
Hexachloro-1,3-butadiene	ND	ug/m3	2.8	1.25		01/16/07 02:02	87-68-3	
n-Hexane	**20.6**	ug/m3	0.90	1.25		01/16/07 02:02	110-54-3	
2-Hexanone	ND	ug/m3	1.0	1.25		01/16/07 02:02	591-78-6	
Methylene Chloride	**4.7**	ug/m3	0.89	1.25		01/16/07 02:02	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	1.0	1.25		01/16/07 02:02	108-10-1	
Methyl-tert-butyl ether	ND	ug/m3	0.91	1.25		01/16/07 02:02	1634-04-4	
Naphthalene	ND	ug/m3	3.4	1.25		01/16/07 02:02	91-20-3	
Propylene	**8.7**	ug/m3	0.44	1.25		01/16/07 02:02	115-07-1	
Styrene	ND	ug/m3	1.1	1.25		01/16/07 02:02	100-42-5	
1,1,2,2-Tetrachloroethane	ND	ug/m3	1.8	1.25		01/16/07 02:02	79-34-5	
Tetrachloroethene	**45.3**	ug/m3	1.8	1.25		01/16/07 02:02	127-18-4	
Tetrahydrofuran	**6.3**	ug/m3	0.75	1.25		01/16/07 02:02	109-99-9	SS
Toluene	**66.9**	ug/m3	0.96	1.25		01/16/07 02:02	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/m3	1.2	1.25		01/16/07 02:02	120-82-1	

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ANALYTICAL RESULTS

Project: LANDMARK ENV.
Pace Project No.: 1044301

Sample: LSG-2 **Lab ID: 1044301002** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
1,1,1-Trichloroethane	ND	ug/m3	1.4	1.25		01/16/07 02:02	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	1.4	1.25		01/16/07 02:02	79-00-5	
Trichloroethene	ND	ug/m3	1.4	1.25		01/16/07 02:02	79-01-6	
Trichlorofluoromethane	ND	ug/m3	1.4	1.25		01/16/07 02:02	75-69-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	2.0	1.25		01/16/07 02:02	76-13-1	
1,2,4-Trimethylbenzene	**13.4**	ug/m3	3.1	1.25		01/16/07 02:02	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	3.1	1.25		01/16/07 02:02	108-67-8	
Vinyl acetate	ND	ug/m3	0.89	1.25		01/16/07 02:02	108-05-4	
Vinyl chloride	ND	ug/m3	0.65	1.25		01/16/07 02:02	75-01-4	
m&p-Xylene	**27.1**	ug/m3	2.2	1.25		01/16/07 02:02	1330-20-7	
o-Xylene	**8.7**	ug/m3	1.1	1.25		01/16/07 02:02	95-47-6	

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ANALYTICAL RESULTS

Project: LANDMARK ENV.
Pace Project No.: 1044301

Sample: LSG-3 **Lab ID: 1044301003** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
Acetone	**61.1**	ug/m3	0.60	1.25		01/16/07 02:35	67-64-1	
Benzene	**3.0**	ug/m3	0.81	1.25		01/16/07 02:35	71-43-2	
Bromodichloromethane	ND	ug/m3	1.8	1.25		01/16/07 02:35	75-27-4	
Bromoform	ND	ug/m3	2.6	1.25		01/16/07 02:35	75-25-2	
Bromomethane	ND	ug/m3	0.99	1.25		01/16/07 02:35	74-83-9	
1,3-Butadiene	ND	ug/m3	0.56	1.25		01/16/07 02:35	106-99-0	
2-Butanone (MEK)	**9.0**	ug/m3	0.75	1.25		01/16/07 02:35	78-93-3	
Carbon disulfide	ND	ug/m3	0.79	1.25		01/16/07 02:35	75-15-0	
Carbon tetrachloride	ND	ug/m3	1.6	1.25		01/16/07 02:35	56-23-5	
Chlorobenzene	ND	ug/m3	1.2	1.25		01/16/07 02:35	108-90-7	
Chloroethane	ND	ug/m3	0.68	1.25		01/16/07 02:35	75-00-3	
Chloroform	ND	ug/m3	1.2	1.25		01/16/07 02:35	67-66-3	
Chloromethane	**1.1**	ug/m3	0.52	1.25		01/16/07 02:35	74-87-3	SS
Cyclohexane	ND	ug/m3	0.85	1.25		01/16/07 02:35	110-82-7	
Dibromochloromethane	ND	ug/m3	2.1	1.25		01/16/07 02:35	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	2.0	1.25		01/16/07 02:35	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	1.5	1.25		01/16/07 02:35	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	1.5	1.25		01/16/07 02:35	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	1.5	1.25		01/16/07 02:35	106-46-7	
Dichlorodifluoromethane	**3.3**	ug/m3	1.2	1.25		01/16/07 02:35	75-71-8	
1,1-Dichloroethane	ND	ug/m3	1.0	1.25		01/16/07 02:35	75-34-3	
1,2-Dichloroethane	ND	ug/m3	1.0	1.25		01/16/07 02:35	107-06-2	
1,1-Dichloroethene	ND	ug/m3	1.0	1.25		01/16/07 02:35	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	1.0	1.25		01/16/07 02:35	156-59-2	IC
trans-1,2-Dichloroethene	ND	ug/m3	1.0	1.25		01/16/07 02:35	156-60-5	
1,2-Dichloropropane	ND	ug/m3	1.2	1.25		01/16/07 02:35	78-87-5	
cis-1,3-Dichloropropene	ND	ug/m3	1.2	1.25		01/16/07 02:35	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	1.2	1.25		01/16/07 02:35	10061-02-6	
Dichlorotetrafluoroethane	ND	ug/m3	1.8	1.25		01/16/07 02:35	76-14-2	
Ethyl acetate	ND	ug/m3	0.91	1.25		01/16/07 02:35	141-78-6	IC
Ethylbenzene	**3.2**	ug/m3	1.1	1.25		01/16/07 02:35	100-41-4	
4-Ethyltoluene	**6.3**	ug/m3	3.1	1.25		01/16/07 02:35	622-96-8	
n-Heptane	ND	ug/m3	1.0	1.25		01/16/07 02:35	142-82-5	
Hexachloro-1,3-butadiene	ND	ug/m3	2.8	1.25		01/16/07 02:35	87-68-3	
n-Hexane	ND	ug/m3	0.90	1.25		01/16/07 02:35	110-54-3	
2-Hexanone	ND	ug/m3	1.0	1.25		01/16/07 02:35	591-78-6	
Methylene Chloride	**3.1**	ug/m3	0.89	1.25		01/16/07 02:35	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	1.0	1.25		01/16/07 02:35	108-10-1	
Methyl-tert-butyl ether	ND	ug/m3	0.91	1.25		01/16/07 02:35	1634-04-4	
Naphthalene	ND	ug/m3	3.4	1.25		01/16/07 02:35	91-20-3	
Propylene	**3.5**	ug/m3	0.44	1.25		01/16/07 02:35	115-07-1	
Styrene	ND	ug/m3	1.1	1.25		01/16/07 02:35	100-42-5	
1,1,2,2-Tetrachloroethane	ND	ug/m3	1.8	1.25		01/16/07 02:35	79-34-5	
Tetrachloroethene	**2.6**	ug/m3	1.8	1.25		01/16/07 02:35	127-18-4	
Tetrahydrofuran	ND	ug/m3	0.75	1.25		01/16/07 02:35	109-99-9	
Toluene	**9.1**	ug/m3	0.96	1.25		01/16/07 02:35	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/m3	1.2	1.25		01/16/07 02:35	120-82-1	

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ANALYTICAL RESULTS

Project: LANDMARK ENV.
Pace Project No.: 1044301

Sample: LSG-3 **Lab ID: 1044301003** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
1,1,1-Trichloroethane	ND	ug/m3	1.4	1.25		01/16/07 02:35	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	1.4	1.25		01/16/07 02:35	79-00-5	
Trichloroethene	ND	ug/m3	1.4	1.25		01/16/07 02:35	79-01-6	
Trichlorofluoromethane	**1.6**	ug/m3	1.4	1.25		01/16/07 02:35	75-69-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	2.0	1.25		01/16/07 02:35	76-13-1	
1,2,4-Trimethylbenzene	**9.9**	ug/m3	3.1	1.25		01/16/07 02:35	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	3.1	1.25		01/16/07 02:35	108-67-8	
Vinyl acetate	**2.8**	ug/m3	0.89	1.25		01/16/07 02:35	108-05-4	
Vinyl chloride	ND	ug/m3	0.65	1.25		01/16/07 02:35	75-01-4	
m&p-Xylene	**14.2**	ug/m3	2.2	1.25		01/16/07 02:35	1330-20-7	
o-Xylene	**6.2**	ug/m3	1.1	1.25		01/16/07 02:35	95-47-6	

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ANALYTICAL RESULTS

Project: LANDMARK ENV
Pace Project No.: 1044301

Sample: LSG-4 **Lab ID: 1044301004** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
Acetone	**64.8**	ug/m3	0.64	1.34		01/16/07 06:45	67-64-1	
Benzene	**3.0**	ug/m3	0.87	1.34		01/16/07 06:45	71-43-2	
Bromodichloromethane	ND	ug/m3	1.9	1.34		01/16/07 06:45	75-27-4	
Bromoform	ND	ug/m3	2.8	1.34		01/16/07 06:45	75-25-2	
Bromomethane	ND	ug/m3	1.1	1.34		01/16/07 06:45	74-83-9	
1,3-Butadiene	ND	ug/m3	0.60	1.34		01/16/07 06:45	106-99-0	
2-Butanone (MEK)	**14.7**	ug/m3	0.80	1.34		01/16/07 06:45	78-93-3	
Carbon disulfide	**27.7**	ug/m3	0.84	1.34		01/16/07 06:45	75-15-0	
Carbon tetrachloride	ND	ug/m3	1.7	1.34		01/16/07 06:45	56-23-5	
Chlorobenzene	ND	ug/m3	1.3	1.34		01/16/07 06:45	108-90-7	
Chloroethane	**23.6**	ug/m3	0.72	1.34		01/16/07 06:45	75-00-3	SS
Chloroform	ND	ug/m3	1.3	1.34		01/16/07 06:45	67-66-3	
Chloromethane	ND	ug/m3	0.56	1.34		01/16/07 06:45	74-87-3	
Cyclohexane	**3.0**	ug/m3	0.91	1.34		01/16/07 06:45	110-82-7	
Dibromochloromethane	ND	ug/m3	2.3	1.34		01/16/07 06:45	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	2.1	1.34		01/16/07 06:45	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	1.6	1.34		01/16/07 06:45	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	1.6	1.34		01/16/07 06:45	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	1.6	1.34		01/16/07 06:45	106-46-7	
Dichlorodifluoromethane	**5.5**	ug/m3	1.3	1.34		01/16/07 06:45	75-71-8	
1,1-Dichloroethane	ND	ug/m3	1.1	1.34		01/16/07 06:45	75-34-3	
1,2-Dichloroethane	ND	ug/m3	1.1	1.34		01/16/07 06:45	107-06-2	
1,1-Dichloroethene	ND	ug/m3	1.1	1.34		01/16/07 06:45	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	1.1	1.34		01/16/07 06:45	156-59-2	IC
trans-1,2-Dichloroethene	ND	ug/m3	1.1	1.34		01/16/07 06:45	156-60-5	
1,2-Dichloropropane	ND	ug/m3	1.3	1.34		01/16/07 06:45	78-87-5	
cis-1,3-Dichloropropene	ND	ug/m3	1.2	1.34		01/16/07 06:45	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	1.2	1.34		01/16/07 06:45	10061-02-6	
Dichlorotetrafluoroethane	ND	ug/m3	1.9	1.34		01/16/07 06:45	76-14-2	
Ethyl acetate	**26.3**	ug/m3	0.98	1.34		01/16/07 06:45	141-78-6	IC
Ethylbenzene	ND	ug/m3	1.2	1.34		01/16/07 06:45	100-41-4	
4-Ethyltoluene	ND	ug/m3	3.4	1.34		01/16/07 06:45	622-96-8	
n-Heptane	ND	ug/m3	1.1	1.34		01/16/07 06:45	142-82-5	
Hexachloro-1,3-butadiene	ND	ug/m3	2.9	1.34		01/16/07 06:45	87-68-3	
n-Hexane	**6.3**	ug/m3	0.96	1.34		01/16/07 06:45	110-54-3	
2-Hexanone	ND	ug/m3	1.1	1.34		01/16/07 06:45	591-78-6	
Methylene Chloride	**1.9**	ug/m3	0.95	1.34		01/16/07 06:45	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	1.1	1.34		01/16/07 06:45	108-10-1	
Methyl-tert-butyl ether	ND	ug/m3	0.98	1.34		01/16/07 06:45	1634-04-4	
Naphthalene	ND	ug/m3	3.6	1.34		01/16/07 06:45	91-20-3	
Propylene	**12.7**	ug/m3	0.47	1.34		01/16/07 06:45	115-07-1	
Styrene	ND	ug/m3	1.2	1.34		01/16/07 06:45	100-42-5	
1,1,2,2-Tetrachloroethane	ND	ug/m3	1.9	1.34		01/16/07 06:45	79-34-5	
Tetrachloroethene	ND	ug/m3	1.9	1.34		01/16/07 06:45	127-18-4	
Tetrahydrofuran	ND	ug/m3	0.80	1.34		01/16/07 06:45	109-99-9	
Toluene	**1.6**	ug/m3	1.0	1.34		01/16/07 06:45	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/m3	1.3	1.34		01/16/07 06:45	120-82-1	

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ANALYTICAL RESULTS

Project: LANDMARK ENV.
Pace Project No.: 1044301

Sample: LSG-4 **Lab ID: 1044301004** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
1,1,1-Trichloroethane	ND	ug/m3	1.5	1.34		01/16/07 06:45	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	1.5	1.34		01/16/07 06:45	79-00-5	
Trichloroethene	ND	ug/m3	1.5	1.34		01/16/07 06:45	79-01-6	
Trichlorofluoromethane	**14.5**	ug/m3	1.5	1.34		01/16/07 06:45	75-69-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	2.1	1.34		01/16/07 06:45	76-13-1	
1,2,4-Trimethylbenzene	ND	ug/m3	3.4	1.34		01/16/07 06:45	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	3.4	1.34		01/16/07 06:45	108-67-8	
Vinyl acetate	ND	ug/m3	0.95	1.34		01/16/07 06:45	108-05-4	
Vinyl chloride	ND	ug/m3	0.70	1.34		01/16/07 06:45	75-01-4	
m&p-Xylene	ND	ug/m3	2.4	1.34		01/16/07 06:45	1330-20-7	
o-Xylene	ND	ug/m3	1.2	1.34		01/16/07 06:45	95-47-6	

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ANALYTICAL RESULTS

Project: LANDMARK ENV.
Pace Project No.: 1044301

Sample: LSG-5 **Lab ID: 1044301005** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
Acetone	ND	ug/m3	0.64	1.34		01/16/07 07:18	67-64-1	
Benzene	**38.8**	ug/m3	0.87	1.34		01/16/07 07:18	71-43-2	
Bromodichloromethane	ND	ug/m3	1.9	1.34		01/16/07 07:18	75-27-4	
Bromoform	ND	ug/m3	2.8	1.34		01/16/07 07:18	75-25-2	
Bromomethane	ND	ug/m3	1.1	1.34		01/16/07 07:18	74-83-9	
1,3-Butadiene	ND	ug/m3	0.60	1.34		01/16/07 07:18	106-99-0	
2-Butanone (MEK)	ND	ug/m3	0.80	1.34		01/16/07 07:18	78-93-3	
Carbon disulfide	**362**	ug/m3	0.84	1.34		01/16/07 07:18	75-15-0	E
Carbon tetrachloride	ND	ug/m3	1.7	1.34		01/16/07 07:18	56-23-5	
Chlorobenzene	ND	ug/m3	1.3	1.34		01/16/07 07:18	108-90-7	
Chloroethane	**270**	ug/m3	0.72	1.34		01/16/07 07:18	75-00-3	E
Chloroform	ND	ug/m3	1.3	1.34		01/16/07 07:18	67-66-3	
Chloromethane	ND	ug/m3	0.56	1.34		01/16/07 07:18	74-87-3	
Cyclohexane	ND	ug/m3	0.91	1.34		01/16/07 07:18	110-82-7	
Dibromochloromethane	ND	ug/m3	2.3	1.34		01/16/07 07:18	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	2.1	1.34		01/16/07 07:18	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	1.6	1.34		01/16/07 07:18	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	1.6	1.34		01/16/07 07:18	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	1.6	1.34		01/16/07 07:18	106-46-7	
Dichlorodifluoromethane	**3.6**	ug/m3	1.3	1.34		01/16/07 07:18	75-71-8	
1,1-Dichloroethane	ND	ug/m3	1.1	1.34		01/16/07 07:18	75-34-3	
1,2-Dichloroethane	ND	ug/m3	1.1	1.34		01/16/07 07:18	107-06-2	
1,1-Dichloroethene	ND	ug/m3	1.1	1.34		01/16/07 07:18	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	1.1	1.34		01/16/07 07:18	156-59-2	IC
trans-1,2-Dichloroethene	ND	ug/m3	1.1	1.34		01/16/07 07:18	156-60-5	
1,2-Dichloropropane	ND	ug/m3	1.3	1.34		01/16/07 07:18	78-87-5	
cis-1,3-Dichloropropene	ND	ug/m3	1.2	1.34		01/16/07 07:18	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	1.2	1.34		01/16/07 07:18	10061-02-6	
Dichlorotetrafluoroethane	ND	ug/m3	1.9	1.34		01/16/07 07:18	76-14-2	
Ethyl acetate	**17.3**	ug/m3	0.98	1.34		01/16/07 07:18	141-78-6	IC
Ethylbenzene	**6.3**	ug/m3	1.2	1.34		01/16/07 07:18	100-41-4	
4-Ethyltoluene	**7.7**	ug/m3	3.4	1.34		01/16/07 07:18	622-96-8	
n-Heptane	ND	ug/m3	1.1	1.34		01/16/07 07:18	142-82-5	
Hexachloro-1,3-butadiene	ND	ug/m3	2.9	1.34		01/16/07 07:18	87-68-3	
n-Hexane	**51.6**	ug/m3	0.96	1.34		01/16/07 07:18	110-54-3	
2-Hexanone	ND	ug/m3	1.1	1.34		01/16/07 07:18	591-78-6	
Methylene Chloride	ND	ug/m3	0.95	1.34		01/16/07 07:18	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	1.1	1.34		01/16/07 07:18	108-10-1	
Methyl-tert-butyl ether	ND	ug/m3	0.98	1.34		01/16/07 07:18	1634-04-4	
Naphthalene	ND	ug/m3	3.6	1.34		01/16/07 07:18	91-20-3	
Propylene	**21.9**	ug/m3	0.47	1.34		01/16/07 07:18	115-07-1	
Styrene	ND	ug/m3	1.2	1.34		01/16/07 07:18	100-42-5	
1,1,2,2-Tetrachloroethane	ND	ug/m3	1.9	1.34		01/16/07 07:18	79-34-5	
Tetrachloroethene	**56.9**	ug/m3	1.9	1.34		01/16/07 07:18	127-18-4	
Tetrahydrofuran	**17.6**	ug/m3	0.80	1.34		01/16/07 07:18	109-99-9	SS
Toluene	**74.4**	ug/m3	1.0	1.34		01/16/07 07:18	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/m3	1.3	1.34		01/16/07 07:18	120-82-1	

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ANALYTICAL RESULTS

Project: LANDMARK ENV.
Pace Project No.: 1044301

Sample: LSG-5 **Lab ID: 1044301005** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
1,1,1-Trichloroethane	ND	ug/m3	1.5	1.34		01/16/07 07:18	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	1.5	1.34		01/16/07 07:18	79-00-5	
Trichloroethene	ND	ug/m3	1.5	1.34		01/16/07 07:18	79-01-6	
Trichlorofluoromethane	ND	ug/m3	1.5	1.34		01/16/07 07:18	75-69-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	2.1	1.34		01/16/07 07:18	76-13-1	
1,2,4-Trimethylbenzene	**12.3**	ug/m3	3.4	1.34		01/16/07 07:18	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	3.4	1.34		01/16/07 07:18	108-67-8	
Vinyl acetate	ND	ug/m3	0.95	1.34		01/16/07 07:18	108-05-4	
Vinyl chloride	ND	ug/m3	0.70	1.34		01/16/07 07:18	75-01-4	
m&p-Xylene	**24.1**	ug/m3	2.4	1.34		01/16/07 07:18	1330-20-7	
o-Xylene	**7.7**	ug/m3	1.2	1.34		01/16/07 07:18	95-47-6	

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ANALYTICAL RESULTS

Project: LANDMARK ENV.
Pace Project No.: 1044301

Sample: LSG-6 **Lab ID: 1044301006** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
Acetone	ND	ug/m3	0.66	1.38		01/16/07 07:53	67-64-1	
Benzene	**15.5**	ug/m3	0.90	1.38		01/16/07 07:53	71-43-2	
Bromodichloromethane	ND	ug/m3	1.9	1.38		01/16/07 07:53	75-27-4	
Bromoform	ND	ug/m3	2.9	1.38		01/16/07 07:53	75-25-2	
Bromomethane	ND	ug/m3	1.1	1.38		01/16/07 07:53	74-83-9	
1,3-Butadiene	ND	ug/m3	0.62	1.38		01/16/07 07:53	106-99-0	
2-Butanone (MEK)	ND	ug/m3	0.83	1.38		01/16/07 07:53	78-93-3	
Carbon disulfide	**2.1**	ug/m3	0.87	1.38		01/16/07 07:53	75-15-0	
Carbon tetrachloride	ND	ug/m3	1.8	1.38		01/16/07 07:53	56-23-5	
Chlorobenzene	ND	ug/m3	1.3	1.38		01/16/07 07:53	108-90-7	
Chloroethane	**2.1**	ug/m3	0.75	1.38		01/16/07 07:53	75-00-3	SS
Chloroform	ND	ug/m3	1.4	1.38		01/16/07 07:53	67-66-3	
Chloromethane	**1.3**	ug/m3	0.58	1.38		01/16/07 07:53	74-87-3	SS
Cyclohexane	ND	ug/m3	0.94	1.38		01/16/07 07:53	110-82-7	
Dibromochloromethane	ND	ug/m3	2.3	1.38		01/16/07 07:53	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/m3	2.2	1.38		01/16/07 07:53	106-93-4	
1,2-Dichlorobenzene	ND	ug/m3	1.7	1.38		01/16/07 07:53	95-50-1	
1,3-Dichlorobenzene	ND	ug/m3	1.7	1.38		01/16/07 07:53	541-73-1	
1,4-Dichlorobenzene	ND	ug/m3	1.7	1.38		01/16/07 07:53	106-46-7	
Dichlorodifluoromethane	**3.6**	ug/m3	1.4	1.38		01/16/07 07:53	75-71-8	
1,1-Dichloroethane	ND	ug/m3	1.1	1.38		01/16/07 07:53	75-34-3	
1,2-Dichloroethane	ND	ug/m3	1.1	1.38		01/16/07 07:53	107-06-2	
1,1-Dichloroethene	ND	ug/m3	1.1	1.38		01/16/07 07:53	75-35-4	
cis-1,2-Dichloroethene	ND	ug/m3	1.1	1.38		01/16/07 07:53	156-59-2	IC
trans-1,2-Dichloroethene	ND	ug/m3	1.1	1.38		01/16/07 07:53	156-60-5	
1,2-Dichloropropane	ND	ug/m3	1.3	1.38		01/16/07 07:53	78-87-5	
cis-1,3-Dichloropropene	ND	ug/m3	1.3	1.38		01/16/07 07:53	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/m3	1.3	1.38		01/16/07 07:53	10061-02-6	
Dichlorotetrafluoroethane	ND	ug/m3	1.9	1.38		01/16/07 07:53	76-14-2	
Ethyl acetate	ND	ug/m3	1.0	1.38		01/16/07 07:53	141-78-6	IC
Ethylbenzene	**6.7**	ug/m3	1.2	1.38		01/16/07 07:53	100-41-4	
4-Ethyltoluene	**4.8**	ug/m3	3.4	1.38		01/16/07 07:53	622-96-8	
n-Heptane	ND	ug/m3	1.1	1.38		01/16/07 07:53	142-82-5	
Hexachloro-1,3-butadiene	ND	ug/m3	3.0	1.38		01/16/07 07:53	87-68-3	
n-Hexane	**12.6**	ug/m3	0.99	1.38		01/16/07 07:53	110-54-3	
2-Hexanone	ND	ug/m3	1.1	1.38		01/16/07 07:53	591-78-6	
Methylene Chloride	ND	ug/m3	0.98	1.38		01/16/07 07:53	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/m3	1.1	1.38		01/16/07 07:53	108-10-1	
Methyl-tert-butyl ether	ND	ug/m3	1.0	1.38		01/16/07 07:53	1634-04-4	
Naphthalene	ND	ug/m3	3.7	1.38		01/16/07 07:53	91-20-3	
Propylene	**3.3**	ug/m3	0.48	1.38		01/16/07 07:53	115-07-1	
Styrene	ND	ug/m3	1.2	1.38		01/16/07 07:53	100-42-5	
1,1,2,2-Tetrachloroethane	ND	ug/m3	1.9	1.38		01/16/07 07:53	79-34-5	
Tetrachloroethene	**43.4**	ug/m3	1.9	1.38		01/16/07 07:53	127-18-4	
Tetrahydrofuran	ND	ug/m3	0.83	1.38		01/16/07 07:53	109-99-9	
Toluene	**57.3**	ug/m3	1.1	1.38		01/16/07 07:53	108-88-3	
1,2,4-Trichlorobenzene	ND	ug/m3	1.4	1.38		01/16/07 07:53	120-82-1	

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ANALYTICAL RESULTS

Project: LANDMARK ENV.
Pace Project No.: 1044301

Sample: LSG-6 **Lab ID: 1044301006** Collected: 12/29/06 00:00 Received: 01/02/07 16:25 Matrix: Air

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
TO15 MSV AIR	Analytical Method: TO-15							
1,1,1-Trichloroethane	ND	ug/m3	1.5	1.38		01/16/07 07:53	71-55-6	
1,1,2-Trichloroethane	ND	ug/m3	1.5	1.38		01/16/07 07:53	79-00-5	
Trichloroethene	ND	ug/m3	1.5	1.38		01/16/07 07:53	79-01-6	
Trichlorofluoromethane	ND	ug/m3	1.5	1.38		01/16/07 07:53	75-69-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/m3	2.2	1.38		01/16/07 07:53	76-13-1	
1,2,4-Trimethylbenzene	**5.0**	ug/m3	3.4	1.38		01/16/07 07:53	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/m3	3.4	1.38		01/16/07 07:53	108-67-8	
Vinyl acetate	ND	ug/m3	0.98	1.38		01/16/07 07:53	108-05-4	
Vinyl chloride	ND	ug/m3	0.72	1.38		01/16/07 07:53	75-01-4	
m&p-Xylene	**23.8**	ug/m3	2.4	1.38		01/16/07 07:53	1330-20-7	
o-Xylene	**8.9**	ug/m3	1.2	1.38		01/16/07 07:53	95-47-6	

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QUALITY CONTROL DATA

Project: LANDMARK ENV.
Pace Project No.: 1044301

QC Batch: AIR/5059
QC Batch Method: TO-15
Analysis Method: TO-15
Analysis Description: TO15 MSV AIR Low Level
Associated Lab Samples: 1044301001, 1044301002, 1044301003, 1044301004, 1044301005, 1044301006

METHOD BLANK: 302092
Associated Lab Samples: 1044301001, 1044301002, 1044301003, 1044301004, 1044301005, 1044301006

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
1,1,1-Trichloroethane	ug/m3	ND	1.1	
1,1,2,2-Tetrachloroethane	ug/m3	ND	1.4	
1,1,2-Trichloroethane	ug/m3	ND	1.1	
1,1,2-Trichlorotrifluoroethane	ug/m3	ND	1.6	
1,1-Dichloroethane	ug/m3	ND	0.82	
1,1-Dichloroethene	ug/m3	ND	0.81	
1,2,4-Trichlorobenzene	ug/m3	ND	0.99	
1,2,4-Trimethylbenzene	ug/m3	ND	2.5	
1,2-Dibromoethane (EDB)	ug/m3	ND	1.6	
1,2-Dichlorobenzene	ug/m3	ND	1.2	
1,2-Dichloroethane	ug/m3	ND	0.82	
1,2-Dichloropropane	ug/m3	ND	0.94	
1,3,5-Trimethylbenzene	ug/m3	ND	2.5	
1,3-Butadiene	ug/m3	ND	0.45	
1,3-Dichlorobenzene	ug/m3	ND	1.2	
1,4-Dichlorobenzene	ug/m3	ND	1.2	
2-Butanone (MEK)	ug/m3	ND	0.60	
2-Hexanone	ug/m3	ND	0.83	
4-Ethyltoluene	ug/m3	ND	2.5	
4-Methyl-2-pentanone (MIBK)	ug/m3	ND	0.83	
Acetone	ug/m3	ND	0.48	
Benzene	ug/m3	ND	0.65	
Bromodichloromethane	ug/m3	ND	1.4	
Bromoform	ug/m3	ND	2.1	
Bromomethane	ug/m3	ND	0.79	
Carbon disulfide	ug/m3	ND	0.63	
Carbon tetrachloride	ug/m3	ND	1.3	
Chlorobenzene	ug/m3	ND	0.94	
Chloroethane	ug/m3	ND	0.54	
Chloroform	ug/m3	ND	0.99	
Chloromethane	ug/m3	ND	0.42	
cis-1,2-Dichloroethene	ug/m3	ND	0.81	IC
cis-1,3-Dichloropropene	ug/m3	ND	0.92	
Cyclohexane	ug/m3	ND	0.68	
Dibromochloromethane	ug/m3	ND	1.7	
Dichlorodifluoromethane	ug/m3	ND	1.0	
Dichlorotetrafluoroethane	ug/m3	ND	1.4	
Ethyl acetate	ug/m3	ND	0.73	IC
Ethylbenzene	ug/m3	ND	0.88	
Hexachloro-1,3-butadiene	ug/m3	ND	2.2	
m&p-Xylene	ug/m3	ND	1.8	
Methyl-tert-butyl ether	ug/m3	ND	0.73	
Methylene Chloride	ug/m3	ND	0.71	

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QUALITY CONTROL DATA

Project: LANDMARK ENV.
Pace Project No.: 1044301

METHOD BLANK: 302092
Associated Lab Samples: 1044301001, 1044301002, 1044301003, 1044301004, 1044301005, 1044301006

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
n-Heptane	ug/m3	ND	0.83	
n-Hexane	ug/m3	ND	0.72	
Naphthalene	ug/m3	ND	2.7	
o-Xylene	ug/m3	ND	0.88	
Propylene	ug/m3	ND	0.35	
Styrene	ug/m3	ND	0.87	
Tetrachloroethene	ug/m3	ND	1.4	
Tetrahydrofuran	ug/m3	ND	0.60	
Toluene	ug/m3	ND	0.77	
trans-1,2-Dichloroethene	ug/m3	ND	0.81	
trans-1,3-Dichloropropene	ug/m3	ND	0.92	
Trichloroethene	ug/m3	ND	1.1	
Trichlorofluoromethane	ug/m3	ND	1.1	
Vinyl acetate	ug/m3	ND	0.71	
Vinyl chloride	ug/m3	ND	0.52	

LABORATORY CONTROL SAMPLE: 302093

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1-Trichloroethane	ug/m3	58.3	57.3	98	60-134	
1,1,2,2-Tetrachloroethane	ug/m3	74	75.1	101	55-141	
1,1,2-Trichloroethane	ug/m3	59.4	63.6	107	64-129	
1,1,2-Trichlorotrifluoroethane	ug/m3	81.8	110	135	55-137	
1,1-Dichloroethane	ug/m3	43.6	57.6	132	59-136	
1,1-Dichloroethene	ug/m3	41.9	42.4	101	60-137	
1,2,4-Trichlorobenzene	ug/m3	80.6	63.5	79	50-150	
1,2,4-Trimethylbenzene	ug/m3	53	52.0	98	63-137	
1,2-Dibromoethane (EDB)	ug/m3	82.8	90.7	109	61-136	
1,2-Dichlorobenzene	ug/m3	64.8	60.2	93	60-139	
1,2-Dichloroethane	ug/m3	43.6	48.0	110	56-141	
1,2-Dichloropropane	ug/m3	49.4	48.9	99	57-131	
1,3,5-Trimethylbenzene	ug/m3	52.5	49.8	95	61-134	
1,3-Butadiene	ug/m3	24.3	35.5	146	53-140	L3
1,3-Dichlorobenzene	ug/m3	67.3	63.3	94	59-136	
1,4-Dichlorobenzene	ug/m3	64.2	61.9	96	59-130	
2-Butanone (MEK)	ug/m3	32.4	30.9	95	54-133	
2-Hexanone	ug/m3	45.8	51.4	112	54-139	
4-Ethyltoluene	ug/m3	55	61.8	112	61-138	
4-Methyl-2-pentanone (MIBK)	ug/m3	45.8	52.4	114	53-139	
Acetone	ug/m3	24.4	33.2	136	50-139	
Benzene	ug/m3	34.4	37.4	109	64-125	
Bromodichloromethane	ug/m3	70.9	75.8	107	61-131	
Bromoform	ug/m3	110	135	123	66-138	
Bromomethane	ug/m3	40.3	57.6	143	55-135	L3
Carbon disulfide	ug/m3	33.3	29.6	89	50-150	

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QUALITY CONTROL DATA

Project: LANDMARK ENV.
Pace Project No.: 1044301

LABORATORY CONTROL SAMPLE: 302093

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Carbon tetrachloride	ug/m3	67.8	69.8	103	58-135	
Chlorobenzene	ug/m3	49.6	46.5	94	62-139	
Chloroethane	ug/m3	27.1	41.4	153	56-140	SS
Chloroform	ug/m3	48.7	56.2	115	50-150	
Chloromethane	ug/m3	21	31.6	150	56-144	SS
cis-1,2-Dichloroethene	ug/m3	42.7	67.5	158	62-135	IC
cis-1,3-Dichloropropene	ug/m3	48.9	46.1	94	64-133	IC
Cyclohexane	ug/m3	35.7	34.2	96	54-139	
Dibromochloromethane	ug/m3	95.3	112	117	50-150	
Dichlorodifluoromethane	ug/m3	50.8	49.7	98	60-130	
Dichlorotetrafluoroethane	ug/m3	71.8	115	160	59-130	L3
Ethyl acetate	ug/m3	35.9	37.0	103	60-132	
Ethylbenzene	ug/m3	46.4	49.6	107	65-140	
Hexachloro-1,3-butadiene	ug/m3	115	105	92	50-150	
m&p-Xylene	ug/m3	92.7	99.2	107	60-132	
Methyl-tert-butyl ether	ug/m3	38.1	38.5	101	50-150	
Methylene Chloride	ug/m3	37.1	45.5	123	56-138	
n-Heptane	ug/m3	43.3	48.0	111	62-135	
n-Hexane	ug/m3	35.8	33.4	93	62-134	
Naphthalene	ug/m3	55.3	46.6	84	70-130	
o-Xylene	ug/m3	46.8	49.8	106	64-132	
Propylene	ug/m3	18.4	16.4	89	56-125	
Styrene	ug/m3	45.9	51.6	112	69-134	
Tetrachloroethene	ug/m3	67.6	74.2	110	60-137	
Tetrahydrofuran	ug/m3	31.5	58.2	185	52-139	SS
Toluene	ug/m3	41	43.8	107	69-130	
trans-1,2-Dichloroethene	ug/m3	39.9	45.3	113	50-150	
trans-1,3-Dichloropropene	ug/m3	50.8	56.9	112	70-142	
Trichloroethene	ug/m3	56.8	52.3	92	60-134	
Trichlorofluoromethane	ug/m3	57.7	67.8	117	56-141	
Vinyl acetate	ug/m3	38.3	44.5	116	61-142	
Vinyl chloride	ug/m3	26.3	42.7	162	66-132	L3

SAMPLE DUPLICATE: 302336

Parameter	Units	1044011003 Result	Dup Result	RPD	Max RPD	Qualifiers
1,1,1-Trichloroethane	ug/m3	ND	ND	0	25	
1,1,2,2-Tetrachloroethane	ug/m3	ND	ND	0	25	
1,1,2-Trichloroethane	ug/m3	ND	ND	0	25	
1,1,2-Trichlorotrifluoroethane	ug/m3	ND	ND	0	25	
1,1-Dichloroethane	ug/m3	ND	ND	0	25	
1,1-Dichloroethene	ug/m3	ND	ND	0	25	
1,2,4-Trichlorobenzene	ug/m3	ND	ND	0	25	
1,2,4-Trimethylbenzene	ug/m3	14.3	14.3	.07	25	
1,2-Dibromoethane (EDB)	ug/m3	ND	ND	0	25	
1,2-Dichlorobenzene	ug/m3	ND	ND	0	25	
1,2-Dichloroethane	ug/m3	ND	ND	0	25	

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QUALITY CONTROL DATA

Project: LANDMARK ENV.
Pace Project No.: 1044301

SAMPLE DUPLICATE: 302336

Parameter	Units	1044011003 Result	Dup Result	RPD	Max RPD	Qualifiers
1,2-Dichloropropane	ug/m3	ND	ND	0	25	
1,3,5-Trimethylbenzene	ug/m3	4.2	4.1	1	25	
1,3-Butadiene	ug/m3	ND	ND	0	25	
1,3-Dichlorobenzene	ug/m3	ND	ND	0	25	
1,4-Dichlorobenzene	ug/m3	ND	ND	0	25	
2-Butanone (MEK)	ug/m3	ND	ND	0	25	
2-Hexanone	ug/m3	ND	ND	0	25	
4-Ethyltoluene	ug/m3	11.2	10.5	6	25	
4-Methyl-2-pentanone (MIBK)	ug/m3	ND	ND	0	25	
Acetone	ug/m3	ND	ND	0	25	
Benzene	ug/m3	15.9	15.6	2	25	
Bromodichloromethane	ug/m3	ND	ND	0	25	
Bromoform	ug/m3	ND	ND	0	25	
Bromomethane	ug/m3	ND	ND	0	25	
Carbon disulfide	ug/m3	ND	ND	0	25	
Carbon tetrachloride	ug/m3	ND	ND	0	25	
Chlorobenzene	ug/m3	ND	ND	0	25	
Chloroethane	ug/m3	ND	ND	0	25	
Chloroform	ug/m3	ND	ND	0	25	
Chloromethane	ug/m3	ND	ND	0	25	
cis-1,2-Dichloroethene	ug/m3	ND	ND	0	25	IC
cis-1,3-Dichloropropene	ug/m3	ND	ND	0	25	
Cyclohexane	ug/m3	9.0	8.8	2	25	
Dibromochloromethane	ug/m3	ND	ND	0	25	
Dichlorodifluoromethane	ug/m3	3.6	3.6	1	25	
Dichlorotetrafluoroethane	ug/m3	ND	ND	0	25	
Ethyl acetate	ug/m3	ND	ND	0	25	IC
Ethylbenzene	ug/m3	7.7	7.6	.6	25	
Hexachloro-1,3-butadiene	ug/m3	ND	ND	0	25	
m&p-Xylene	ug/m3	26.8	27.1	.7	25	
Methyl-tert-butyl ether	ug/m3	ND	ND	0	25	
Methylene Chloride	ug/m3	ND	ND	0	25	
n-Heptane	ug/m3	ND	ND	0	25	
n-Hexane	ug/m3	14.1	13.7	3	25	
Naphthalene	ug/m3	ND	2.7J	19	25	
o-Xylene	ug/m3	9.6	9.4	2	25	
Propylene	ug/m3	ND	ND	0	25	
Styrene	ug/m3	2.8	2.9	5	25	
Tetrachloroethene	ug/m3	ND	ND	0	25	
Tetrahydrofuran	ug/m3	12.6	12.6	.5	25	SS
Toluene	ug/m3	40.0	40.7	2	25	
trans-1,2-Dichloroethene	ug/m3	ND	ND	0	25	
trans-1,3-Dichloropropene	ug/m3	ND	ND	0	25	
Trichloroethene	ug/m3	5.6	5.7	.5	25	
Trichlorofluoromethane	ug/m3	3.3	1.9	52	25	D6
Vinyl acetate	ug/m3	ND	ND	0	25	
Vinyl chloride	ug/m3	ND	ND	0	25	

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QUALITY CONTROL DATA

Project: LANDMARK ENV.
Pace Project No.: 1044301

SAMPLE DUPLICATE: 302337

Parameter	Units	1044256024 Result	Dup Result	RPD	Max RPD	Qualifiers
1,1,1-Trichloroethane	ug/m3	ND	ND	0	25	
1,1,2,2-Tetrachloroethane	ug/m3	ND	ND	0	25	
1,1,2-Trichloroethane	ug/m3	ND	ND	0	25	
1,1,2-Trichlorotrifluoroethane	ug/m3	ND	ND	0	25	
1,1-Dichloroethane	ug/m3	ND	ND	0	25	
1,1-Dichloroethene	ug/m3	ND	ND	0	25	
1,2,4-Trichlorobenzene	ug/m3	ND	ND	0	25	
1,2,4-Trimethylbenzene	ug/m3	ND	2.1J	2	25	
1,2-Dibromoethane (EDB)	ug/m3	ND	ND	0	25	
1,2-Dichlorobenzene	ug/m3	ND	ND	0	25	
1,2-Dichloroethane	ug/m3	ND	ND	0	25	
1,2-Dichloropropane	ug/m3	ND	ND	0	25	
1,3,5-Trimethylbenzene	ug/m3	ND	ND	0	25	
1,3-Butadiene	ug/m3	ND	ND	0	25	
1,3-Dichlorobenzene	ug/m3	ND	ND	0	25	
1,4-Dichlorobenzene	ug/m3	ND	ND	0	25	
2-Butanone (MEK)	ug/m3	7.6	8.2	8	25	
2-Hexanone	ug/m3	1.3	1J	20	25	
4-Ethyltoluene	ug/m3	ND	ND	0	25	
4-Methyl-2-pentanone (MIBK)	ug/m3	2.2	2.0	5	25	
Acetone	ug/m3	ND	ND	0	25	
Benzene	ug/m3	2.9	2.9	2	25	
Bromodichloromethane	ug/m3	ND	ND	0	25	
Bromoform	ug/m3	ND	ND	0	25	
Bromomethane	ug/m3	ND	ND	0	25	
Carbon disulfide	ug/m3	ND	ND	0	25	
Carbon tetrachloride	ug/m3	ND	ND	0	25	
Chlorobenzene	ug/m3	ND	ND	0	25	
Chloroethane	ug/m3	ND	ND	0	25	
Chloroform	ug/m3	ND	1.3	200	25	D6
Chloromethane	ug/m3	8.0	8.6	8	25	SS
cis-1,2-Dichloroethene	ug/m3	ND	ND	0	25	IC
cis-1,3-Dichloropropene	ug/m3	ND	ND	0	25	
Cyclohexane	ug/m3	2.1	2.3	9	25	
Dibromochloromethane	ug/m3	ND	ND	0	25	
Dichlorodifluoromethane	ug/m3	3.3	3.7	11	25	
Dichlorotetrafluoroethane	ug/m3	ND	ND	0	25	
Ethyl acetate	ug/m3	2.1	3.1	40	25	D6,IC
Ethylbenzene	ug/m3	1.7	1.8	2	25	
Hexachloro-1,3-butadiene	ug/m3	ND	ND	0	25	
m&p-Xylene	ug/m3	5.6	5.7	.9	25	
Methyl-tert-butyl ether	ug/m3	ND	ND	0	25	
Methylene Chloride	ug/m3	1.5	1.8	20	25	
n-Heptane	ug/m3	ND	ND	0	25	
n-Hexane	ug/m3	4.2	5.1	20	25	
Naphthalene	ug/m3	6.3	6.7	6	25	
o-Xylene	ug/m3	1.7	1.7	.6	25	
Propylene	ug/m3	ND	ND	0	25	

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QUALITY CONTROL DATA

Project: LANDMARK ENV.
Pace Project No.: 1044301

SAMPLE DUPLICATE: 302337

Parameter	Units	1044256024 Result	Dup Result	RPD	Max RPD	Qualifiers
Styrene	ug/m3	ND	1.2	1	25	
Tetrachloroethene	ug/m3	ND	ND	0	25	
Tetrahydrofuran	ug/m3	4.2	3.9	7	25	SS
Toluene	ug/m3	12.8	12.7	.5	25	
trans-1,2-Dichloroethene	ug/m3	ND	ND	0	25	
trans-1,3-Dichloropropene	ug/m3	ND	ND	0	25	
Trichloroethene	ug/m3	ND	ND	0	25	
Trichlorofluoromethane	ug/m3	ND	ND	0	25	
Vinyl acetate	ug/m3	ND	ND	0	25	
Vinyl chloride	ug/m3	ND	ND	0	25	

Pace Analytical®
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QUALIFIERS

Project: LANDMARK ENV
Pace Project No.: 1044301

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SAMPLE QUALIFIERS

Sample: 1044301001

[1] The Total Hydrocarbon (THC) pattern is evenly distributed throughout the chromatogram (before and after toluene).

[2] The sample was analyzed within the recommended holding time but had QC failures. The reported results were analyzed outside the recommended holding time and confirmed the original analysis.

Sample: 1044301002

[1] The Total Hydrocarbon (THC) pattern is evenly distributed throughout the chromatogram (before and after toluene).

[2] The sample was analyzed within the recommended holding time but had QC failures. The reported results were analyzed outside the recommended holding time and confirmed the original analysis.

Sample: 1044301003

[1] The Total Hydrocarbon (THC) pattern is evenly distributed throughout the chromatogram (before and after toluene).

[2] The sample was analyzed within the recommended holding time but had QC failures. The reported results were analyzed outside the recommended holding time and confirmed the original analysis.

Sample: 1044301004

[1] The Total Hydrocarbon (THC) pattern occured in the first half of the chromatogram (before toluene).

[2] The sample was analyzed within the recommended holding time but had QC failures. The reported results were analyzed outside the recommended holding time and confirmed the original analysis.

Sample: 1044301005

[1] The Total Hydrocarbon (THC) pattern occured in the first half of the chromatogram (before toluene).

[2] The sample was analyzed within the recommended holding time but had QC failures. The reported results were analyzed outside the recommended holding time and confirmed the original analysis.

Sample: 1044301006

[1] The Total Hydrocarbon (THC) pattern is evenly distributed throughout the chromatogram (before and after toluene).

[2] The sample was analyzed within the recommended holding time but had QC failures. The reported results were analyzed outside the recommended holding time and confirmed the original analysis.

ANALYTE QUALIFIERS

D6 The relative percent difference (RPD) between the sample and sample duplicate exceeded laboratory control limits.

E Analyte concentration exceeded the calibration range. The reported result is estimated.

IC The initial calibration for this compound was outside of method control limits. The result is estimated.

L3 Analyte recovery in the laboratory control sample (LCS) exceeded QC limits. Analyte presence below reporting limits in associated samples. Results unaffected by high bias.

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QUALIFIERS

Project: LANDMARK ENV
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ANALYTE QUALIFIERS

SS	This analyte did not meet the secondary source verification criteria for the initial calibration. The reported result should be considered an estimated value.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: LANDMARK ENV.
Pace Project No.: 1044301

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
1044301001	**LSG-1**	TO-15	AIR/5059		
1044301002	**LSG-2**	TO-15	AIR/5059		
1044301003	**LSG-3**	TO-15	AIR/5059		
1044301004	**LSG-4**	TO-15	AIR/5059		
1044301005	**LSG-5**	TO-15	AIR/5059		
1044301006	**LSG-6**	TO-15	AIR/5059		