Phase II Environmental Site Assessment Report
Duluth Waterfront Property
Duluth, Minnesota
August 2004

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1.0 Introduction

This Phase II Environmental Site Investigation Report describes the results of investigative field work conducted for the City of Duluth at the Duluth Waterfront property (Property) on June 2, 2004. The Property is located at 500 to 1000 Railroad Street in Duluth, Saint Louis County, Minnesota, as shown on Figure 1. Investigation activities described in this report were conducted according to the Phase II Sampling and Analysis Plan (Barr, 2004a) as amended. The investigation was undertaken as part of the City of Duluth's Brownfields Assessment Pilot Program grant funded by the US Environmental Protection Agency (EPA).

1.1 Background

The Property is comprised of two parcels (Parcel A and Parcel B). Both of these parcels are composed of current and former piers and slips on filled land on the shore of the Duluth Harbor Basin of Superior Bay. The Property has a complex ownership and development history with various former industrial and commercial uses on the parcels. Former uses included manufacturing, loading and unloading from shipping and rail, scrap metal operations, storage and warehousing (including potential fuel storage) and other industrial uses.

The Minnesota Pollution Control Agency (MPCA) informed Barr of a reported pipe-line associated with manufactured gas production operations near the Property. Barr conducted a review of historic utility mapping with the city engineering department for the area adjacent to the two parcels. Evidence of the presence of this reported site feature was not found. Figure 2 shows the Property layout and notable current and former features.

Much of the Property is currently vacant, with a portion of Parcel A currently in use for parking and as part of the Waterfront Park (Figure 2). There are currently two complete building structures on the Property (a storage garage on Parcel B and warming hut at the Waterfront Park on Parcel A), and former building slabs and footings are still present across much of the site. Please see Figure 2 for site features. A minor amount of scattered debris material is present on Parcel B and portions of Parcel A. These features are shown on Figure 2.

Barr Engineering Company completed a Phase I Environmental Property Assessment (Phase I Assessment) in March 2004 that identified potential environmental concerns associated with the Property (Barr, 2004b). The Phase I Assessment report recommended an investigation to assess

recognized environmental conditions (RECs) identified during the Assessment. The Phase II Sampling and Analysis Plan (SAP), prepared for the City of Duluth in April, 2004 (amended May, 2004), outlined the proposed scope of work for the investigation. This report discusses the results of that investigation.

1.2 Investigation Objectives and Report Organization

The investigation focused on evaluating findings identified as Recognized Environmental Conditions (RECs) in the Phase I Environmental Site Assessment (Barr, 2004b) as follows:

- **REC 1** – The Property shallow soils (both parcels) are primarily composed of fill material of unknown origin and may contain debris or contamination from off-site sources (a property-wide REC).

- **REC 2** – There was a documented release of petroleum products from the former Food Service of America Leaking Underground Storage Tank (LUST) site located in the southern part of Parcel A. This Assessment does not specifically address this REC except as petroleum impacts in this area of the Property may be co-mingled with other environmental impacts from industrial activities or the fill materials used in the excavation of the LUST site.

- **REC 3** – Activities associated with scrap materials handling at the former Northern Scrap Iron and Metal facility (encroaching the northeast corner of Parcel B) may have impacted soil and/or groundwater on the northwestern border of Parcel B.

- **REC 4** – Petroleum oil, paint, and solvent storage and handling may have occurred in the former building located in the central Parcel B area during the past tenancy of various companies.

- **REC 5** – Release of chemicals, hazardous materials or manufacturing waste by-products (including petroleum products) associated with electrical equipment manufacturing at the former Western Electric facility on the northern side of Parcel B.

In general, the primary goals of the Phase II Investigation were to provide the City of Duluth with a preliminary characterization of soil quality at the Property, and to perform a preliminary evaluation of

risk to human health and the environment resulting from any soil contamination identified at the Property.

The organization and content of this report is as follows:

- Section 1 provides background information on the Property and describes the purpose and objectives of the investigation.
- Section 2 provides a summary of the investigation activities performed.
- Section 3 presents the results from investigation activities and provides discussion on those results.
- Section 4 provides conclusions and recommendations for the Property.

2.0 Investigation Activities

The investigation was conducted on June 2, 2004. As detailed in the SAP, the scope of work included the completion of direct-push soil borings for the purpose of delineating the depth of fill deposits, characterizing soil type and quality, and collecting analytical soil samples. The scope of work also included collecting shallow soil samples to characterize shallow soil quality across the site.

Geoprobe (direct-push) services were provided by Twin Ports Testing (Superior, Wisconsin) and overseen by a representative from Barr Engineering Company. Laboratory analytical services were provided by Legend Technical Services, Inc (Saint Paul, Minnesota). Investigative activities were conducted in accordance with Barr's Standard Operating Procedures (SOPs) included in the SAP.

Minor modifications to the soil boring locations proposed in the SAP were made based on field conditions. The modifications affected the locations and depths of soil borings, and types of analytical samples collected. Actual soil boring depths and locations are as described below and shown on Figure 2. The direct-push borings were used to collect samples of the fill and soil to depths of 2 to 15 feet. The shallow soil samples were collected using the direct-push soil boring method to a depth of 2 feet. The samples collected and analysis performed are summarized in Table 1.

2.1 Soil Sampling

Fourteen soil borings were advanced at the Property. Soil boring locations were located on the Property using a differential Global Positioning System (dGPS) unit. Soil boring locations B2, B3, B4, B5 and B6 were modified from the planned locations provided in the SAP based on conditions in the field, including limited access, sampler refusal and utilities. The soil borings were advanced from five to 15 feet of depth. A proposed 20-foot deep soil boring at B2 was terminated and abandoned at 10 feet of depth due to very loose saturated sand conditions which prevented representative soil sample recovery. Soil materials from each of the soil borings were screened for evidence of staining and discoloration, odor, sheen, and the presence of organic vapors (headspace). Organic vapor headspace concentrations were determined using a photoionization detector (PID) equipped with an 11.7 eV bulb. The lithology was classified in each soil boring using the ASTM D-2488 Visual-Manual method. Field screening results and lithologic descriptions are shown in the soil boring logs provided in Appendix A and discussed in Section 3.0. Soil materials recovered during boring advancement were disposed of by thin-spreading in the location of each boring. Sampling equipment

was decontaminated between each boring location by washing with an alconox-water solution followed by a clean water rinse.

Select soil analytical samples were collected according to Barr's SOPs and the rationale discussed in the SAP. A summary of the soil samples collected and analyses performed are presented in Table 1. Analytical results are presented in Table 2 and discussed in Section 3.0. Soil samples were identified by the boring location and sampling depth. For example, a soil sample collected from 1 to 2 feet bgs at soil boring B1 was identified as 'B1 1-2'. Analytical parameters for the samples included the Resource Conservation and Recovery Act (RCRA) list of metals, diesel range organics (DRO), volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). Table 1 summarizes the samples collected and analysis performed.

2.2 Potential Asbestos Containing Material (ACM) Sampling

A certified asbestos sampler (Linda Thiry) from Arrowhead Consulting and Testing Inc. was available to collect samples from suspected asbestos-containing materials (ACM) during the site investigation. A thorough site inspection dedicated to sampling for ACMs was not included in this scope of work and no materials consistent with ACMs were observed on the surface or in soil boring samples during the soil boring investigation, therefore, no samples were collected for bulk asbestos analysis.

3.0 Results and Discussion

3.1 Lithology

The near surface geology at the Property was characterized in soil borings as ranging from loose or compact poorly-graded sand and clayey sand on both parcels, with some clayey gravel areas on Parcel B. The water table was between 5 to 10 feet below grade. Bedrock was not encountered. Soil materials observed during this investigation were generally fill materials, that in some locations showed traces of wood, brick, concrete and other debris. Further lithologic information is presented in the soil boring logs and shallow soil sampling descriptions in Appendix A.

3.2 Field Screening Results

Field screening showed no elevated organic vapor headspace concentrations (>5.0 ppm) in any of the soil borings or shallow soil samples. However soils from several borings and a few of the shallow soil samples showed trace odors or staining or showed evidence of debris materials as follows:

- B1 – Trace petroleum and sewage-like odor and discoloration were noted from 10 to 15 feet of depth. No debris materials were noted.
- B2 – Trace incidental odor from 7.5 to 10 feet of depth. No debris materials were noted.
- B3 –Wood, brick and asphalt debris were noted at up to 2.5 feet of depth in this boring and sampler refusal was encountered at two initial attempted locations within 20 feet of the successful boring.
- B5 – Trace incidental odor was noted from 2.5 to 10 feet of depth and traces of mottled discoloration were present through the entire 10 foot depth of the boring.
- B6 – Trace odor was noted from 5 to 7.5 feet of depth. Trace mottled, gray discoloration was reported from 1 to 3 feet of depth. Brick, concrete and gravel fill materials were also present in the 1-3 foot depth interval.
- B7 – Trace mottled brown discoloration was noted throughout the entire 10 foot depth of the boring.

- B8 – Moderate staining was present in this boring from 5 to 10 feet of depth, however recovery was minimal from the 10 to 15 foot sample. Brick, metal, potential ash and other debris materials were noted in the boring from 5 to 10 feet of depth, although again, insufficient sample was recovered below this depth to determine total depth of debris materials.

- SS4 – Trace discoloration was present in this shallow soil sample.

- SS8 – Trace staining was present from 0.5 to 2 feet of depth.

All other soil samples and field screened intervals showed headspace readings similar to background levels and contained no apparent evidence of odors, staining, discoloration or debris materials.

3.3 Analytical Results

3.3.1 Data Quality

A review of the quality control data was conducted to assess the validity of the analytical results for the June 2004 sampling event at the Waterfront Site. This review was performed in accordance with the Quality Assurance Project Plan (Barr, September 2003). Analysis was performed by Legend Technical Services located in St. Paul, Minnesota.

Multiple matrix spike (MS) recoveries fell outside acceptance limits. Several of the elevated MS recoveries were due to analyte concentration at four times or greater the spike concentration. Other associated quality control data indicated acceptable accuracy and precision so no qualification was necessary. The field blank was extracted for semivolatile organics analysis past the method holding time. All semivolatile organics data for the field blank was qualified accordingly. All data met the data project requirements and is deemed acceptable, with the above qualification, for the purposes of this project.

3.3.2 Soil Analytical Results

Sixteen soil samples were analyzed by the laboratory, as shown in Table 2. The analytical result findings for soil are summarized in Table 1. Including field duplicates, thirteen soil samples were analyzed for RCRA metals, two soil samples were analyzed for DRO, four samples were analyzed for VOCs, and six samples were analyzed for SVOCs. The analytical results are compared to potentially applicable screening criteria in Table 2 including Tier I Soil Leaching Values (SLVs) and Tier II

Industrial Soil Reference Values (SRVs). These are risk-based screening criteria developed by the MPCA for evaluating possible impacts at industrial properties. The SLVs evaluate the risk to groundwater from leachate attributable to contaminant concentrations in soil and the SRVs evaluate direct contact exposure scenarios for industrial land uses. Tier II Industrial SRV criteria for DRO do not exist, however the MPCA typically regards DRO concentrations greater than 100 mg/kg in coarse-grained soil, such as that present at the Property, to be indicative of a potential concern. The DRO evaluation criterion is based on the MPCA's past experience with petroleum release sites and is a common clean-up criteria that has been applied on a site-specific basis. Table 2 lists the available risk-screening criteria. If compounds exceed these criteria they are signified by bold, highlight, or underline notations in the table results cells. Table 1 summarizes the results of the analytical sampling.

3.3.2.1 RCRA Metals

All of the analyzed samples showed detections for arsenic, barium, chromium and lead. Cadmium was detected in three samples (B5 at 0 to 2.5 feet of depth, B7 at 2.5 to 5 feet of depth and SS8 at 0.5 to 1 feet of depth), and mercury was detected in two borings (B7 at 2.5 to 5 feet of depth and SS4 at 0 to 0.5 feet of depth). Selenium and silver were not detected in the soil samples. Tier II SRV screening criteria were not exceeded in any of the samples analyzed for RCRA metals SVOC compounds. The Tier I SLV screening criteria of 18 mg/kg was exceeded for chromium in eight of the analyzed samples. The highest chromium value was in sample SS8 0 to 1 feet of depth (43 mg/kg).

3.3.2.2 SVOC Sampling Results

SVOC parameters were detected in two of the five sample locations analyzed for these compounds. Concentrations of SVOCs were relatively low and below applicable risk-screening criteria, including the Benzo(a)pyrene (BaP) equivalent Tier I SLV and Tier II SRV screening values. The sample from boring B7 from a depth of 0 to 1 feet and it's duplicate (B7 0'-1.0' DUP) contained trace concentrations of several polycyclic aromatic hydrocarbon (PAH) compounds, with a BaP equivalent of 0.48 mg/kg in the duplicate sample and non-detectable in the recorded sample. The boring B8 sample collected from 7.5 to 10 feet of depth and the shallow sample SS2 showed detections for several PAH compounds with BaP equivalents of 0.18 mg/kg and 2.6 mg/kg respectively.

3.3.2.3 VOC Sampling Results

Three sample locations were analyzed for VOCs, B2 at the 7.5 to 10 foot depth interval (and its field duplicate), B6 at the 2.5- to 5-foot depth interval, and SS5 at the 0- to 1-foot depth interval. None of the applicable screening values were exceeded for VOCs and the only detected VOC parameters were bromomethane in the boring B2 samples (0.35 and 0.36 mg/kg), and naphthalene in the boring B6 sample (1.3 mg/kg).

3.3.2.4 DRO Sampling Results

DRO was detected in shallow soil sample SS-8 from 0.5 to 1 feet of depth and its field duplicate, with DRO concentrations of 19 and 31 mg/kg, respectively. The concentrations were both below the general screening concentration of 100 mg/kg.

3.4 Discussion

3.4.1 Fill Materials

Based on the investigation findings, fill materials cover the entire site. The fill materials were generally clayey sand to poorly-graded sand, significant debris or other anthropogenic materials were observed in a few localized areas. Initial borings placed in the vicinity of borings B3 and B4 in the western portion of Parcel A encountered slabs and concrete debris, and the boring eventually advanced at B3 encountered wood, brick and other building demolition debris to a depth of 2.5 feet. Thin layers of presumed demolition debris were also present in borings B6 and B8 (both on Parcel B) from 3 to 5 feet of depth and 5 to 10 feet of depth respectively. None of the borings could be advanced to the native soil materials due to very loose soil conditions encountered below the water table (at 5 to 10 feet below grade).

Boring B5 was placed in a filled former slip to characterize the fill materials in this location. The boring showed poorly-graded sand and poorly-graded sand with clay with no obvious debris or waste materials but traces of sewage-like odor and mottled staining. Analytical samples taken in this boring from the surface to 2.5’ of depth did not exceed screening criteria for metals, and a sample from 5 to 7.5 feet of depth showed no detections for SVOCs.

3.4.2 Impacts from Former Scrap Metals Operations

The analytical results from samples taken at this location (SS5 0’-1’ and B8 7.5’-10’) showed no exceedances for metals or SVOCs, although there were detections for RCRA metals and PAH

compounds in B8 7.5'-10'. The sampled interval showed traces of debris, including metal shards and other non-native materials consistent with the reported former use as a scrap metal operation.

3.4.3 Electrical Equipment Manufacturing and Industrial Areas

Boring B7 and shallow sample SS7 were placed in the reported former location of an electrical equipment manufacturing facility. Borings B4 and B6 and shallow soil samples SS7 and SS8 were all placed at areas of reported industrial storage and/or manufacturing. Samples from boring B7 showed very slightly elevated headspace of 2.1ppm from the surface to 2.5 feet of depth and traces of staining. Analytical results from B7 at the surface to 1 foot of depth showed detections for PAH compounds, however, these were below SRV screening values. The soil materials at SS7 showed no evidence of impacts and this sample was not analyzed. Boring B6 and shallow sample location SS8 showed trace staining from 1 to 3 feet of depth and 0.5 to 2 feet of depth, respectively. Analytical soil samples from these two locations showed a single detection for naphthalene as a VOC compound in the sample from 2.5 to 5 feet of depth in boring B6. DRO was detected below the applicable risk screening criteria in SS8 (potentially attributable to the Former Food Service of America LUST site). The sample from B6 showed no detections for DRO.

3.4.4 Surficial Soil Quality

A total of eleven samples of surficial soils spread collected from across the Property were analyzed for RCRA metals, SVOCs, VOCs and DRO parameters. None of these samples showed exceedances of SRV or other potentially applicable soil risk screening criteria. Two sample locations on Parcel B showed detections for analyzed parameters (the sample from boring B7 from 0 to 1 feet of depth for SVOCs, and the sample SS8 from 0.5 to 1 feet of depth for DRO compounds). Sample SS1 from 0 to 0.5 feet of depth on Parcel A contained detectable concentrations for SVOC compounds.

4.0 Conclusions

4.1 Conclusions

The following can be concluded from this investigation:

- Soil samples collected and analyzed for this Phase II investigation contained trace detectable concentrations of VOC and SVOC constituents although none of the measured concentrations exceeded Tier I SLV or Tier II Industrial SRV screening criteria.

- All of the analyzed samples detected low concentrations of RCRA metals and none of the Tier II SRV screening criteria were exceeded for any of the detected metal parameters.

- Surface and near surface soils samples (less than 2.5 feet of depth) at several locations on both Parcel A and Parcel B (SS2, SS3, SS4, SS6, SS8 and B5), exceeded the Tier I SLV screening criteria for Chromium. This indicates a potential chromium impact to groundwater at the Property from these near surface soils.

- Diesel range organic (DRO) compounds were detected in soil materials present at the former Food America LUST location. The measured concentrations in the analyzed sample were below typical MPCA action levels for this soil type.

- Minor amounts of debris material, including building debris from presumably former Property structures, are scattered across portions of Parcel B and the west portion of Parcel A. Although no visible ACM was observed at the surface or in soil samples from the soil borings, it is possible that such materials may be present among debris in the subsurface in locations not observed during the field work. A thorough inspection for potential ACMs among these scattered debris and fill materials was not included in this scope of work and no ACM samples were collected.

- This investigation did not include any ground water characterization, therefore we are unable to specifically discuss ground water quality at the Property. However, analytical soil samples taken from near or just above the water table in borings B2, B5 and B8, as well as field-screening observations indicated no obvious impacts from volatile or semi-volatile organic in soil borings at or near the water table.

4.2 Recommendations

The purpose of this Investigation was to provide a preliminary characterization of soil quality at the Property, and to perform a preliminary evaluation of risk to human health and the environment resulting from any soil contamination identified at the Property. The limited number of borings and sample analysis performed do not constitute a complete investigation of a site of this nature for all potential future uses. The following list presents our recommendations in undertaking future redevelopment efforts:

In advance of any redevelopment on the Property, particularly underground construction, a Construction Contingency Plan (CCP) should be prepared. Although no contaminants exceeded Tier II Industrial SRVs, a CCP will be helpful to ensure that if potentially contaminated materials are encountered during subsurface development activities, these materials will be recognized, characterized, and managed appropriately. The CCP generally describes the sequence of actions and/or procedures to be followed if suspect contaminated materials are encountered during redevelopment work and helps minimize delays to construction should impacted soil, groundwater or other materials be encountered.

In addition to these primary issues, redevelopment plans should include measures to correctly manage other debris present on the Property, including concrete slabs, minor amounts of demolition debris, rubble, brush, metal fencing, and garbage, especially on the western portion of Parcel A and the entirety of Parcel B.

As a part of future redevelopment, a combined surficial inspection and shallow test excavation investigation should be undertaken by a Licensed Asbestos Inspector to eliminate as a potential concern any issues associated with potentially asbestos containing building debris which may be present on the Property.

Groundwater samples were not collected or analyzed in this phase of the investigation. Future redevelopment could be affected by ground water impacts if any are present (i.e. management of potentially contaminated dewatering water). Therefore, once redevelopment plans are better known, the need for ground water data should be re-evaluated. As chromium concentrations were consistently shown above the Tier I SLVs, this groundwater sampling should include analysis for potential chromium impacts to groundwater above applicable health risk limits (HRLs).

5.0 References

Barr Engineering Company (Barr), 2004a. "Sampling and Analysis Plan, Duluth Brownfields – Duluth Waterfront Property, Phase II Investigation", prepared for the City of Duluth, Minnesota, April, 2004 and "Addendum I" May, 2004.

Barr Engineering Company (Barr), 2004b. "Phase I Environmental Site Assessment Duluth Waterfront Property, 500-1000 Railroad Street, Duluth, Minnesota," prepared for the City of Duluth, Minnesota, April, 2004.

Barr Engineering Company (Barr), 2003. "Quality Assurance Project Plan, Brownfield Assessment Pilot Program, Revision 0.0" prepared for the City of Duluth, Minnesota, September, 2004.

Table 1

Samples Collected and Analysis Performed
Duluth Waterfront Property
Phase II Investigation
Duluth, Minnesota

Sample Identification	Collection Method	Analyses Performed	Analytical Method	Analytical Exceedances (1)
B1 10'-12.5'	Soil Boring	Not Analyzed	--	--
B2 7.5'-10'	Soil Boring	VOCs	EPA 8260B	None
B3 0.5'-2.5'	Soil Boring	RCRA metals	EPA 6010B, EPA 7471A*	None
B4 0'-2.5'	Soil Boring	Not Analyzed	--	--
B5 0'-2.5'	Soil Boring	RCRA metals	EPA 6010B, EPA 7471A*	Cr exceeded Tier I SLV
B5 5'-7.5'	Soil Boring	SVOCs	EPA 8270C	None
B6 2.5'-5'	Soil Boring	DRO, VOCs	WDNR Modified, EPA 8260B	None
B7 0'-1.0'	Soil Boring	SVOCs	EPA 8270C	None
B7 2.5'-5'	Soil Boring	RCRA metals	EPA 6010B, EPA 7471A*	None
B8 7.5'-10'	Soil Boring	RCRA metals, SVOCs	EPA 6010B, EPA 7471A*, EPA 8270C	None
SS3 0'-0.5' MW3 0'-0.5'	Masked Duplicate of SS3 0'-0.5'	RCRA metals	EPA 6010B, EPA 7471A*	Cr exceeds Tier I SLV
B2 7.5'-10' MW3 7.5'-10'	Masked Duplicate of B2 7.5'-10'	VOCs	EPA 8260B	None
B7 0'-2.5' MW7 0'-2.5'	Masked Duplicate of B7 0'-1.0'	SVOCs	EPA 8270C	None
SS1 0'-0.5'	Soil Boring	RCRA metals, SVOCs	EPA 6010B, EPA 7471A* EPA 8270C	None
SS2 0'-0.5'	Soil Boring	RCRA metals	EPA 6010B, EPA 7471A*	Cr exceeds Tier I SLV
SS3 0'-0.5'	Soil Boring	RCRA metals, SVOCs	EPA 6010B, EPA 7471A* EPA 8270C	Cr exceeds Tier I SLV

Table 1

Samples Collected and Analysis Performed
Duluth Waterfront Property
Phase II Investigation
Duluth, Minnesota

Sample Identification	Collection Method	Analyses Performed	Analytical Method	Analytical Exceedances (1)
SS4 0'-0.5'	Soil Boring	RCRA metals	EPA 6010B, EPA 7471A*	Cr exceeds Tier I SLV
SS5 0'-1.0'	Soil Boring	RCRA metals, VOCs	EPA 6010B, EPA 7471A*, EPA 8260B	None
SS6 0.5'-1.0'	Soil Boring	RCRA metals	EPA 6010B, EPA 7471A*	Cr exceeds Tier I SLV
SS7 0.5'-1.0'	Soil Boring	Not Analyzed	--	--
SS8 0.5'-1.0'	Soil Boring	DRO, RCRA metals	WDNR Modified, EPA 6010B, EPA 7471A*	Cr exceeds Tier I SLV
SS9 0'-1.0'	Soil Boring	RCRA metals	EPA 6010B, EPA 7471A*	Cr exceeds Tier I SLV

Note: VOC = Volatile Organic Compounds

RCRA Metals = Resource Conservation and Reclamation Act listed metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver)

SVOCs = Semivolatile Organic Compounds

DRO = Diesel Range Organics

* = For Mercury Analysis only

(1) These are comparisons to potentially applicable Tier II Industrial Soil Reference and MPCA guidelines for DRO concentrations included in Table 2.