ANALYSIS OF BROWNFIELDS CLEANUP ALTERNATIVES

80-100 CHARLOTTE STREET ROCHESTER, NEW YORK

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1.0 INTRODUCTION

This report presents alternatives evaluated for remediation of petroleum-impacted soil and metal-impacted fill material identified at 80-100 Charlotte Street, Rochester, New York (Site). The Site is currently owned by the City of Rochester (City). Appendix A includes a project locus map (Figure 1) and a site plan (Figure 2). Specifically, this report summarizes the previous environmental evaluations conducted at the Site and the areas of impacted media that will be remediated; the proposed future use of the Site; potential exposure scenarios; the applicable relevant and appropriate regulations (ARARs) that will be used as cleanup objectives at the Site; and, the remedial alternatives evaluated.

1.1 Background

A Phase I Environmental Site Assessment (Phase I ESA) report dated May 2002 and a Phase II Environmental Site Assessment (Phase II ESA) dated July 2002 were completed by Day Environmental, Inc. (DAY) for the Site. Based on the findings of these evaluations, the following concerns require remedial responses:

- Stained Surface Soils: Several approximate three-foot diameter or less areas of stained surface soils, on the northwest portion of the Site, were determined to be impacted with heavy-weight total petroleum hydrocarbons (TPH) designated as lube oil and one sample contained the semi-volatile organic compound (SVOC) benzo (b)fluoranthene above the recommended soil cleanup objective (RSCO) referenced in the New York State Department of Environmental Conservation (NYSDEC) *Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels* dated January 24, 1994 (TAGM 4046) as amended by the NYSDEC's Supplemental Tables dated August 22, 2001.

- Active Spills on Adjoining/Nearby Properties: Evidence of petroleum-type contamination was detected in saturated soil and groundwater on the northwest and southwest portions of the Site. This contamination appears attributable to active spills on adjoining/nearby properties located west and northwest of the Site.

- Former On-Site Gasoline UST System: Evidence of petroleum contamination exceeding the RSCOs referenced in the NYSDEC TAGM 4046 as amended by the NYSDEC's Supplemental Tables dated August 22, 2001 was detected in proximity to, and hydraulically downgradient from, a former underground storage tank (UST) system used to store gasoline. The contamination is generally present in an approximate 2-foot to 4-foot layer of soil immediately above bedrock. The NYSDEC was notified regarding the petroleum contamination that was encountered, and the NYSDEC subsequently generated a spill file (NYSDEC Spill #0270474), which currently has an "active" status.

- Fill Material: Fill material generally consisting of re-worked soil with lesser amounts of coal, ash, concrete, asphalt, brick, slag and wood is present generally across the Site. Analytical laboratory test results for samples of fill material indicated this heterogeneous fill contains concentrations of arsenic, barium, cadmium, lead or mercury that exceed applicable the RSCOs and/or background ranges referenced in NYSDEC TAGM 4046.

1.2 Proposed Future Use of Site

Currently, the conceptual future use of the Site includes redevelopment for a combination of commercial and residential usage with a parking lot and landscaped areas. The City is currently working on plans for contiguous vacant lots to the west addressed 14-60 Charlotte Street that adjoin the Site. The plans for this adjoining project include phased redevelopment with residential townhouses.

1.3 Exposure Pathways

Based on the location of the contaminants identified above, the potential routes of exposure include direct contact during the remedial work and potential soil gas vapors that may contain petroleum-related VOCs. Since the Site is in an urban setting, it is not anticipated that contact with groundwater is an exposure pathway (i.e., the Site and surrounding area are serviced by a municipal water supply). Potential exposure during the remedial work will be managed with a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) designed to protect Site workers and the public.

1.4 Applicable or Relevant and Appropriate Requirements

The anticipated applicable or relevant and appropriate requirements (ARARs) for the Site are identified below:

- Generally, impacted soil will be remediated to the RSCOs referenced in the NYSDEC TAGM 4046 (as amended by the NYSDEC's Supplemental Tables dated August 22, 2001). Impacted soil or fill containing contaminants above RSCOs that are left in-place will be managed with a Site Management Plan (SMP) for potential future disturbances (e.g., utility repair work).

- Contamination in groundwater will be evaluated using NYSDEC *Technical and Operational Guidance Series 1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (TOGS 1.1.1) dated June 1998 and or using an exposure assessment conducted in accordance with the provisions set forth in the *"Guidance for Petroleum Spill Site Inactivation"* (PSSI) dated February 23, 1998. Also the Risk Based Corrective Action (RBCA) Tool Kit for Chemical Releases software may be used to assist in performing the PSSI exposure assessment.

- Evaluation of post-remedial soil gas sampling results will be based on provisions set forth in the Human Health Risk Assessment guidelines outlined in NYSDEC DER-10 and/or the New York State Department of Health (NYSDOH) *Draft Guidance for Evaluating Soil Vapor Intrusion in the State of New York* dated February 2005.

2.0 ANALYSIS OF BROWNFIELDS CLEANUP ALTERNATIVES

This analysis focuses on remediation of petroleum-impacted soil and groundwater (i.e., not SVOC-impacted surface soil or metals in fill materials). Remedial technologies evaluated were based on technical feasibility, short-term and long-term effectiveness/permanence, and cost. The technologies evaluated in the screening process included: 1) no action; 2) soil removal and disposal; 3) enhanced in-situ biodegradation; and, 4) in-situ air sparging/soil vapor extraction. In addition, the proposed remedy will include a post remedial soil gas survey to evaluate the requirements for Institutional Controls and/or Engineering Controls (i.e., vapor barrier) prior to Site redevelopment. Also, the proposed remedy will include development/implementation of a SMP in order to manage potential future disturbances of residual contamination left in-place.

2.1 No Action

The No Action alternative includes no active remedial actions and leaves the Site as currently found.

Applicability: Some natural attenuation may occur to reduce contaminant concentrations with time; however, a timeframe or the completeness of natural attenuation would be unknown.

Limitations: Factors that would limit the applicability and effectiveness of the process include:

- Redevelopment of the Site would encounter contamination above ARARs and would not be recommended without implementing remedial actions and/or institutional/engineering controls.
- Potential migration of contaminants is a concern if no remedial actions and/or institutional/engineering controls are implemented.

Estimated Cost: $0

2.2 Soil Removal and Disposal

As part of this alternative, a waste characterization study would be completed. The Soil Removal and Disposal alternative includes the excavation and off-site disposal of petroleum-impacted soil from the former gasoline UST system. This alternative is intended to remove the source area of petroleum-impacted soil. Specifically, this alternative would include excavation and off-site disposal of the 2-foot to 4-foot thick layer of petroleum-impacted soil directly above the bedrock (i.e., approximately 9 feet in depth) over an approximate 8,000 square foot area. This area equates to approximately 1,500 tons of petroleum-impacted soil. In the event that groundwater is encountered during soil removal activities, dewatering of the excavation will be conducted, as necessary (i.e., potentially source removal of contaminated groundwater). However, an additional approximate 3,000 tons of 'clean' soil/fill not impacted with petroleum contamination will require removal and staging on-site (i.e., the petroleum-impacted soil is beneath the 'clean' soil/fill material). Post-removal confirmatory soil samples would be collected in order to evaluate concentrations of contaminants left in-place. During the soil removal work, air monitoring would be performed as specified in a HASP and a CAMP. A SMP would be required for management of fill materials with heavy metals and for petroleum-impacted soil that is left in-place.

Monitoring of the groundwater would be conducted in order to evaluate the effects of the source area soil removal on the residual concentrations of contaminants in the groundwater. As such, this alternative includes the installation of six groundwater monitoring wells and four rounds of sampling (i.e., quarterly sampling for one year). Based on the results of the post-removal groundwater monitoring, groundwater remediation may be conducted (e.g., in-situ bioremediation).

Since some petroleum-impacted soil and groundwater will be left in-place, this alternative includes post-removal soil gas sampling from up to six locations. This sampling will be used to evaluate the need for engineering controls (e.g., vapor mitigation systems) for potential buildings.

Applicability: Excavation and off-site disposal is a standard treatment method for petroleum-impacted soils. Soil removal and disposal can be 'easily' implemented and should facilitate timely redevelopment of the Site.

Limitations: Factors that would limit the applicability and effectiveness of the process include:

- The excavated area will need to be secured or backfilled daily to minimize potential safety issues.
- The Site may require additional fencing to secure the Site for the excavation work.
- Although not anticipated, dewatering of the excavation could increase cost.

Estimated Cost Range: $220,000 to $250,000

2.3 Enhanced In-Situ Biodegradation

The Enhanced In-Situ Biodegradation alternative includes the injection of oxygen release compound (ORC). The injection of ORC enhances in-situ biological processes and degrades the petroleum contamination into inert compounds. The ORC would be delivered through a series of injection wells throughout the petroleum-impacted area. The injection work may require multiple injections over time to adequately degrade the petroleum contamination. This alternative includes injecting ORC over an approximate 8,000 square-foot area. During the ORC injection work, air monitoring would be required as specified in a HASP and CAMP. In addition, a SMP would be required for management of fill materials with heavy metals and for petroleum-impacted soil left in-place.

Monitoring of the groundwater would be conducted in order to evaluate the effects of the remedial work on the concentrations of contaminants in the groundwater. As such, this alternative includes the installation of six groundwater monitoring wells and eight rounds of sampling (i.e., quarterly sampling for two years). In addition, this alternative includes post-remedial soil gas sampling from up to six locations. This sampling will be used to evaluate the need for engineering controls (e.g., vapor mitigation systems) for potential buildings.

Applicability: Enhanced biological processes should be effective in remediating petroleum contamination in soil and groundwater.

Limitations: Factors that would limit the applicability and effectiveness of the process include:

- This process may require a longer timeframe than soil removal and disposal.
- Redevelopment of at least the 8,000 square-foot portion of the property may not be possible for at least 1-2 years (i.e., the injection of ORC would require access to the area).
- The effectiveness of injecting ORC in the unsaturated zone may be limited (i.e., potentially leaving pockets of contamination in-place).

Estimated Cost Range: $210,000 to $275,000

2.4 In-Situ Air Sparging and Soil Vapor Extraction

The In-Situ Air Sparging and Soil Vapor Extraction (AS/SVE) alternative includes the construction of an AS/SVE system to remediate soil and groundwater impacted with petroleum contamination. The injection of air enhances the movement of petroleum contaminants and the SVE system removes the vapors from the subsurface. The system would consist of a series of air injection and vapor extraction wells throughout the petroleum-impacted area. The AS/SVE system would remediate the petroleum contamination over time (i.e., about 2 to 4 years). During the construction and operation of the system, air monitoring would be required as specified in a HASP and CAMP. In addition, a SMP would be required for management of fill materials with heavy metals and for petroleum-impacted soil left in-place.

Monitoring of the groundwater would be conducted in order to evaluate the effects of the remedial work on the residual concentrations of contaminants in the groundwater. As such, this alternative includes the installation of six groundwater monitoring wells and eight rounds of sampling (i.e., semi-annual sampling for up to four years). In addition, this alternative includes post-remedial soil gas sampling from up to six locations. This sampling will be used to evaluate the need for engineering controls (e.g., vapor mitigation systems) for potential buildings.

Applicability: AS/SVE systems are effective in remediating petroleum contamination in soil and groundwater.

Limitations: Factors that would limit the applicability and effectiveness of the process include:

- The Site soil conditions may limit the effectiveness of AS/SVE (i.e., radius of influence may be decreased due to low permeability or saturated soils).
- Heterogeneous fill materials at the Site (i.e., fill materials/debris, potential former residential basements, etc.) may lead to channeling of the AS/SVE (i.e., preferential pathways), which may leave pockets of contamination in-place.
- This process would require a longer timeframe than soil removal and disposal.
- Redevelopment of the property would be possible while the AS/SVE system is operating; however, redevelopment may be limited in certain areas (i.e., a small building would be required to house the AS/SVE system and would require regular access).
- Long-term maintenance of the system would be required.

Estimated Cost Range: $180,000 to $225,000

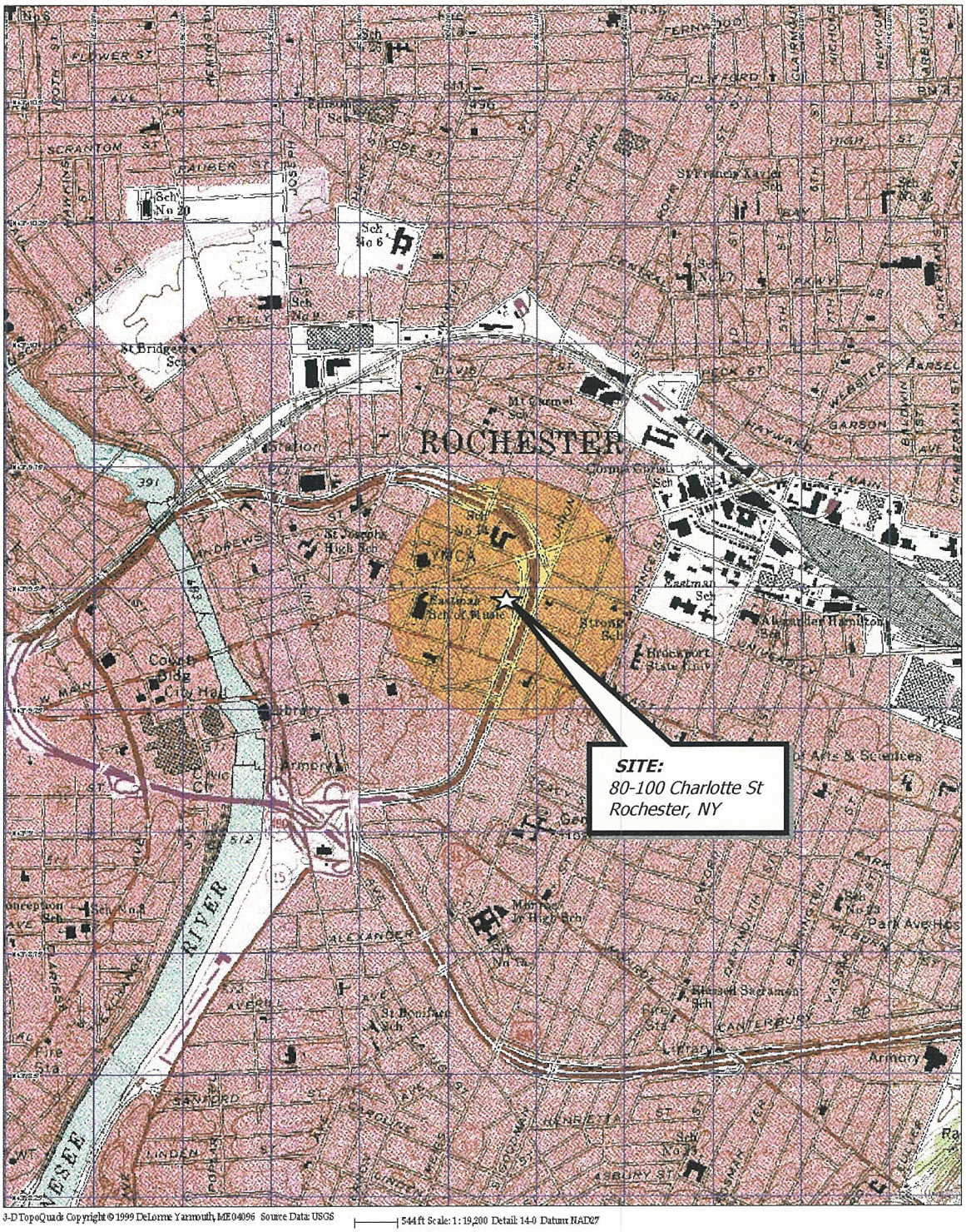
3.0 RECOMMENDED CLEANUP ALTERNATIVE

The No Action alternative will not remediate contamination at the Site and will limit or prohibit redevelopment activities. The Soil Removal and Disposal alternative should remove a majority of the contamination at the Site and the remaining residual contaminants will be monitored via groundwater monitoring and soil gas sampling and if necessary, the Soil Removal and Disposal alternative includes a provision for 'polishing' groundwater contamination. In addition, a SMP will manage potential future disturbances of residual contamination left in-place. The Soil Removal and Disposal alternative should assist in the redevelopment of the Site and provides the shortest timeframe for remediation. The AS/SVE and Enhanced In-Situ Biodegradation alternatives may meet ARARs for portions of the Site; however, pockets of contamination may be left in-place. The timeframe for cleanup for the AS/SVE and Enhanced In-Situ Bioremediation alternatives will extend redevelopment efforts and/or may limit redevelopment on portions of the Site. A table comparing these alternatives is provided in Appendix B.

Based on the cost and implementation timeframes associated with the remedial alternatives, the Soil Removal and Disposal alternative is the recommended remedial alternative for the Site.

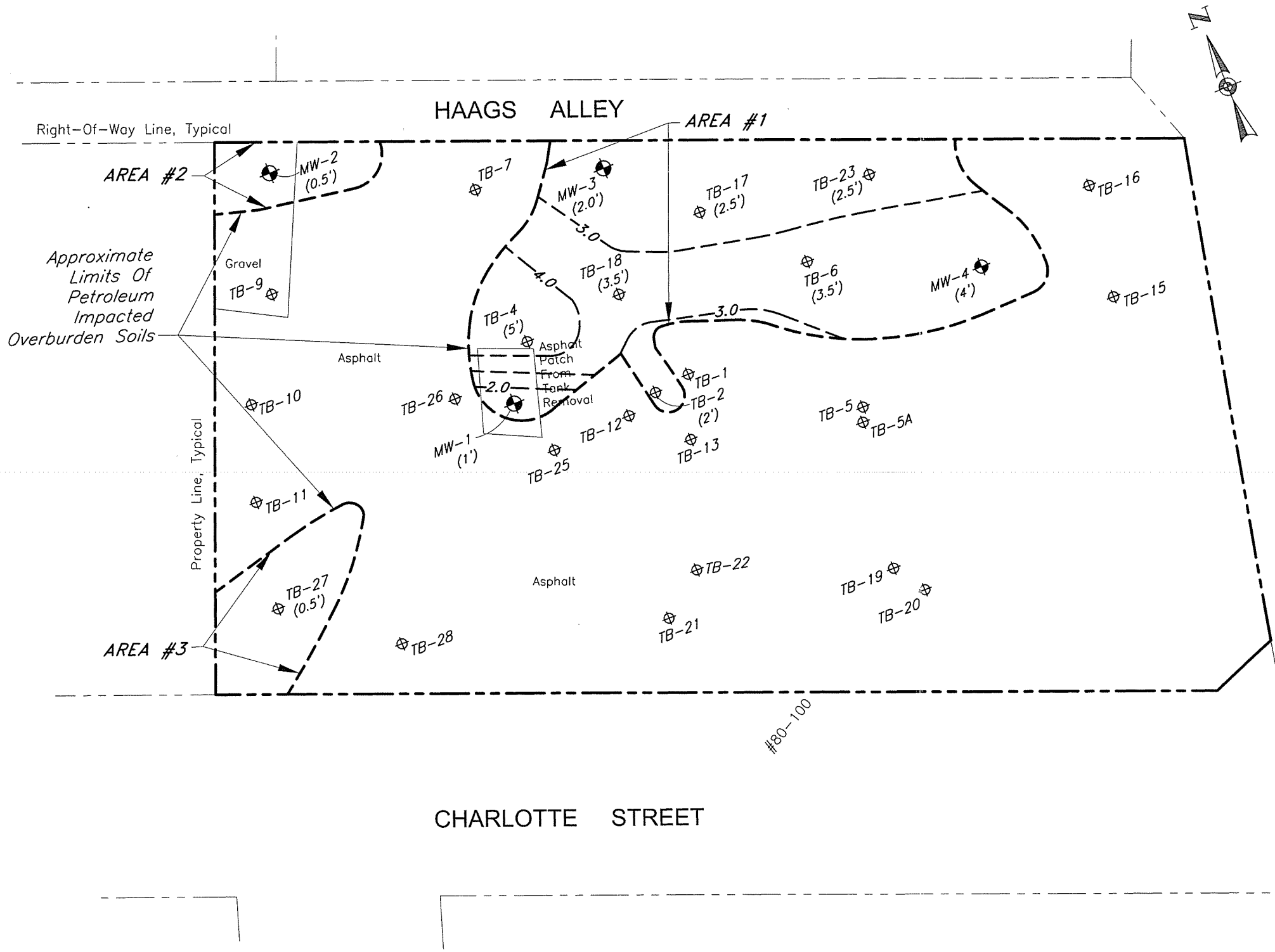
APPENDIX A

FIGURES



Drawing Produced From: 3-D TopoQuads, DeLorme Map Co., referencing USGS quad map Rochester East (NY) 1995. Site Lat/Long: N43°09.48' – W77°35.83'

DATE 07-11-2002 DRAWN BY Jad SCALE 1" = 2000'	day DAY ENVIRONMENTAL, INC. ENVIRONMENTAL CONSULTANTS ROCHESTER, NEW YORK 14614-1008	PROJECT TITLE 80-100 CHARLOTTE STREET ROCHESTER, NY Analysis of Brownfields Cleanup Alternatives DRAWING TITLE PROJECT LOCUS MAP	PROJECT NO. 3638R-05 FIGURE 1



SITE PLAN
1" = 30'

NOTES

1. Site plan produced from a tax map of The City Of Rochester; an architectural drawing for Vanderlinde Electric Corp, drawing number B-1, Site Plan, dated 3-12-1962; and notes of site visit by representatives of Day Environmental, Inc. On 6-07-2002.
2. Locations of test borings and sample points tape-measured from existing site structures, and are considered accurate to the degree implied by the method used.

LEGEND

MW-3 (2.0')	Overburden groundwater monitoring well with thickness of petroleum impacted overburden soils
TB-18 (3.5')	Test Boring with thickness of petroleum impacted overburden soils
2.0	Petroleum Impacted overburden soil contour with thickness label

FIELD VERIFIED BY	DPN
DATE	06-2002
DRAWN BY	RJM
DATE DRAWN	05-16-2005
SCALE	1" = 30'
DATE ISSUED	05-16-2005

day
DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10165-1617

PROJECT TITLE
80 - 100 CHARLOTTE STREET
ROCHESTER, NEW YORK

ANALYSIS OF BROWNFIELDS CLEANUP ALTERNATIVES

DRAWING TITLE
Site Plan

PROJECT NO.
3638R-05

FIGURE 2

Ref1: CharlotteBase-1.dwg
Ref2: PetroPlan-1.dwg
Ref3:
Ref4:
Ref5:
Ref6:

Xerox432AnsiB-2; 11 x 17
Layout Name: Layout 1

Time Plotted: Mon May 16 15:15 2005
File Name: Rocity\3638\3638-1.dwg

APPENDIX B

COMPARISON OF BROWNFIELDS CLEANUP ALTERNATIVES TABLE

TABLE 1

80-100 CHARLOTTE STREET
ROCHESTER, NEW YORK

Comparison of Brownfields Cleanup Alternatives

Criteria	No Action	Soil Removal and Disposal	Enhanced In-Situ Biodegradation	In-Situ Air Sparging/ Soil Vapor Extraction
Short-Term and Long-Term Effectiveness/Permanence	May not be an effective or permanent remedy. Redevelopment would not be recommended.	Effective and permanent remedy. May leave some residual petroleum-impacted soil and groundwater to be managed by Site Management Plan (SMP) and possible groundwater polishing.	Effective remedy; however, pockets of contamination may be left in-place. Timeframe for redevelopment will be longer than Soil Removal and Disposal. Requires SMP for residual petroleum-impacted soil and groundwater.	Effective remedy; however, pockets of contamination may be left in-place. Timeframe for redevelopment will be longer than Soil Removal and Disposal. Requires SMP for residual petroleum-impacted soil and groundwater.
Implementability	Easy	Easy	Moderate	Moderate
Estimated Duration of Cleanup	0 years	1 year	1 to 2 years	2 to 4 years
Estimated Cost Range	**$ 0**	**$220,000 – $250,000**	**$210,000 – $275,000**	**$180,000 – $225,000**