



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

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June 13, 2013

Brett Harrison
Alliance Residential Company
1300 Dexter Avenue N, Suite 110
Seattle, WA 98109

Re: Opinion pursuant to WAC 173-340-515(5) on Proposed Remedial Action for the following Hazardous Waste Site:

- **Name:** Broadstone Capital Venture LLC
- **Address:** 1414 10th Avenue, Seattle, Washington
- **Facility/Site No.:** 17539
- **CSID:** 12090
- **VCP No.:** NW2703

Dear Mr. Harrison:

Thank you for submitting documents regarding your proposed remedial action for the Broadstone Capital Hill Venture LLC (Site) for review by the Washington State Department of Ecology (Ecology) under the Voluntary Cleanup Program (VCP). Ecology appreciates your initiative in pursuing this administrative option for cleaning up hazardous waste sites under the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

This letter constitutes an advisory opinion regarding a review of submitted documents/reports pursuant to requirements of MTCA and its implementing regulations, Chapter 70.105D RCW and Chapter 173-340 WAC, for characterizing and addressing the following release(s) at the Site:

- Total petroleum hydrocarbons - diesel and oil range (TPH-D, TPH-O) into soil and groundwater
- Benzene, toluene, ethylbenzene, xylenes (BTEX) into soil and groundwater
- Chlorinated volatile organic compounds - tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride into groundwater
- Naphthalene into soil and groundwater.

Ecology is providing this advisory opinion under the specific authority of RCW 70.105D.030(1)(i) and WAC 173-340-515(5).

This opinion does not resolve a person's liability to the state under MTCA or protect a person from contribution claims by third parties for matters addressed by the opinion. The state does not have the authority to settle with any person potentially liable under MTCA except in accordance with RCW 70.105D.040(4). The opinion is advisory only and not binding on Ecology.



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Ecology's Toxics Cleanup Program has reviewed the following information regarding your proposed remedial actions:

1. *Cleanup Action Plan Addendum Broadstone Capital Hill Property – VCP Project No. NW2703 11th & Union Development Site, Seattle, Washington*, prepared by PES Environmental. Dated June 10, 2013.
2. *Cleanup Action Plan Broadstone Capital Hill*, prepared by PES Environmental. Dated March 13, 2013.

The report listed above will be kept in the Central Files of the Northwest Regional Office of Ecology (NWRO) for review by appointment only. Appointments can be made by calling the NWRO resource contact at 425.649.7235 or or sending an e-mail to nwro_public_request@ecy.wa.gov.

The Site is defined by the extent of contamination caused by the following releases:

- Total petroleum hydrocarbons - diesel and oil range (TPH-D, TPH-O) into soil and groundwater
- Benzene, toluene, ethylbenzene, xylene (BTEX) into soil and groundwater
- Chlorinated Volatile Organic Compounds (VOCs) - tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride into groundwater
- Naphthalene into soil and groundwater.

TPH-D was detected above the MTCA Method A cleanup level in soil and groundwater samples collected from the vicinity of a former 6,000-gallon diesel fuel underground storage tank (UST) on the north side of the 1406 10th Avenue building. The highest concentration of TPH-D (8,780 milligrams per kilogram (mg/kg) at 3 feet below ground surface (bgs)) in soil was collected south of the former UST location. TPH-D was also detected in soil above Method A in the southeast portion of the Property under the 1406 10th, 1401 11th and 1405 11th buildings and in the northern gravel parking lot, the source of which is unknown.

TPH-D concentrations were detected in groundwater above the MTCA Method A cleanup level in the southern portion of the Site. The highest concentration of TPH-D (961,000 micrograms per liter (µg/L)) in groundwater was detected in a grab sample from beneath the 1405 11th Avenue building. The source of the TPH-D groundwater plume in the southeast quadrant of the Site is unknown.

Oil-range petroleum hydrocarbons were detected in soil and groundwater above the MTCA Method A cleanup level from an unknown source at 8 feet beneath the 1406 10th building basement floor in soil at 2,940 mg/kg and in groundwater at 194,000 µg/L.

PCE, TCE and vinyl chloride were below MTCA Method A cleanup levels in soil samples collected throughout the property. PCE, TCE and vinyl chloride were detected above MTCA Method A cleanup levels in groundwater samples collected from the vicinity of the former UST and at a monitoring well south of the 1406 10th Avenue building. The source of chlorinated VOCs in groundwater is unknown but suspected to be related to sump and associated subsurface drainage piping.

Historic use of the Property included an auto body repair shop, paint shop, auto repair facility, machine shop, blacksmith and forging shop, automotive parts manufacturing facility, bakery, warehouse and business offices. Planned future use of the Property is retail and residential units. Redevelopment of the Property (1406 and 1416 10th Avenue and 1401 and 1405 11th Avenue) is planned to begin June 2013. All existing structures will be demolished, with the exception of the brick facades of the buildings along East Union Street and 11th Avenue. The entire property will be excavated to depths of 6 to 9 feet below current basement floor elevations to allow for installation of a below-ground parking structure, with additional excavation in areas of confirmed soil and groundwater contamination.

Based on a review of supporting documentation listed above, pursuant to **requirements contained in MTCA and its implementing regulations, Chapter 70.105D RCW and Chapter 173-340 WAC, for characterizing and addressing the following release(s) at the Site, Ecology has determined:**

- The extent of TPH-D contamination in soil has not been vertically or horizontally delineated in the southeastern portion of the Property and may extend beyond the Property boundaries. The extent of TPH-O contamination in soil has not been vertically or horizontally (south/southwest of B-18) delineated beneath the 1406 10th Avenue building.
- Oil-range petroleum hydrocarbons were detected in groundwater above the MTCA Method A cleanup level beneath the 1406 10th building groundwater at 194,000 µg/L. The highest concentration of TPH-D (961,000 micrograms per liter (µg/L)) in groundwater was detected in a grab sample from beneath the 1405 11th Avenue building. These concentrations indicate the presence of free product. The post redevelopment groundwater monitoring plan should include gauging all monitoring wells for product and thickness should be measured if present. If present, removal and treatment of free product is a minimum cleanup requirement as per WAC 173-340-360(2)(A).
- To meet the substantive requirements of MTCA, full lateral and vertical extent of contamination in soil and groundwater will need to be determined. PES has proposed a groundwater monitoring plan to assess post excavation conditions. The plan includes the installation of four new groundwater monitoring wells and the preservation of MW-3 (Enclosure A). The additional monitoring wells are intended to address down gradient concerns and to fully delineate contamination in groundwater vertically and laterally, establish flow direction and gradient and determine plume stability. If the four proposed wells do not fully delineate the extent of the groundwater plume, additional monitoring wells will be needed. Once the plume has been fully delineated and remediated, contaminant concentrations must remain below MTCA Method A Cleanup Levels for a minimum of four consecutive quarters for each contaminant of concern to meet the substantive requirements of MTCA for groundwater.
- A Terrestrial Ecological Evaluation (TEE) may be required unless it is determined the Site qualifies for an exclusion. The TEE decision-making process must be documented as per WAC 173-340-7490. A TEE process interactive user's guide can be found at: <http://www.ecy.wa.gov/programs/tcp/policies/terrestrial/TEEHome.htm>
- The current proposed Cleanup Action Plan (CAP) for the Broadstone Property, if implemented, will most likely constitute an interim action for soil contamination at the Property and does not resolve soil or groundwater contamination for the entire Site.

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Ecology only provides opinions on Site cleanup action plans once Site characterization has been completed.

- Ecology is in agreement with PES that removal and disposal of source material is the most effective and preferred remedial method to address Property soil contamination.
- PES stated in their June 10, 2013 CAP addendum that Site characterization will be completed concurrent with and post excavation. A Remedial Investigation/Feasibility Study (as per WAC 17-340-350 and 173-340-360) which addresses the Site will be submitted. Remedial Investigation, Feasibility Study and disproportionate cost analysis outlines are included in Enclosure B to aid in the completion of these documents.

This opinion does not represent a determination by Ecology that a proposed remedial action will be sufficient to characterize and address the specified contamination at the Site or that no further remedial action will be required at the Site upon completion of the proposed remedial action. To obtain either of these opinions, you must submit appropriate documentation to Ecology and request such an opinion under the VCP. **This letter also does not provide an opinion regarding the sufficiency of any other remedial action proposed for or conducted at the Site.**

Please note that this opinion is based solely on the information contained in the documents listed above. Therefore, if any of the information contained in those documents is materially false or misleading, then this opinion will automatically be rendered null and void.

The state, Ecology, and its officers and employees make no guarantees or assurances by providing this opinion, and no cause of action against the state, Ecology, its officers or employees may arise from any act or omission in providing this opinion.

Again, Ecology appreciates your initiative in conducting independent remedial action and requesting technical consultation under the VCP. As the cleanup of the Site progresses, you may request additional consultative services under the VCP, including assistance in identifying applicable regulatory requirements and opinions regarding whether remedial actions proposed for or conducted at the Site meet those requirements.

If you have any questions regarding this opinion, please contact me at 425.649.7097 or e-mail desc461@ecy.wa.gov.

Sincerely,



Diane Escobedo, Site Manager
NWRO Toxics Cleanup Program

DE:SA

Enclosures (2): A – Site Diagram
 B – Remedial Investigation, Feasibility Study and Disproportionate Cost
 Analysis outlines

cc: Daniel A. Balbiani, PES Environmental, Inc.
 Sonia Fernandez, Ecology VCP Coordinator

Remedial Investigation Outline

The following annotated outline is a suggested schematic for elements to be included in a Remedial Investigation report. It is not intended to replace MTCA's specific requirements as presented in 173-340-350(7) WAC.

The main purpose of the outline is to facilitate the preparation of a document that is clear, comprehensive, and to the point. A secondary, but important, purpose for this project is to make document preparation and review more efficient.

INTRODUCTION

(concise, bulleted if possible)

- Site name, VCP number, Name, address, and phone number of project consultant, Current owner/operator
- Purpose of document *(very brief restatement of what an RI is for, reference the WAC)*

SITE IDENTIFICATION AND DESCRIPTION

(focus on defining the site in the context of its' location)

- Site discovery and regulatory status *(describe how the site was identified and where it is in the MTCA process)*
- Site and property location/definition *(define actual MTCA site location relative to property or study area)*
- Neighborhood setting
- Physiographic setting/topography

Figure – Vicinity Map *(preferably with topography)*

Figure – Property/Site Map *(preferably with topography)*

Appendix – Legal description of property, present owner and operator, chronological listing of past owners and operators

PROPERTY DEVELOPMENT AND HISTORY

(this section focuses on the built environment, both current and historical, and presents the sources of contamination and release mechanisms)

- Past site uses and facilities
- Current site use and facilities
- Proposed or potential future site uses
- Zoning *(if appropriate)*
- Transportation/roads
- Utilities, water supply
- Potential sources of site contamination

- Potential sources of contamination from neighboring properties (*discuss nearby sources if known*)

Figure – Historical site features (*may be combined with Figure 2*)

Figure – Potential contaminant sources

Figure – Utilities (*may be combined with Figure 2*)

Table – Potential Contaminants

ENVIRONMENTAL INVESTIGATION/INTERIM ACTION SUMMARY

(Concise summary presentation of the investigations that have been done at the site, along with prior remedial actions. Focused mostly on figures and tables. Details of and methods used in former investigations and remediation in appendices)

- Constituents of Concern (*brief discussion about which specific compounds were chosen for analysis and why*)
- Soil
- Surface water
- Ground water
- Sediment
- Air/soil vapor
- Natural resources/wildlife
- Cultural history/archeology
- Interim actions (*brief intro to prior remediation activities*)

Figure – Soil investigation data points (*show potential source areas*)

Figure – Surface water/groundwater investigation data points (*show potential source areas*)

Figure – Air investigation data points (*show potential source areas*)

Figure – Prior remediation activities

Table – Exploration Summary

Table – Analytical Schedule per media (*include analytical methods and reporting limits, as possible*)

Appendix – Previous Investigations (*detailed discussion goes here*)

Appendix - Exploration and sampling methodology (*may combine with Previous Investigations*)

Appendix – Boring/ Well logs

Appendix - Prior Interim Actions

NATURAL CONDITIONS

- Geology
(*focus on interpretation*)
 - Regional Setting (*brief*)
 - Property Geologic Conditions (*synthesis, not regurgitation of boring logs*)
 - Physical Properties (*unlikely to need this section, but in some cases may be useful to present data on soil adsorptive capacity, organic content, strength, etc.*)

Figure – Plan view of geologic unit distribution (*if helpful*)

Figure - Cross section A-A' (*show borings, wells, screened intervals, water levels*)

Figure – Cross section B-B' (*if necessary*)

- Surface Water
(*brief description of the surface water system*)
 - Property drainage
 - Area surface water/floodplain issues
 - Regulatory classifications, if any (*e.g surface water classification*)

Figure – Surface water Conditions (*only if information not already in a prior figure*)

- Ground Water
(*focus on interpretation*)
 - Occurrence (*aquifers, water levels, confinement, geometry, continuity, physical properties*)
 - Movement (*directions, gradient if important, seasonal fluctuations, tidal influence*)
 - Discharge
 - Recharge (*if significant for site*)
 - Regulatory classifications, if any (*e.g. sole source aquifer*)

Figure – Cross section with ground water information (*if not already included above*)

Figure – Water table/potentiometric surface maps (*for various seasons or tidal conditions, show surface water*)

Appendix – Ground water elevation data (*a table*)

- Natural Resources and Ecological Receptors
(*preparatory to a TEE*)
 - Greenbelts and other natural habitat

- Wildlife
- Other Information required to conduct evaluations under -7491, -7492, or if necessary - 7493

Figure – showing natural areas, as appropriate

CONTAMINANT OCCURRENCE AND MOVEMENT

(very little text, mostly figures and tables, transport modeling is unlikely to be needed for service station sites but if it was, would likely go in this section, main point is to provide easy-to-understand figures showing the depth and breadth of contamination)

- Waste Material (*sludges, fluids, stockpiles*)
- Soil
- Surface Water
- Ground Water
- Sediment
- Air/Soil Vapor

Figures – Cross sections showing soil contamination with depth

Figures – Plan views showing soil contamination across site (*relative to releases if known*)

Figures – Cross section showing ground water contamination with depth (*if appropriate*)

Figures – Plan views showing ground water contamination in each aquifer (*relative to soil contamination and P-head map*)

Figures – XY plots of specific contaminants with time (*as appropriate*)

Figures – Others as appropriate to show the distribution of surface water, ground water, or air data

Tables – All of the analytical data against final cleanup levels (*exceedances highlighted, no need to develop screening levels*)

Tables – Summary of exceedances (*if helpful*)

Appendix – QA report

Appendix – Analytical lab reports

CONCEPTUAL MODEL

(putting the whole story together, graphic illustrations are best)

- Contaminant release/fate and transport/potential or actual receptors
- Data gaps (*is anything missing*)

CLEANUP STANDARDS

(developing appropriate cleanup standards based on receptors and pathways)

- Soil
 - Reasonable maximum exposure
 - Cleanup levels protective of contact, ground water, inhalation, terrestrial species, surface water, sediment
 - Points of compliance
 - Regulatory classifications *(classification of soil as dangerous or solid waste)*
- Ground Water
 - Highest beneficial use/reasonable maximum exposure
 - Cleanup levels protective of potable use, inhalation, surface water, sediment
 - Points of compliance
- Other Media as appropriate
 - Cleanup levels protective of
 - Points of compliance

Table – Cleanup Levels *(all potentially applicable values with final selected cleanup level noted)*

AREAS REQUIRING CLEANUP

(the final story detailing where the contamination exceeds an applicable cleanup standard, brief text, mostly tables, figures)

- Constituents of Concern *(a brief summary of compounds that exceed cleanup levels or “indicator hazardous substances” under MTCA. For most service station sites, the COCs should be the same)*
- Soil – vertical and lateral
- Ground water – vertical and later
- Sediment –
- Surface Water
- Soil Vapor/air

Figures – Plan view and vertical sections of areas requiring cleanup

REFERENCES

Feasibility Study (FS) Outline
June 2011

The following annotated outline is a schematic of elements to be included in a FS report. It is only one of many possible outlines, and is not intended to replace MTCA's specific requirements as presented in WAC 173-340-350, and associated sections.

The main purposes of this outline are therefore to:

- Provide a standardized format that will facilitate the preparation and review of the many FS reports that will be completed for the Shell Multi-Site project. As already stated, it is not the only format that will satisfy MTCA.
- Clarify the requirements of that portion of an FS commonly known as the disproportionate cost analysis (DCA). This one element engenders more confusion and controversy than the rest of the FS process combined.

Note that an FS need not be done if a cleanup involving complete removal is already being planned.

Annotations are denoted by Italicized text in parenthesis

I. INTRODUCTION

(If the FS is part of an RI/FS document, then only the purpose of the FS needs to be stated. Otherwise provide a concise summary of the RI; use figures if at all possible.)

- **Purpose** *(develop and evaluate cleanup action alternatives as basis for selecting cleanup action)*
- **Site Identification and Surroundings** *(site name, VCP number, site definition, property(s) identified, neighborhood setting; physiographic setting/topography)*
- **Property Development and History** *(past, current and future uses; roads, utilities)*
- **Natural Conditions** *(geology, surface water, ground water, natural habitat)*
- **Contaminant Occurrence and Movement** *(release sources/ mechanisms; distribution and movement in all affected media)*

II. AREAS REQUIRING CLEANUP

(This section reiterates what needs to be cleaned up, why it needs to be cleaned up, and where it needs to be cleaned up)

- **Soil Cleanup: Chemicals of concern, exposure pathways, exceedances, areas/volumes requiring cleanup, point of compliance.** *(limited text, table with cleanup levels, distribution best shown with figures – both plan view and cross section, describe soil volumes, soil type, and any special conditions)*
- **Ground water Cleanup** *(same as above)*
- **Other Media Cleanup** *(same as above)*

III. IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES

(This section may or may not be needed. It is not required by MTCA, but may be useful as a means to eliminate specific technologies from further consideration. A variety of criteria can be chosen for screening, but typical factors are cost, effectiveness, and implementability. A table format is best for the screening)

(Shell may wish to prepare a standard remedial technologies appendix for use in all feasibility studies. This could simplify the screening process by having a ready-made description of all technologies that realistically could be used at service station sites.)

IV. SELECTION AND DESCRIPTION OF CLEANUP ALTERNATIVES

(Here is where distinct alternatives are established and described only – no comparison. Some text is useful, but the bulk of the description is best put into a table with accompanying figures.)

(MTCA requires:

- *A reasonable number and type of alternatives*
- *Alternatives that protect human health and the environment by eliminating, reducing, or otherwise controlling risks*

- *Alternatives that have the standard point of compliance for all affected media, unless they are not technically possible or are disproportionately costly for the benefit obtained.*
- *At least one permanent cleanup action alternative, unless it is not technically possible or is disproportionately costly for the benefit obtained.)*

(Ecology expectations for cleanup (WAC 173-340-370) should also be considered in formulating the alternatives, even though these expectations are not explicit evaluation criterion.)

- **Cleanup Action Objectives** *(These are not required by MTCA, nor are they evaluation criteria under MTCA, but may be helpful in clarifying what the remedy needs to accomplish.)*
- **Alternative 1** *(Describe: actions, costs and schedule, other considerations such as habitat, land use)*
- **Alternatives 2, 3, 4, etc.**

V. DETAILED EVALUATION OF ALTERNATIVES

(Best put into tabular format with numerical values for weighting criteria, important to have figure showing cost versus environment benefit for disproportionate cost analysis.)

*(A cleanup action must meet these minimum requirements [WAC 173-340-360(2) (a)] :
Threshold requirements*

- *Protect human health and the environment*
- *Comply with cleanup standards*
- *Comply with applicable state and federal laws*
- *Provide for compliance monitoring*

Other requirements

- *Use permanent solutions to the maximum extent practicable*
- *Provide for a reasonable restoration time frame*
- *Consider public concerns*

Project-specific requirements

- *Engineering criteria established for the specific project, as appropriate)*

- **Comparison with Threshold Criteria** *(Determine if alternatives meet threshold requirements. Only alternatives that meet these requirements advance to the next stage of comparison)*
- **Comparison with "Use Permanent Solutions to the Maximum Extent Practicable" (PMEP) Criterion** *(Ecology prefers permanent solutions, which are essentially those in which cleanup standards can be met without further action at the site.)*

Determining PMEP – Disproportionate Cost Analysis (DCA) *(this is the method to determine the most practicable permanent solution, or to demonstrate the cleanup action is a permanent solution to the maximum extent practicable. In practice the analysis compares costs and benefits and allows selection of an alternative that provides the greatest relative benefit at least cost.)*

Test

"Costs are disproportionate to benefits if the incremental costs of the alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by the alternative over that of the other lower cost alternative." WAC 173340-360 (3)(e)(i)

Procedure

- A. *The alternatives are compared with the evaluation criteria listed below. The comparison may be quantitative or qualitative and require the use of best professional judgment. **However, at this time Ecology's northwest regional office favors a quantitative analysis. Quantitative factors should be applied to both weighting of the evaluation criteria and to the ranking of alternatives for each criterion. The basis for the criteria weighting and the alternative rankings should be clearly explained and supported.** An example table showing weighting factors and rankings is attached at the end of this document.*
- B. *The most practicable permanent alternative is the baseline against which other alternatives are compared. The results of the comparison are best displayed in a graph which shows relative environmental benefit on one axis and cost on another. An example is attached at the end of this document.*

Evaluation Criteria

(following are the required comparison criteria for the DCA. Cost is not listed since it is an obvious criterion)

Protectiveness

Permanence

Effectiveness over the long term

Management of short-term risks

Technical and administrative implementability

Consideration of public concerns

(for VCP sites, there is no direct opportunity for the public to comment on planned cleanup actions. However, information is available to public on the Ecology website regarding the multi-site pilot project, and the public could comment on any planned actions)

(A more complete definition of each of these criteria is in WAC 173-340-360(3)(f))

- **Comparison with "Reasonable Restoration Time Frame" Criterion** *(this criterion requires that a cleanup action be completed within a reasonable amount of time – WAC 173-340-360(4). By completed, MTCA means cleanup levels have been met at the point of compliance. Making a restoration time frame longer is not allowed when there are practicable actions available that can reduce the amount of time.*

Factors to use determining whether the time frame is reasonable

(the following basic factors are outlined in MTCA. There are also special provisions for specific situations in Section -360. Ecology prefers immediate cleanups, but sometimes accepts up to 5 years for good cause. Anything beyond this needs an extremely persuasive analysis)

Potential Risk

(how risky is the existing situation based on type, extent and toxicity of contamination, and sensitivity of surrounding land uses now and in the future.)

Practicality of Achieving Shorter Time Frame

Availability of Alternate Water Supplies

(if impact on a local water supply is a major issue, this factor would need to be specifically considered)

Likely Effectiveness and Reliability of Institutional Controls

(this factor would only need to be considered where contaminants are being left in place as part of a final cleanup)

Ability to Control and Monitor Contaminant Migration

(how sure can we be sure about contaminant movement over time)

Potential for Contaminant Degradation Over time

(can we be sure the contaminants will degrade based on evidence from other sites)

VI. CONCLUSIONS

(focus in this section on the results of the analysis and the consequent proposed cleanup action)

VI. REFERENCES

APPENDICES

- Alternative Cost Estimates

DCA Outline - Not intended to replace MTCA's specific requirements as presented in WAC 173-340-350, and associated sections.
5/27/2009

Disproportionate Cost Analysis (DCA) Outline

The following annotated outline is a schematic of elements to be included in the disproportionate cost analysis portion of a feasibility study (FS). It is not intended to replace MTCA's specific requirements as presented in WAC 173-340-350, and associated sections. Annotations are denoted by italicized parenthesis.

The main purpose of this outline is to:

- Clarify the requirements of the portion of an FS commonly known as the disproportionate cost analysis (DCA).

NOTE: Note that a DCA need not be done if a cleanup involving complete removal is already being planned.

I. SELECTION AND DESCRIPTION OF CLEANUP ALTERNATIVES

(This is where distinct alternatives are established and described only – no comparison. Some text is useful but the bulk of the description is best put into a table with accompanying figures.)

MTCA requires:

- A reasonable number and type of alternatives
 - Alternatives that protect human health and the environment by eliminating, reducing, or controlling risks.
 - Alternatives that have the standard point of compliance for all affected media, unless that are not technically possible or are disproportionately costly for the benefit obtained.
 - At least one permanent cleanup alternative, unless it is not technically possible or is disproportionately costly for the benefit obtained.
- **Cleanup Action Objectives** *(These are not required by MTCA nor are they evaluation criteria under MTCA, but may be helpful in clarifying what the remedy needs to accomplish)*
 - **Alternative 1** *(Describe: actions, cost and schedule, other considerations such as habitat, land use.)*
 - **Alternative 2, 3, 4 etc.**

II. DETAILED EVALUATION OF ALTERNATIVES

(Best put into tabular format with numerical values for weighting criteria, important to have figure showing cost versus environmental benefit for disproportionate cost analysis)

A. Applicable criteria *(A cleanup action must meet the following minimum requirements [WAC 173-340-360(2)(a)], the project engineer may also establish project-specific requirements:*

Threshold requirements

- *Protect human health and the environment*
- *Comply with cleanup standards*
- *Comply with applicable state and federal laws*
- *Provide for compliance monitoring*

Other requirements

- *Use permanent solutions to the maximum extent practicable*
- *Provide for a reasonable restoration time frame*
- *Consider public concerns*

Project-Specific requirements

- *Engineering criteria established for the specific project, as appropriate)*

B. Comparison with Threshold Criteria *(Determine if alternatives meet threshold requirements)*

5/27/2009

- C. **Comparison with Other MTCA Requirements** (Only alternatives that meet the threshold requirements are advanced to the next stage of comparison)
- D. **Use Permanent Solutions to the Maximum Extent Practicable (PMEP)** (A "permanent cleanup action" is an action in which cleanup standards can be met without further action being required at the site being cleaned up or any other site involved with the cleanup action, other than the approved disposal of any residue from the treatment of hazardous substances.)

– *Determining PMEP - Disproportionate Cost Analysis (DCA)*

Test: Costs are disproportionate to benefits if the incremental costs of the alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by the alternative over that of the other lower cost alternative.

DCA PROCEDURE

- A. The alternatives evaluated in the DCA shall be ranked from most to least permanent.
- B. The most practicable permanent solution evaluated shall be the baseline against which other alternatives are compared.
- C. The comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment. In particular, the department has the discretion to favor or disfavor qualitative benefits and use that information in selecting a cleanup action.

Evaluation Criteria for DCA (WAC173-340-360(3))

The following criteria shall be used to evaluate and compare each cleanup action alternative when conducting a disproportionate cost analysis to determine whether a cleanup action is permanent to the maximum extent practicable.

1. Protectiveness

Overall protectiveness of human health and the environment.

2. Permanence

The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances.

3. Cost

The cost to implement the alternative.

4. Effectiveness over the long term

The following types of cleanup action components may be used as a guide, in descending order, when assessing the relative degree of long-term effectiveness:

- Reuse or recycling;
- destruction or detoxification;
- immobilization or solidification;
- on-site or offsite disposal in an engineered, lined and monitored facility;
- on-site isolation or containment with attendant engineering controls;
- and

- institutional controls and monitoring.

5. Management of short-term risks

The risk to human health and the environment associated with the alternative during construction and implementation.

6. Technical and administrative implementability

Ability to be implemented including consideration of whether the alternative is technically possible.

7. Consideration of public concerns

Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns.

A more complete definition of each of these criteria is in WAC 173-340-360(3)(f)

III. CONCLUSIONS (*The conclusion section analyzes results from the evaluation and makes recommendations based on those evaluations.*)

The following is an example of a Disproportionate Cost Analysis (DCA) that has been submitted to Ecology. The FS that this DCA is a component of has not been approved or denied, it is still being evaluated. This example does include the key elements of a FS w/DCA that are identified in WAC 173-340-360.

The key elements are:

- An evaluation of alternatives to the threshold requirements in WAC 173-340-360(2)(a)
- An evaluation of alternatives to the 7 criteria in WAC 173-340-360(3)(f)

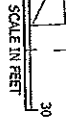
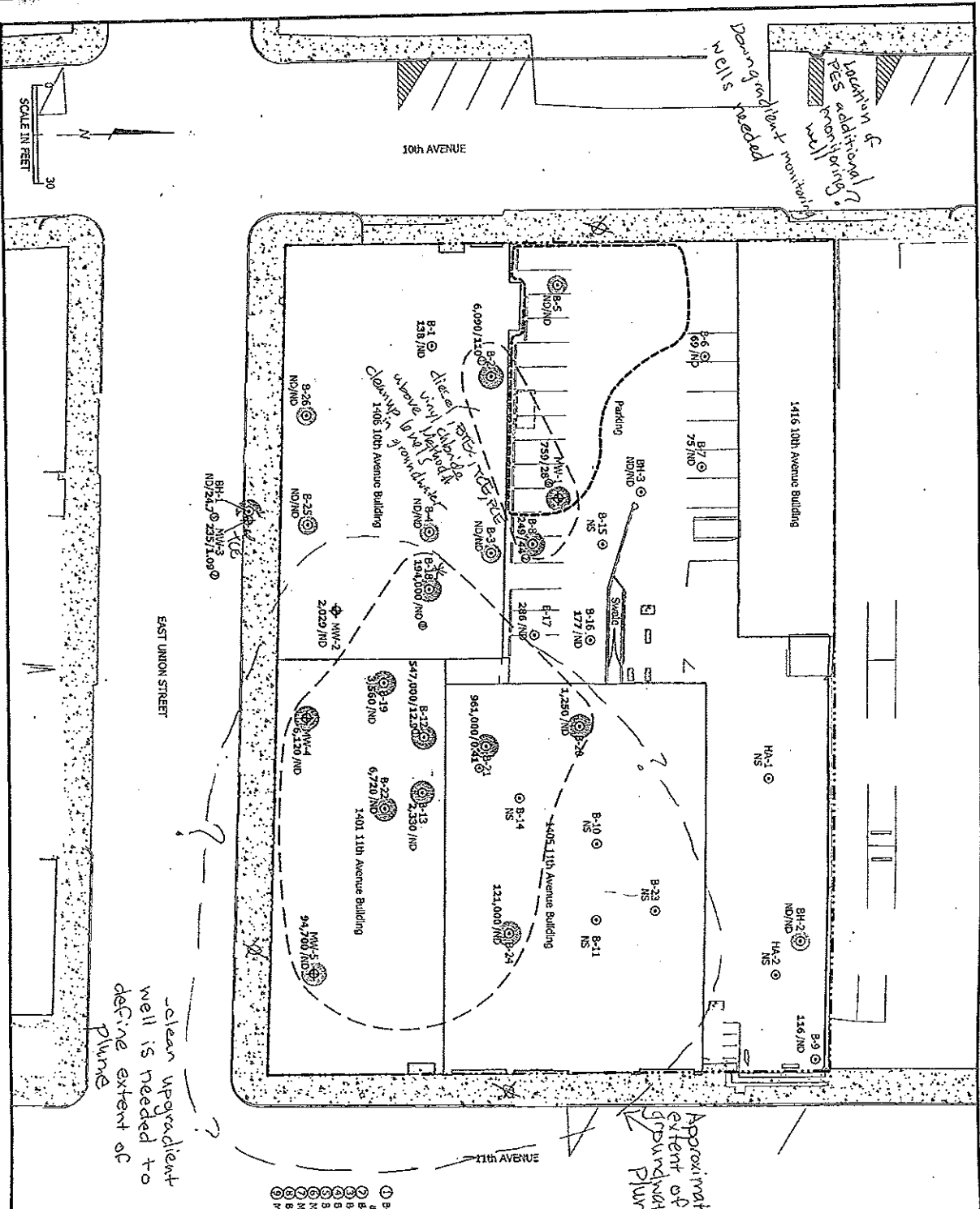
NOTE: Note that a FS is used to identify, and compare to, the alternative that is permanent to the maximum extent practicable (PMEP). The weighting factors that are used in this example were identified by the client/consultant. The weighting factor for permanence and the ranking values would be rigorously examined and would need to reflect this requirement.

DCA Outline - Not intended to replace MTCA's specific requirements as presented in WAC 173-340-350, and associated sections.

5/27/2009

Example of DCA portion of FS

Table 1. Detailed Evaluation of Alternatives and Applied Technologies			
Alternative Number	Alternative 1	Alternative 2	Alternative 3
Description, and Ranking	Soil Containment, Incidental Excavation, Off-Site Disposal, and Institutional Controls	Soil Containment, Partial Excavation, Off-Site Disposal, and Institutional Controls	Excavation, Off-Site Transport, and Disposal Area of Containment (sq ft)
Area of Containment (sq ft)	31,500	29,000	0
Volume of Soil Removal (cy)	100	400	2,500
Overall Alternative Ranking	7	7.8	8.5
Compliance with MTCA Threshold Criteria			
Protection of Human Health and the Environment	Yes – Alternative will protect human health and the environment.	Yes – Alternative will protect human health and the environment.	Yes – Alternative will protect human health and the environment.
Compliance with Cleanup Standards	Yes – Active remedial measures (removal and containment) are used for soils not complying with cleanup standards.	Yes – Active remedial measures (removal and containment) are used for soils not complying with cleanup standards.	Yes – Active remedial measure (removal) is used for soils not complying with cleanup standards.
Compliance with Applicable State and Federal Laws	Yes – Alternative complies with applicable laws.	Yes – Alternative complies with applicable laws.	Yes – Alternative complies with applicable laws.
Provision for Compliance Monitoring	Yes – Alternative includes provisions for compliance monitoring (i.e., compliance soil sampling during removal and long-term groundwater monitoring).	Yes – Alternative includes provisions for compliance monitoring (i.e., compliance soil sampling during removal and long-term groundwater monitoring).	Yes – Alternative includes provisions for compliance monitoring (i.e., compliance soil sampling during removal).
Restoration Time Frame	Restoration time frame is 1 to 2 years for design and construction. Long-term monitoring of 5 years or more may be required to ensure compliance.	Restoration time frame is 1 to 2 years for design and construction. Long-term monitoring of 5 years or more may be required to ensure compliance.	Restoration time frame is 1 to 2 years for design and construction.
Evaluation Criteria			
Protectiveness (30% Weighted Factor):	This alternative will achieve overall protection (7).	This alternative will achieve overall protection (8).	This alternative will be most protective for the Site (9).
Permanence (20% Weighted Factor):	Impacted soils are contained. Some incidental removal of impacted soils required for road construction. This alternative is not as permanent as Alternatives 2 or 3 (7).	Alternative reduces the volume of impacted material by removal of most impacted soils. Remaining impacted soils are contained (8).	Alternative reduces the volume of impacted material by completely removing, to greatest degree technically feasible, impacted surface and subsurface soils throughout the Site (9).
Long-Term Effectiveness (20% Weighted Factor):	Alternative makes most use of containment, with some removal and off-site disposal (7).	Alternative makes use of partial removal and off-site disposal, with containment for the remaining area (8).	Alternative makes greatest use of removal and off-site disposal (9).
Short-Term Risk Management (10% Weighted Factor):	Less disturbance of impacted soils, effective short-term (8).	More disturbance of impacted soils, less effective short-term (7).	Most disturbance of impacted soils, least effective short-term (6).
Implementability (10% Weighted Factor):	Most Implementable; it may require temporary access restrictions during excavation. Access restrictions will be required over the entire Site permanently (8).	Implementable; it may require temporary access restrictions during excavation. Access restrictions will be required over the entire Site permanently (8).	Implementable; it may require temporary access restrictions during excavation (7).
Public Concerns (10% Weighted Factor):	Alternative does not remove all impacted soils from Site. May not be desirable due to permanent access restrictions (5).	Alternative does not maximize removal and disposal of impacted soils. Another public concern may be during the excavation activities because of the temporary access restrictions (7).	Alternative maximizes removal and disposal of impacted soils. The only public concern may be during the excavation activities because of the temporary access restrictions (9).
Cost:	\$114,000	\$181,000	\$571,000



Location of PES monitoring well
Down gradient monitoring wells needed

clean up gradient well is needed to define extent of plume

Approximate extent of diesel groundwater plume

- Explanation**
- Approximate Property Boundary
 - MW-1 - Monitoring Well Location
 - B-1 - Previous Environmental Investigation Boring Location
 - Location of former 6,000-gallon Diesel UST (removed 1991)
 - Approximate Limits of 1993 Remedial Excavation
 - Applicable Washington State Department of Ecology Model Toxic Control Act (MTCOA) Method A Cleanup Levels:
 - MTCOA Diesel and Oil = 500 ppb
 - Benzenes = 2 mg/L (200 µg/L)
 - Chlorobenzenes = 1,000 ppb
 - TCE = 5 µg/L
 - VC = 0.2 µg/L
 - PCE = 5 µg/L
 - Naphthalenes = 160 µg/L
 - MTCOA Method A Cleanup Levels
 - * Method reporting 100/ft for TPH-D above

- ① B-2 - Total VOCs detected: Benzene (12.5 µg/L), ethylbenzene (95.8 µg/L), and xylene (1.64 µg/L).
- ② B-8 - Total VOCs detected: TCE (7.74 µg/L); VC (0.49 µg/L); and PCE (85.5 µg/L).
- ③ B-12 - Total VOCs detected: Naphthalene (0.5 µg/L).
- ④ B-21 - Total VOCs detected: VC (0.41 µg/L).
- ⑤ B-11 - Total VOCs detected: TCE (2.47 µg/L).
- ⑥ MW-1 - Total VOCs detected: TCE (7.58 µg/L) and PCE (20.1 µg/L).
- ⑦ MW-3 - Total VOCs detected: TCE (7.08 µg/L) and PCE (20.1 µg/L).
- ⑧ MW-5 - Total VOCs detected: TCE (7.08 µg/L) and PCE (20.1 µg/L).
- ⑨ MW-2 - TPH-heavy Oil also detected at 214 µg/L.

NS - Not Sampled
NA - Not Analyzed
ND - Not Detected
MTCOA Method A Reporting Limit (MRL) = 759/27.6 = Concentration of Total Petroleum Hydrocarbons (TPH)/Total Volatile Organic Compound (VOCs) in micrograms per Liter (µg/L) (2012 Investigation)

TCE = Trichloroethylene
VC = Vinyl Chloride
PCE = Tetrachloroethylene

Bold denotes constituent detected at concentration at or above laboratory method reporting limit (MRL).

X PES proposed monitoring well location

PES Environmental Inc.
Engineering & Environmental Services

Areas Excavated Groundwater Cleanup Levels
Broadstone Capital Hill Property
11th Avenue and East Union Street
Seattle, Washington

1375.001.02.002 1375-001.02.002 CAP 2-5 EAS 3/13
DATE

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