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MEMORANDUM

DATE: January 11, 2001

TO: Al Jacobson, A&B Jacobson, LLC

Boston

FROM: Jeremy Porter and Doug Hillman, Hart Crowser, Inc.

RE: **Groundwater Monitoring Program and Site Closure Plan**
Market Street Property
Seattle, Washington
J-4063-10

Chicago

Denver

This memorandum describes the proposed groundwater monitoring program and site closure plan for the Market Street and Jacobson properties located at 2801 Market Street NW in the Ballard district of Seattle, Washington. The goal of the groundwater monitoring program is to ensure groundwater leaving the site is protective of human health and the environment. The groundwater monitoring program will verify the following:

Fairbanks

- **Wall Performance.** Constituent concentrations in groundwater exiting the iron wall comply with wall performance standards; and

Jersey City

- **Compliance with Remedial Action Objectives.** Constituent concentrations in groundwater at the point of compliance are below cleanup levels.

Juneau

Wall Performance and Compliance Objectives

Wall Performance Standards

Long Beach

Wall performance standards are conservative estimates of the maximum constituent concentrations exiting the iron wall necessary to meet cleanup levels at the point of compliance. In the Cleanup Action Plan, wall performance standards of 100 ug/L for each chlorinated constituent (PCE, TCE, cis-DCE, and VC) were proposed. These concentrations were based on natural attenuation modeling downgradient of the wall. Wall performance to this point indicates that cis-DCE concentrations exiting the west gate are higher than 100 ug/L; however, there is no surface water cleanup level for this compound, and the MTCA Method B groundwater cleanup level (80 ug/L) used in place of a surface water standard is over an order of magnitude higher than the Method B surface water cleanup levels for PCE or VC. Natural attenuation modeling using 1,000 ug/L cis-DCE exiting the wall results in

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constituent concentrations at the point of compliance that are below cleanup levels. Therefore, we propose the following wall performance standards:

Wall performance standards for compounds with surface water criteria:

- **PCE**: 100 ug/L;
- **TCE**: 100 ug/L; and
- **VC**: 100 ug/L.

Wall performance standard for compound with no surface water criterion:

- **Cis-DCE**: 1,000 ug/L.

We propose using wells (IG-2, IG-3, and IG-4) installed in the reactive gates for this monitoring since these provide the most direct measure of wall performance. Wells downgradient of the gates are subject to a lag time in monitoring wall performance.

Cleanup Levels at the Point of Compliance

The following cleanup levels were presented in the Cleanup Action Plan (Hart Crowser, 1999a) for chlorinated compounds:

- Concentrations of the parent compounds, PCE and TCE, should not exceed 4.15 and 55.6 ug/L, respectively, at the point of groundwater discharge to Salmon Bay; and

- Concentrations of the daughter product, VC, should not exceed 2.92 ug/L at the point of groundwater discharge to Salmon Bay.

In addition to these cleanup levels, we propose the following cleanup level for cis-DCE:

- Concentrations of the daughter product, cis-DCE, should not exceed 80 ug/L at the point of groundwater discharge to Salmon Bay.

These compliance standards are based on Washington State Department of Ecology (Ecology) Method B, CLARC II Update (2/28/96) surface water cleanup levels for PCE, TCE, and VC, and groundwater cleanup level for cis-DCE, since there are no surface water standard for cis-DCE. They are consistent with the site screening criteria presented in the Cleanup Action Plan (Hart Crowser, 1999a).

Groundwater Monitoring Program

The groundwater monitoring program should provide periodic monitoring of PCE, TCE, cis-DCE, and VC concentrations in three primary areas: upgradient of the iron wall, within the iron wall, and at the point of compliance by the Ship Canal. In addition, selected wells that monitor potential breakthrough points (around or underneath the iron wall) should also be included in the program to ensure the contaminant plume remains adequately captured by the iron wall. Chemical data from these wells will be subject to wall performance standards. The short-term groundwater monitoring program was outlined in a memo to Ecology dated November 17, 1999 (Hart Crowser, 1999b). Consistent with that memo, we have re-evaluated the monitoring program based on one year of monitoring data.

Currently, 41 wells are monitored monthly for groundwater elevation, and 24 wells are monitored quarterly for chemicals. Results from the first three quarters of the first year of monitoring indicate consistency in both groundwater flow direction and chemical parameters. A proposed schedule for continued monitoring on each property is outlined below. This proposed schedule is based on the results of the first year of monitoring.

- **Second-Year Monitoring.** A reduced set of wells (19) will be monitored quarterly for an additional year for groundwater elevation and chemicals (analyzed for VOCs by EPA Method 8021B).

- **Well Performance Monitoring after the Second Year.** Seven wells evaluating wall performance will be monitored twice a year for the third and fourth years of monitoring. These seven wells will be monitored once a year for the fifth through tenth years of monitoring. After ten years of monitoring, the wall performance monitoring program will be re-evaluated.

- **Compliance Monitoring after the Second Year.** Three wells on the downgradient property will be monitored quarterly during the third year of monitoring. These three wells will be monitored twice a year during the fourth and fifth years of monitoring. One well at the point of compliance will be monitored once a year during the sixth through tenth years of monitoring. After ten years of monitoring, the compliance program will be re-evaluated.

- **Five-Year Ecology Review.** Every five years, after the conclusion of the ten years of groundwater monitoring described above, the seven wells evaluating wall performance and the three wells on the downgradient property will be monitored and the results will be provided to Ecology. This five-year review monitoring will continue every five years for twenty years unless terminated by Ecology.

Site Closure

We propose obtaining a No Further Action (NFA) determination from Ecology for groundwater for the subject properties under the following scenarios:

- **Market Street Property.** A groundwater NFA letter will be issued after one year of quarterly monitoring data indicate wall performance standards are being met.

- **Jacobson Property.** A groundwater NFA letter will be issued after one year of quarterly monitoring data indicate cleanup levels at the point of compliance are met without supplemental treatment between the wall and point of compliance.

A sample schedule describing the monitoring plan outlined above, which assumes a groundwater NFA for the Market Street Property is issued during the second year and a groundwater NFA for the Jacobson Property is issued during the third year, is presented in Table 1. The wells proposed for performance and compliance monitoring are listed in Table 1 in bold.

If groundwater NFAs are not issued as assumed for Table 1, groundwater monitoring will be performed as follows:

- **Performance and Compliance Monitoring before a Groundwater NFA is Issued.** If results from the second year of monitoring do not meet site closure requirements for one or both properties, quarterly monitoring of the wells on that property will continue. If a consistent downward trend in constituent concentrations is observed after four consecutive quarters of monitoring, but concentrations still exceed site closure requirements, performance monitoring of ten wells, twice a year, will be performed.

- **Performance Monitoring after a Groundwater NFA Has Been Issued.** Performance monitoring on each property will continue after issuance of an NFA. Performance monitoring will consist of monitoring eight wells twice a year for two years. If concentrations are seasonally stable, after two years the same eight wells will be monitored annually until 10 years after wall installation. After 10 years, the performance monitoring program will be re-evaluated.

If either wall performance or compliance standards are exceeded in two consecutive monitoring events, and a downward trend in constituent concentrations is not evident, additional action will need to be considered. This could occur under the following circumstances:

- **Wall Performance Standards are Exceeded but Compliance Standards are Met.** In this case, additional natural attenuation investigation and modeling may be appropriate if required by Ecology. If updated natural attenuation modeling indicates that measured wall performance is adequate and compliance standards continue to be met, wall performance standards may be adjusted.

- **Wall Performance Standards are Met but Compliance Standards are Exceeded.** In this case, downgradient treatment via ORC injection or other appropriate technology may be required by Ecology until compliance standards are met. Constituent concentrations at the point of compliance may drop gradually because the slow rate of groundwater flow will slowly flush out contaminants present downgradient of the iron wall.

- **Both Wall Performance and Compliance Standards are Exceeded.** In this case, Ecology may require downgradient treatment as an interim action while wall maintenance is performed. Wall maintenance may involve mixing the iron/sand gates, replacing the iron, or constructing new slurry wall or treatment gate sections.

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Attachments:
References
Table 1 - Proposed Long-Term Monitoring Plan

REFERENCES

Hart Crowser, 1999a. Cleanup Action Plan, Market Street Property. Prepared for A&B Jacobson, LLC. June 22, 1999.

Hart Crowser, 1999b. Proposed Groundwater Monitoring, Market Street Site Iron Wall. Memorandum to Norm Peck, Washington State Department of Ecology, November 17, 1999.

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