

Health Consultation

Technical Document Review

**Draft Site Wide Feasibility Study Report
Philip Services Corporation – Georgetown Facility
Seattle, King County, Washington**

January 20, 2006

Prepared by

**The Washington State Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry**



Foreword

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of a health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. Health consultations focus on specific health issues so that DOH can respond to requests from concerned residents or agencies for health information on hazardous substances. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health. The findings in this report are relevant to conditions at the site during the time of this health consultation, and should not necessarily be relied upon if site conditions or land use changes in the future.

For additional information or questions regarding DOH or the contents of this health consultation, please call the health advisor who prepared this document:

Barbara Trejo
Washington State Department of Health
Office of Environmental Health Assessments
P.O. Box 47846
Olympia, WA 98504-7846
(360) 236-3373
FAX (360) 236-3383
1-877-485-7316
Web site: www.doh.wa.gov/consults

For more information about ATSDR, contact the ATSDR Information Center at 1-888-422-8737 or visit the agency's Web site: www.atsdr.cdc.gov/.

Summary and Statement of Issues

This health consultation report summarizes the Washington Department of Health (DOH) concerns and recommendations regarding the September 2005, Philip Services Corporation (PSC) *Draft Site Wide Feasibility Study Report* (SWFS), *PSC Georgetown*.¹ The SWFS is being conducted under the Washington State Department of Ecology (Ecology) oversight pursuant to the Model Toxics Control Act (MTCA) cleanup regulation (Chapter 173-340 WAC). DOH's objective in reviewing the SWFS was to determine whether human health issues were adequately addressed during SWFS and whether PSC's preferred remedies for addressing the site contamination are protective of human health. DOH's concerns and recommendations regarding the SWFS report were initially sent to Ecology in a letter on October 20, 2005 (Appendix A). DOH conducts health consultations in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR).

Background

The PSC facility is located at 734 South Lucile Street in the Georgetown community of Seattle, King County, Washington. Various companies have operated at this property from at least the mid-1930s, the last being PSC. Contaminants, including volatile organic compounds, have been detected in soils on and immediately adjacent to the PSC property and groundwater on and downgradient of the PSC property.²

Groundwater generally flows from the PSC facility to the west/southwest toward the Duwamish River. A portion of the Georgetown community overlies this contaminated groundwater, which poses a potential threat to indoor air quality. Land use in the Georgetown community near and downgradient of the PSC facility is mixed residential, commercial, and industrial.

PSC installed a subsurface hydraulic barrier wall and groundwater recovery system as an interim cleanup measure in early 2004. The system is designed to contain contaminated groundwater at the PSC facility and portions of some nearby property where high levels of contaminants, including dense non-aqueous liquids (DNAPLs), were detected in soil and groundwater. PSC is currently monitoring the barrier wall and groundwater recovery system to confirm that it is working as designed. PSC also took interim measures in the nearby Georgetown community by installing soil vapor vacuum systems in some buildings where groundwater appeared to pose a threat to indoor air quality. These installations are generally referred to as inhalation pathway interim measures (IPIMs). PSC maintains and periodically monitors these soil vapor vacuum systems to ensure that the systems are operating as designed.

The PSC SWFS was conducted to begin identifying final remedial alternatives for a portion of the site and selecting a preferred remedy. Final decisions about the remedial alternatives used to cleanup the site are made by Ecology.

Discussion

The draft SWFS study focuses on two areas of the PSC site: the hydraulic control interim measure (HCIM) Area and the Outside Area. The HCIM Area includes the PSC property and

portions of some adjacent properties that are enclosed by the subsurface barrier wall. The Outside Area includes the area outside of the barrier wall extending to 4th Avenue South where PSC contaminants have been identified in groundwater. Some contaminated soils that appear to potentially be associated with the PSC facility also exist in the Outside Area. However, it appears that most of those soils do not extend far beyond the barrier wall.

PSC proposes passive hydraulic containment as the final remedy for the HCIM Area. The main elements of this approach consists of maintaining the existing low permeability subsurface barrier wall to contain contaminated groundwater, completion of site capping to prevent direct contact with soils/dust and limit infiltration of rain water, limiting vapor intrusion into future structures, and institutional controls. Currently, it appears that only a small amount of contaminated groundwater is migrating across the barrier wall. PSC proposes to continue using the existing groundwater recovery system, which produces an inward hydraulic gradient, to minimize the loss of contaminants through the barrier wall until such time that it can demonstrate that pumping is no longer necessary to contain contaminated groundwater. PSC also proposes to continue groundwater monitoring outside of the wall to confirm that the barrier continues to contain the contaminated groundwater. These all seem like reasonable measure that will help reduce or eliminate potential human exposure to soil and groundwater contaminants associated with the HCIM Area.

PSC claims that the barrier wall is also effectively containing contaminated soil gas. However, there is no data to support this claim. DOH considers soil gas migrating through the barrier wall as a potential exposure pathway if the soil gas migrates some distance beyond the barrier wall. Further discussion and recommendations regarding this soil gas issue are included in the comments below.

DOH has a number of concerns regarding PSC's remedial alternatives evaluation and preferred remedy for the Outside Area. PSC did not conduct a detailed evaluation of remedial alternatives for soils outside the wall and only considered natural attenuation or remedies that supported natural attenuation during its detailed remedial alternatives evaluation. Natural attenuation is one of many options for addressing contaminated groundwater at the site and should not preclude evaluation of other viable options. In addition, the groundwater conditional point of compliance (CPOC) selected by PSC does not appear protective for the groundwater to indoor air pathway. Further discussion and recommendations regarding these issues are included below.

General Comment/Recommendation

The SWFS was limited to evaluating remedial alternatives for the contamination found on the PSC property and the area extending from the PSC property to 4th Avenue South where PSC contaminants have been identified. Contaminated groundwater associated with the PSC facility is also found between 4th Avenue South and the Duwamish River but this area was not addressed by PSC in the SWFS because it appears that other facilities might be contributing contaminants to groundwater in this area, creating a co-mingled plume.

The co-mingled plume, which does not appear to be well characterized, contains the highest trichloroethylene (TCE) and cis-1,2-dichloroethene (cis-1,2-DCE) levels found at the water table

downgradient of the PSC facility (see Figures 4-3 and Figures 4-6) and these levels exceed groundwater cleanup levels that are intended to be protective of indoor air (see Table 3-2). Levels of vinyl chloride also are found in groundwater between 4th Avenue South and the Duwamish River that exceed cleanup levels (see Figure 4-9 and Table 3-2). No information is provided about other chemicals. However, it is possible that other chemicals could also be posing a possible health risk in the co-mingled plume area. No information is provided in the SWFS report to indicate if additional characterization is planned, when the feasibility study (FS) for the co-mingled plume area will be conducted, or whether the area poses any short-term health risks to nearby community.

Recommendation – Information should be added to the report indicating whether any interim measures (e.g., further plume characterization, indoor air sampling to evaluate potential health risks) will be conducted in the co-mingled plume area. The timeframe for conducting a FS for the co-mingled plume area should also be added to the report.

Specific Comments/Recommendations

1. **Section 3.2, Groundwater Cleanup Levels** – The SWFS report indicates that the final RI groundwater cleanup levels protective of the surface water pathway (i.e., Duwamish River) were calculated based on an Asian Pacific Island (API) exposure scenario for the consumption of fish. Tribal fishing also occurs along the Duwamish River. However, there is no mention of this fact or mention of tribal consumption rates.

Recommendation – Some discussion about tribal consumption rates and whether the groundwater to surface water cleanup levels will be protective of tribal members that consume fish from the Duwamish River should be added to the report. If API consumption rates are not protective of tribes then cleanup levels should be recalculated.

2. **Section 3.2.1, HCIM Area Groundwater Cleanup Levels** – This section of the report claims that the groundwater to surface water pathway is not complete since the HCIM area is contained. However, PSC does not appear to take into account that a plume of contaminated groundwater exists beyond the barrier wall that poses a potential threat to surface water.

Recommendation - The FS report should be revised to accurately reflect that the condition of the groundwater to surface water pathway.

3. **Section 3.2.2, Outside Area Groundwater Cleanup Levels** - PSC states that “As long as the inhalation pathway is being addressed by the inhalation pathway interim measures (IPIMs), the only remaining pathway to address is the groundwater to surface water pathway.” DOH understood that IPIMs were intend as interim measures until groundwater cleanup levels are achieved, not a final remedy for addressing groundwater contamination.

Recommendation – PSC should consider remedial alternatives other than existing IPIMs to address contaminated groundwater that poses an indoor air health risk in the Outside Area. IPIMs should be installed where necessary until groundwater cleanup levels protective of indoor air have been achieved.

4. **Section 3.3, Remediation Levels** – The report notes that the IPIMs are addressing the groundwater to indoor air pathway within the SWFS area and no risk to human health exists. This may be true now. However, it is unknown whether this will continue to be the case in the future.

Recommendation – PSC should continue using its IPIM approach until groundwater cleanup levels are met because changes in groundwater concentrations or future changes to buildings could result in increased risks to building occupants.

5. **Section 4.2 Affected Groundwater** –TCE, cis-1,2-DCE, and vinyl chloride (VC) are listed as the key indicator chemicals of concern (COC) for the Outside Area but in section 4.2.1.4 TCE, VC, and 1,4-dioxane are listed as the COCs.

Recommendation – A consistent list of indicator COCs should be presented in the report.

6. **Section 4.2.1.4, Selection of Indicator COCs** - The criteria that PSC used to select indicator chemicals is not consistent with criteria presented in the Model Toxics Control Act (MTCA) cleanup regulation (WAC 173-340-703), which could result in the inappropriate selection of indicator COCs, leading to possible human exposures to contaminants.

Recommendation –PSC should comply with the regulation to reduce the possibility of the human exposures to site contaminants.

7. **Section 5.2.2, Point of Compliance** – PSC proposes to establish a conditional point of compliance (CPOC) for all groundwaters along the west side of Denver Avenue South rather than using the standard Ecology point of compliance, which is throughout the groundwater. However, this would not be appropriate given that the groundwater to indoor air pathway is a potential exposure pathway in the Outside Area.

Recommendation –Ecology should consider establishing the groundwater POC for the water table throughout the site to protect human health via the indoor air pathway.

8. **Section 5.2.2, Point of Compliance** – The report states that “groundwater cleanup action alternatives, therefore, will be designed to attain remediation levels (based on protection of surface water) and cleanup levels (based primarily on protection of surface water and, for shallow groundwater, indoor air) at the proposed CPOC.” However, contaminated groundwater above cleanup levels already exists beyond the CPOC and needs to be addressed.

Recommendation – Groundwater cleanup alternatives should be considered for all areas where groundwater cleanup levels are exceeded.

9. **Section 6.2, Groundwater Remediation Technologies** – PSC has identified chemical oxidation as a groundwater remediation technology that can be an effective measure for cleaning up groundwater contaminated with chlorinated compounds like TCE but screened

out this technology for limited and unsupported reasons (e.g., chemical oxidization was not cost effective but providing no information to support that claim).

Recommendation – PSC should retain chemical oxidation as a potential groundwater remedial action for further evaluation.

10. **Section 6.5 Technology Screening Criteria** - Natural attenuation is one of many remedial options for addressing contaminants in soil and groundwater below the site. However, PSC has set up its technology screening evaluation to select cleanup options that support and build on natural attenuation only, although natural attenuation might not be the best long-term approach for this site.

Recommendation – A technology’s impact on natural attenuation should not be used during the initial screening of the remedial technologies.

11. **Section 6.6, Technology Screening and Review of Retained Technologies** – The expected life of the barrier wall is not provided in the SWFS report. However, at some point in the future, it will likely begin failing. If soil and groundwater are being cleaned up behind the barrier wall rather than just contained, then contaminants in these media might not pose a health risk in the future when the wall begins to fail. However if soil and groundwater inside the barrier are not cleaned up and the wall begins to fail, contaminants could migrate outside the wall, creating a potential health risk.

Recommendation – The expected life of the barrier wall should be a factor that is considered when evaluating remedial alternatives for the site and determining whether remedial measures should be taken in soils and groundwater behind the barrier wall.

12. **Section 6.6, Technology Screening and Review of Retained Technologies** - PSC has identified a number of remedial options but has rejected a number of them because they cannot treat all site contaminants. However, some of these options might be successful in reducing soil and/or groundwater contaminant levels if combined with other alternatives.

Recommendation – DOH recommends that treatment options that can be grouped with other treatment options to reduce or eliminate site contaminants be retained and further evaluated.

13. **Section 8.1, HCIM Remedial Alternatives** – Understanding whether the levels of contaminants in soil gas and groundwater behind the barrier wall are changing is important when conducting long-term monitoring during remediation. However, PSC has not included either soil gas or groundwater monitoring within the HCIM Area in either of the alternatives it evaluated.

Recommendation – Soil gas probes and groundwater monitoring wells should be monitored inside the barrier wall as part of the remedy for the HCIM Area.

14. **Section 8.3.2 Preferred HCIM Remedial Alternatives** –The draft SWFS report indicates that the permeability of the barrier wall is approximately 10^{-8} cm/sec and as a result acts as a

hydraulic containment system for groundwater and soil vapors. PSC conducts groundwater monitoring inside and outside of the barrier wall to demonstrate the ability of the barrier wall to contain contaminated groundwater. However, PSC provides no evidence to demonstrate that the barrier wall is containing soil vapors other than noting in Section 4.6.1 that the barrier wall is made up of material that is unlikely to crack (i.e., cement and highly plastic clay), even being resistant to desiccation cracks like those typical of concrete. This information, however, contradicts photographs of the barrier wall taken by PSC during the barrier wall installation, which show evidence of significant desiccation cracking near the surface of the barrier wall. This suggests that the barrier wall could be a potential preferential pathway for soil gas to migrate from the inside to the outside of the barrier wall in the vadose zone where it could affect indoor air quality in nearby structures and/or soil gas contaminant levels along nearby utility corridors. The contaminants levels in groundwater outside of the barrier wall might also be affected if the soil gas levels are high enough.

Recommendation –PSC should install and monitor some soil gas probes in the vadose zone, inside and outside of the barrier wall to determine whether soil gas is moving beyond the barrier wall posing a potential health risk to the nearby community.

15. **Section 9.0, Development and Evaluation of Remedial Alternatives: Outside Area** – PSC notes that contaminated soils outside the barrier wall, on non-PSC property, are not considered significant for the SWFS because they are of the limited volume and capped with pavement. Workers at these locations, however, could potentially be exposed to this contaminated soil if the pavement is removed.

Recommendation –Contaminated soils outside the barrier wall if left in place below pavement should be addressed, using, at a minimum, institutional controls to prevent possible exposure.

16. **Section 9.1, Outside Area Remedial Alternatives** – PSC suggests that the remedial alternative for addressing the vapor intrusion pathway in the Outside Area continue to be the IPIM. However, there are no specifics provided in the SWFS report to indicate whether PSC only intends to maintain and monitor the existing soil vapor vacuum systems installed at some of the buildings or continue following all the steps laid out in its IPIM approach in addition to maintaining and monitoring existing systems.

Recommendation –PSC should continue to implement all the steps included in its IPIM approach (e.g., continue groundwater monitoring, comparison of contaminant levels with screening values). The recommendation made by DOH regarding the IPIM approach in its August 9, 2005, health consultation report should be incorporated, as appropriate, in the IPIM approach.

17. **Section 9.1, Outside Area Remedial Alternatives** – Monitored natural attenuation (MNA) or MNA with enhanced anaerobic bioremediation of hotspots immediately downgradient of the HCIM Area the two alternatives selected by PSC for Outside Area. No alternatives other than natural attenuation and maintaining the IPIMs are proposed downgradient of the proposed CPOC.

Recommendation – Alternatives, other than MNA, should be evaluated for the area between the CPOC and 4th Avenue South to see if cleanup levels can be achieved in this area in a shorter time frame, thereby reducing the length of time the groundwater poses a potential indoor air health risk to the community.

18. **Section 9.1.1, Alternative OA-1: Monitored Natural Attenuation** – PSC reports that groundwater monitoring would be conducted at the CPOC and downgradient of its proposed CPOC as part of this alternative. It should be noted, however, that the wells selected for the monitoring downgradient of the CPOC (see Figure 9-2) would not allow for a determination of the lateral extent of the plume.

Recommendation – Additional monitoring wells should be added to this proposed monitoring well network so the lateral extent of contaminants at the water table can be established.

19. **Section 9.1.1, Alternative OA-1: Monitored Natural Attenuation** – PSC proposes conducting long-term groundwater monitoring for 30 years. However, groundwater cleanup protective of surface water, which exceeds the level for protection of indoor air, is not expected to be achieved for 50 to 60 years at the CPOC.

Recommendation – Groundwater monitoring should be conducted until cleanup levels protective of human health (surface water and indoor air) are achieved throughout the site.

20. **Section 9.1.1, Alternative OA-1: Monitored Natural Attenuation (MNA)** – PSC notes that one of the institutional or administrative controls needed for the proposed MNA remedial alternative is limiting withdrawal and use of groundwater. PSC plans to use an existing City of Seattle bylaw to prevent groundwater withdrawal and use, which is not unreasonable. However, PSC does not indicate that they will be contacting the City of Seattle regarding this administrative control, which could pose a health problem; in the future, if the City of Seattle decides to change this bylaw and allow the groundwater to be withdrawn and used.

Recommendation – The City of Seattle should be notified about the above proposed administrative control to prevent any possible future exposures.

21. **Section 9.1.1, Alternative OA-1: Monitored Natural Attenuation (MNA)** - PSC proposes no institutional or administrative controls to ensure that building owners/occupants underlain by the plume understand that changes to their building could result in groundwater contaminants migrating into indoor air.

Recommendation – PSC should include ongoing community education regarding the groundwater to indoor air pathway and potential indoor air health risks that could result if modifications to buildings occur. In addition, an Ecology contact name should be provided to the community so they know who to contact if they intend to make modification to the buildings that could increase their potential exposure to groundwater contaminants via indoor air.

22. **Section 9.2.5, Management of Short-Term Risks** – PSC notes, for the first time, in this section that enhanced anaerobic biodegradation could create methane in the subsurface, possibly causing fire hazards. It is unclear how much of threat this actually poses because no additional information is provided.

Recommendation – If methane generation is a real risk associated with enhanced anaerobic biodegradation (e.g. fire, explosion), additional information should be provided in the report addressing this issue. Measures to reduce those risks, if they exist, should also be mentioned.

Children’s Health Concerns

Children could potentially be exposed to groundwater contaminants associated with the PSC site via the indoor air pathway. Children can be uniquely vulnerable to the hazardous effects of environmental contaminants. When compared to adults, pound for pound of body weight, children breathe more air. These facts lead to an increased exposure to contaminants. Additionally, the fetus is highly sensitive to many chemicals, particularly with respect to potential impacts on childhood development. For these reasons, DOH considers the specific impacts that contaminated media and cleanup alternatives might have on children, as well as other sensitive populations.

Conclusions

The PSC draft SWFS report provides a summary of the remedial alternatives evaluation and a preferred remedy for cleanup of contaminated soil and groundwater associated with a portion of the PSC site. During its review, DOH identified issues and concerns that need to be addressed to ensure that remedies protective of human health are evaluated and implemented at the PSC facility and the portion of the Georgetown community underlain by contaminated groundwater.

Recommendations

Recommendations regarding the SWFS for the PSC site are summarized in the discussion section above.

Public Health Action Plan

1. DOH is available to review future versions of the SWFS report.
2. DOH will post this health consultation report on its web site to make it available to the general public.

Preparer of Report

Barbara Trejo
Washington State Department of Health
Office of Environmental Health Assessments
Site Assessment Section

Designated Reviewer

Wayne Clifford, Manager
Site Assessment Section
Office of Environmental Health Assessments
Washington State Department of Health

ATSDR Technical Project Officer

Alan Parham
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

References

- 1 Geomatrix Consultants, Inc. Draft site wide feasibility study report. Seattle, Washington: Geomatrix Consultants, Inc. September 2005.
- 2 Philip Services Corporation. Final comprehensive remedial investigation report. Renton, Washington: Philip Services Corporation. November 14, 2003

Appendix A

October 20, 2005 Letter

Draft Site Wide Feasibility Study Report
Philip Services Corporation – Georgetown Facility
Seattle, King County, Washington

October 20, 2005

Mr. Ed Jones
Washington State Department of Ecology
3190 – 160th Avenue SE
Bellevue, Washington 98008-5452

Dear Ed:

RE: Draft Site Wide Feasibility Study Report
Philip Services Corporation – Georgetown Facility
Seattle, King County, Washington

This letter summarizes the Washington Department of Health (DOH) comments and recommendations regarding the September 2005, Philip Services Corporation (PSC) *Draft Site Wide Feasibility Study Report (SWFS)*, PSC Georgetown. DOH appreciates the opportunity to review and comment on this draft document.

The SWFS study focuses on two areas of the PSC site: the hydraulic control interim measure (HCIM) Area and the Outside Area. The HCIM Area includes the PSC property and portions of some adjacent properties that are enclosed by the subsurface barrier wall that was installed in January 2004. The Outside Area includes the area outside of the barrier wall extending to 4th Avenue South where PSC contaminants have been identified in groundwater. Some contaminated soils that appear to potentially be associated with the PSC facility also exist in the Outside Area. However, it appears that most of those soils do not extend far beyond the barrier wall.

DOH's objective while reviewing the draft SWFS report was to determine whether human health issues were adequately addressed during SWFS and whether PSC's preferred remedies for addressing the site contamination are protective of human health. The SWFS report contains information about biodegradation rates and fate and transport modeling results, which DOH understands were developed with Ecology input, and used when evaluating remedial alternatives for the Outside Area. DOH read through these sections for background information but is relying on Ecology to indicate whether there are issues or concerns with the modeling or development of biodegradation rates.

PSC proposes passive hydraulic containment as the final remedy for the HCIM Area. The main elements of this approach consists of maintaining the existing low permeability subsurface barrier wall to contain contaminated groundwater, completion of site capping to prevent direct contact with soils/dust and limit infiltration of rain water, limiting vapor intrusion into future structures, and institutional controls. Currently, it appears that only a small amount of contaminated groundwater is migrating across the barrier wall. PSC proposes to continue using the existing groundwater recovery system, which produces an inward hydraulic gradient, to minimize the loss of contaminants through the barrier wall until such time that it can demonstrate that pumping is no longer necessary to contain contaminated groundwater. PSC also proposes to continue groundwater monitoring outside of the wall to confirm that the barrier continues to contain the contaminated groundwater. These all seems like reasonable measure that will help reduce or eliminate potential human exposure to soil and groundwater contaminants associated with the HCIM Area.

PSC claims that the barrier wall is also effectively containing contaminated soil gas. However, there is no data to support this claim. DOH considers soil gas migrating through the barrier wall as a potential exposure pathway if the soil gas migrates some distance beyond the barrier wall. Further discussion and recommendations regarding this soil gas issue are included in the comments below.

DOH has a number of concerns regarding PSC's remedial alternatives evaluation and preferred remedy for the Outside Area. PSC did not conduct a detailed evaluation of remedial alternatives for soils outside the wall and only considered natural attenuation or remedies that supported natural attenuation during its detailed remedial alternatives evaluation. Natural attenuation is one of many options for addressing contaminated groundwater at the site and should not preclude evaluation of other viable options. In addition, the groundwater conditional point of compliance (CPOC) selected by PSC does not appear protective for the groundwater to indoor air pathway. Further discussion and recommendations regarding these issues are included below.

General Comment/Recommendation

The SWFS was limited to evaluating remedial alternatives for the contamination found on the PSC property and the area extending from the PSC property to 4th Avenue South where PSC contaminants have been identified. Contaminated groundwater associated with the PSC facility is also found between 4th Avenue South and the Duwamish River but this area was not addressed by PSC in the SWFS because it appears that other facilities might be contributing contaminants to groundwater in this area, creating a co-mingled plume.

The co-mingled plume, which does not appear to be well characterized, contains the highest trichloroethylene (TCE) and cis-1,2-dichloroethene (cis-1,2-DCE) levels found at the water table downgradient of the PSC facility (see Figures 4-3 and Figures 4-6) and these levels exceed groundwater cleanup levels that are intended to be protective of indoor air (see Table 3-2). Levels of vinyl chloride also are found in groundwater between 4th Avenue South and the Duwamish River that exceed cleanup levels (see Figure 4-9 and Table 3-2). No information is provided about other chemicals. However, it is possible that other chemicals could also be posing a possible health risk in the co-mingled plume area. No information is provided in the SWFS

report to indicate if additional characterization is planned, when the feasibility study (FS) for the co-mingled plume area will be conducted, or whether the area poses any short-term health risks to nearby community.

Recommendation –Information should be added to the report indicating whether any interim measures (e.g., further plume characterization, indoor air sampling to evaluate potential health risks) will be conducted in the co-mingled plume area. The timeframe for conducting a FS for the co-mingled plume area should also be added to the report.

Specific Comments/Recommendations

1. **Section 3.2, Groundwater Cleanup Levels** – The SWFS report indicates that the final RI groundwater cleanup levels protective of the surface water pathway (i.e., Duwamish River) were calculated based on an Asian Pacific Island (API) exposure scenario for the consumption of fish. Tribal fishing also occurs along the Duwamish River. However, there is no mention of this fact or mention of tribal consumption rates.

Recommendation – Some discussion about tribal consumption rates and whether the groundwater to surface water cleanup levels will be protective of tribal members that consume fish from the Duwamish River should be added to the report. If API consumption rates are not protective of tribes then cleanup levels should be recalculated.

2. **Section 3.2.1, HCIM Area Groundwater Cleanup Levels** – This section of the report claims that the groundwater to surface water pathway is not complete since the HCIM area is contained. However, PSC does not appear to take into account that a plume of contaminated groundwater exists beyond the barrier wall that poses a potential threat to surface water.

Recommendation - The FS report should be revised to accurately reflect that the condition of the groundwater to surface water pathway.

3. **Section 3.2.2, Outside Area Groundwater Cleanup Levels** - PSC states that “As long as the inhalation pathway is being addressed by IPIMs, the only remaining pathway to address is the groundwater to surface water pathway.” DOH understood that IPIMs were intended as interim measures until groundwater cleanup levels are achieved, not a final remedy for addressing groundwater contamination.

Recommendation – PSC should consider remedial alternatives other than existing IPIMs to address contaminated groundwater that poses an indoor air health risk in the Outside Area. IPIMs should be installed where necessary until groundwater cleanup levels protective of indoor air have been achieved.

4. **Section 3.3, Remediation Levels** – The report notes that the IPIMs are addressing the groundwater to indoor air pathway within the SWFS area and no risk to human health exists. This may be true now. However, it is unknown whether this will continue to be the case in the future.

Recommendation – PSC should continue using its IPIM approach until groundwater cleanup levels are met because changes in groundwater concentrations or future changes to buildings could result in increased risks to building occupants.

5. **Section 4.2 Affected Groundwater** –TCE, cis-1,2-DCE, and vinyl chloride (VC) are listed as the key indicator chemicals of concern (COC) for the Outside Area but in section 4.2.1.4 TCE, VC, and 1,4-dioxane are listed as the COCs.

Recommendation – A consistent list of indicator COCs should be presented in the report.

6. **Section 4.2.1.4, Selection of Indicator COCs** - The criteria that PSC used to select indicator chemicals is not consistent with criteria presented in the Model Toxics Control Act (MTCA) cleanup regulation (WAC 173-340-703), which could result in the inappropriate selection of indicator COCs, leading to possible human exposures to contaminants.

Recommendation –PSC should comply with the regulation to reduce the possibility of the human exposures to site contaminants.

7. **Section 5.2.2, Point of Compliance** – PSC proposes to establish a conditional point of compliance (CPOC) for all groundwaters along the west side of Denver Avenue South rather than throughout the groundwater, which is the standard Ecology point of compliance (POC). However, this would not be appropriate given that the groundwater to indoor air pathway is a potential exposure pathway in the Outside Area.

Recommendation –Ecology should consider establishing the groundwater POC for the water table throughout the site to protect human health via the indoor air pathway.

8. **Section 5.2.2, Point of Compliance** – The report states that “groundwater cleanup action alternatives, therefore, will be designed to attain remediation levels (based on protection of surface water) and cleanup levels (based primarily on protection of surface water and, for shallow groundwater, indoor air) at the proposed CPOC.” However, contaminated groundwater above cleanup levels already exists beyond the CPOC.

Recommendation – Groundwater cleanup alternatives should be considered for all areas where groundwater cleanup levels are exceeded.

9. **Section 6.2, Groundwater Remediation Technologies** – PSC has identified chemical oxidation as a groundwater remediation technology that can be an effective measure for cleaning up groundwater contaminated with chlorinated compounds like TCE but screened out this technology for limited and unsupported reasons (e.g., chemical oxidization was not cost effective but providing no information to support that claim).

Recommendation – PSC should retain chemical oxidation as a potential groundwater remedial action for further evaluation.

10. **Section 6.5 Technology Screening Criteria** - Natural attenuation is one of many remedial options for addressing contaminants in soil and groundwater below the site. However, PSC has set up its technology screening evaluation to select cleanup options that support and build on natural attenuation only, although natural attenuation might not be the best long-term approach for this site.

Recommendation – A technology’s impact on natural attenuation should not be used during the initial screening of the remedial technologies.

11. **Section 6.6, Technology Screening and Review of Retained Technologies** – The expected life of the barrier wall is not provided in the SWFS report. However, at some point in the future, it will likely begin failing. If soil and groundwater are being cleaned up behind the barrier wall rather than just contained then these media might not pose a health risk in the future when the wall begins to fail.

Recommendation – The expected life of the barrier wall should be a factor that is considered when evaluating remedial alternatives for the site and determining whether remedial measures should be taken in soils and groundwater behind the barrier wall.

12. **Section 6.6, Technology Screening and Review of Retained Technologies** - PSC has identified a number of remedial options but has rejected a number of them because they cannot treat all site contaminants. However, some of these options might be successful in reducing soil and/or groundwater contaminant levels if combined with other alternatives.

Recommendation – DOH recommends that treatment options that can be grouped with other treatment options to reduce or eliminate site contaminants be retained and further evaluated.

13. **Section 8.1, HCIM Remedial Alternatives** – Understanding whether the levels of contaminants in soil gas and groundwater behind the barrier wall are changing is important when conducting long-term monitoring during remediation. However, PSC has not included either soil gas or groundwater monitoring within the HCIM Area in either of the alternatives it evaluated.

Recommendation – Soil gas probes and groundwater monitoring wells should be monitored inside the barrier wall as part of the remedy for the HCIM Area.

14. **Section 8.3.2 Preferred HCIM Remedial Alternatives** –The draft SWFS report indicates that the permeability of the barrier wall is approximately 10^{-8} cm/sec and as a result acts as a hydraulic containment system for groundwater and soil vapors. PSC conducts groundwater monitoring inside and outside of the barrier wall to demonstrate the ability of the barrier wall to contain contaminated groundwater. However, PSC provides no evidence to demonstrate that the barrier wall is containing soil vapors other than noting in Section 4.6.1 that the barrier wall is made up of material that is unlikely to crack (i.e., cement and highly plastic clay) including desiccation cracks like those typical of concrete. This information, however, contradicts photographs of the barrier wall taken by PSC during the barrier wall installation, which show evidence of significant desiccation cracking near the surface of the barrier wall.

This suggests that the barrier wall could be a potential preferential pathway for soil gas to migrate from the inside to the outside of the barrier wall in the vadose zone where it could affect indoor air quality in nearby structures and/or soil gas contaminant levels along nearby utility corridors. The groundwater table outside of the barrier wall might also be affected if the soil gas levels are high enough.

Recommendation –PSC should install and monitor some soil gas probes in the vadose zone, inside and outside of the barrier wall to determine whether soil gas is moving beyond the barrier wall posing a potential health risk to the nearby community.

15. **Section 9.0, Development and Evaluation of Remedial Alternatives: Outside Area** – PSC notes that contaminated soils outside the barrier wall, on non-PSC property, are not considered significant for the SWFS because they are of the limited volume and capped with pavement. Workers at these locations, however, could potentially be exposed to this contaminated soil if the pavement is removed.

Recommendation –Contaminated soils outside the barrier wall if left in place below pavement should be addressed, using, at a minimum, institutional controls to prevent possible exposure.

16. **Section 9.1, Outside Area Remedial Alternatives** – PSC suggests that the remedial alternative for addressing the vapor intrusion pathway in the Outside Area continue to be the IPIM. However, there are no specifics provided in the SWFS report to indicate whether PSC only intends to maintain and monitor the existing soil vapor vacuum systems installed at some of the buildings or continue following all the steps laid out in its IPIM approach in addition to maintaining and monitoring existing systems.

Recommendation –PSC should continue to implement all the steps included in its IPIM approach (e.g., continue groundwater monitoring, comparison with screening values). The recommendation made by DOH regarding the IPIM approach in its August 9, 2005, health consultation report should be incorporated, as appropriate, in the IPIM approach.

17. **Section 9.1, Outside Area Remedial Alternatives** – Monitored natural attenuation (MNA) or MNA with enhanced anaerobic bioremediation of hotspots immediately downgradient of the HCIM Area the two alternatives selected by PSC for Outside Area. No alternatives other than natural attenuation and maintaining the IPIMs are proposed downgradient of the proposed CPOC.

Recommendation – Alternatives, other than MNA, should be evaluated for the area between the CPOC and 4th Avenue South to see if cleanup levels can be achieved in this area in a shorter time frame, thereby reducing the length of time the groundwater poses a potential indoor air health risk to the community.

18. **Section 9.1.1, Alternative OA-1: Monitored Natural Attenuation** – PSC reports that groundwater monitoring would be conducted at the CPOC and downgradient of its proposed CPOC as part of this alternative. It should be noted, however, that the wells selected for the

monitoring downgradient of the CPOC (see Figure 9-2) would not allow for a determination of the lateral extent of the plume.

Recommendation – Additional monitoring wells should be added to this proposed monitoring well network so the lateral extent of contaminants at the water table can be established.

19. **Section 9.1.1, Alternative OA-1: Monitored Natural Attenuation** – PSC proposes conducting long-term groundwater monitoring for 30 years. However, groundwater cleanup protective of surface water, which exceeds the level for protection of indoor air, is not expected to be achieved for 50 to 60 years at the CPOC.

Recommendation – Groundwater monitoring should be conducted until cleanup levels protective of human health (surface water and indoor air) are achieved throughout the site.

20. **Section 9.1.1, Alternative OA-1: Monitored Natural Attenuation (MNA)** – PSC notes that one of the institutional or administrative controls needed for the proposed MNA remedial alternative is limiting withdrawal and use of groundwater. PSC plans to use an existing City of Seattle bylaw to prevent groundwater withdrawal and use, which is not unreasonable. However, PSC does not indicate that they will be contacting the City of Seattle regarding this administrative control, which could pose a health problem, in the future, if the City of Seattle decides to change this bylaw and allow the groundwater to be withdrawn and used.

Recommendation – The City of Seattle should be notified about the above proposed administrative control to prevent any possible future exposures.

21. **Section 9.1.1, Alternative OA-1: Monitored Natural Attenuation (MNA)** - PSC proposes no institutional or administrative controls to ensure that building owners/occupants underlain by the plume understand that changes to their building could result in groundwater contaminants migrating into indoor air.

Recommendation – PSC should include ongoing community education regarding the groundwater to indoor air pathway and potential indoor air health risks that could result if modifications to buildings occur. In addition, an Ecology contact name should be provided to the community so they know who to contact if they intend to make modification to the buildings that could increase their potential exposure to groundwater contaminants via indoor air.

22. **Section 9.2.5, Management of Short-Term Risks** – PSC notes, for the first time, in this section that enhanced anaerobic biodegradation could create methane in the subsurface, possibly causing fire hazards. It is unclear how much of threat this actually poses because no additional information is provided.

Recommendation – If methane generation is a real risk then additional information should be provided when evaluating enhanced anaerobic biodegradation. Measures to reduce those risks, if they exist, should also be mentioned.

If you have any questions or concerns about DOH's comments and recommendations, please feel free to contact me at (360) 236-3373 or by e-mail at barbara.trejo@doh.wa.gov.

Sincerely,

Barbara Trejo
Health Assessor/Hydrogeologist
Site Assessment Section

Cc: Marcia Bailey, EPA
Cathy Hendrickson
Pam Bridgen, Environment International

Certification

This Philip Services Corporation (PSC) health consultation report was prepared by the Washington State Department of Health (DOH) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and procedure existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner

Technical Project Officer, CAT, SPAB, DHAC

The Division of Health Assessment and Consultation (DHAC) ATSDR, has reviewed this health consultation report and concurs with the findings.

Team Lead, CAT, SPAB, DHAC, ATSDR