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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Region Office
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April 29, 2025

Donald F. May, CPA
Chief Financial Officer
The Hearthstone at Green Lake
6720 E. Green Lake Way N.
Seattle, WA 98103
(dmay@hearthstone.org)

RE: Remedial Alternative for the Groundwater Plume

Site Name: Plastic Sales & Services
Location: 6860, 6869, and 6870 Woodlawn Avenue NE, Seattle WA
CSID: 2074
Facility : 1948927

Dear Donald F. May:

Thank you for providing Ecology with the background and technical documents listed below, which enabled Ecology to conduct its necessary review of the remedial actions taken to date:

- 2024 annual groundwater progress report, dated Feb. 13, 2025
- "Remedial Alternative_TechMemo_Draft", dated Jan. 16, 2025
- Tech Memo "Analysis of ZVI and EDS-ER Pilot Test Results", dated Jan. 16, 2025
- "December 2024 Janke Building Vapor Intrusion Assessment Results" submitted by an email from Clare Tochilin, dated Jan. 6, 2025
- Street Use Permit issued by the City of Seattle on March 6, 2024

Based on its review of the documents, Ecology recommends amending the Consent Decree (CD) and preparing a supplemental Feasibility Study (FS) and Cleanup Action Plan (CAP):

Consent Decree (CD) Amendment and supplemental Cleanup Action Pan (CAP)

Ecology asks Hearthstone to prepare a draft Consent Decree (CD) Amendment and a supplemental Feasibility Study and Cleanup Action Plan (CAP). The supplemental FS and CAP

will summarize and present preferred cleanup alternatives for the expanded groundwater contamination that is not part of the 2016 Consent Decree.

Remedial Alternatives for the Expanded Groundwater Plume

1. Ecology is open to the use of sodium permanganate (or other oxidizing substances such as modified Fenton's reagent, etc.), creating an oxidation condition for the deep-water bearing zone.
2. However, Ecology recommends using as a bench study, the remedial alternatives proposed in the "Remedial Alternative_TechMemo_Draft" dated Jan. 16, 2025. A focused Feasibility Study (FS) will evaluate the bench study results and select final preferred cleanup alternatives.
3. At the meeting on February 6, 2025, between Ecology and SoundEarth, SoundEarth stated that the oxidation for the deep-water bearing zone will be conducted first, and ERD with bioaugmentation for the shallow-water bearing zone will be conducted later. Please specify the timeline of the oxidation and ERD treatment in the supplemental FS.
4. Various conclusions have been presented to Ecology regarding the oxidation effectiveness in treating the PCE and TCE contamination:
    a. Farallon's oxidation bench study presented in Sections 7.1.1, 7.2.1, and 7.2.2 and Appendix G of the of Plastic Sales RIFS dated July 3, 2013, shows that the oxidation is not effective:

        "Deep Zone monitoring wells MW-7 and MW-14 for injection. Groundwater samples collected from down-gradient Deep Zone monitoring wells MW-9, MW-10, MW-12, and MW-13 did not show any appreciable changes in PCE concentration during the 43-day monitoring period following the pilot-test injection"

    b. SoundEarth's supplemental FS report dated March 16, 2016, also concluded that oxidation failure risk is high:

        "The risk for both failure and liability of chemical oxidation is higher due to natural degradation processes, such as soil oxidant demand, that consume the permanganate."

    c. An email from Tom Camarata dated February 12, 2025, stated that

        "In SoundEarth's opinion, the Farallon pilot test likely had no impact on PCE in the groundwater at monitoring well MW9 because the dose of potassium permanganate was too low (2.5%). Sodium permanganate can be applied using a 10% to 40% dose"

    d. Ecology has concerns over the short half-life of sodium permanganate. The sodium permanganate injected in the former source area near the former monitoring well

MW7 and MW14 may not be effective in treating the PCE and TCE contaminations beneath the Woodlawn Street that appears to act as a secondary source.

e. The geochemistry data presented in the tech memo "Analysis of ZVI and EDS-ER Pilot Test Results" indicate the groundwater conditions in both shallow and deep zones are at reducing condition. (ORP is negative, around -100). This reducing condition should be in favor of ERD process, not oxidation process.

5. Another cleanup alternative that could be considered and evaluated in the supplemental FS report is ERD treatment for both shallow and deep groundwater zones, like the ERD treatment (injection of emulsified vegetable oil EVO) conducted in June 2019 under the 2016 Consent Decree.

6. Bioaugmentation and S-Micro ZVI (sulfidated) are recommended as part of the ERD. If these technologies are used, Ecology recommends including injection of additional amendments such as nutrients, pH buffers, sodium lactate, emulsifiers, anoxic water, etc., to increase efficacy of the bioaugmented EVO.

7. During the pilot test, conducted in March 2024, ZVI and EDS-ER were injected into 7 injections wells in the shallow water bearing zone and 6 injection wells in the deep-water bearing zone. In comparison, during the 2019 ERD treatment, EVO was injected into 45 injection wells in the shallow water bearing zone and 23 injection wells in the deep-water bearing zone. The limited injections of the 2024 pilot test could be one of the reasons why the ZVI and EDS-ER appears to be not as effective.

8. Hearthstone is not required to select ERD as the preferred cleanup alternative for the expanded groundwater treatment, nor is Hearthstone required to select oxidation cleanup alternative for the deep-water bearing zone. However, Hearthstone is required to conduct appropriate cleanup actions to reduce the contamination in the groundwater to meet MTCA cleanup levels to the maximum extent practicable in a reasonable restoration time frame.

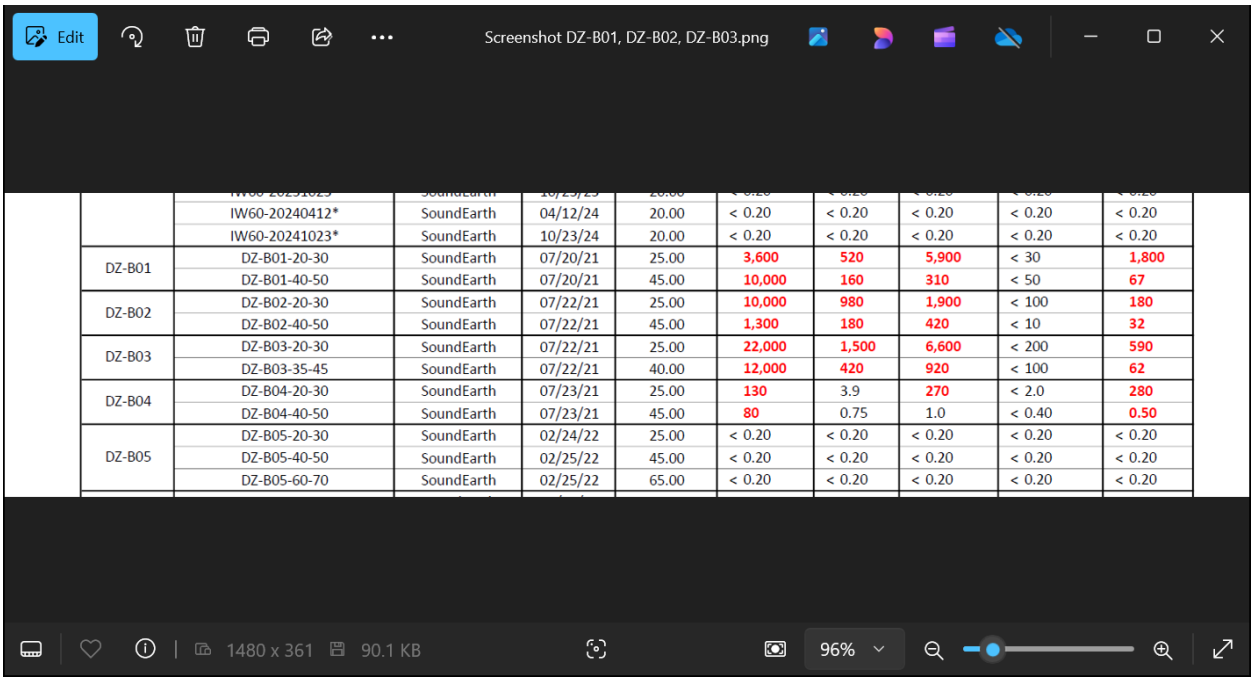
Janke Building Vapor Intrusion Assessment

Ecology recommends continuing the annual vapor intrusion assessment at the Janke building until the solvent concentrations in the groundwater is substantially reduced.

Site Boundary Map

- The Site boundary map shown in the 2024 Progress report is inaccurate. It should include the groundwater contamination found in the geoprobe DZ-B02 and DZ-B03 area.

Geoprobe DZ-01, DZ-B02, DZ-B03 and DZ-B04 in 2021



	IW60-20240412*	SoundEarth	04/12/24	20.00	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
	IW60-20241023*	SoundEarth	10/23/24	20.00	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
DZ-B01	DZ-B01-20-30	SoundEarth	07/20/21	25.00	3,600	520	5,900	< 30	1,800
	DZ-B01-40-50	SoundEarth	07/20/21	45.00	10,000	160	310	< 50	67
DZ-B02	DZ-B02-20-30	SoundEarth	07/22/21	25.00	10,000	980	1,900	< 100	180
	DZ-B02-40-50	SoundEarth	07/22/21	45.00	1,300	180	420	< 10	32
DZ-B03	DZ-B03-20-30	SoundEarth	07/22/21	25.00	22,000	1,500	6,600	< 200	590
	DZ-B03-35-45	SoundEarth	07/22/21	40.00	12,000	420	920	< 100	62
DZ-B04	DZ-B04-20-30	SoundEarth	07/23/21	25.00	130	3.9	270	< 2.0	280
	DZ-B04-40-50	SoundEarth	07/23/21	45.00	80	0.75	1.0	< 0.40	0.50
DZ-B05	DZ-B05-20-30	SoundEarth	02/24/22	25.00	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
	DZ-B05-40-50	SoundEarth	02/25/22	45.00	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
	DZ-B05-60-70	SoundEarth	02/25/22	65.00	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20

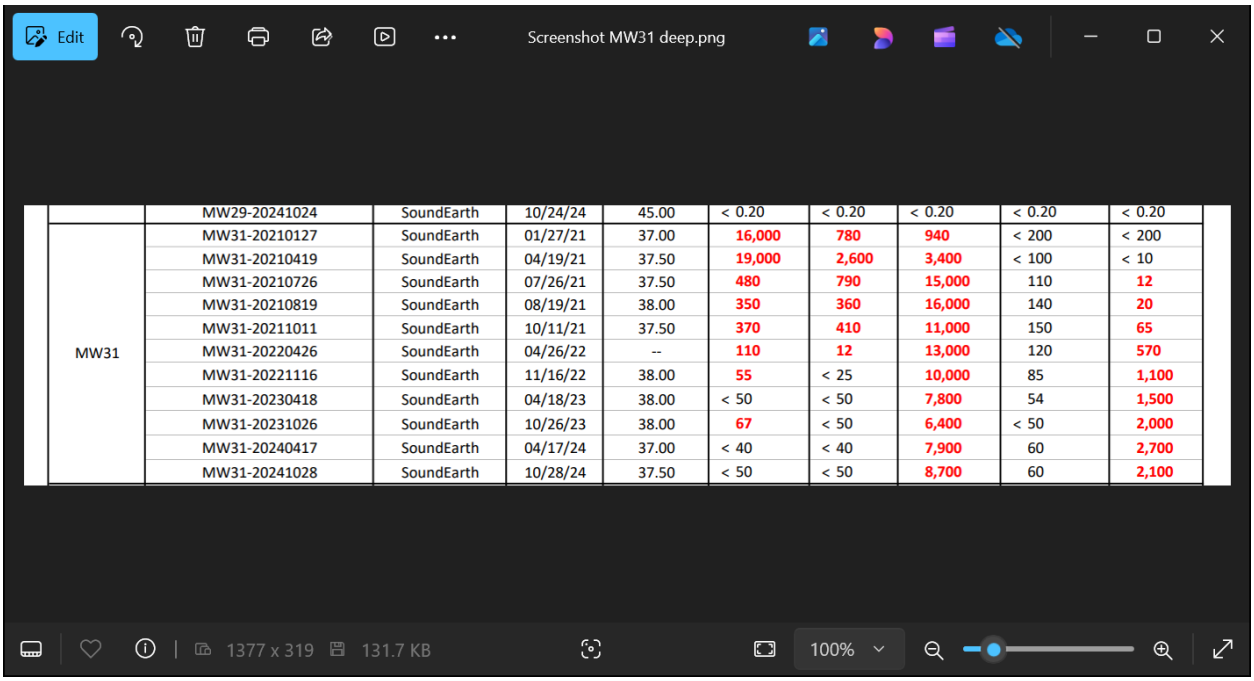
2024 Pilot Test

Ecology does not agree with the conclusions presented in the Tech Memo “Analysis of ZVI and EDS-ER Pilot Test Results”.

- The performance of the pilot test should not be evaluated only based on changes in VC concentration. VC is a daughter product, is not a good indicator to be used to evaluate if biodegradation is occurring. The evaluation should be based on data trends in all the chlorinated solvents (PCE, TCE, cis-1,2-DCE, VC) in conjunction with MNA parameters (methane, ethane, ethene, chloride) and other geochemical parameters. Evaluating these together provides multiple lines of evidence since subsurface conditions are variable and complex.
- Ecology does not understand the statement in the Pilot Test tech memo that “PCE and TCE were not evaluated because those concentrations were not reported above laboratory reporting limits or were less than cleanup levels.” That statement conflicts with the data provided in Table 1 of the memo, which shows a range of detectable to non-detectable concentrations and trends for PCE and TCE at a number of the site wells during the study timeframe (e.g., MW03, MW06, MW09, MW10, MW28, MW29, MW35, IW16, IW32).
- Many monitoring wells show high concentrations of the PCE and TCE exceeding cleanup levels of 5ppb, including monitoring well MW31. The concentration of PCE in MW31 is presented as “less than 50ppb.” Is the “less than 50ppb of PCE in the monitoring well

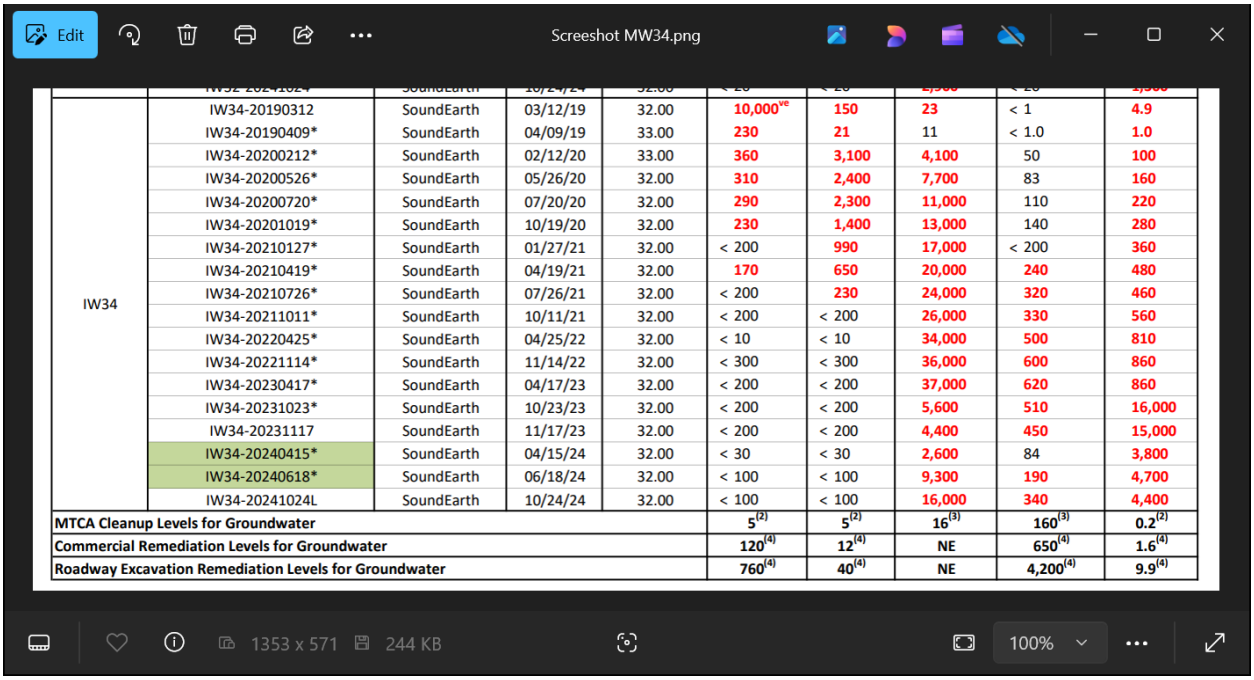
31" considered as "not above laboratory reporting limits" for the conclusion of the pilot test? PCE concentration of 50ppb is 10 times of MTCA cleanup level of 5ppb. Similar for MW34, the PCE concentration is reported as less than 100ppb, or less than 200ppb, are the PCE concentrations in MW34 considered as "not above laboratory reporting limits?"

MW31 in the deep-water bearing zone



	MW29-20241024	SoundEarth	10/24/24	45.00	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
MW31	MW31-20210127	SoundEarth	01/27/21	37.00	16,000	780	940	< 200	< 200
	MW31-20210419	SoundEarth	04/19/21	37.50	19,000	2,600	3,400	< 100	< 10
	MW31-20210726	SoundEarth	07/26/21	37.50	480	790	15,000	110	12
	MW31-20210819	SoundEarth	08/19/21	38.00	350	360	16,000	140	20
	MW31-20211011	SoundEarth	10/11/21	37.50	370	410	11,000	150	65
	MW31-20220426	SoundEarth	04/26/22	--	110	12	13,000	120	570
	MW31-20221116	SoundEarth	11/16/22	38.00	55	< 25	10,000	85	1,100
	MW31-20230418	SoundEarth	04/18/23	38.00	< 50	< 50	7,800	54	1,500
	MW31-20231026	SoundEarth	10/26/23	38.00	67	< 50	6,400	< 50	2,000
	MW31-20240417	SoundEarth	04/17/24	37.00	< 40	< 40	7,900	60	2,700
	MW31-20241028	SoundEarth	10/28/24	37.50	< 50	< 50	8,700	60	2,100

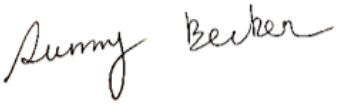
MW34 in the deep-water bearing zone



IW34	IW34-20190312	SoundEarth	03/12/19	32.00	10,000[ve]	150	23	< 1	4.9
	IW34-20190409*	SoundEarth	04/09/19	33.00	230	21	11	< 1.0	1.0
	IW34-20200212*	SoundEarth	02/12/20	33.00	360	3,100	4,100	50	100
	IW34-20200526*	SoundEarth	05/26/20	32.00	310	2,400	7,700	83	160
	IW34-20200720*	SoundEarth	07/20/20	32.00	290	2,300	11,000	110	220
	IW34-20201019*	SoundEarth	10/19/20	32.00	230	1,400	13,000	140	280
	IW34-20210127*	SoundEarth	01/27/21	32.00	< 200	990	17,000	< 200	360
	IW34-20210419*	SoundEarth	04/19/21	32.00	170	650	20,000	240	480
	IW34-20210726*	SoundEarth	07/26/21	32.00	< 200	230	24,000	320	460
	IW34-20211011*	SoundEarth	10/11/21	32.00	< 200	< 200	26,000	330	560
	IW34-20220425*	SoundEarth	04/25/22	32.00	< 10	< 10	34,000	500	810
	IW34-20221114*	SoundEarth	11/14/22	32.00	< 300	< 300	36,000	600	860
	IW34-20230417*	SoundEarth	04/17/23	32.00	< 200	< 200	37,000	620	860
	IW34-20231023*	SoundEarth	10/23/23	32.00	< 200	< 200	5,600	510	16,000
	IW34-20231117	SoundEarth	11/17/23	32.00	< 200	< 200	4,400	450	15,000
	IW34-20240415*	SoundEarth	04/15/24	32.00	< 30	< 30	2,600	84	3,800
	IW34-20240618*	SoundEarth	06/18/24	32.00	< 100	< 100	9,300	190	4,700
	IW34-20241024L	SoundEarth	10/24/24	32.00	< 100	< 100	16,000	340	4,400
MTCA Cleanup Levels for Groundwater					5[(2)]	5[(2)]	16[(3)]	160[(3)]	0.2[(2)]
Commercial Remediation Levels for Groundwater					120[(4)]	12[(4)]	NE	650[(4)]	1.6[(4)]
Roadway Excavation Remediation Levels for Groundwater					760[(4)]	40[(4)]	NE	4,200[(4)]	9.9[(4)]

If you have any questions, please contact me at (425) 457-3842 or sunny.becker@ecy.wa.gov .

Sincerely,



Sunny Becker
Site Manager
Toxics Cleanup Program, NWRO