

Institutional Controls Plan Addendum; Montgomery Downtown Environmental Assessment Project; Montgomery, Alabama

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On behalf of the Downtown Environmental Alliance (DEA), Jacobs has prepared this addendum to the Institutional Controls Plan (ICP) (CH2M 2019a) for the Downtown Environmental Assessment Project (DEAP). The purpose of this addendum is to present recommendations to modify the monitoring frequency based on the past 3 years of annual monitoring and reporting as described in the ICP. The initial 3-year annual monitoring was agreed upon as part of the site's ICP, and the DEA and Alabama Department of Environmental Management (ADEM) agreed to re-evaluate an appropriate monitoring frequency at the conclusion of 2022.

Summary of Annual Monitoring (2020–2022)

As specified in the ICP, the annual monitoring for the initial 3 years consisted of the following action items:

- Groundwater sampling and analysis of seven existing monitoring wells within the site monitoring network
- Property inspections and interviews with randomly selected properties within the Institutional Control (IC) notification boundary
- Environmental Covenant Management for eligible downtown properties
- IC notification letters sent to all property owners within the IC notification boundary
- Meeting and Community Outreach Group (COG) coordination
- Remedial Action Progress Report (RAPR) documentation

Over the past 3 years of groundwater sampling, groundwater concentrations of tetrachloroethene (PCE) have remained stable or declined across the site and have remained below historical concentrations (Table 1). Fluctuations in PCE concentrations were observed in downgradient wells MW-12S and MW-13S, which was expected based on the groundwater flow direction and the Conceptual Site Model (CSM).

Based on the CSM, the migration of PCE impacted groundwater to the Alabama River and Cypress Creek in the vicinity of MW-13S is impeded. Cypress Creek is connected to the Alabama River through a culvert. Based on the elevation of the culvert and the close correlation in water levels between the creek, MW-13S, and the river identified during the hydraulic study, backwater from the Alabama River ponds in Cypress Creek, and Alabama River water interacts with groundwater near MW-13S through pore water exchange. The influence of the Alabama River, and to a lesser degree Cypress Creek, likely reduces the concentration of PCE in groundwater located in the vicinity of MW-13S that ultimately interacts with both water bodies due to dilution by pore water exchange and dispersion.

A Dilution Attenuation Factor (DAF) of 103 was developed in the Alternatives Analysis/Risk Assessment report (CH2M 2019b) to estimate PCE concentrations in Cypress Creek based on the PCE concentrations observed at MW-13S (i.e., the area of highest downgradient concentrations approximately 300 feet from

Cypress Creek). Although concentrations of downgradient well MW-12S fluctuate, groundwater flows toward the most downgradient well with the highest concentrations, MW-13S, and the DAF calculations are based on the transect closest to Cypress Creek. Using an updated plume width of 560 feet, measured along a transect line running from MW-14S and through MW-13S (i.e., across the leading edge of the plume), Jacobs recalculated a DAF of 73 in 2022 to re-evaluate the conditions near Cypress Creek with updated site data since 2019 (see calculations in Table 2). Using the updated DAF of 73 (Table 2) and the maximum PCE concentration measured at MW-13S in June 2021 (292 parts per billion [ppb]), the estimated PCE concentration in Cypress Creek resulting from the DEAP plume discharge is 4.0 ppb. This estimated PCE concentration is well below the most conservative surface water quality criteria for potable water and surface water recreational use (11 ppb), and approximately an order of magnitude below the surface water quality criteria for fish and wildlife surface water (36 ppb), which is the most likely water use. Therefore, the current PCE concentration at MW-13S does not pose an unacceptable risk to surface water receptors at Cypress Creek.

Over the past 2 years (2020 and 2021), site inspections and interviews have been conducted at 28 of the 99 properties within the IC notification boundary (20 randomly selected properties, 5 within the 300 Madison Avenue block, and 3 existing environmental covenant properties). Ten additional random inspections were conducted in 2022. Based on the findings of these inspections, the DEA has not encountered any properties using groundwater for any purpose. One historical well (not used for potable water) was observed in the Old Alabama Town Historical District. The well has since been permanently closed. Also, a pit structure was encountered at the old Montgomery Water Works Building on North Court Street. This pit has since been closed and locks placed on the cover. The DEA has worked closely with large developments in the downtown area (such as the Equal Justice Initiative) to make them aware of the ICs and City Ordinance in-place for their development work.

IC notification letters have been sent annually to all downtown property owners for the past 3 years (2019 through 2021). The DEA sent out another set of notice letters in the fourth quarter of 2022.

Over the past 2 years (2020 and 2021), the DEA has submitted annual RAPRs to ADEM to document the annual activities for the DEAP. A report for 2022 will be submitted by March 1, 2023.

Conclusions and Recommendations

Based on the results of the actions taken during the past 3 years, the DEA is recommending that the ICP be amended to modify the frequency of the aforementioned activities as follows:

- Continue to collect groundwater samples from the six site monitoring wells (MW-02S, MW-03S, MW-08S, MW-12S, MW-13S, and MW-14S) on an annual basis. However, should any of these wells exhibit concentrations below the Groundwater Protection Standard (GWPS) for three consecutive annual sampling events, these wells will be placed on "standby" status and groundwater sampling will not be conducted at these wells going forward. Based on the 2022 groundwater sampling results, Monitoring Well MW-01S has exhibited three consecutive PCE concentrations below its GWPS (5.0 ppb) and, therefore, will be placed on standby status.
- To maintain monitoring of groundwater flow and direction at the site, we propose continuing to collect groundwater depth-to-water measurements at the nine shallow and six intermediate zone wells on an annual basis. While collecting depth-to-water measurements, wells will be inspected for functionality and maintenance will be recommended, if needed.
- Recent inspections and interviews suggest that downtown property owners are aware of the ICs and restrictions, and no groundwater wells are in use. In addition, a city ordinance prohibits installation and use of wells in this area. However, out of an abundance of caution, we recommend that a windshield driving inspection of the DEAP area continue to be performed annually to review the site for major construction efforts and changes to the property use in the downtown area. The City Engineering Department also will continue to review plans for major developments that might encounter groundwater. In addition, we recommend that random property inspections and interviews should be conducted on a triannual basis, with the next set of inspections/interviews to be conducted in 2025.

- We recommend that environmental covenant management continue to be managed on the project website; assistance with these covenants will be available through the DEA or their consultant.
- We recommend that IC notification letters continue to be mailed annually to ensure existing and new downtown property owners will be informed of the ICs and City Ordinance for the DEAP.
- We recommend that COG communications continue to maintain a relationship with downtown business owners and residents and keep them informed of project progress.
- We recommend that RAPRs be submitted on a triannual basis at the conclusion of the 2025 monitoring activities. We further recommend that annual technical memoranda be submitted to inform ADEM of the annual activities conducted at the DEAP. The annual technical memoranda will be submitted by March 31, 2024, and March 31, 2025, following the conclusion of the 2023 and 2024 monitoring activities. The next RAPR will be submitted by March 31, 2026, following the conclusion of the 2025 monitoring activities.

Please let us know if you have any questions or comments on this plan.

References

CH2M HILL Engineers, Inc. (CH2M). 2019a. *Institutional Controls Plan, Downtown Environmental Assessment Project, Montgomery, Alabama*. Prepared for Alabama Department of Environmental Management by the Downtown Environmental Alliance. July.

CH2M HILL Engineers, Inc. (CH2M). 2019b *Risk Assessment/Alternatives Analysis Report Downtown Environmental Assessment Project, Montgomery, Alabama*. Prepared for Alabama Department of Environmental Management by the Downtown Environmental Alliance. February.

Tables

Table 1. Groundwater Sampling Results*ICP Addendum, Montgomery Downtown Environmental Assessment Project, Montgomery, Alabama*

Station ID	Date Sampled	May 2022 PCE Concentrations	June 2021 PCE Concentrations	April 2020 PCE Concentration	July 2016 PCE Concentration
Shallow Interval Wells					
MW-01S	5/25/2022	1 U	1 U	1 U	1.56
MW-02S	5/27/2022	31.2	41.4	45.6 J	34.1
MW-03S	5/27/2022	15.5	21.6	33.1 J	6.27
MW-08S	5/26/2022	30.5	45.2	80.7 J	78.4
MW-12S	5/26/2022	36.4	20.3	30.7 J	58.9
MW-13S	5/26/2022	264	292	209	174
MW-14S	5/26/2022	5.68	5.05	5.78 J	N/A

Notes:

Concentrations presented in micrograms per liter (µg/L).

The higher of the native and field duplicate concentration is presented for MW-02S.

Bold text indicates concentration exceeds the MCL (5 µg/L).

DEAP = Downtown Environmental Assessment Project

J = estimated concentration due to laboratory control sample recovery slightly above control limits; the result may be biased high.

MCL = U.S. Environmental Protection Agency Maximum Contaminant Level

PCE = tetrachloroethene

U = analyte was not detected

Table 2. Updated Calculation of Cypress Creek Attenuation Factor

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Date	Plume Thickness ⁽¹⁾ (ft)	Discharge Length ⁽²⁾ (ft)	Discharge Area ⁽³⁾ (ft ²)	Hydraulic Gradient ⁽⁴⁾ (unitless)	Hydraulic Conductivity ⁽⁵⁾ (cm/s)	Aquifer Discharge Rate ⁽⁶⁾ (cm ³ /s)	Aquifer Discharge Rate (L/day)	Discharge from Coliseum Blvd. Plume to Cypress Creek ⁽⁷⁾ (L/day)	DAF for MW-13S to Cypress Creek	Calculated PCE Concentration in Cypress Creek (ppb) ⁽⁸⁾	Surface Water Quality Criteria for Fish and Wildlife (ppb)
Original DAF in Alternatives Analysis/Risk Assessment Report											
2019	35	400	14,000	0.008	0.0036	375	32,363	3,324,940	103	1.69	36
Updated DAF											
2022	35	560	19600	0.008	0.0036	524.40192	45308.32589	3324940	73.38474629	4	36

Notes:

⁽¹⁾ Plume thickness based on distance between the water table (~40 ft bgs at MW-02S) and the point halfway between the bottom screen depth of the deepest well with detected PCE above MCL (MW-02S at 60 ft bgs) and the top of screen for shallowest well where PCE was not detected (MW-07S, at 85 ft bgs), conservatively rounded up to the nearest 5 ft. For example, the plume thickness = (60 ft + ((85 ft - 60 ft)/2)) - 40 ft = 32.5 ft, rounded to 35 ft.

⁽²⁾ Discharge length estimated as the general width of the distal end of the plume measured parallel to the creek. The 2022 length accounts for MW-14S, which was installed after the original evaluation.

⁽³⁾ Discharge area calculated as rectangular area using the plume thickness and discharge length.

⁽⁴⁾ Hydraulic gradient defined as change in head from TMPZ-1 to the closest upgradient well (MW-08S) (9.27 ft) over measured distance between TMPZ-1 and MW-08S (1,161 ft).

⁽⁵⁾ Hydraulic conductivity based on geometric mean of hydraulic conductivities determined by slug tests (Data Evaluation Report, Black & Veatch, 2000).

⁽⁶⁾ Aquifer Discharge Rate = hydraulic conductivity * hydraulic gradient * discharge area (does not assume retardation of flow from Alabama River porewater exchange).

⁽⁷⁾ Assumes the Coliseum Boulevard Plume contribution accounts for all flow in Cypress Creek (data obtained from the Coliseum Boulevard Plume Southwest Treatment Area under NPDES permit AL0081167. The total estimated annual flow, based on the monthly averages, in 2017 for the Discharge Pond was 320.6 million gallons. Mean discharge obtained from U.S. Geological Survey station 02420000 based on 79 years of record.

⁽⁸⁾ PCE concentrations obtained from MW-13S during the 2016 Environmental Investigation sampling event (174 ppb) and the highest recorded concentration during the June 2021 groundwater sampling event (292 ppb).

DAF - dilution attenuation factor calculated as the ratio between the discharge of the porewater exchange (from surface water discharge) and groundwater inflow (aquifer discharge).

bgs = below ground surface

cm² = square centimeter

cm/s = centimeters per second

cm³/s = centimeters cubed per second

ft = feet

ft² = square feet

L/day = liters per day

NPDES = National Pollutant Discharge Elimination System

PCE = tetrachloroethene

ppb = parts per billion