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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Region Office
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May 4, 2023

Mike Arnold
G-Logics
40 2nd Avenue SE
Issaquah, WA 98027
(mikea@g-logics.com)

Re: Opinion on Proposed Cleanup of the following Site:

Site Name:	Mossman Property
Site Address:	3461 E Lake Sammamish Shore Ln NE, Sammamish, WA 98074
Cleanup Site ID:	12703
Facility/Site ID:	7911
VCP Project ID:	NW3321

Dear Mike Arnold:

The Washington State Department of Ecology (Ecology) received your request for an opinion on your proposed independent cleanup of the Mossman Property (Site). This letter provides our opinion. We are providing this opinion under the authority of the Model Toxics Control Act (MTCA), Chapter 70A.305 RCW.

Issue Presented and Opinion

Does the proposed Work Plan *Revised Draft Cleanup Action Plan, Mossman Residence, 3461 East Lake Sammamish Shore Lane Northeast, Sammamish, Washington,* dated February 14, 2023 (*February 2023 dCAP*) meet the stated objectives with respect to Site data gaps?

YES. Ecology has determined that the proposed remedial actions currently considered an interim cleanup action may constitute as the final cleanup action provided that confirmation soil sampling and subsequent groundwater sampling data show the Site is in compliance with sections 350 through 390 of WAC 173-340.

Description of the Site

This opinion applies to the only Site described as follows. The Site is defined by the nature and extent of contamination associated with the following releases:

- Diesel- (TPH-D) and oil-range (TPH-O) total petroleum hydrocarbons, benzene, total xylenes, and naphthalene into the Soil.
- TPH-D and TPH-O into the Groundwater and Surface Water.

- Benzene and naphthalene into the Air.

Enclosure A includes a detailed description and diagram of the Site, as currently known to Ecology.

Please note a parcel of real property can be affected by multiple sites. At this time, we have no information that the parcel(s) associated with this Site are affected by other sites.

Basis for the Opinion

This opinion is based on the information contained in the following documents:

1. G-Logics, *Draft Cleanup Action Plan, Mossman Residence, 3461 East Lake Sammamish Shore Lane Northeast, Sammamish, Washington*, February 14, 2023.

2. G-Logics, *Draft Cleanup Action Plan, Mossman Residence, 3461 East Lake Sammamish Shore Lane Northeast, Sammamish, Washington,* July 12, 2022.

3. Ecology, *Re: Opinion Pursuant to WAC 173-340-515(5) on Remedial Action for the following Hazardous Waste Site: Mossman Property, 3461 East Lake Sammamish Shore Lane NE, Sammamish, WA*, June 9, 2022.

4. G-Logics, *2021 Soil and Groundwater Sampling, Mossman Residence, 3461 East Lake Sammamish Shore Lane NE, Sammamish, WA 98074*, January 11, 2022.

5. TRC Environmental Corporation, *Remedial Investigation Report, Mossman Residence, 3461 East Lake Sammamish Shore Lane NE, Sammamish, Washington*, June 28, 2021.

6. G-Logics, *Additional Site Characterization, 3461 East Lake Sammamish Shore Lane NE, Sammamish, WA 98074*, June 29, 2020.

7. Ecology, *Initial Investigation Field Report, Mossman Property, 3461 East Lake Sammamish Lane NE, Sammamish, WA 98074*, October 14, 2013.

8. Environmental Partners, Inc., *Re: Phase II Environmental Site Assessment, Mossman Residence, 3461 East Lake Sammamish Shore Lane, Sammamish, Washington*, July 1, 2013.

9. Environmental Partners, Inc., *Underground Storage Tank Site Assessment Report, Mossman Residence, 3461 E. Lake Sammamish Shore Lane, Sammamish, Washington*, February 4, 2013.

A number of these documents are accessible in electronic form from the Site webpage[1]. The complete records are stored in the Central Files of the Northwest Regional Office of Ecology (NWRO) for review by appointment only. Visit our Public Records Request page[2], to submit a public records request or get more information about the process. If you require assistance with this process, you may contact the Public Records Officer at publicrecordsofficer@ecy.wa.gov or 360-407-6040.

[1] https://apps.ecology.wa.gov/cleanupsearch/site/12703
[2] https://ecology.wa.gov/publicrecords

This opinion is void if any of the information contained in those documents is materially false or misleading.

Analysis of the Proposed Cleanup

Based on a review of the *February 2023 dCAP*, Ecology has determined:

1. **Characterization of the Site.**

   Ecology has determined that characterization of the Site is sufficient to establish cleanup standards and select a cleanup action. The Site is described above and in **Enclosure A.**

   - **Soil contamination at the Site has been sufficiently characterized.**

     Soil at the Site contains TPH-D, TPH-O, benzene, total xylenes, and naphthalene above the Method A cleanup levels. Contamination at the Site originated from an underground storage tank (UST) used for storage of heating oil, located near the north property boundary. The heating oil tank was installed when the residence on the Property was constructed in 1949.

     In July 2012, following discovery of a sheen on Lake Sammamish immediately west of the Property, an UST Site Assessment was conducted for the heating oil UST. Due to access restrictions, the UST had to be cut into pieces prior to removal from the Site. Soil samples collected from the sidewalls and bottom of the UST excavation contained TPH-D above the Method A cleanup level.

     Additional soil sampling activities were conducted at the Site from 2013 to 2021, and are described in detail in **Enclosure A**. Results from these explorations have characterized the horizontal and vertical extent of soil contaminated with TPH-D, TPH-O, benzene, total xylenes, and naphthalenes at the Site. During an Ecology site visit on January 26, 2023, G-Logics indicated that additional geotechnical borings would be advanced along the north Property boundary to evaluate soils for excavation shoring. Ecology recommends collecting environmental samples from these borings to analyze for Site contaminants.

   - **Sediment contamination at the Site has been sufficiently characterized.**

     Five sediment samples were collected in September 2015 west of the ordinary high-water mark from the uppermost 3 inches of sediment (see **Enclosure A, Figure 7**). None of the of the sediment samples contained TPH-D, TPH-O, or naphthalenes above the laboratory reporting limits.

   - **Groundwater contamination at the Site has not been sufficiently characterized.**

     Groundwater samples were first collected from the Site in May 2013. Initial results indicated that concentrations of TPH-D+TPH-O were present in groundwater west-southwest of the location of the former heating oil UST toward Lake Sammamish. Groundwater samples were collected from Site monitoring wells MW-1 through MW-9 from 2013 to 2021. Samples collected from MW-1 and MW-3 to MW-6 regularly contained TPH-D+TPH-O above the Method A cleanup level.

     Groundwater samples collected from temporary wells installed in borings B-1, B-4, B-5, B-8, B-11, B-12, B-14, GLB-8 to GLB-10, GLB-12, and GLB-14 to GLB-15 contained TPH-D+TPH-O above the Method A cleanup level. The extent of groundwater containing TPH-D+TPH-O above the Method A cleanup level has been delineated to the northwest and southeast. The extents of groundwater containing TPH-D+TPH-O above the Method A cleanup level have

not been delineated northeast of the former UST and downgradient of the four monitoring wells completed adjacent to the Lake Sammamish shoreline (MW-1, MW-2, MW-5, MW-6; see **Enclosure A, Figure 6**).

Light non-aqueous phase liquid (LNAPL) has been present in MW-2 since it was installed in May of 2013. Measurements of LNAPL thickness in MW-2 ranged from 0.01 to 2.21 feet between May 2013 and October 2021. LNAPL has not been observed in any other permanent or temporary wells at the Site. LNAPL thickness in MW-2 has decreased steadily since the installation of three recovery wells in the vicinity of the well in 2014.

Ecology understands that installing a surveyed staff gauge on the dock west of the Site is not feasible due to the condition of the dock. Ecology concurs with the use of Lake Sammamish elevation from the USGS Water Data database for comparison with water table elevation measured from Site monitoring wells. Ecology recommends including a rose diagram with groundwater contour maps to display groundwater flow direction and magnitude for all sampling events. Please note that Electronic Information Management (EIM) Database requirements state that water level data must be recorded relative to NAVD88.

- **Surface water contamination at the Site does not need additional characterization.**

  Ecology concurs that sampling of groundwater in monitoring wells adjacent to Lake Sammamish, and comparing these data to surface water cleanup levels is appropriate for this Site, instead of sampling lake water that is likely impacted by contamination sources other than the Site. Ecology understands that sheen on the lake water has not been observed since April 2014, after the heating oil UST was removed.

- **Vapor intrusion risk at the Site has been sufficiently evaluated.**

  Sub-slab soil gas and indoor air samples were collected from the house on the Property in November 2013. Three sub-slab soil gas samples were collected from the western portion of the residence closest to the former heating oil tank (see **Enclosure A Figure 7**). All three samples contained naphthalene above the Method B screening level.

  Three indoor air samples were collected from the residence on the Property and one was collected from the crawlspace of the residence on the north-adjacent property. All three air samples collected from the residence on the Property contained benzene above the Method B cleanup level for unrestricted use. However, based on the lack of benzene above the reporting limit in sub-slab soil gas samples, vapor intrusion from contaminated soil and groundwater is not considered a source for benzene in indoor air.

  Two air samples collected from the crawlspace of the house on the north-adjacent property did not contain benzene or naphthalene above the Method B screening levels when corrected with concentrations observed in the ambient air sample.

- **EIM Database Submittal.**

  Ecology appreciates uploading of Site data to the EIM database. The last EIM database upload corresponds to a field collection date of May 19, 2020. Please continue to upload Site data as it is available.

2. **Establishment of cleanup standards.**

Ecology has determined the cleanup levels and points of compliance you established for the Site may meet the substantive requirements of MTCA pending further evaluation and documentation.

- **Soil.**

  MTCA Method A soil cleanup levels for unrestricted uses (WAC 173-340-740(2); Table 720-1) with the standard point of compliance for protection of groundwater throughout the Site are appropriate.

  Ecology appreciates your evaluation of the need for a Terrestrial Ecological Evaluation (TEE) for the Site. Based on its location 500 feet away from 1.5 acres of contiguous undeveloped land, Ecology concurs that the Site qualifies for an exemption from the TEE process. Therefore, the standard Method A soil cleanup levels and point of compliance as discussed above are appropriate at the Site. Please note that a TEE Form[3] is required to record your decision-making process for the TEE.

- **Groundwater.**

  Groundwater at the Site discharges to Lake Sammamish along the Western Site boundary (Eastern shore of Lake Sammamish). Per WAC 173-340-720(3)(b)(iv), where groundwater discharges to surface water, Method A groundwater cleanup levels shall be established for protection of surface water beneficial uses. Per WAC 173-201A-600(1), the highest beneficial use of Lake Sammamish surface water is protection of drinking water.

  As discussed in *Implementation Memorandum No. 23: Concentrations of Gasoline and Diesel Range Organics Predicted to be Protective of Aquatic Receptors in Surface Waters*[4], revised August 2021, toxicity values for TPH-D+TPH-O protective of aquatic receptors depend on the degree of weathering of the release. As discussed in *2021 Soil and Groundwater Sampling, Mossman Residence, 3461 East Lake Sammamish Shore Lane NE, Sammamish, WA*, dated January 11, 2022, analytical reports for groundwater samples collected in 2014 from MW-4 near the source of the release and MW-1 along the plume axis indicated that the samples likely contained weathered diesel. Therefore, in accordance with WAC 173-340-730(2)(b)(ii), the Method A groundwater cleanup level for TPH-D + TPH-O (500 µg/L) is applicable, which is based on protection from noncarcinogenic effects during drinking water use (see WAC 173-340-900, Table 720-1). Ecology recommends including a laboratory narrative describing the weathering pattern observed for TPH-D+TPH-O at the Site to further establish the potential toxicity of the release to aquatic organisms.

  The standard point of compliance, throughout the Site from the uppermost level of the saturated zone to the lowest depth that could be potentially affected, is appropriate (WAC 173-340-720(8)(b)). If, following the implementation of the cleanup action, cleanup levels cannot be reached in a reasonable time frame, a conditional point of compliance may be appropriate (WAC 173-340-720(8)(c)). Further information regarding conditional points of compliance for properties abutting surface water is available in Ecology's *Implementation Memorandum No. 16: Developing Conditional Points of Compliance at MTCA Sites Where Groundwater Discharges to Surface Water*, revised December 2017[5].

[3] https://apps.ecology.wa.gov/publications/SummaryPages/ECY090300.html
[4] https://apps.ecology.wa.gov/publications/SummaryPages/1909043.html
[5] https://apps.ecology.wa.gov/publications/SummaryPages/1609053.html

- **Air.**

  MTCA Method B cleanup levels protective of unrestricted use, are appropriate for the Site (WAC 173-340-750(3)). The standard point of compliance is ambient air throughout the Site (WAC 173-340-750(6)).

3. **Selection of cleanup action.**

   Ecology has determined the cleanup action you proposed for the Site is may meet the substantive requirements of MTCA, depending on the results of performance and confirmation sampling. The cleanup action described in the *February 2023 DCAP* includes the following remedial activities:

   - Demolition of the existing house located on the Property, to facilitate access to subsurface contamination;
   - Excavation and removal of soils contaminated with TPH-D, benzene, total xylenes, and naphthalenes at the Site;
   - Application of oxygen releasing compound within the extents of the excavation; and
   - Monitored attenuation of TPH-D + TPH-O in groundwater.

   Ecology concurs with your proposed remedial activities as an interim action at the Site. Per WAC 173-340-430, the interim action may constitute the cleanup action for the Site if the interim action is subsequently shown to comply with sections 350 through 390 of WAC 173-340. Confirmation soil and groundwater sampling data collected pursuant to the interim action will be used to make a determination regarding the necessity for further action for the site and/or property.

   As part of the cleanup action, the *February 2023 DCAP* proposed the use of Groundwater Model Remedy 1, described further in *Model Remedies for Sites with Petroleum Impacts to Groundwater*, revised December 2017[6]. This model remedy requires that soil and groundwater throughout the Site meet the cleanup standards discussed in Section 2. The proposed cleanup action is expected to meet the requirements in WAC 173-340-360(2). The applicability of a Model Remedy will depend upon post-cleanup groundwater monitoring results.

   As discussed in Section 1 of this opinion letter, a monitoring well located upgradient of the groundwater plume is not currently installed at the Site. Ecology concurs with your proposed monitoring well network (which will include an upgradient monitoring well) to assess the progress of attenuation of TPH-D+O in groundwater, as discussed in the *February 2023 DCAP* and the *Guidance on Remediation of Petroleum-Contaminated Groundwater by Natural Attenuation*, published July 2005[7]. Per Section 3.3 of this guidance, the verification of the monitored natural attenuation (MNA) as a component of the cleanup action requires validation using appropriate data analysis methods, such as the Ecology MNA Workbook Tools[8]. MNA validation will also need to include time-series plots of TPH-D + TPH-O in groundwater (as was requested in the June 9, 2022 VCP opinion letter from Ecology), for any existing and new Site monitoring wells.

[6] https://apps.ecology.wa.gov/publications/SummaryPages/1609057.html
[7] https://apps.ecology.wa.gov/publications/SummaryPages/0509091.html
[8] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Clean-up-petroleum-contamination

Ecology appreciates your inclusion of benzene, toluene, ethylbenzene, and total xylenes in the groundwater compliance monitoring program. After demonstration of four consecutive quarters of benzene and total xylenes below the Method A cleanup levels, discontinued analysis of these compounds may be proposed for Ecology concurrence.

Figures 3 and 4 of the *February 2023 DCAP* indicate that soil and groundwater with concentrations above Method A cleanup levels extends onto the neighboring property to the north (3463 E Lake Sammamish Shore Lane NE; parcel 192506-9062). Figure 7 of the *February 2023 DCAP* shows the proposed remedial excavation extending onto this neighboring property. Please confirm that the neighboring property owner has granted permission for access to their property.

Limitations of the Opinion

1. **Opinion does not settle liability with the state.**

   Liable persons are strictly liable, jointly and severally, for all remedial action costs and for all natural resource damages resulting from the release or releases of hazardous substances at the Site. This opinion does not:

   - Resolve or alter a person's liability to the state.
   - Protect liable persons from contribution claims by third parties.

   To settle liability with the state and obtain protection from contribution claims, a person must enter into a consent decree with Ecology under RCW 70A.305.040(4).

2. **Opinion does not constitute a determination of substantial equivalence.**

   To recover remedial action costs from other liable persons under MTCA, one must demonstrate that the action is the substantial equivalent of an Ecology-conducted or Ecology-supervised action. This opinion does not determine whether the action you proposed will be substantially equivalent. Courts make that determination. *See* RCW 70A.305.080 and WAC 173-340-545(2).

3. **Opinion is limited to proposed cleanup.**

   This letter does not provide an opinion on whether further remedial action will actually be necessary at the Site upon completion of your proposed cleanup. To obtain such an opinion, you must submit a report to Ecology upon completion of your cleanup and request an opinion under the Voluntary Cleanup Program (VCP).

4. **State is immune from liability.**

   The state, Ecology, and its officers and employees are immune from all liability, and no cause of action of any nature may arise from any act or omission in providing this opinion. *See* RCW 70A.305.170.

Contact Information

Thank you for choosing to clean up the Site under the VCP. Ecology appreciates the efforts of your client and project team in developing a remedial action approach for the Site. As you conduct your cleanup, please do not hesitate to request additional services. We look forward to working with you.

For more information about the VCP and the cleanup process, please visit our webpage [9]. If you have any questions about this opinion, please contact me by phone at 206-459-6287 or by email at david.unruh@ecy.wa.gov.

Sincerely,

David Unruh, LG
Site Manager
Toxics Cleanup Program, NWRO

Enclosures (1): A – Site Description and Diagrams

cc: Mike Mossman, Property Owner (mossmanmc@gmail.com)
Thomas Morin, TRC Environmental Corporation (tmorin@trccompanies.com)
Sonia Fernández, VCP Coordinator (sonia.fernandez@ecy.wa.gov)

[9] https://www.ecy.wa.gov/vcp

Enclosure A

Description and Diagrams of the Site

Site Description

This section provides Ecology's understanding and interpretation of Site conditions and is the basis for the opinions expressed in the body of the letter.

Site: The Site is defined by releases of the following in Sammamish, King County, Washington:

- Diesel-range total petroleum hydrocarbons (TPH-D), benzene, total xylenes, and naphthalenes to the Soil.
- TPH-D and oil-range total petroleum hydrocarbons (TPH-O) into the Groundwater.
- Benzene and naphthalenes into the Air.

The Site is located at 3461 East Lake Sammamish Shore Lane NE in Sammamish, King County, WA. It consists of two irregularly-shaped King County tax parcels with the numbers 192506-9042 (3461 E Lake Sammamish Shore Ln NE; Property; **Figure 1**; **Figure 2**) and 192506-9062 (3463 E Lake Sammamish Shore Ln NE), totaling 0.40 acres in area.

According to MTCA, the Site is defined as all areas where contamination has come to be located. Based on currently available data, the Site includes the Property and a small area on the southern portion of 3463 E Lake Sammamish Shore Ln NE.

Area and Property Description: The Site is located in an area zoned for residential use in Sammamish. Surrounding properties to the north, east, and south are currently in use as single-family homes. The Site is bounded to the west by Lake Sammamish.

Property History and Current Use: The Property was first developed with a single-family residence in 1949, which currently remains in use. The original heating system for the home used heating oil, which was stored in a 500-gallon underground storage tank (UST) located to the north of the building (**Figure 2**). In 2012, following purchase of the Property by the current owner, the heating system was converted from heating oil to natural gas.

Sources of Contamination: Releases of TPH-D, TPH-O, benzene, total xylenes, and naphthalenes (collectively Site COCs) to soil, groundwater, soil gas, and surface water were first discovered in 2012. Based on the location of contamination and the results of a UST Site Assessment conducted in December 2012, the heating oil UST appears to be the sole source of contamination at the Site (**Figure 2**).

Physiographic Setting: The Site is located on the eastern margin of the Puget Sound Lowland physiographic province, a north-south trending structural and topographic depression that is bordered to the west by the Olympic Mountains and to the east by the Cascade Mountain foothills. The Puget Sound Lowland is underlain by Tertiary volcanic and sedimentary bedrock and has been filled to the present-day land surface with Pleistocene-aged glacial and nonglacial sediments.

Repeated advances and retreats of the continental glaciers that flowed through the area out of Canada more than 10,000 years ago created the low undulating plains that are characteristic of the Puget Sound Lowland. Current land surfaces reflect the changes that are directly related to the most recent glacial advance and retreat through Snohomish County. Known as the Vashon Stade of the Fraser Glaciation, it took place between 13,000 and 10,000 years ago.

The Site is located on the eastern shore of Lake Sammamish, a 7-mile-long, 1.5-mile-wide lake occupying a depression created during the Fraser Glaciation (**Figure 1**). The Site is situated on relatively flat ground surface at an elevation of 35 feet above mean sea level (amsl).

Surface/Storm Water System: Stormwater on and in the vicinity of the Site drains via sheet flow to Lake Sammamish. The Site is located directly adjacent to Lake Sammamish.

Ecological Setting: The Site is located in a low-density residential area. A majority of land surfaces on the Property are covered with buildings, and asphalt and concrete pavement with some small, landscaped areas.

Geology: The geological map of the area[10] indicates the Site is underlain by younger Quaternary alluvium, an unconsolidated succession of organic-rich, stratified sand, silt, and clay. Boring logs for explorations completed at the Site indicate that the Property is underlain by fill materials to a maximum depth of 8 feet bgs. Fill materials are underlain by organic-rich silty sands, sands, and gravels with trace amounts of silt, interpreted to be younger Quaternary alluvium to the maximum explored depth of 12.5 feet bgs.

Groundwater: From 2013 to 2020, nine wells were installed at the Site (MW-1 to MW-9; **Figure 2**; **Figure 3**). Wells were installed with 5- to 10-foot-long screens set from 2 to 12 feet bgs. Groundwater is present at the Site at depths ranging from 0.01 to 6.88 feet bgs (29.92 to 25.07 feet National Geodetic Vertical Datum of 1929 [NGVD 29]). Groundwater flow is southwest toward Lake Sammamish (**Figure 3**).

Water Supply: Drinking water is supplied to the Property by water mains operated by the Northeast Sammamish Sewer and Water District. Water for the District is sourced from three wells in the Evans Creek Valley and two wells located on the Sahalee Upland, all located east of the Site. The Northeast Sammamish Sewer and Water District also sources water from adjacent water districts to the north and south. The Site is located approximately 1 mile east of the closest 10-year wellhead protection zone for a municipal supply well.

Release and Extent of Contamination:

Soil: Following the discovery of a sheen on surface water in Lake Sammamish east of the Site in November 2011, a UST Site Assessment was conducted. When the assessment was conducted in July 2012, approximately 113 gallons of heating oil and/or water were measured in the UST. Due to access restrictions, the UST had to be cut into pieces for decommissioning and removal. Soil samples collected from the sidewalls and bottom of the UST excavation all contained TPH-D above the Method A cleanup level, with the exception of a sample collected from the east sidewall of the excavation (**Figure 4**).

Soil samples were collected during several rounds of investigation from May 2013 to October 2021 from a total of 39 borings (B-1 to B-14, GB-1 to GB-7; GLB-8 to GLB-16; MW-1 to MW-9; **Figure 2**). Soils containing Site COCs above their respective cleanup levels were encountered to the east and southeast of the former UST at depths ranging from approximately 1.5 to 9 feet bgs. Soil samples collected from the following explorations contained Site contaminants of concern (COCs) above their respective Method A cleanup levels (**Figure 2**):

- **TPH-D+O**: B-1, B-2, B-4, B-5, B-11, GB-2, GB-3, GB-4, GLB-8, GLB-9, GLB-12, MW-1, MW-2, MW-

[10] https://ngmdb.usgs.gov/Prodesc/proddesc_5609.htm

3, and MW-4.
- **Benzene**: GLB-9 and MW-4.
- **Total xylenes**: GB-2 and MW-4.
- **Naphthalene**: GB-2, GB-4, GLB-8, and MW-4.

Groundwater: Groundwater samples were collected from both permanent and temporary wells installed at the Site. Temporary wells were installed in borings B-1, B-3, and B-4 to B-14, advanced and sampled from May 2013 to February 2014 (**Figure 5**). Groundwater samples collected from explorations B-1, B-4, B-5, B-8, B-11, B-12, and B-14 contained TPH-D+O above the Method A cleanup level. In October 2021, groundwater was sampled from temporary wells installed in borings GLB-8 to GLB-16. Groundwater samples collected from these explorations contained TPH-D+O above the Method A cleanup level, with the exception of samples collected from GLB-11 and GLB-13.

Light non-aqueous phase liquid (LNAPL) has been observed in MW-2 since its installation in 2013. Measurements of LNAPL at this well have ranged from 2.21 to 0.01 feet in thickness. LNAPL was also observed in MW-1 in September 2015. Wells MW-1 and MW-2 are constructed with 5-foot screen intervals installed from approximately 2 to 7 feet bgs. Depth to water measurements taken from May 2013 to October 2021 ranged from 0.01 to 1.89 feet bgs and 0.80 to 3.25 feet bgs in MW-1 and MW-2, respectively.

Groundwater samples were collected intermittently from May 2013 to October 2021 from Site monitoring wells MW-1 to MW-9. Concentrations of TPH-D+O regularly exceeded the Method A cleanup level during this period at MW-1, and MW-3 through MW-6. Due to the presence of LNAPL in MW-2, groundwater samples were not collected from the well with the exception of one sample in October 2021. Groundwater samples collected from the remaining Site groundwater monitoring wells did not contain TPH-D+O above the cleanup level.

Sediment: Five sediment samples were collected at the Site in September 2015 (SS-1 to SS-5; **Figure 6**). Sediment samples were located west of the ordinary high-water mark from the uppermost 0.25 feet of sediment. None of the sediment samples contained TPH-D, TPH-O, or naphthalene above the laboratory reporting limits.

Soil Vapor and Indoor Air: Sub-slab soil vapor and indoor air samples were collected at the Site in November 2013. Three sub-slab soil gas samples were collected from the western portion of the residence (A-1ss to A-3ss; **Figure 6**). All three samples contained naphthalene above the Method B screening level for vapor intrusion. Other Site COCs were not detected above the Method B screening level.

Air samples were collected from the following locations (**Figure 6**):

- Three samples were collected from the residence on the Property (A-1IA to A-3IA).
- One sample was collected from the crawlspace of the north-adjacent property (A-4cs).
- One ambient air sample was collected southwest of the residence on the Property (A-5AM).

After corrections for ambient concentrations were applied, analytical results from A-1IA, A-2IA, and A-3IA contained benzene above the Method B cleanup level for unrestricted use. However, based on the results of sub-slab soil vapor sampling discussed above, vapor intrusion is not assumed to be a source for these concentrations. None of the other Site COCs were detected above the Method B cleanup level in the remaining samples.

Remedial Actions: Following the discovery of LNAPL in MW-2 in 2014, three 18-inch diameter passive recovery wells were installed in the immediate vicinity of the monitoring well (**Figure 2**). LNAPL was recovered from the wells using disposable bailers, peristaltic pumps and disposable tubing, and sorbent socks. Between March 2014 and April 2021, a total of approximately 69 gallons of fluid (including approximately 33 gallons of product) have been recovered from the recovery wells. This total does not include any LNAPL volume captured by sorbent socks.

Enclosure A Figure 1

Project File: 01-0864-D F1.vsd

g-logics

Property Location Maps

Mossman Residence

3461 East Lake Sammamish Shore Lane NE

Sammamish, Washington

Figure 1

Mapping Reference: Delorme and King County iMap

Understood location of hedge row/fencing.

G-Logics Legend

- G-Logics Groundwater Monitoring Well Location
- G-Logics 2020 Boring Locations
- G-Logics 2021 Boring Locations
- 10,000 — DRO Concentration in Soil Exceeding 10,000 mg/kg
- 2,000 — DRO Concentration in Soil Exceeding MTCA Method A Cleanup Level 2,000 mg/kg
- 519 — DRO Concentrations from EPI and G-Logics soil sampling, see EPI Table 1 and G-Logics Table 1 for Analytical Results, highest result from multiple depths shown when applicable
- 5,123 — DRO Concentrations >2,000 mg/kg
- <51.5 — DRO Concentrations Not Detected

EPI Legend

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- SEDIMENT SAMPLE LOCATION
- INDOOR AIR SAMPLE LOCATION
- SUB-SLAB SAMPLE LOCATION
- PROPERTY BOUNDARY
- TOPOGRAPHIC COUNTOUR IN FEET (DATUM: NGVD 29)

Base Map is from Environmental Partners Inc. (EPI) Technical Memo, dated 11/16/2018

The isoconcentration contours represent an interpretation of available data, for the indicated date. These contours may change with additional measurements and/or data points, remedial efforts, natural attenuation, and/or other influences.

Approximate Drawing Scale: 1" = 10'

0 ft. 6 ft. 10 ft. 20 ft.

Note: This figure contains information in color. Black & white photocopies may not be suitable for review.

DRO Concentrations in Soil, 2013-2021

Mossman Residence, Heating Oil Site

3461 East Lake Sammamish Shore Lane NE

Sammamish, WA

Enclosure A Figure 2

Figure 3

Mapping Reference: Environmental Partners Inc., Triad Associates, G-Logics Data.

Project File: 01-0864-D F3 DRO in Soil Isocontours.vsdx

Understood location of hedge row/fencing.

MW-8
26.05'

MW-6
25.98'

MW-2
26.04'

MW-1
26.09'

MW-5
26.05'

MW-7
26.05'

MW-3
26.18'

MW-9
26.36'

MW-4
27.41'

27'

26'

RESIDENCE

STORAGE AREA

ASPHALT

PATIO

FOOTING

(APPARENT) SEPTIC TANK LID

HEATING OIL UST EXCAVATION

ROCK WALL

RECOVERY WELLS

CONCRETE STAIRS

BRICK PAVERS

DOCK

EDGE OF WATER AS MEASURED SEPTEMBER 2015

ORDINARY HIGH WATER MARK

FEMA ZONE X
FEMA ZONE AE

E LAKE SAMMAMISH

SSMH (SEWER PUMP)

EPI Legend

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- SEDIMENT SAMPLE LOCATION
- INDOOR AIR SAMPLE LOCATION
- SUB-SLAB SAMPLE LOCATION
- PROPERTY BOUNDARY
- TOPOGRAPHIC COUNTOUR IN FEET (DATUM: NGVD 29)

Base Map is from Environmental Partners Inc. (EPI) Technical Memo, dated 11/16/2018

G-Logics Legend

- G-Logics Groundwater-Monitoring Well Location
- MW-5 / 26.49' — Well Identification / Groundwater Elevation in feet (NGVD 29)
- -26'- Groundwater Elevation Contour Line
- Inferred Groundwater Flow Direction

The groundwater contours represent an interpretation of available data, for the indicated date. Site groundwater contours may change with additional measurements and/or data points, weather changes, construction activities, and/or other influences.

g-logics

Approximate Drawing Scale: 1" = 10'

0 ft. 6 ft. 10 ft. 20 ft.

Note: This figure contains information in color. Black & white photocopies may not be suitable for review.

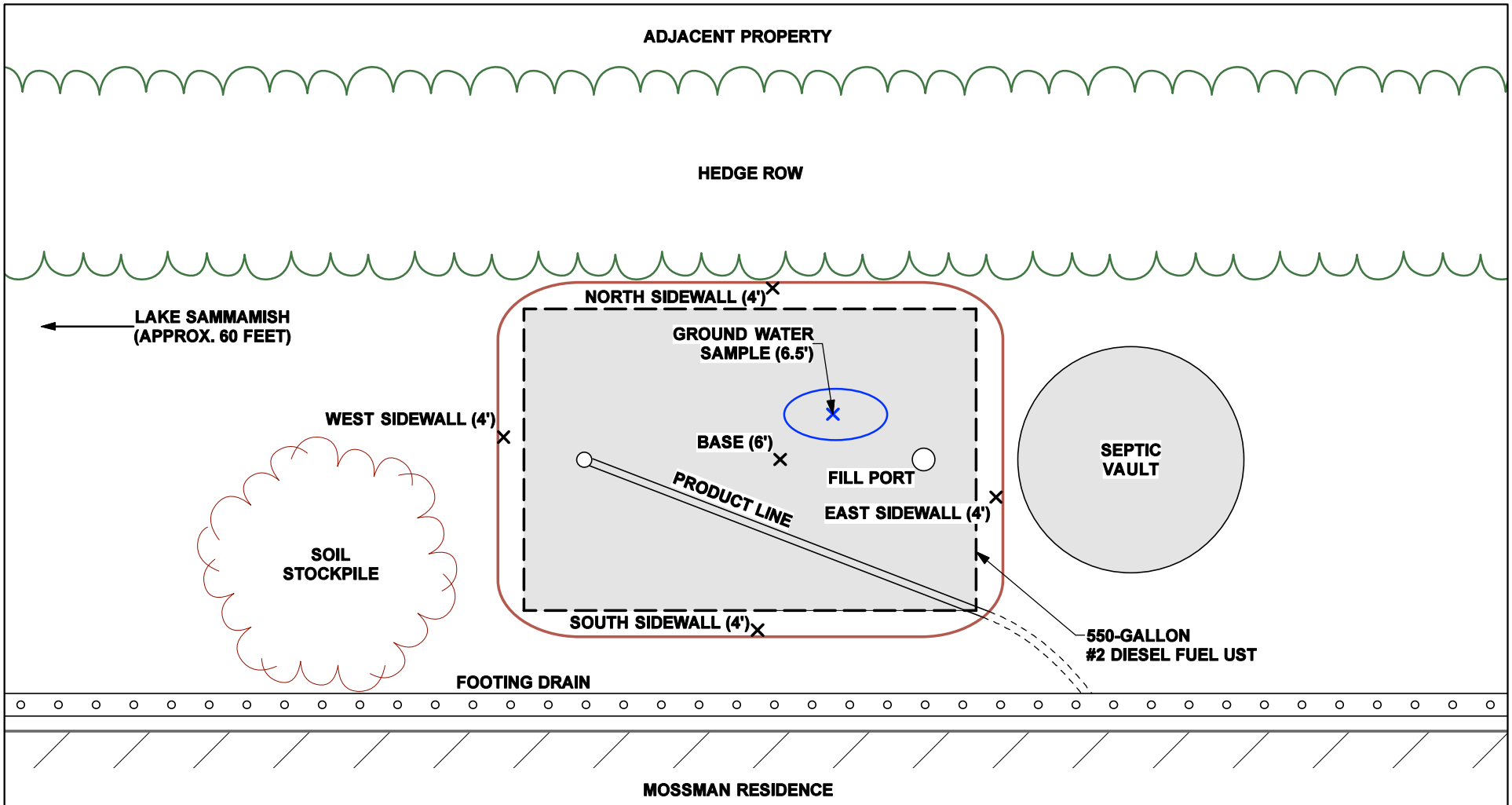
Groundwater Contours, 10/21/2021
Mossman Residence, Heating-oil Site
3461 East Lake Sammamish Shore Lane NE
Sammamish, WA

Enclosure A Figure 3

Figure 5

Project File: *01-0864-D F5 Groundwater Contours.vsd*

Mapping Reference: Environmental Partners Inc., Triad Associates, G-Logics Measurements.



Enclosure A Figure 4

KEY:

× - SOIL SAMPLE LOCATION

× - GROUNDWATER SAMPLE LOCATION

0 0.5 1 2

APPROXIMATE SCALE: 1" = 2'

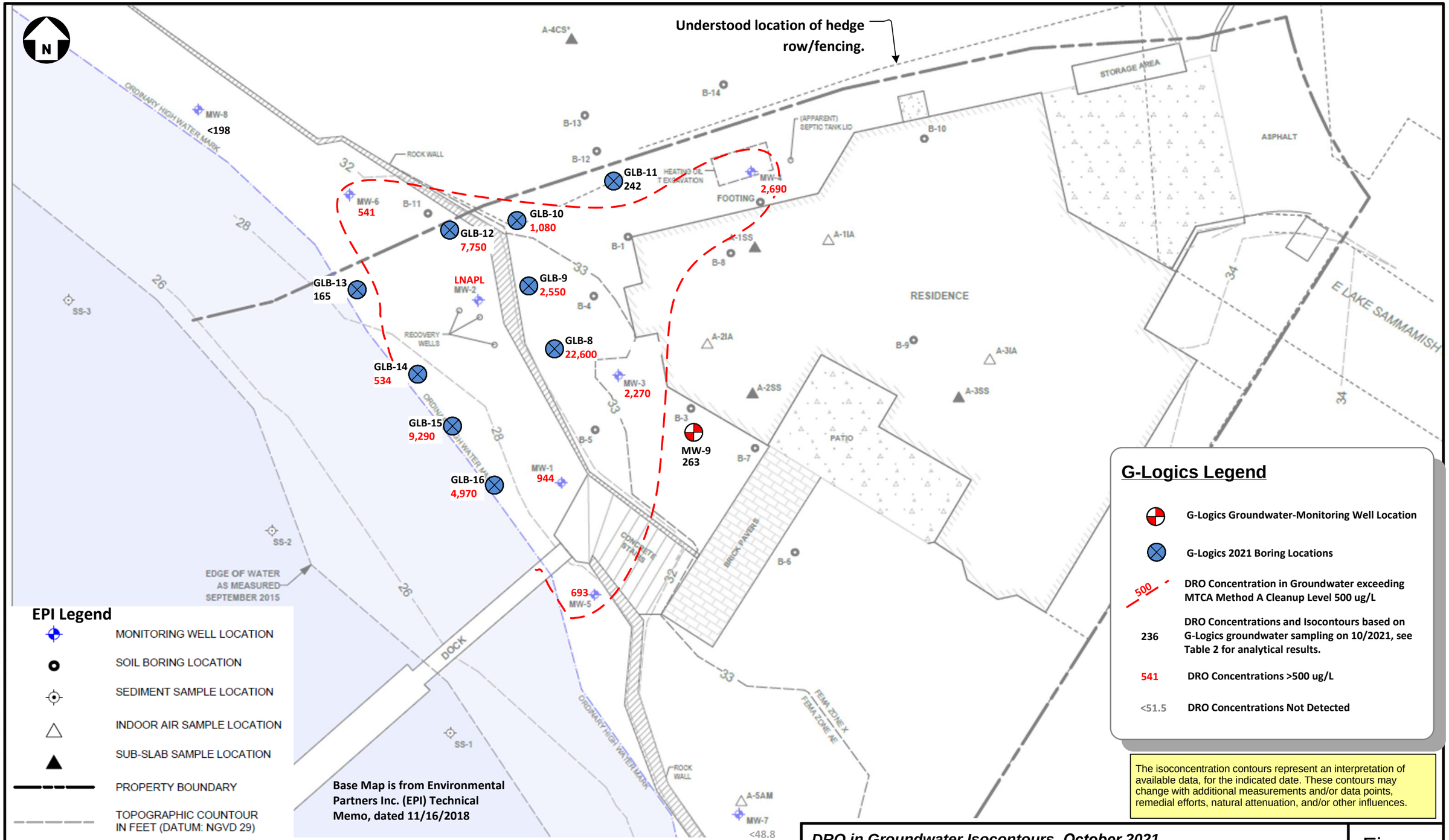
ENVIRONMENTAL PARTNERS INC

295 NE Gilman Boulevard, Suite 201
Issaquah, Washington 98027

FIGURE 2

SAMPLE LOCATION MAP

PROJECT	65201.0		
PREPARED FOR	MOSSMAN RESIDENCE UST		
LOCATION	3461 E. LAKE SAMMAMISH SHORE LANE SAMMAMISH, WASHINGTON		
SHEET	DRAWN BY	REVIEWED BY	DATE
1 of 1	ALW	GAM	1/18/13



Project File: 01-0864-D F4 DRO in Groundwater Isocontours.vsdx

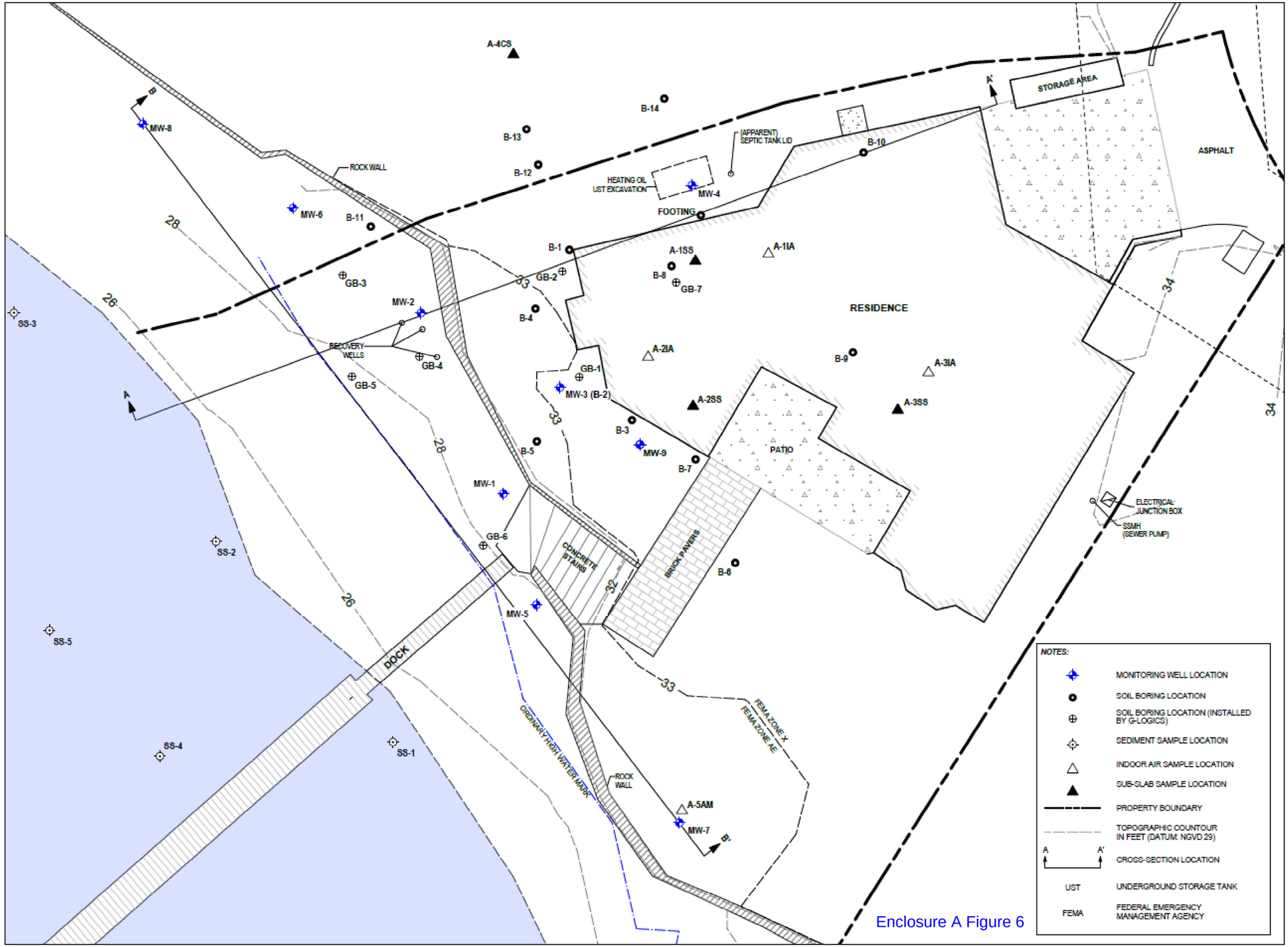
g-logics

DRO in Groundwater Isocontours, October 2021
Mossman Residence, Heating Oil Site
3461 East Lake Sammamish Shore Lane NE
Sammamish, WA

Enclosure A Figure 5

Figure 4

Mapping Reference: Environmental Partners Inc., Triad Associates, G-Logics Data.



NOTES:

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- SOIL BORING LOCATION (INSTALLED BY G-LOGICS)
- SEDIMENT SAMPLE LOCATION
- INDOOR AIR SAMPLE LOCATION
- SUB-SLAB SAMPLE LOCATION
- PROPERTY BOUNDARY
- TOPOGRAPHIC COUNTOUR IN FEET (DATUM: NGVD 29)
- A — A' CROSS-SECTION LOCATION
- UST UNDERGROUND STORAGE TANK
- FEMA FEDERAL EMERGENCY MANAGEMENT AGENCY

Enclosure A Figure 6

N

0 2.5 5 10

SCALE: 1" = 10'

TRC
1180 NW MAPLE ST, SUITE 310
ISSAQUAH, WA 98027
425.395.0010
WWW.TRCCOMPANIES.COM

FIGURE 2

SITE REPRESENTATION WITH SAMPLE LOCATIONS AND CROSS-SECTION LOCATIONS

REPORT
REMEDIAL INVESTIGATION REPORT

LOCATION
3461 E LAKE SAMMAMISH SHORE LN NE
SAMMAMISH, WASHINGTON

PREPARED FOR
MR. MIKE MOSSMAN

PROJECT NUMBER
015364.0007

DATE 4/22/21
DRAWN BY ..... VPB
REVIEWED BY ..... SPT