

February 27, 2020

Mr. William F. Gartz  
7703 West Mercer Way  
Mercer Island, WA 98040

RE: SIDE SEWER SETTLEMENT AT 7701/7703 WEST MERCER WAY,  
MERCER ISLAND, WASHINGTON

Dear Mr. Gartz:

This letter describes our geological and geotechnical engineering findings regarding the side sewer line that extends from your northern neighbor's house (Lewis property, 7701 West Mercer Way), across your property (7703 West Mercer Way) within an easement, and then connects to the public sewer line. We understand your neighbor, Mr. Lewis, alleges you placed fill over his side sewer as part of landscaping on the slope below your house, and installed a steel H-pile cantilever soldier pile wall and new dock. He alleges the fill and vibrations from pile driving caused portions of the side sewer line to settle. Further, he alleges this settlement caused his backflow preventer to close and back sewage up into his house.

This letter presents revisions to the letter we provided dated February 14, 2019. We received additional information since we prepared that letter. The additional information includes additional surveys, geotechnical studies for the soldier pile retaining walls that were constructed in August 2016, a timeline of events that you prepared, and a letter prepared by Terra Associates, Inc. on behalf of Mr. Lewis. This additional information includes:

- Another video pipe inspection and surveys to estimate the side sewer lines and grades. The video pipeline inspection and surveys were performed on January 7, 2020.
- Additional geotechnical that you previously commissioned for designing and permitting the cantilever soldier pile walls near your waterfront, including:
  - Liu & Associates, Inc., September 1, 2011, Geotechnical Investigation, Soldier Pile Retaining Wall. Gartz Residence, 7703 West Mercer Way, Mercer Island, Washington. L&A Job No. 11-059.
  - Liu, September 5, 2011, Design Calculations, Soldier Pile Wall. Gartz Residence, 7703 West Mercer Way, Mercer Island, Washington.
- Gartz, July 10, 2019, Memo Re: Timeline of Sewer issue (enclosed).
- Terra, May 22, 2019, Geotechnical Engineering Evaluation, Mercer Island Sewer, 7701 W. Mercer Way, Mercer Island, Washington

The revisions to this letter include:

- Background information, to correct the pier construction dates.
- Geologic and Geotechnical Information to include the information from Liu (2011).
- Side Sewer Survey to include new information.
- Conclusions regarding the Terra opinions.
- Conclusions to include the new information.
- Recommendations for repairing the side sewer.

## BACKGROUND

We understand that prior to 2012 your access to the lake was down a steep impervious stairway along your north property line. The stairway consisted of creosote timber risers filled with concrete treads. In 2012, you removed those stairs and built retained fill concrete masonry unit (CMU) walls and a steel-framed/sand-filled walkway that traversed across the slope from the patio below the house to the shoreline near your southern neighbor. The grading you performed to replace the stairs along your northern property line near the area where your neighbor's side sewer settled included cuts and fills less than 2 feet thick. The enclosed Site Plan from the 2015 permit documents, Figure 1, shows the site topography before and after the construction. The black topographic contours show current elevations, and the blue contours show elevations prior to grading. The topsoil fill has a unit weight that is close to half the unit weight of the timber and concrete removed. Therefore, the change in stress over the side sewer was small.

In March 2015, Shannon & Wilson reviewed the grading and retained fill you completed between your house and Lake Washington. We concluded this work was in accordance with City of Mercer Island requirements and geotechnical recommendations described in the reports described in the following section. We presented our conclusions in our letter, City of Mercer Island Permit Application Number 1410-199, Hillside Grading at 7703 West Mercer Way, Mercer Island, Washington, dated March 25, 2015.

We understand that in 2016 you completed additional landscaping along the shoreline. That landscaping included:

- Replaced your timber retaining wall along the shoreline with cantilevered soldier pile retaining wall constructed with steel H-piles and timber lagging. This work is 25 to 60 feet downslope and south from where you neighbor's sewer settled.



- Completed the steel-framed, gravel-filled pathway near your southern property line to the shoreline. This work occurred downslope and south from where your neighbor's sewer settled.

This landscaping and pier replacement work you completed in 2012 and 2016 was designed and constructed in accordance with geotechnical reports you commissioned. The City of Mercer Island permitted and inspected the work.

After completing your landscaping work in August 2016, and to avoid potential future complaints by your neighbor regarding the sewer within the easement, you commissioned Fisher Plumbing and Heating & Rooter to perform a video pipe inspection on August 8, 2016. Their report stated:

"Video pipe camera inspection of sanitary sewer from backflow in neighbor's yard 7701 revealed pipe to be broken at backflow and leaking into lake. There is also a belly in pipe from backflow to 10-15 feet. Remainder of pipe is 6" PVC. No abnormalities were viewed on remainder of pipe to what appears to be a manhole or access to sewer 100' from backflow. Pipe in disrepair is on 7701 property. There was large amounts of soap blocking backflow."

After the side sewer break was discovered, we understand your neighbor repaired the broken connection in 2016, but did not correct the "belly" (sag) in the pipe on his property. Therefore, the settled sewer line sloped uphill from his property to your property.

In July and August 2017, you rebuilt your pier about 10 feet to the south of its original location. The pier is in Lake Washington, i.e., the construction did not change the ground near where your neighbor's sewer settled.

In July 2018, we understand your neighbor complained of sewage backing up into his house. He claimed this was due to your previous landscape work. Again, you retained two plumbing contractors to video inspect the side sewer. We understand their conclusions were the same as in 2016 regarding the sag in the side sewer at the property line, and that proper drainage grades were present across your property. They noted that the low point in the side sewer sag was at the backflow preventer on your neighbor's property, which caused it to close. The closed backflow preventer caused the sewage to back up. After being informed, your neighbor excavated and removed the backflow preventer and connected a temporary 2-inch-diameter ABS sewer line on the ground surface between his house and the property line where the backflow preventer had been. The temporary sewer was still in use when we made our site visit on January 5, 2019.

## GEOLOGIC AND GEOTECHNICAL INFORMATION

You commissioned two geotechnical studies for remodeling your house and to evaluate geologic and geotechnical hazards on your property. Those reports include:

- Associated Earth Sciences, Inc. (AESI), Subsurface Exploration, Geologic Hazard, and Geotechnical Engineering Report, Gartz-Holt Remodel, Mercer Island, Washington, dated April 17, 2007 (AESI report)
- Battermann Geotechnical Consulting, PLLC, Robin Holt & William Gartz, 7703 West Mercer Way, Mercer Island, Washington, dated January 11, 2013 (Battermann report)

Those reports describe the subsurface conditions and geologic hazards at the site. The AESI report provided geotechnical design recommendations for foundations, walls, site grading, and drainage.

As described above, you commissioned Liu to provide design recommendations for the steel H-pile retaining walls near the shoreline. That study included drilling one boring about 12 feet above the lake level and about 14 feet upslope from the shoreline (refer to Plate 2 in Liu, 2011).

Our 2015 study included reviewing the previous geotechnical reports you commissioned and other published literature, including:

- Geologic Map of Mercer Island, Washington, by Kathy Troost and Aaron P. Wisher, October 2006
- Environmental Critical Area maps available on the City of Mercer Island GIS Portal <http://pubmaps.mercergov.org/SilverlightViewerEssentialsExternal/Viewer.html?Viewer=ExternalWebGIS>
- Subsurface data from the GeoMapNW database, available at <https://fortress.wa.gov/dnr/geology/?Theme=subsurf>

In general, this information shows the slope beneath your house is underlain by fill, colluvium, possible Holocene lake deposits, and pre-Olympia fine-grained glacial deposits:

**Fill:** The fill consists of loose to medium dense, silty sand with gravel. Where encountered in borings drilled by AESI (2007), the fill was about 4 to 15.5 feet thick. The soil we observed in the side sewer line excavation near the property line consisted of loose silty sand fill.

**Colluvium:** Colluvium is soil that is transported on slopes by non-concentrated erosion, including slope creep, rainsplash and sheetwash erosion, and landsliding. Colluvium is not



visible at the surface on the slope. It likely underlies the fill and consists of silt; sandy silt; and silty, sandy gravel that is medium dense.

**Holocene Lake Deposits:** Silt, clay, and local sand layers formed in Lake Washington after the last glacial retreat. When the lake was lowered in 1916 with the construction of the Lake Washington Ship Canal, some of these deposits were above lake level. While not visible at the surface, loose sand, medium stiff silt, and/or clay likely are present beneath fill and colluvium, and extending up to 9 feet above the present lake level. The Holocene Lake deposits were deposited over colluvium and Pre-Olympia deposits. They likely interfinger with colluvium.

**Pre-Olympia Deposits:** These consist of silt and clay that were deposited in lakes and ponds and then overridden by advancing continental glaciers. They were overridden by at least three glacial advances, resulting in glacially overconsolidated hard clay and silt. When disturbed, these deposits remold to soft to medium stiff clay and silt.

Boring B-1 (Liu, 2011) encountered 11 feet of medium dense to loose sand overlying medium stiff to very hard fine sandy to clayey silt. The boring was completed on August 10, 2011. The boring log states that groundwater was not encountered. Liu (2011) interpreted the lower 7.5 feet of the loose sand as possible slide debris.

The boring was drilled above an approximately 3-foot-high timber retaining wall; therefore, the upper few feet of sand present in the boring likely was fill. The loose sand described on the boring log from 3.5 to 11 feet below ground surface likely consists of Holocene Lake deposits that interfinger with Colluvium.

## SITE OBSERVATIONS

We observed the landscape features on your property during our 2015 study and during our recent site visit on January 5, 2019. Retained fills for walkways and patios generally appear similar to when we observed them in 2015. We did not observe evidence of significant new settlement or downslope movement.

The side sewer easement alignment on your property is mostly under landscape slopes and partly under a walkway. The walkway typically has less than 1 foot of retained fill. The sewer video inspection described above indicates the side sewer has not settled visibly along most of its length along the easement.

We made the following observations in the area where the video inspection showed the break, and where the temporary sewer line connects to the 6-inch-diameter side sewer line:

- On your property, your old steps down to the lake had been removed and landscaped to create a relatively uniform slope, i.e., without substantial visible cut and fill areas. One tree well is present below and south of the excavation that your neighbor made to expose the broken side sewer and to connect the temporary sewer line. That tree well has a CMU wall that retains up to 2 feet of soil.
- A steep sidewalk is present on your neighbor's property. The temporary excavation made to connect the temporary sewer line is just south of this sidewalk and north of your mutual property line. The sidewalk is displaced laterally more than 6 inches to the south. Your neighbor's CMU wall retained patio north of the sidewalk is causing the sidewalk displacement. Photographs 2 and 3 show the sidewalk and the obvious lateral displacement caused by the adjacent wall.
- A geotextile-wrapped perforated pipe is present just south of and parallel to sidewalk. It was apparently installed to provide subsurface drainage next to the sidewalk. However, it was not buried sufficiently deep, and is not surrounded by drainage aggregate. Now it is exposed at the ground surface along much of the sidewalk. It appears to contribute to surficial erosion. See Photograph 4.
- A CMU-retained patio is present over your neighbor's side sewer line (Patio 1). It extends between the sidewalk and your neighbor's house, with a maximum retained height of about 6 feet. The CMU wall has displaced downslope and settled. We measured more than 5.5 inches of relative settlement (assuming the upslope portions had not moved, and the wall had been built level). The CMU blocks on the wall face have pulled apart and show obvious evidence of settlement. The pavers behind the wall have gaps that indicate at least 5 inches of lateral movement in a downslope direction. The pavers have settled relative to the CMU wall. We did not observe evidence of wall drainage or geosynthetic reinforcement. See Photographs 5 and 6.
- A long CMU-retained patio is present between your neighbor's house and the lakeshore (Patio 2). That wall shows obvious evidence of settlement and lateral movement. That evidence includes:
  - The CMU wall has distorted and moved differentially towards the lake and settled.
  - Pavers behind the CMU wall show obvious evidence of settlement and lateral movement. The pavers have apparently settled below the CMU wall in places. They have open joints that indicate lateral displacement.
  - The ground in front of the wall has settled, with more settlement near the south end of the wall. The sidewalk panels show vertical and horizontal relative displacement.
  - Seepage emanates from the bottom of the wall indicating the wall is not properly drained.
  - The pier shows evidence of lateral movement of the shore abutment towards the lake. The pier deck has been compressed and lifted off of the first bent offshore from the bulkhead.



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- The first bent supporting the pier appears high, which could have been caused by uplift at the toe of rotational landslide movement. See Photographs 7 through 9.

We reviewed photographs you provided and aerial photographs available on Google Earth. Those photographs indicate your neighbor constructed Patios 1 and 2 between 2006 and 2009.

## SIDE SEWER SURVEY

A survey was made on January 7, 2020, which included:

- A video pipeline inspection of the side sewer interior.
- Measurements of depth to a sonde attached to the pipeline video camera. The depth measurements were made using a handheld receiver at the surface.
- Professional surveyor measurements of the surface locations where depth measurements to the sonde. Figure 2 presents the survey results, including the side sewer plan and profile shown by the sonde measurements.

The video pipeline inspection and depth measurements to the sonde in the side sewer were made by Pro-Vac. Axis Survey & Mapping, Inc. performed the surveying.

The video pipeline inspection provided better images than the previous video pipeline inspections described above. The improvements occurred because the line was initially flushed with clean water and the video camera remained level and was moved more slowly through the side sewer. Limitations of the video pipeline inspection included:

- The distance measurements were made at the cable spool, which was about 10 feet from the entry points to the side sewer. Therefore, the cable path between the spool and entry points varied resulting in variability in the distance measurements.
- The video camera was pushed into the side sewer and then pulled out. The distance measurements to recognizable points typically were greater when the video camera was pushed in compared to those made as the camera was pulled out.
- When submerged, the video camera could not image the pipeline.

We estimate the distance measurements vary by about +/- 1 foot. This estimate is based on comparing several recognizable points in two sequential video pipeline inspections of the side sewer segment on the Gartz property. Points included the junction with the Gartz side sewer, two pipe joints, and the manhole on the property to the south.

In our opinion, the position and depth measurements made using the sonde and handheld surface receiver were not sufficiently accurate to provide useful information. The

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measurements made for the side sewer segment on the Lewis property show the plan location varies substantially from the projected line. The depths apparently increase from south to north, i.e., the opposite of the likely pipe grade. Therefore, we recommend not using the pipe position measurements to judge pipe grades and plan. The measurements could be used for gross estimates of pipe depth for planning purposes. We estimate the error in position could be on the order of +/- 2 feet. The error could be greater where the side sewer is deeper than 6 to 10 feet below ground surface.

Terra's proposal for the survey work stated: "The company that operates the robot will independently develop the relative side sewer line profile, with pipe slope and ponded depth estimates at least every 2 feet." We understand that Pro-Vac has not yet provided this information. We developed a relative profile based on the presence of ponded water, flowing water and dry pipe sections. In summary:

**Side sewer segment on the Gartz property:** Distances are in feet beginning at the "Y" in the pipe where the temporary Lewis side sewer connects and progressing south. The distances reported below are the average from up to four distance estimates made from the videos, i.e., the video camera was inserted twice and we made distance estimates as the video camera was pushed in and then pulled out.

- |             |   |
|-------------|---|
| 0 – 11.8    | Side sewer is full of water, with depth diminishing to 0 feet at 11.8 feet. The lowest point apparently is at the "Y", which is on the Lewis property close to the property line. |
| 17.4 - 18.9 | Gartz side sewer connection. Minor ponded water in joint and extending about 1 foot downstream. Ponding depth is less than 1 inch.  |
| 34 – 59     | Shallow ponded water. Maximum depth near 45 feet is about one-third of pipe diameter, i.e., about 2 inches.   |
| 110         | Manhole   |

The side sewer pipe is white. Dark zones are visible at the upstream and downstream ends of the Gartz side sewer connection. The pipe at these zones shows about ½ to 1 inch of offset. The dark zones could be caused by a break in the pipe showing the dark surrounding soil, or a flexible black material used to make the connection, e.g., a Kor-N-Seal. In our opinion, a flexible connection likely is present. We made this conclusion because:

- The dark areas appear shiny in the videos. Soil should not be shiny, whereas black rubber likely would be.



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- The Gartz side sewer connects at 90 degrees to the main side sewer. Small movement is common at such intersections, and especially on a steep slope. The Contractor likely used a flexible connector anticipating such small movement.

**Side sewer segment on Lewis property:** Two sequential video pipeline inspections were made of the side sewer segment on the Lewis property. However, the line was not flushed with water, so cobwebs obstructed the camera lens during the initial video pipeline inspection. The pipe appeared unremarkable and did not show areas of distress or obvious bends. The pipe was blocked 13 feet from the opening, which is the approximate distance to the Lewis residence. Reportedly, Mr. Lewis placed a plug in the pipe from inside his house. This segment of the side sewer was dry because it had not been flushed with water. Therefore, we could not evaluate relative level of the side sewer.

#### TERRA MAY 22, 2019, LETTER

Terra provided a letter with their opinions and conclusions regarding the side sewer settlement. In their letter, Terra provides the following conclusions (in italics):

*"A geotechnical report was prepared for the retaining wall project by Liu & Associates on September 1, 2011, prior to any grading. This report indicated that the soils underlying the proposed area for the soldier pile walls consisted of approximately two feet of loose silty sand (fill material) overlying approximately seven and one-half feet of loose sand overlying medium stiff to hard silt. The upper loose sand materials were interpreted to be earlier slide debris. The sand material had Standard Penetration Test (SPT) N-values of 4 and 5. Based on the location of the sewer line and soldier pile wall, it is our opinion that the sewer line likely resides within the upper loose materials observed for the geotechnical report."*

Terra's description of the subsurface conditions varies from the boring log presented by Liu (2011); however, in our opinion the differences are small and not substantial. More to the point, the subsurface conditions encountered in the Liu (2011) boring may not be representative of the subsurface conditions at the side sewer elevations. The boring was drilled through soil that was mostly below the original Lake Washington elevation. Therefore, the loose sandy soil may represent Holocene Lake Deposits, which would not be present at the side sewer elevation. In our opinion, the subsurface conditions at the side sewer location likely consist of colluvium overlying glacially overconsolidated till and/or glaciolacustrine soil. The colluvium typically consists predominately of silty sand and sandy silt.

*"Based on our observations and research into the project, it is our opinion that what likely caused the sag in the sewer line is that during the driving for the soldier piles or piles for the dock, the upper*

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*loose silty sand and sand materials liquefied under the vibrations and then settled. This settlement of the sand soils caused the sewer line to settle and sag resulting in the sewage backup. Sand soils with blow counts of less than 15 are susceptible to liquefaction when they experience vibrations and are wet. As the sewer line and soils are adjacent to Lake Washington, it is likely that the sand soils were wet when the pile driving took place."*

We agree that loose saturated sand is potentially liquefiable; however, we believe the pile-induced vibrations likely were insufficient to cause liquefaction had the soil been saturated. The Liu (2011) boring log states "Test boring terminated at 18.0 ft, groundwater not encountered." Further, we note that the lake level is below the maximum depth of loose sand encountered in the boring. The pile driving occurred in the dry months of July and August. Therefore, we believe the sand would not have been seasonally saturated, and that liquefaction would not have occurred.

*"In addition to the pile driving, additional fill material was placed over the top of the sewer easement. Based on our observations and experiences with sand soils, they are typically not a material that is susceptible to consolidation from additional loading. Therefore, it is our opinion that the additional fill material placed over the top of the sewer easement likely did not cause the sag in the sewer line."*

We agree with this conclusion.

*"Given the likely cause of the settlement and existing conditions, it is our opinion that the settlement of the sand soils is not a perpetual problem. Once the sewer line has been repaired, it is our opinion that it will function as intended without the need for additional measures to stabilize the sand soils. We would note that if any additional work is to take place near the sewer line easement the potential for the sand soils to liquefy should be taken into consideration."*

We generally agree with this conclusion. The site has a steep slope that has landslide potential. Because of the site improvements, such as drainage to reduce surface water flowing onto the slope and the soldier pile recent retaining construction, we believe slope movement is less likely. However, slope movement could occur because of unforeseen and rare events such as water line breaks, earthquakes, etc.

## CONCLUSIONS

In our opinion, the grading, including retained fills, that you completed did not cause ground movement that severed your neighbor's side sewer line near the property line and caused settlement that extends about 10 feet onto your property. The amounts of cuts and fills you made to landscape the slope are small and had little effect on the slope stability. The amount of fill you placed is not sufficient to cause settlement by consolidating or



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compressing the underlying soil. Further, the design and construction practices used in your landscaping were intended to and suitable for reducing slope movement. Those practices included:

- Making small cuts and fills.
- Using geosynthetic reinforcement in retained fills.
- Constructing drainage in retained fills.
- Replacing an old timber retaining wall with a steel H-pile cantilevered soldier pile wall.

As described in the previous section, we do not believe that the pile driving for the soldier pile retaining walls and your new dock cause the soil to liquefy and settle. We believe this because:

- The Liu boring log indicates the soil is not saturated.
- The pile driving occurred during the dry summer months, which further supports that colluvium overlying the glacially overconsolidated soil would not have been saturated.
- The subsurface conditions encountered in Liu boring log are likely not representative of the subsurface conditions under the side sewer.
- The pile driving vibrations likely were not sufficient to cause liquefaction.

In our opinion, fill for your neighbor's Patio 1 that is above his side sewer line is moving downslope. This movement severed the side sewer on his property and caused his side sewer line to sever on his property and to settle mostly on his property and extending about 10 feet on to your property. As described above, that patio wall probably has settled at least 5.5 inches and moved laterally at least 5 inches. As described in the Site Observation Section, we could not see evidence that the Patio 1 walls were properly designed and constructed using conventional geotechnical practices, such as drainage and geosynthetic soil reinforcement. We understand the patio construction was not permitted by the City of Mercer Island.

Patio 2 that is parallel to the lake and downslope from your neighbor's house shows evidence of landslide movement. That movement caused settlement and lateral movement of the sidewalk below the Patio 2 retaining wall. Patio 2 may have been constructed over Holocene Lake silt and clay, which is a weak and settlement prone soil. The Patio 2 movement may have reduced support for the toe of the smaller Patio 1 retaining wall that is over your neighbor's side sewer line. If so, it would have exacerbated the slope movement caused by the Patio 1 fill and retaining wall. As described in the Site Observation Section, we could not see evidence that the Patio 2 walls were properly designed and constructed using conventional geotechnical practices, such as drainage and geosynthetic soil

reinforcement. We understand the patio construction was not permitted by the City of Mercer Island.

A shallower sag exists in the side sewer on your property. That sag extends from about 34 to 59 feet south from the "Y" where the temporary Lewis sewer line connects to the side sewer, i.e., south from near the Lewis/Gartz property line. The video pipeline inspection showed water ponded to about one-third of the pipe diameter. In our opinion, the magnitude of this sag should not affect sewage from freely flowing.

## RECOMMENDATIONS

We recommend replacing the portion of the side sewer line upstream from the junction with the Gartz side sewer. This portion of the side sewer has sagged to the point that it impedes free flow of sewage. A new side sewer section should be graded for free drainage in accordance with City of Mercer Island codes and typical side sewer construction practices.

We anticipate Patio 1 on the Lewis property will continue to slump and move downslope. This ground movement would affect a new side sewer. Therefore, we recommend that Mr. Lewis replace Patio 1 with a new patio that is designed, permitted, and constructed in accordance with City Mercer Island codes. We anticipate this will require geotechnical studies to provide design recommendations.

Patio 2 on the Lewis property may be contributing to the slope between Patios 1 and 2 moving downslope, i.e., it may be reducing support at the toe of Patio 1. Therefore, we recommend that Mr. Lewis design, permit and perform repairs or a replacement for Patio 1 in accordance with City of Mercer Island codes.

## CONCLUDING REMARKS

The analyses, conclusions, and recommendations contained in this letter are based on site conditions as they presently exist, and further assume that the explorations performed by others are representative of the subsurface conditions throughout the site; that is, the subsurface conditions everywhere are not significantly different from those disclosed by the subsurface explorations described in this letter. If there is a substantial lapse of time between the submission of this letter, or if conditions have changed because of natural forces or construction operations at or adjacent to the site, we recommend that we review our letter to determine the applicability of the conclusions and recommendations.

Within the limitations of scope, schedule, and budget, the analyses, conclusions, and recommendations presented in this letter were prepared in accordance with generally



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accepted professional geotechnical engineering principles and practice in this area at the time this letter was prepared. We make no other warranty, either express or implied. These conclusions and recommendations were based on our understanding of the project as described in this letter and the site conditions as observed at the time of our explorations.

The scope of our present services did not include environmental assessments or evaluations regarding the presence or absence of wetlands, or hazardous or toxic substances in the soil, surface water, groundwater, or air, on or below or around this site, or for the evaluation or disposal of contaminated soils or groundwater should any be encountered.

Shannon & Wilson has prepared and included the enclosed, "Important Information About Your Geotechnical Report," to assist you and others in understanding the use and limitations of our report.

We appreciate the opportunity to be of service to you.

Sincerely,

SHANNON & WILSON



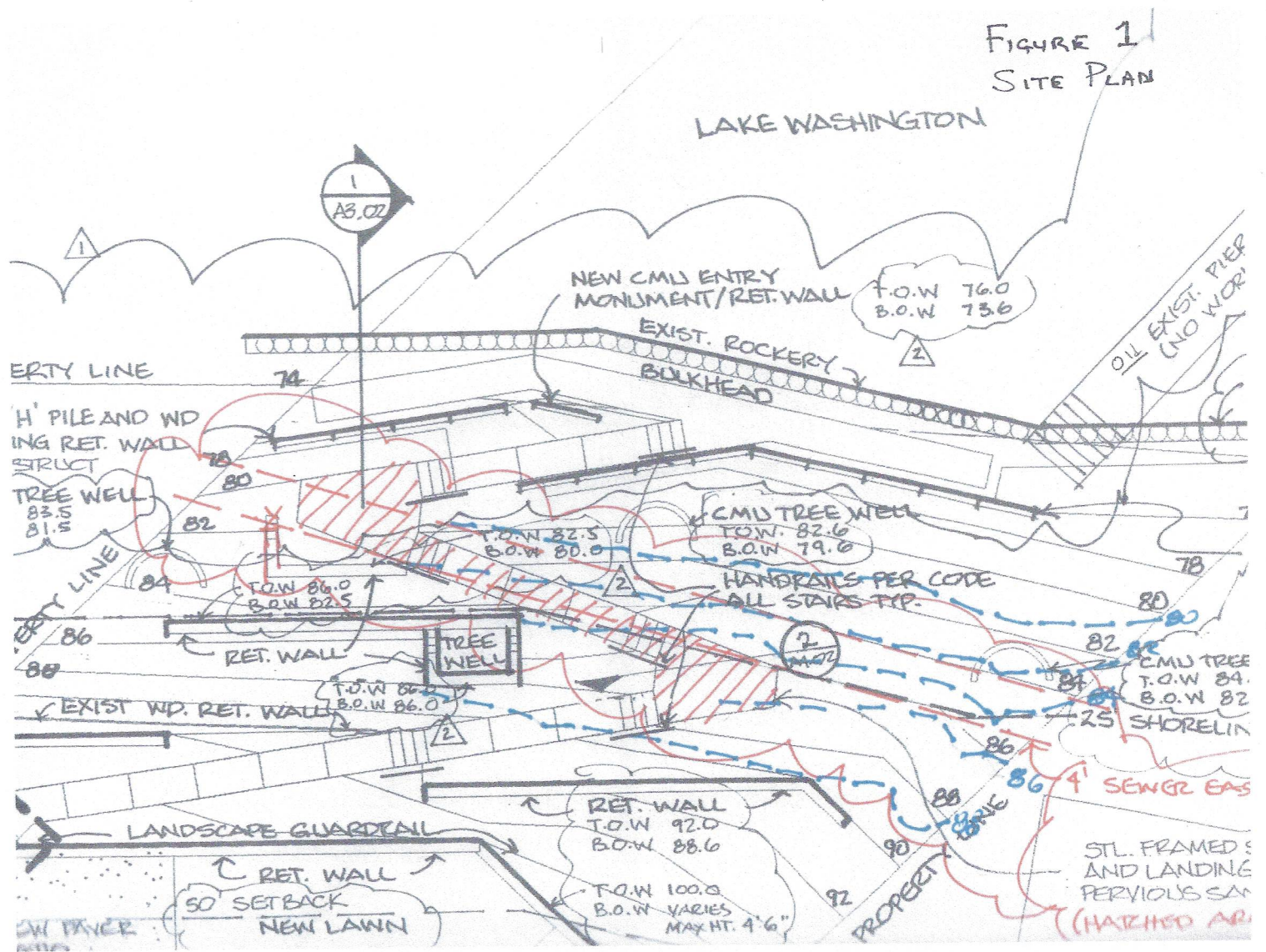
Christopher A. Robertson, PE, LEG  
Vice President

CAR/car

- Enc: Figure 1 – Site Plan  
Figure 2 – January 7, 2020, Survey  
Gartz, July 10, 2019, Memo Re: Timeline of Sewer issue  
Photographs (5 pages)  
Important Information About Your Geotechnical/Environmental Report

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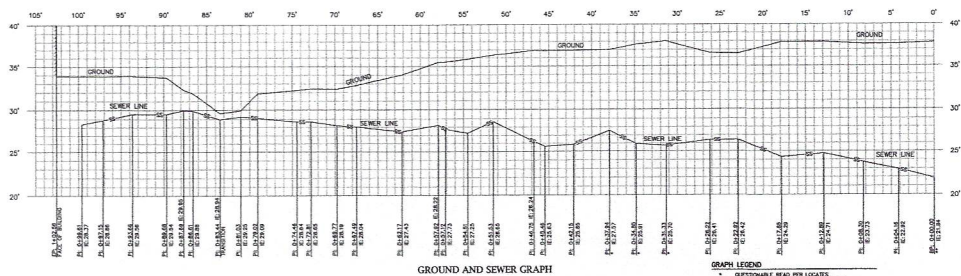
FIGURE 1  
SITE PLAN





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PRIVATE SEWER ASBUILT SURVEY



**BASE OF BEARINGS**  
 ALL BEARINGS REFERRED TO THIS SURVEY WILL BE ALIGNED TO THE CORNER LINE OF LOT 1/4, SW 1/4, SEC. 25, TWP. 24N., RGE. 4E., W.M. CITY OF MERCER ISLAND, KING COUNTY, WASHINGTON.

**HORIZONTAL DATUM**  
 AND 1971

**VERTICAL DATUM**  
 AND 1971

**BENCHMARKS**  
 CITY OF MERCER ISLAND SURVEY DATA WAREHOUSE, DATABASE # 1038, 4" X 5" BENCH SURFACE DOW MARKED 7271 OF MERCER ISLAND GPS CONTROL SURFACE MONUMENT ON TOP OF WATER TREAT STATION, LOCATED APPROXIMATELY 1/4 MILE SOUTH OF THE PROPERTY, BENCH ELEVATION 24.56

**LEGAL DESCRIPTION/TITLE REPORT NOTES**  
 LOT C OF BOUNDARY LINE REVISION M-88-05-03 (3-1) UNDER RECORDING NUMBER 88413003, RECORDS OF KING COUNTY, WASHINGTON.  
 LOT B OF BOUNDARY LINE REVISION M-88-05-03 (3-1) UNDER RECORDING NUMBER 88413003, RECORDS OF KING COUNTY, WASHINGTON.

**EQUIPMENT NOTES**  
 PRIVATE CONTROL POINTS AND ACCESSORY MONUMENT POINTS WERE FIELD MEASURED USING GLOBAL POSITIONING SYSTEM (GPS) SURVEY TECHNIQUE. THE DATA FROM THESE POINTS WERE USED TO CORRECT THE POINTS THAT WERE NOT FIELD MEASURED USING GPS SURVEY TECHNIQUE. THE DATA FROM THESE POINTS WERE USED TO CORRECT THE POINTS THAT WERE NOT FIELD MEASURED USING GPS SURVEY TECHNIQUE. THE DATA FROM THESE POINTS WERE USED TO CORRECT THE POINTS THAT WERE NOT FIELD MEASURED USING GPS SURVEY TECHNIQUE.

**NOTES**  
 THE INFORMATION SHOWN ON THIS MAP REPRESENTS THE RESULTS OF A SURVEY CONDUCTED BY AXIS SURVEY & MAPPING, INC. AND IS NOT TO BE CONSIDERED AS A GUARANTEE OF ACCURACY. THE GENERAL CONDITIONS APPLY TO THIS MAP.

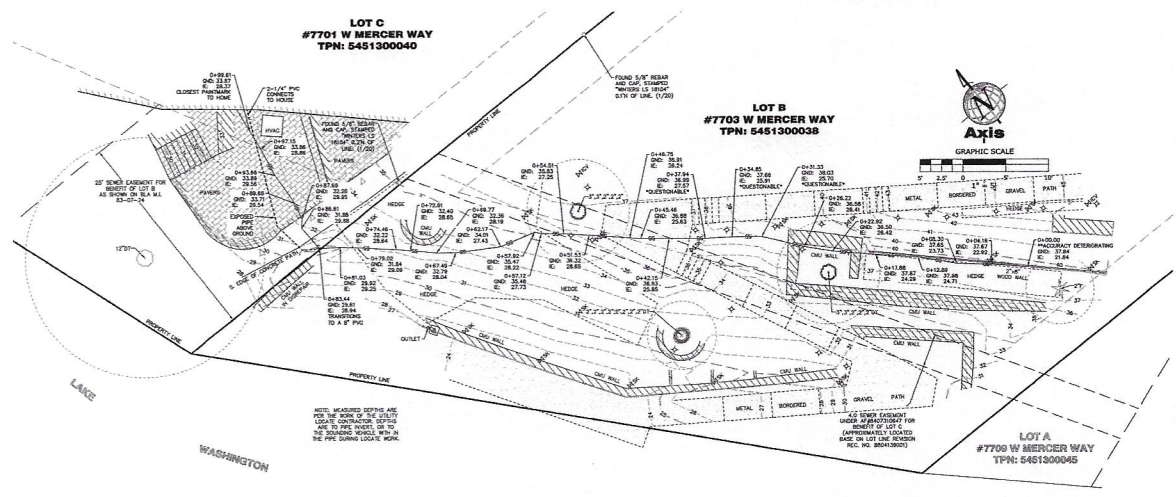


Figure 2 - January 7, 2020 Survey  
 SE 1/4, SW 1/4, SEC. 25, TWP. 24N., RGE. 4E., W.M. CITY OF MERCER ISLAND, KING COUNTY, WASHINGTON

REV#	DESCRIPTION OF REVISION	DATE	BY
#1			
#2			
#3			
#4			
#5			

15245 NE 90TH ST  
 REDMOND, WA 98052  
 TEL: 425.823.5700  
 FAX: 425.823.4500

TERRA ASSOCIATES  
 12220 113TH AVE NE  
 KIRKLAND, WA 98034

SURVEY FOR  
 7701 AND 7703 WEST MERCER WAY  
 MERCER ISLAND, WA 98040

www.axismap.com

JOB NO.	19-025	DATE	1/13/20
DRAWN BY	ERM	CHECKED BY	BEB
SCALE	1" = 5'	SHEET	1 OF 1

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William F. Gartz  
7703 W. Mercer Way  
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July 10, 2019

**Memo Re: Timeline of Sewer issue.**

- September 2006 Gartz/Holt buy house at 7703 W Mercer Way. House was built in 1986. At time of purchase photos show Lewis has no patio or retaining walls between his house and shoreline.
- 2007 or 2008 Lewis hires small-time landscaper Alvarez to build new retaining walls and patio across the width of his property between his house and the shoreline without an engineer or City of Mercer Island permit. The retaining wall and patio are directly over his side-sewer within three feet of the property line. (Approximately 2010: City of Mercer Island files complaint to Mr. Lewis for illegal and unpermitted site retaining walls and patios.)
- 2009 Gartz/Holt hires Lewis' contractor Alvarez to build retaining wall and patio adjacent to their house (does not include site landscape walls)
- 2011 Photos show retaining wall and patio on Gartz/Holt property failing; moving downslope at least 2.5" and pavers settle. Gartz/Holt hire different contractor to design and rebuild retaining wall with Geotech fabric as stabilizer. No movement to-date after rebuilding.
- 2012 Gartz/Holt remove concrete and timber stairs along Lewis property line. Work includes installation of minor landscape retaining walls (less than 4' high), steel framed ramp/stairs crisscrossing their property, and new plant material. Work requires minimal grading (less than 2' cut and fill).
- 2014 Lewis sues Gartz/Holt claiming they violated his sewer easement with their landscaping, his proscriptive easement across their shoreline with construction, and a view covenant with their plants.
- 10/10/2014 Gartz/Holt submit for permit to City of Mercer Island for all 2011 and 2012 construction, and proposed new construction including new stair/ramp to shoreline, retaining wall at shoreline, and pier.
- 04/22/2015 Photo evidence of Lewis' sidewalk, patio, retaining walls, and pier already failing due to land movement before any pile construction on Gartz/Holt property.
- 03/25/2015 Report by Shannon and Wilson, nationally recognized Geotech Engineering firm retained by Gartz/Holt, after site inspection of the 2011 and 2012 design, construction, and performance of landscape walls for City of Mercer Island permit review.

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- 10/1/2015 Settlement CR2A agreement between Lewis and Gartz/Holt for 2014 suit, which includes mutual release for all existing site construction, acknowledgment of Gartz/Holt plan to construct new stairs to shoreline, new shoreline retaining wall, and new pier, and arbitration for settlement of future disputes.
- 06/10/2016 Permit Issued by City of Mercer Island for 2014 submittal for existing and new site construction on Gartz/Holt property.
- 07/22/2016 Pile driving for shoreline retaining wall complete.
- 08/08/2016 Report by Fischer Plumbing on video inspection of entire sewer line from north to south property line. Report states "*Video pipe camera inspection of sanitary sewer from backflow in neighbor's yard 7701 revealed pipe to be broken at backflow and leaking into the lake. There is also a belly in pipe from backflow to 10 – 15 feet – remainder of pipe is 6" PVC. No abnormalities where viewed on remainder of pipe to what appears to be a manhole or access to sewer 110' from backflow. Pipe in disrepair is on 7701 property. There was (sic) large amounts of soap backing backflow.*"
- Lewis accepts inspection and that no construction caused his sewer break.
- Fall 2016 Lewis has laborer reconnect his broken pipe to side-sewer. Connection requires sewage to flow uphill to side-sewer on Gartz/Holt property, and backflow preventer is at low point of connection.
- July/August 2017 Gartz/Holt contractor installs piling and decking for new pier under 2014 permit.
- July 2018 Final inspection by City of Mercer Island approves all site-work under 2014 permit.
- July 2018 Kirby Christian contacts Greg Ursich that Mr. Lewis is experiencing sewage backup into his home's crawl space and lower level. He asserts this is due to Gartz/Holt construction "since 2016".
- 07/18/2018 Report by Fischer Plumbing camera inspection after Lewis complaint. "*Zach arrived onsite to camera the side sewer, he accessed the side sewer from the backflow preventer located behind Mr. Lewis home. When Zach removed the cap on the backflow preventer, he found the side sewer full, and it released sewage out of the system. Zach ran the camera upstream and downstream from the backflow preventer locating a long belly in the side sewer. The ground in this area has settled over the years and could possible be the cause for the belly in the site sewer.*"

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- 07/18/19 Letter to Ursich from Gartz Re: conversation with Fischer Plumbing at time of video inspection. *"According to Zach this settlement is not due to any recent construction on the Gartz property, but due to settlement of the soil on a steep slope over the years. However, the belly on the Gartz property is NOT the cause of the sewage backup in the Lewis house and does not cause any harm as is. The backup into the Lewis house is solely due to the depressed sewer line and BFP on the Lewis property."*
- 07/24/2018 Report by Fischer Plumbing after second camera inspection for copy of video. *"Zach and Don returned to the site to confirm July 18<sup>th</sup> work and camera the side sewer from Mr. Gartz home down to its point of connection into the common side sewer. The information from the July 18<sup>th</sup> visit was confirmed. Zach located the connection of Mr. Gartz connection to be just downstream of long belly that had been located. Downstream of Mr. Gartz connection there is a smaller belly was also found and located. This belly does not appear to be the full depth of the side sewer. Note: We are not able to determine and (sic) accurate length of the bellies do (sic) to the removing of cap on the backflow preventer releases fluid which lowers the level inside the sewer system."*
- 08/07/2018 Memo to Ursich from Gartz Re: Facts, History, Resolution: *"To confirm the cause of his backup and the responsibility for correcting, I had three side-sewer contractors review the situation – Fisher Plumbing, Jafco Sewer Repair, and Seattle Pipeworks. They all reached similar conclusions."* Fischer refused to bid, and the other two never submitted a bid.
- 02/14/19 Report by Shannon and Wilson from their inspection of both Gartz/Holt and Mr. Lewis properties to determine the cause of Mr. Lewis' sewer failure. Conclusion is Mr. Lewis' 2007 illegal and unpermitted construction of retaining walls and patio between his house and shoreline caused land movement which displaced and settled the sewer on Mr. Lewis' property as well as the Gartz/Holt property.

Sincerely,



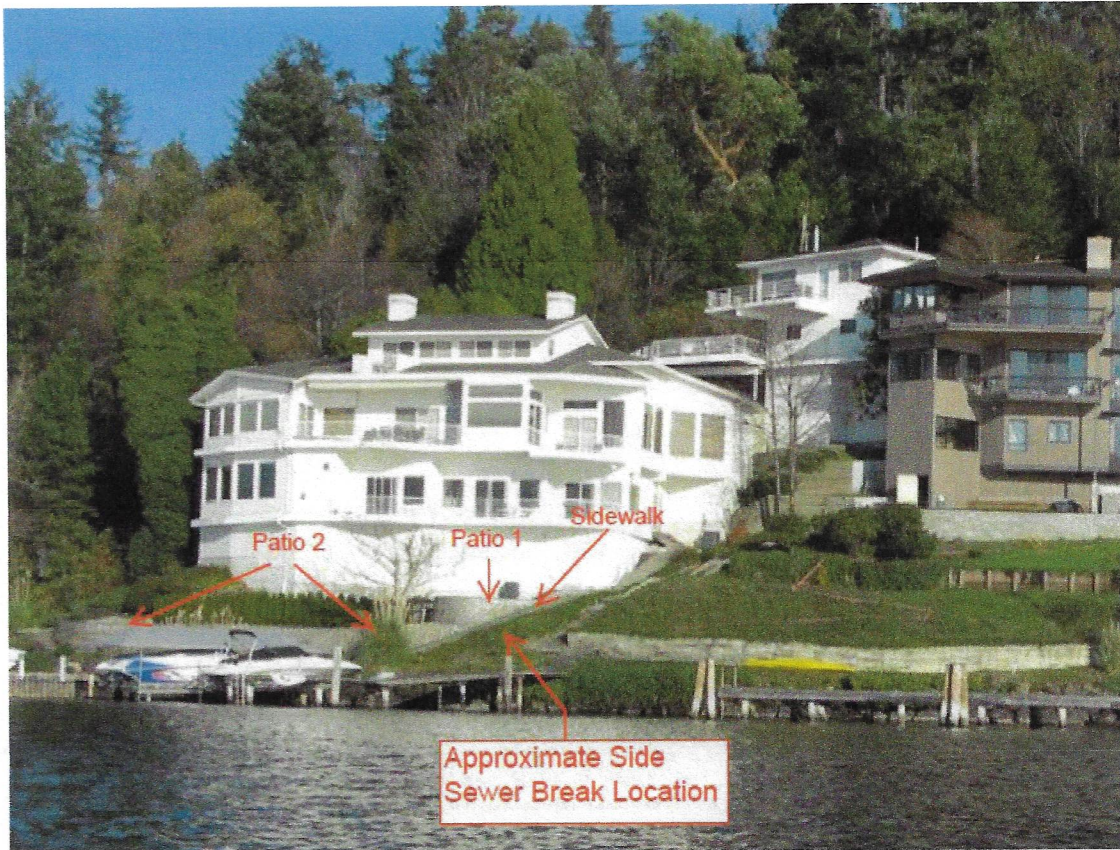
William F. Gartz, AIA

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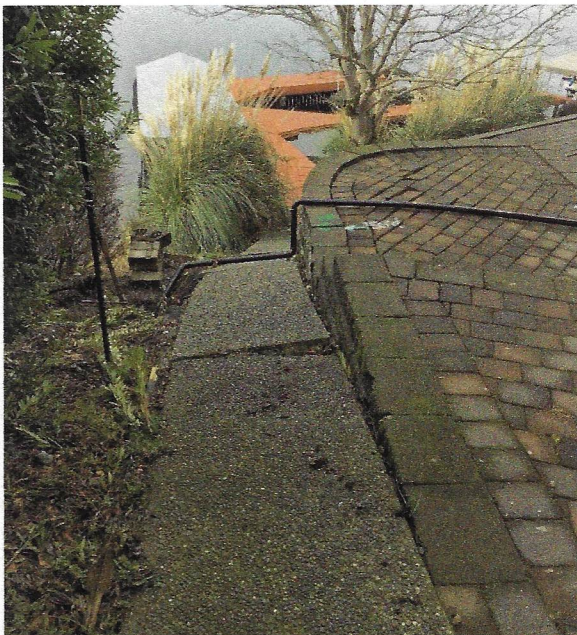


Side Sewer Line Break at 7701/7703 West Mercer Way  
Photographs

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SHANNON & WILSON, INC.



- (1) **December 2009 Overview.** White house is 7701 West Mercer Way. Light brown house to the right (south) is the Gartz Residence at 7703 West Mercer Way.



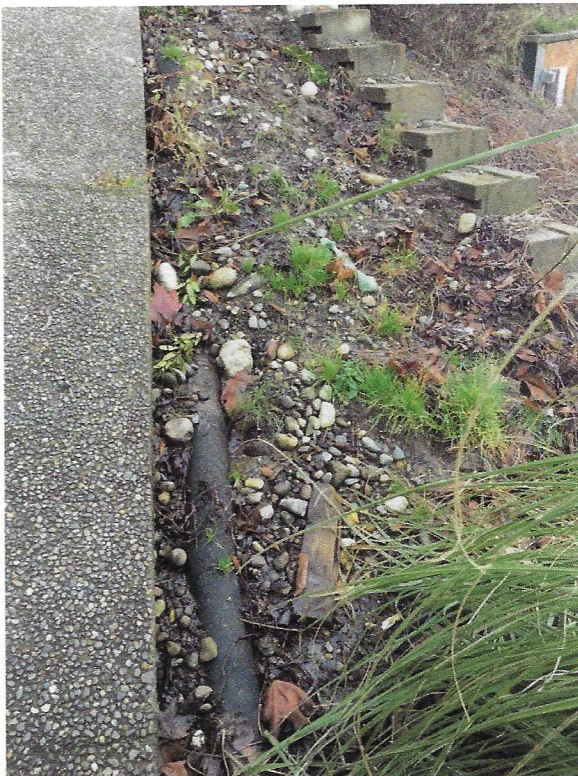
- (2) **7701 Sidewalk Near the Property Line.** January 5, 2019. Looking west to Lake Washington. Note:

- Temporary 2-inch diameter black ABS sewer line crossing over Patio 1, sidewalk and into excavation to connect to the side sewer line.
- Sidewalk panels displaced to the left (south) and displaced vertically at joints.





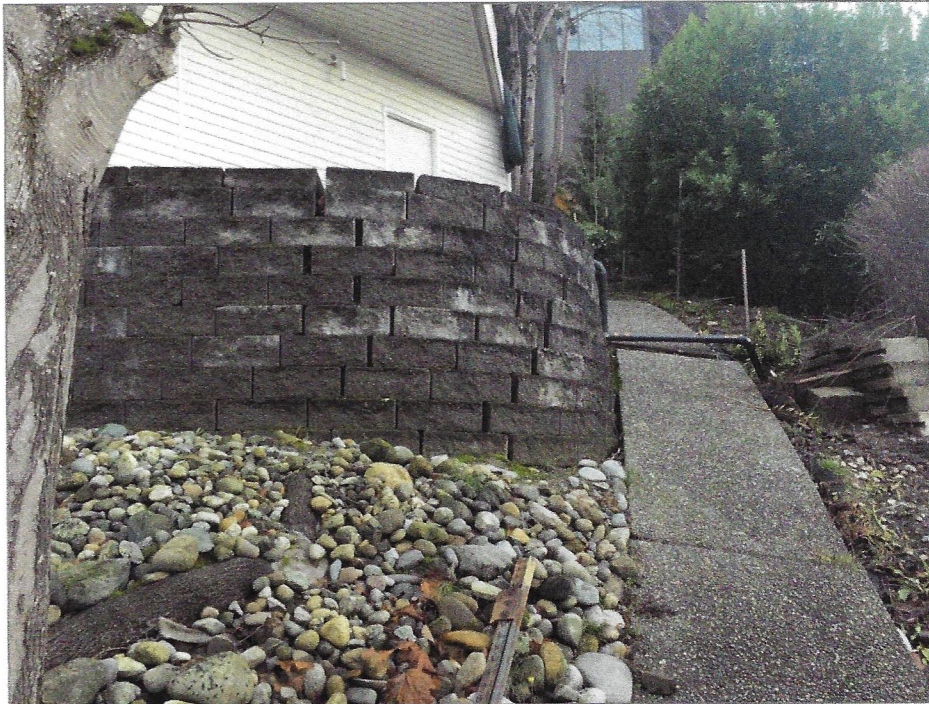
(3) **Closeup of 7701 Sidewalk.** January 5, 2019. The top of the photograph is towards the lake (west). Note the temporary sewer line. The downhill panel is offset 6 inches to the south and about 5<sup>3</sup>/<sub>4</sub> inches to the west.



(4) **Subsurface Drain Line next to 7701 Sidewalk.** January 5, 2019. Looking east. Note:

- Geotextile wrap directly around pipe.
- Subsurface drain is exposed at the surface.
- No drainage backfill around pipe.
- Ground is wet with slight seepage near the bottom of the picture.





(5) **Patio 1 CMU Wall.** Looking east. Note openings between blocks caused by settlement and movement downslope. The wall has pushed the sidewalk to the right (south).



(6) **Patio 1 Pavers.** Looking west. Note the settlement relative to the wall and the openings between the pavers caused by lateral movement.





(7) **Patio 2 CMU Wall.** Looking North. Note apparent sidewalk settlement close to the photographer, curved wall face, and groundwater seepage. In addition to visible seepage in the foreground, the moss along the bottom tiers of the wall indicate moisture for seepage.



(8) **Patio 2 Pavers.** Looking North. Note curved CMU wall top, and pavers that have settled relative to the wall. Gaps between pavers indicate lateral movement toward the lake.





- (9) **7701 Pier.** Note that the deck has buckled upwards because of lateral movement for the abutment towards the lake. The piles may have heaved because of rotational landslide movement.



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Attachment to and part of Report: 102716-001  
Date: February 27, 2020  
To: Mr. William F. Gartz  
Mercer Island, Washington

## Important Information About Your Geotechnical/Environmental Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.



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A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

**The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland**

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