MBGS
Mud Bay Geotechnical Services, LLC
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September 28, 2022 Job: 1988-LEW

Subject: Critical Area Hazard Geotechnical Report
155 Evans Rd,
Toledo, WA 98591
Parcel #011489022000

Dear Russel Hayes,

Per your request, Mud Bay Geotechnical Services, LLC is providing a geotechnical report for Parcel #011489022000. The scope for this project was to perform a site reconnaissance and subsurface investigation of the parcel and prepare a geotechnical report meeting the requirements of the Lewis County critical area geologic hazard ordinance for development of property on or near erosion hazards and steep slopes. The following report provides our opinion of the proposed development and a review of the geologic hazards on site.

This report specifically addresses LCC section 17.38.630 and 17.38.650, which pertain to the requirements for land development on or near steep slopes and/or landslide hazards. Per LCC 17.38.710 a geotechnical report is required when proposed development or alteration is located within a geologically hazardous area or its buffer. This site falls into the classification of a steep slope and erosion hazard area due to having slopes greater than 35 percent with a vertical relief of more than 10 feet positioned throughout the areas of proposed development.

The analyses, conclusions, and recommendations in this report are based on the information available. These informational resources include two hand-augered borings completed specifically for the subject project, down hole dynamic cone penetrometer testing, published geologic information for the site, remote imagery and data analysis, and our experience with similar geologic and soil conditions. The exploratory borings are assumed to be representative of the subsurface conditions where the work will occur. If during construction, subsurface conditions

differ from those described in the explorations, we should be advised immediately so we may reevaluate our recommendations.

SITE LOCATION AND PROJECT DESCRIPTION

The subject parcel designated #011489022000 by Lewis County is mapped as a severe and very severe erosion hazard, and is positioned within steep slopes exceeding 35 percent, as designated on the attached Figure 1, Lewis GIS Hazard Map. The parcel is positioned off the northwest side of Evans Rd, within the steep slopes that transition between the upper glacial terrace and lower Cowlitz River Valley. The site location and approximate parcel location is delineated in the attached Figure 2, Site Location Map. The parcel is accessed via a private residential gravel road that enters the parcel from the northeast. The majority of the parcel is densely vegetated with native Pacific Northwest vegetation including middle to mature aged evergreen and deciduous trees, ferns, vines, and shrubbery.

The parcel grades sharply from southeast to northwest, with severely oversteepened slopes positioned immediately downslope and northwest of Evans Rd. The toe of these oversteepened slopes terminate in a flat bench feature positioned within the central southeastern portion of the parcel. This bench feature will serve as the building location of the proposed detached shop. Downslope of the bench feature the parcel continues to grade moderately and somewhat inconsistently. A graded gravel roadway traverses the moderate slopes in a northwest orientation from the previously mentioned flat bench, providing access to the lower, flat portion of the parcel positioned in the northwest portion of the parcel. This lower portion will serve as the build area for the proposed log cabin home-structure.

SITE GEOLOGY AND SOILS

As part of this project, available geologic data from the Washington Department of Natural Resources (DNR) available at the 1:100,000 scale was reviewed, and a site-specific geologic map was prepared. The project vicinity geologic map is attached as Figure 3, WA DNR Geologic Map. This figure indicates the project vicinity consists of Quaternary alluvium associated with the Cowlitz River Valley. Mapped directly on-site are Quaternary mass wasting deposits associated with the steep slope environment in the parcel's southeastern half, and Pleistocene alpine glacial drift in the parcel's lower, northwestern half. Conditions observed at the site are generally consistent with the mapped geology at the site.

Along with the site geology, soil data was also reviewed and is represented in Figure 4, USDA Soil Map. The soil in the parcel was mapped by the United States Department of Agriculture,

USDA as *Xerorthents, steep.* The USDA describes these soils as gravelly to very gravelly sandy loam that typically forms in steep slope environments.

Mapped soil deposits are consistent with the WA DNR Geologic Map and soil types observed on-site. It should be noted that the slope percentages assigned by the USDA are estimates and may not reflect true surface topography.

SUBSURFACE EXPLORATION

As part of the geotechnical investigation, two (2) test pit explorations were performed from the existing ground surface using a client provided Mini Excavator. Pilot borings were performed at the base of the test pits at selected depths to perform dynamic cone penetrometer testing. The pilot boring was completed using a Humboldt Manufacturing model H-4414QC hand auger with a 4-inch diameter bucket tube sampler. In situ testing was performed at selected depths using a Humboldt Manufacturing model H-4202A dynamic cone penetrometer to estimate the density of the soil. The dynamic cone penetrometer uses a 15-lb steel mass falling a height of 20-inches onto an anvil to penetrate a 1.5-inch diameter 45-degree cone tip seated into the bottom of the hole. The penetrometer is driven 1-inch through the upper slough within the boring and the number of blows is recorded, afterwards the number of blows required to achieve a total of ¾ inches of penetration into the undisturbed soil is recorded. The number of blows from three intervals of the ¾ inches are averaged and recorded as the field N-value. This recorded blow count is correlated to the Standard Penetration Test (SPT) field N-value blow count determined in accordance with ASTM D1586, which is the standard in situ test method for determining relative density of cohesionless soils and the consistency of cohesive soils. Bulk samples were removed from the test pit spoils after the dynamic cone penetration testing was performed in order to observe the soil material at the approximate depth the test was performed. The soil samples were classified visually in the field in general accordance with ASTM D2488, The Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Once transported back to the office, the samples were re-examined, and the field classifications were modified accordingly. Summary logs of the test pits are included in Appendix A. Note the soil descriptions and interfaces shown on the logs are interpretive, and actual changes may be gradual. Upon completion, the pits were backfilled to the original ground surface using excavated material from the spoil piles.

SUBSURFACE AND GROUNDWATER CONDITIONS

The test pits completed for the subject project were designated TP-1-22 and TP-2-22. TP-1-22 was performed in the upper bench feature where the proposed shop feature will be located. TP-2-22 was performed within the lower portion of the site where the proposed log cabin home structure will be constructed. The approximate location of the test pits are shown in the attached Figure 5, Site Exploration Map.

The conditions observed in TP-1-22 consisted of: *loose, moist, brown, well-graded gravel with silt and sand (GW-GM)* from the ground surface to a final depth of 48-inches below grade. Conditions observed in TP-2-22 were largely consistent with those encountered in TP-1-22, consisting of *very loose, moist, brown, well-graded gravel with silt and sand (GW-GM)* from the ground surface to a final depth of 48-inches below grade.

Groundwater was not observed within either of the preformed test pits. Based on the soil type encountered, as well as the USDA soil description characterizing the onsite soils as very deep and well-drained, we do not anticipate perched groundwater conditions during the wet season, and anticipate the static water table elevation to correlate approximately with the elevation of the nearby Cowlitz River.

GEOLOGIC HAZARD ASSESSMENT

As part of the investigation of the site, we reviewed landslide hazard mapping and LiDAR imagery information available from the Washington Department of Natural Resources and created a site-specific landslide hazard map attached as Figure 6. The current landslide hazard mapping inventory available from the Washington State Department of Natural Resources (WA-DNR) shows the presence of 1:100,000-scale landslides positioned within southeastern half of the parcel, within the oversteepened slopes downgrade of Evans Rd.

In addition to WA-DNR landslide hazard mapping, the geomorphology (shape of the land) was analyzed during the site evaluation and compared to the Light Detection and Ranging images (LiDAR) from the Washington State LiDAR portal. LiDAR is a remote sensing method where light is pulsed down to the surface of the Earth and back to a sensor. This methodology enables bare earth images of the surface to be analyzed for the presence of geologic landforms. The most recent available LiDAR images of this site are from 2017. Two-foot and ten-foot contour layer lines were extrapolated from the LiDAR elevation data and superimposed onto the imagery to assist in visualizing the topography of the parcel and can be seen in the attached Figure 7, LiDAR & Contour Map.

Review of the LiDAR imagery and contour mapping supports the presence of prehistoric landslide activity within the steep slopes positioned within the parcel. The headscarp of the steep slopes positioned downslope of Evans Rd is arcuate in nature, and sharply oversteepened at its head, suggesting past landslide activity. Additionally, the downslope terrain exhibits hummocky topography, as well as several bench features. Deeply incised stormwater ravines can be seen present throughout the entire slide debris mass, suggesting prehistoric deposition.

Slope values for the site can be seen in Figure 8, QGIS Slope & Contour Map. The slope percentage values are calculated using elevation data from the most recent LiDAR data available (2017). The slope calculations are expressed as a percentage, where the difference of two elevation points (rise) is divided by the distance between them (run) and then multiplied by 100. For reference, a slope percentage of 100% is equal to a 45° slope angle, where the *rise* is equal to the *run*. Figure 8 indicates that the steep slopes northwest of Evans Rd consist of slopes ranging from 100 to 200 percent, with portions of the slope exceeding 200 percent. The flat upper bench where the shop is proposed consists of slopes ranging from 0 to 15 percent. Downslope of the bench feature the slopes generally range from 35 to 100 percent. The minor slopes positioned north of the lower bench feature where the proposed log cabin home structure is to be located consist of slopes ranging from 15 to 35 percent that span a total elevation of 10 to 20 feet.

During the site reconnaissance, the steep slopes on site were traversed on foot and investigated for in-situ indicators of active mass-wasting activity. Suspected indicators of mass-wasting would likely include potential mechanisms of slide-mass reactivation such as seepage from the vertical slide face, surface runoff erosion of hummocky terrain creating oversteepened slope faces, reactivation of benched topography, or trees with downslope lean and pistol-butted features suggesting loose deposition and downslope creep of onsite soils. Of these potential indicators, none were observed during the site reconnaissance of the onsite steep slopes. The slopes onsite were found to be absent of groundwater seepage from the slope face, and the medium to mature-aged evergreen trees growing from the steep slopes were all observed to be completely straight trunked with no indication of downslope movement over their lifetime.

Though indicators of past mass-wasting activity, likely prehistoric, exist in the form of arcuate headscarping, benched topography, and hummocky downslope terrain, no active indicators of potential active mass-wasting or potential reactivation were observed. Based on this, it is our opinion that the geologic hazard on site is moderate, and is mostly related to surface erosion concerns of the gravelly soils onsite.

GEOTECHNICAL RECOMMENDATIONS

Based on a site reconnaissance, subsurface exploration, and a review of all the site geology and other readily available information presented previously, in the opinion of Mud Bay Geotechnical Services, LLC the potential for geologic hazard is moderate throughout the property. It is our opinion that there are no geologic indications of present mass-wasting activity and that the dominant geologic hazard is surface erosion of the loose gravelly soils encountered on site. As such, the proposed development activities should not serve to increase the risk of geologic hazards on-site nor in the surrounding vicinity given the geotechnical recommendations made in this report are implemented. Based on these conclusions, we have determined a 25-foot setback from the top and toe of the steep slopes to be appropriate.

The attached Figure 13, QGIS Geologic Setback Map delineates the top and toe of slopes greater than 35% and spanning a total elevation loss of 15-feet or greater, and prescribes a setback distance of 25 feet from slopes meeting these criteria. The resulting CAHR Buffer Zone is also delineated. The setback distance was determined based on all of the information compiled for this report. Based on our site assessment and our understanding of the project, we believe a 25-foot setback to be sufficient to mitigate the risk of damage to the home or neighboring properties due to on-site geologic hazard. From our on-site investigation, no indications of past or present slope instability or other geologic hazards were noted in the subject parcel.

Material Backfill

We recommend all material used as backfill for footings and stem walls be placed in horizontal layers no more than 6 inches thick with each layer compacted to 95 percent of the maximum density. The backfill material should be comprised of Gravel Backfill for Walls material meeting the requirements of Section 9-03.12(2) of the WSDOT Standard Specifications, or an equivalent free-draining material. Perimeter drains should be used to collect water away from the footings.

Prior to backfilling, a perimeter footing drain system, consisting of a 4-inch diameter, perforated, or slotted, rigid plastic pipe placed at the base of the structure excavations wherever existing footings are exposed as part of the work. The drain should be embedded in a clean, free-draining sand and gravel meeting the requirements of Section 9-03.12(4) of the WSDOT Standard Specifications for Gravel Backfill for Drains. The drains should be sloped slightly to drain to an appropriate discharge area or tied into the stormwater drainage.

Drainage Considerations

Any groundwater seepage exposed during construction of the structure should be removed from the excavation area and/or directed away from the top of the steep slopes to an area where it can be discharged and stored until it fully infiltrates into the ground.

The site should include a proper drainage design to control and properly discharge surface water. The surface of the developed portion of the parcel should be graded to allow water to flow and collect in a manner that does not increase the surface erosion. Stormwater drainage falling directly onto impervious surfaces should be collected directly in catch basins, rain drains, and downspouts and directed via drain lines to an appropriate discharge area with slopes less than 15 percent. All drain lines discharging above the ground surface should terminate in a T-shaped elbow underlain by a quarry spall apron with a minimum width of 2 feet and a minimum length of 4 feet in order to dissipate the energy of the flowing water. The quarry spalls should be underlain by a geotextile meeting the requirements of a Construction Geosynthetic for Underground Drainage in Section 9-33 of the WSDOT Standard Specifications.

Erosion Control

Onsite materials are erodible when exposed on steep slope areas. No excavated material should be placed on the steep slopes. Soil stockpiles and exposed slope areas should be covered during heavy rainfall and siltation fences or other detention devices should be provided as required to control the transport of eroded material. Silt fences should be used as an erosion control measure and to separate the critical area boundary from the work area where disturbance is allowed. Jute, coir, or turf reinforcement mat should be placed on the surface of all exposed ground surfaces and spoil piles that are not intended for reuse during and following construction, pinned using 9-inch landscaping staples at a 16-inch spacing. The erosion condition adjacent to the structures should be monitored periodically for any signs of surface erosion, degradation, and shallow failures. If significant erosion or failures are observed, then those should be mitigated as soon as possible.

Vegetation should be maintained where disturbance is not necessary as part of construction. Existing bare and disturbed soil areas should be planted immediately with grass and deep-rooted plants and native conifers to help reduce erosion potential. Where felling of trees is necessary on the existing slopes, stumps should be left intact.

All graded slopes and exposed areas should be hydroseeded as soon as possible after grading is complete. If the construction is not completed until the later part of the summer or fall and winter months, then the slopes should be left covered until the springtime growing season.

Excavations

Temporary cuts will be stable at a vertical angle up to 4 feet in height and may be used in the design where temporary excavations are less than or equal to 4 feet will be necessary to construct the project.

We anticipate that temporary excavation cuts greater than 4 feet in height will be stable at a maximum slope angle of 1H:1V. The ground surface at the top of the temporary cuts should be periodically monitored for vertical movement, cracks, and other signs of instability. If signs of instability are observed, we should be contacted immediately so that we can assist and provide additional geotechnical recommendations.

Site Grading

Permanent cuts should be stable at a slope angle of less than 26 degrees (2H:1V). Permanent fills constructed of WSDOT Standard Specifications Select Borrow or Common Borrow should be stable at a maximum slope of less than or equal to 26 degrees (2H:1V). We recommend limiting any new permanent fills to a height of five feet and limited to the approved development area outside of the minimum 25-foot setback buffer.

RECOMMENDED ADDITIONAL SERVICES

Before construction begins, we recommend a copy of the draft plans and specifications prepared for the project be made available for review so that we can ensure that the geotechnical recommendations in this report are included in the Contract. Mud Bay Geotechnical Services, LLC is also available to provide geotechnical engineering and construction monitoring services throughout the remainder of the design and construction of the project. The integrity of the geotechnical elements of a project depends on proper site preparation and construction procedures. In addition, engineering decisions may need to be made in the field if conditions are encountered that differ from those described in this report. During the construction phase of the project, we recommend that Mud Bay Geotechnical Services, LLC be retained to review construction proposals and submittals, perform inspections of foundation subgrade, verify slope setbacks, and provide recommendations for any other geotechnical considerations that may arise during construction.

INTENDED USE AND LIMITATIONS

This report has been prepared to assist the client and their consultants in the engineering design and construction of the subject project. It should not be used, in part or in whole for other purposes without contacting Mud Bay Geotechnical Services, LLC for a review of the applicability of such reuse. This report should be made available to prospective contractors for their information only and not as a warranty of ground conditions.

The conclusions and recommendations contained in this report are based on Mud Bay Geotechnical Services, LLC understanding of the project at the time that the report was written and on-site conditions that existed at time of the field exploration. If significant changes to the nature, configuration, or scope of the project occur during the design process, we should be consulted to determine the impact of such changes on the recommendations and conclusions presented in this report.

Parcel boundaries reflected in this report and attached maps are interpreted from public Geographic Information Systems portals from your local jurisdiction, and do not reflect surveyed property boundaries. Digitized parcel boundaries reflected in this report are intended to assist in visualization and report comprehension and are not for legal interpretation.

Site exploration and testing describes subsurface conditions only at the sites of subsurface exploration and at the intervals where samples are collected. These data are interpreted by Mud Bay Geotechnical Services, LLC rendering an opinion regarding the general subsurface conditions. Actual subsurface conditions can be discovered only during earthwork and construction operations. The distribution, continuity, thickness, and characteristics of identified (and unidentified) subsurface materials may vary considerably from that indicated by the subsurface data. While nothing can be done to prevent such variability, Mud Bay Geotechnical Services, LLC is prepared to work with the project team to reduce the impacts of variability on project design, construction, and performance.

We appreciate the opportunity to serve your geotechnical needs on this project and look forward to working with you in the future. A current copy of our Summary of Qualifications for preparing Critical Area Hazard reports in Lewis County is attached as Appendix B. Please contact us at your earliest convenience if you have any questions or would like to discuss any of the contents of this report.

Sincerely,

Chris Heathman, P.E.

Mud Bay Geotechnical Services, LLC

Digitally signed by
Chris Heathman, PE
Date: 2022.09.28
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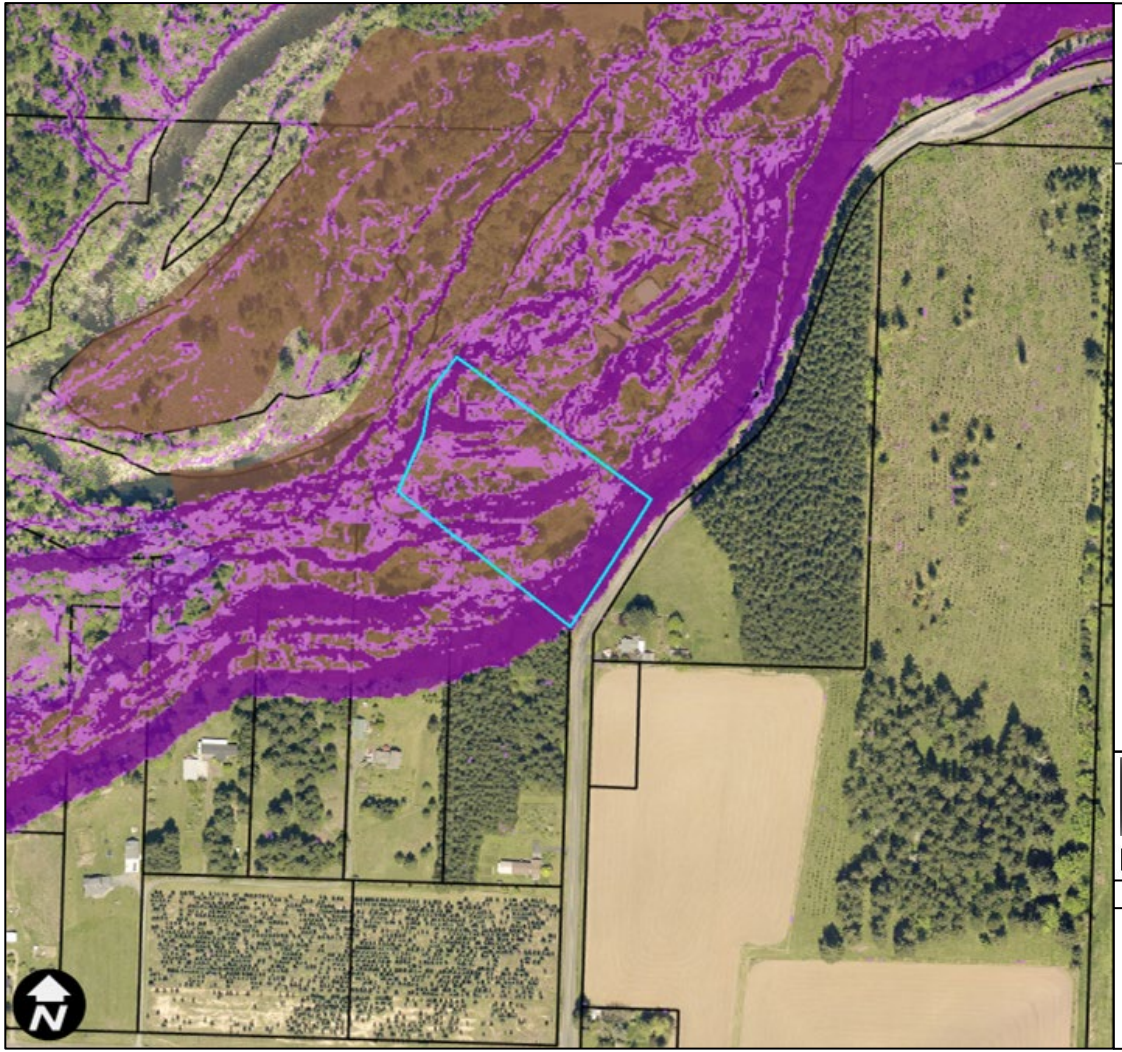

LEWIS COUNTY
est. 1845

Lewis County G.I.S.

Legend

Slopes 15%+ (lidar)

- 15 - 35%
- 35% and greater

Erosion Hazard Areas

- Severe
- Very severe
- Parcels
- **Approximate Parcel Boundary**

0 205 410 820 ft

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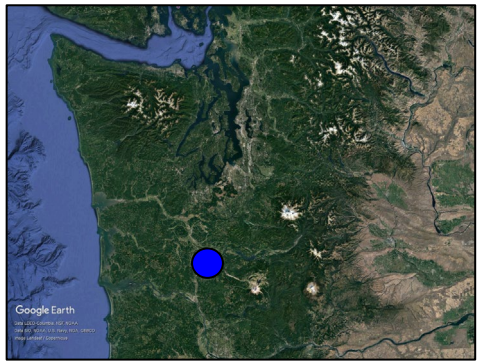
Mud Bay Geotechnical Services, LLC

JOB #:1988-LEW | Date: August, 2022

Figure 1: Lewis GIS Hazard Map
155 Evans Rd,
Toledo, WA 98591
Critical Area Geotechnical Report



Legend

- Site Location
- Approximate Parcel Boundary

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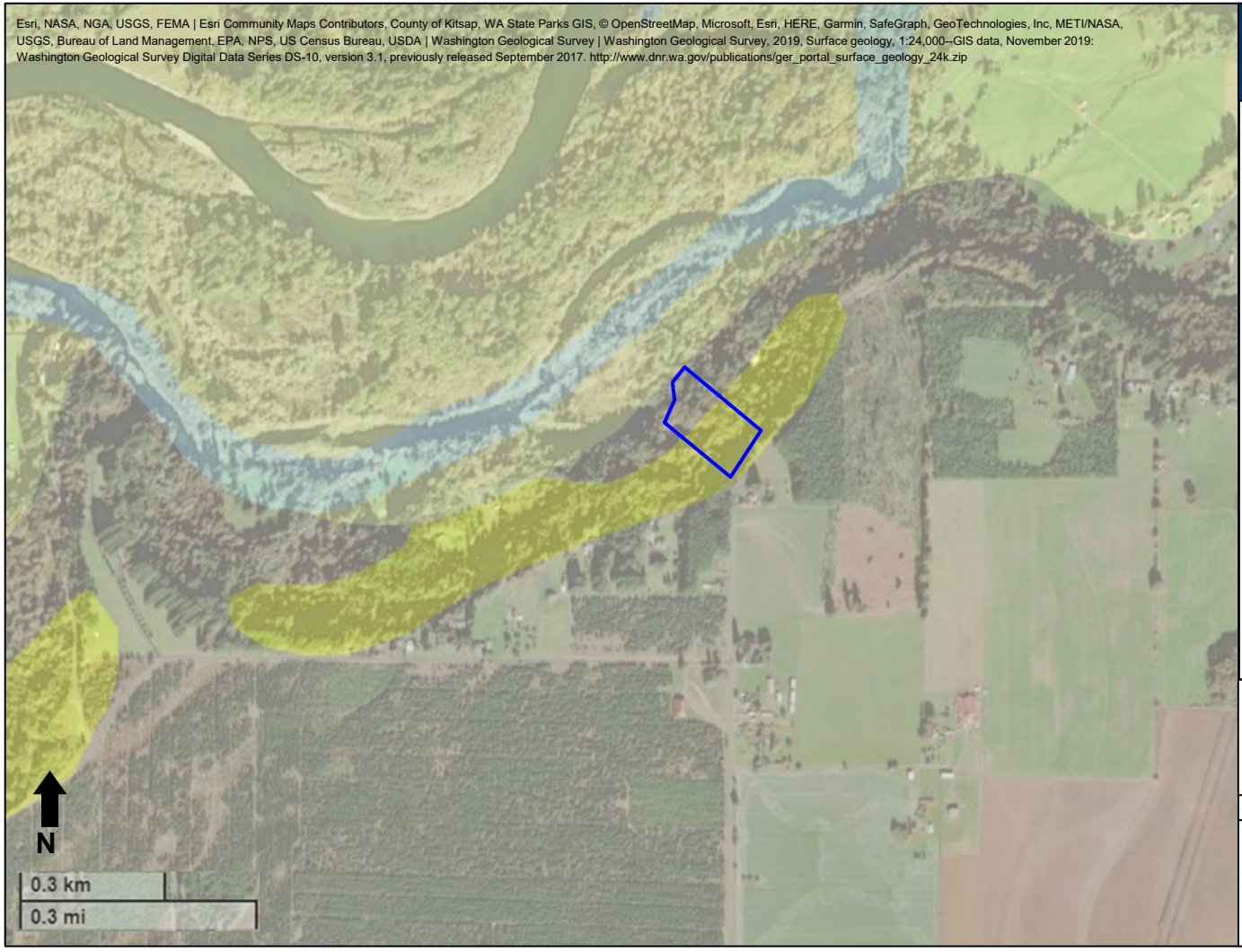
JOB #:1988-LEW | Date: August, 2022

Figure 2: Site Location Map
155 Evans Rd,
Toledo, WA 98591
Critical Area Geotechnical Report



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Legend

Geologic Units 100K

- Quaternary mass-wasting deposits
- Pleistocene alpine glacial drift
- Quaternary alluvium

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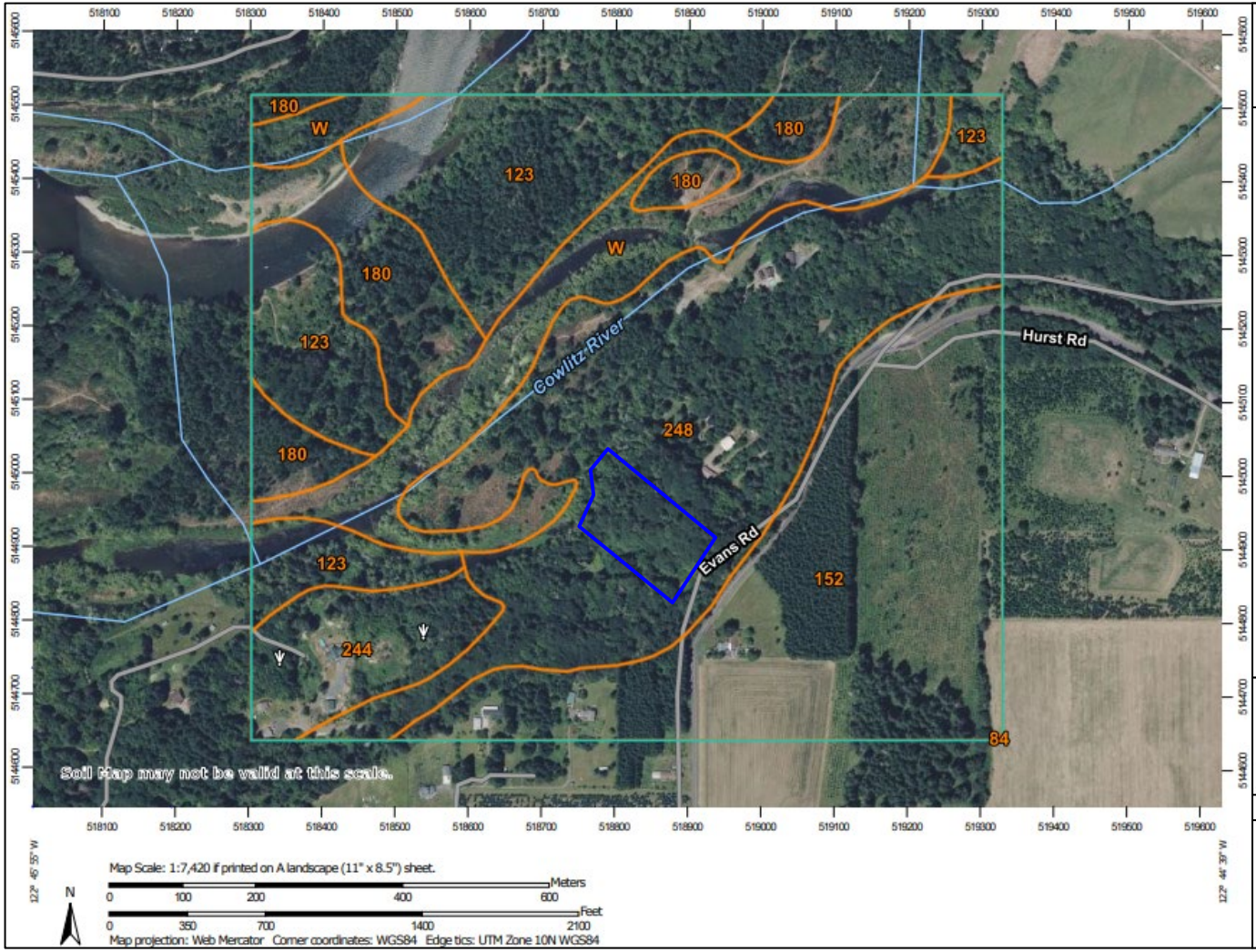
Figure 3: WA DNR Geologic Map
155 Evans Rd,
Toledo, WA 98591
Critical Area Geotechnical Report



USDA Natural Resources Conservation Service

Legend

Approximate Parcel Boundary

Map Unit Symbol	Map Unit Name
84	Doty silt loam
123	Ledow sand
152	Olequa silt loam, 0 to 5 percent slopes
180	Riverwash
244	Winston gravelly loam, 8 to 15 percent slopes
248	Xerorthents, steep

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Figure 4: USDA Soil Map
155 Evans Rd,
Toledo, WA 98591
Critical Area Geotechnical Report

Legend

Approximate Parcel Boundary

Approximate Test Pit Locations

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Figure 5: Site Exploration Map

155 Evans Rd,
Toledo, WA 98591
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Legend

Site Location

Landslides

Landslide Compilation

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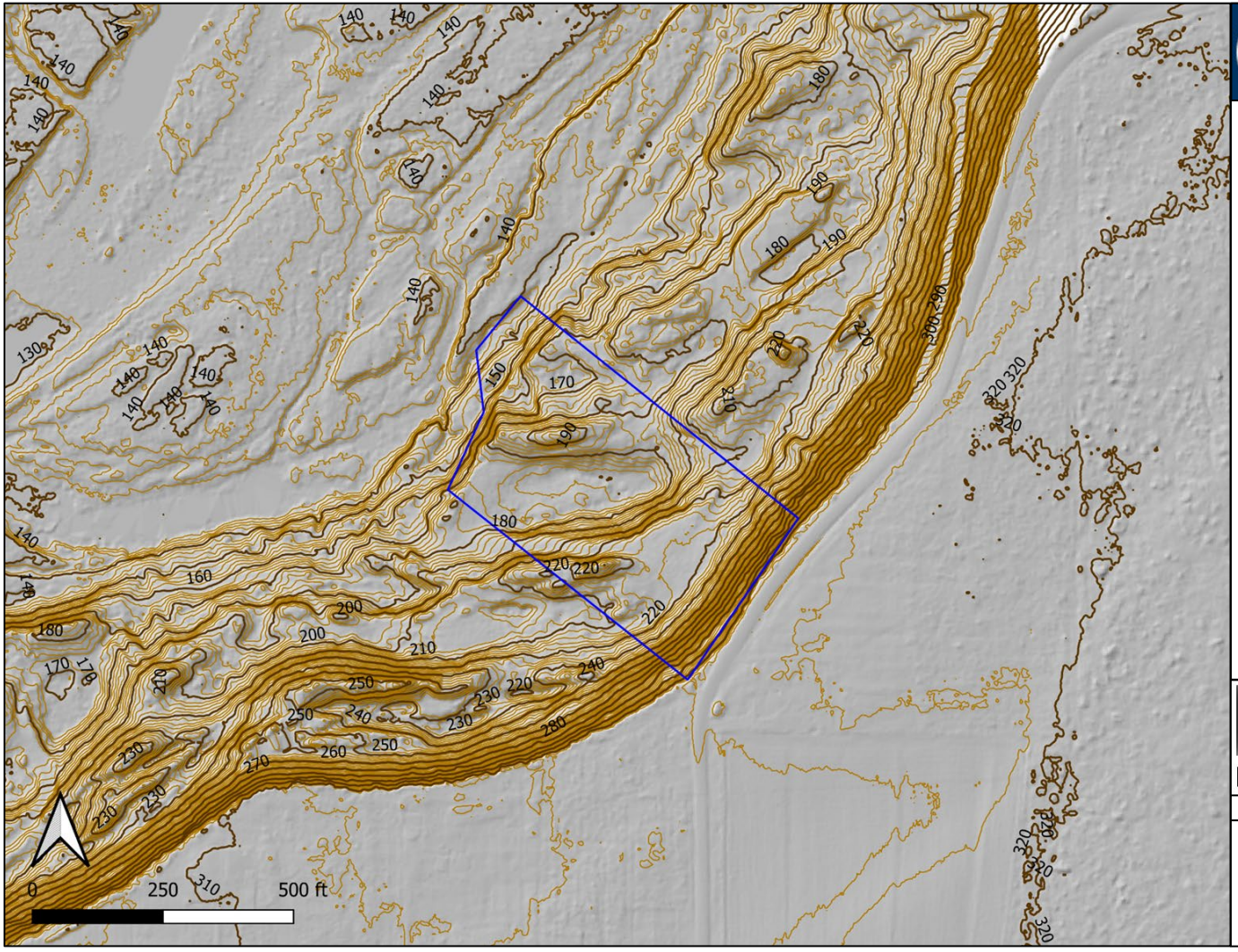
Figure 6: WA DNR Landslide Map
155 Evans Rd,
Toledo, WA 98591
Critical Area Geotechnical Report



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Legend

- Approximate Parcel Boundary
- 10 ft Contours
- 2 ft Contours

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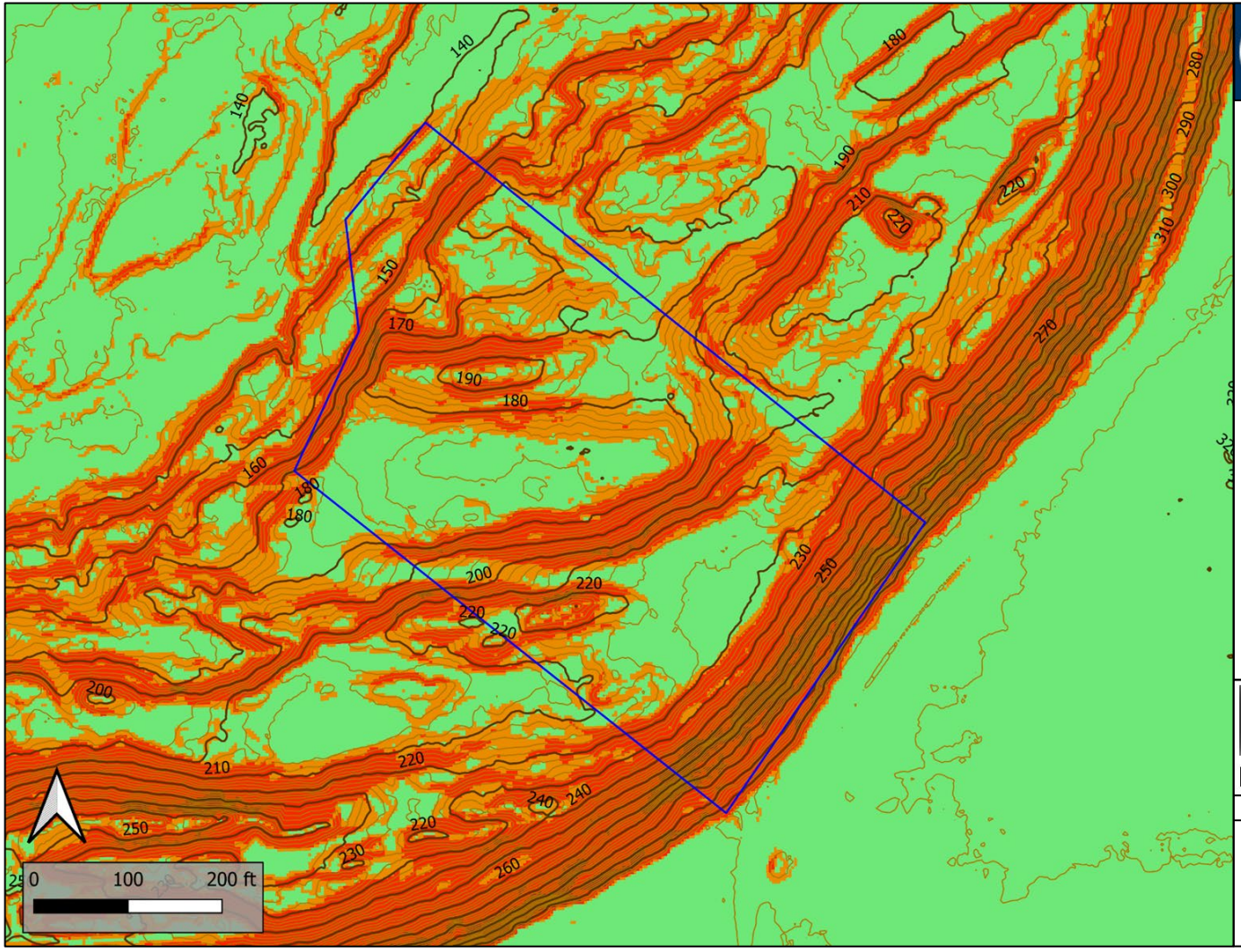
JOB #:1988-LEW	Date: August, 2022

Figure 7: LiDAR & Contour Map
155 Evans Rd,
Toledo, WA 98591
Critical Area Geotechnical Report



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Legend

- Approximate Parcel Boundary
- 10 ft Contours
- 2 ft Contours

Slope Percent

- 0 - 15 %
- **15 - 35 %**
- 35 - 100 %
- 100 - 200 %
- >200 %

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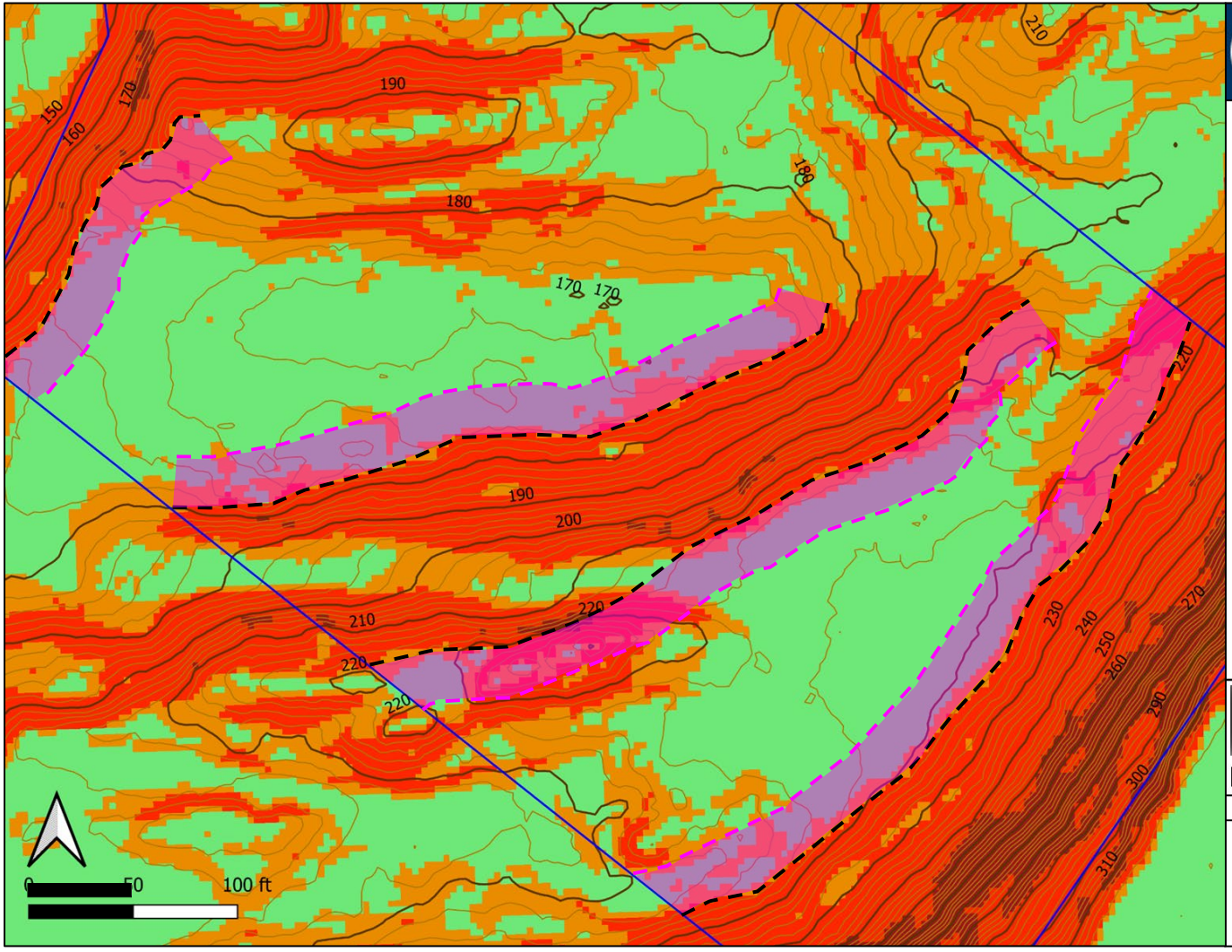
Figure 8: QGIS Slope & Contour Map
155 Evans Rd,
Toledo, WA 98591
Critical Area Geotechnical Report



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Legend

- Approximate Parcel Boundary
- 10 ft Contours
- 2 ft Contours

Slope Percent

- 0 - 15 %
- 15 - 30 %
- 15 - 35 %
- 100 - 200 %
- >200 %

- **Top/Toe of Slope**
- **25ft Setback**
- **CAHR Buffer Zone**

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Figure 9: QGIS Geologic Setback Map
155 Evans Rd,
Toledo, WA 98591
Critical Area Geotechnical Report

APPENDIX A – FINAL TEST PIT LOGS

MBGS Mud Bay Geotechnical Services, LLC		Project: CAHR Site Development	Client: Russel Hayes	Test Pit No. 1 of 2: TP-1-22
		Project Number: 1988-LEW	Contractor: N/A	Equipment: MiniEx
Address: 155 Evans Rd, Toledo WA Parcel #011489022000	Date	Started: 6/23/2022	Bit Type: n/a	Diameter: n/a
		Completed: 6/23/2022	Hammer Type: n/a	Fluid: n/a
Logged By: Logan Krehbiel		Backfilled: 6/23/2022	Hammer Weight: n/a	Hammer Drop: n/a
Helper: Tim Gollan		Groundwater Depth: n/a	Elevation: Existing Surface	Total Depth of Test Pit: 48 inches
GPS Method: N/A		GPS Coordinates: N/A		GPS Elevation: (± __ ft.)

Depth (in.)	Sample Type	Sample Number	Blow Counts (blows/3/4")	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors **Rock Description:** modifier, color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions.	Dry Density (pcf)	Moisture Content (%)	Additional Test
24"	☒	S-1	5		Loose, moist, brown, well-graded gravel with sand and silt (GW-GM).			
48"	☒	S-2	N/A		Moist, brown, well-graded gravel with sand and silt (GW-GM). Digging difficulty suggests loose to medium dense condition.			

Test Pit and Boring Log Symbols

- Standard Penetration Slit Spoon Sampler (SPT)
- California Sampler
- Shelby Tube
- CPP Sampler
- Stabllized Ground water
- Groundwater At time of Excavation
- Bulk/ Bag Sample

Soil Density Modifiers

Gravel, Sand, Non-Plastic Silt		Elastic Silts and Clays	
Blows/3/4"	Density	Blows/3/4"	Consistency
0-4	Very Loose	0-1	Very Soft
5-10	Loose	2-4	Soft
11-24	Medium Dense	5-8	Medium Stiff
25-50	Dense	9-15	Stiff
REF	Very Dense	16-30	Very Stiff
		31-60	Hard
		>60	Very Hard

MBGS Mud Bay Geotechnical Services, LLC		Project: CAHR Site Development	Client: Russel Hayes	Test Pit No. 2 of 2: TP-2-22
		Project Number: 1988-LEW	Contractor: N/A	Equipment: MiniEx
Address: 155 Evans Rd, Toledo WA Parcel #011489022000	Date	Started: 6/23/2022	Bit Type: n/a	Diameter: n/a
		Completed: 6/23/2022	Hammer Type: n/a	Fluid: n/a
Logged By: Logan Krehbiel		Backfilled: 6/23/2022	Hammer Weight: n/a	Hammer Drop: n/a
Helper: Tim Gollan		Groundwater Depth: n/a	Elevation: Existing Surface	Total Depth of Test Pit: 48 inches
GPS Method: N/A		GPS Coordinates: N/A		GPS Elevation: (± __ ft.)

Depth (in.)	Sample Type	Sample Number	Blow Counts (blows/3/4")	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors **Rock Description:** modifier, color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions.	Dry Density (pcf)	Moisture Content (%)	Additional Test
24"	☒	S-1	3		Very loose, moist, brown, well-graded gravel with sand and silt (GW-GM).			
36"	☒	S-2	2					
48"	☒	S-3	4		Very loose, moist, brown, well-graded gravel with sand and silt (GW-GM).			

Test Pit and Boring Log Symbols

- Standard Penetration Slit Spoon Sampler (SPT)
- California Sampler
- Shelby Tube
- CPP Sampler
- Stabllized Ground water
- Groundwater At time of Excavation
- Bulk/ Bag Sample

Soil Density Modifiers

Gravel, Sand, Non-Plastic Silt		Elastic Silts and Clays	
Blows/3/4"	Density	Blows/3/4"	Consistency
0-4	Very Loose	0-1	Very Soft
5-10	Loose	2-4	Soft
11-24	Medium Dense	5-8	Medium Stiff
25-50	Dense	9-15	Stiff
REF	Very Dense	16-30	Very Stiff
		31-60	Hard
		>60	Very Hard