Materials Testing & Consulting, Inc.
Geotechnical Engineering • Materials Testing • Special Inspection • Environmental Consulting

September 1, 2016

Suzanne Gilbert, *Architect*
Capital Projects Manager
Mount Vernon School District No. 320
124 East Lawrence Street
Mount Vernon, WA 98273

Subject: Geotechnical Investigation and Engineering Services
East Division Street Elementary - Phase 1 Site Investigation
5401 East Division Street
Mount Vernon, Washington

MTC Project No.: 16B134

Dear Ms. Gilbert:

This letter transmits our Geotechnical Investigation Report for the above-referenced project. Materials Testing & Consulting, Inc. (MTC) performed this geotechnical study in accordance with our Proposal for Geotechnical Services, dated June 28, 2016.

We would be pleased to continue our role as your geotechnical engineering consultants during the project planning and construction. We also have a keen interest in providing materials testing and special inspection during construction of this project. We will be pleased to meet with you at your convenience to discuss these services.

We appreciate the opportunity to provide geotechnical engineering services to you for this project. If you have any questions regarding this report, or if we can provide assistance with other aspects of the project, please contact me at (360) 755-1990.

Respectfully Submitted,
MATERIALS TESTING & CONSULTING, INC.

Kurt W. Parker, L.G.
Senior Project Geologist

John Gillaspy, L.E.G.
NW Region Geotechnical Manager

Attachment: Geotechnical Investigation Report

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PHASE 1 GEOTECHNICAL SITE INVESTIGATION

EAST DIVISION STREET ELEMENTARY

5401 EAST DIVISION STREET
MOUNT VERNON, WASHINGTON

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9-1-2016

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September 1, 2016
MTC Project Number: **16B134**

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1.0 INTRODUCTION

1.1 GENERAL

This report presents the findings and recommendations of Materials Testing & Consulting, Inc.'s (MTC) geotechnical investigation conducted in support of the design and construction of the proposed elementary school complex development. The proposed project site is located northeast of the intersection of East Division Street and Skagit Highlands Parkway in Mount Vernon, Skagit County, Washington. Maps depicting the general location, aerial photo of existing conditions, and proposed layout of the project site are provided in Figures 1 and 2A through 2C of Appendices A and B.

1.2 PROJECT DESCRIPTION

It is our understanding that the proposed project consists of developing the existing forested property for a new elementary school complex, comprised of a high ceiling 1-story to 2-story light-load large-footprint contiguous building structure as well as associated infrastructure, paved accesses and parking lots, sports fields, and stormwater controls/facilities. The property is designated as Parcels 131738 and 131739, and comprises almost 16 acres of land. The main development area is roughly 10 acres in size located among the north, northeast and eastern portions of the property, with the southwest area to remain undeveloped designated as a wetland critical area. A new access drive is planned to serve the site, extending from East Division Street northward to the site location in a narrow corridor of roughly 700 lineal feet. At this time, the project is undergoing conceptual design. The purpose of this study has been to provide an overview site characterization with general geotechnical recommendations for development as well as feasibility-level commentary on design aspects such as stormwater design.

Topography of the project vicinity is typically gentle and rolling, with a predominantly level or low west to northwest gradient in the area of the proposed site construction. The area of current proposed development is vacant land comprised of mature second-growth forest in the Skagit Highlands area on the eastern margins of the City of Mount Vernon. The site is anticipated to require logging of dense forest within the concentrated development zone.

Based on preliminary project concepts provided to date, construction is assumed to be close to existing grade, with some local grading expected for topographic variations but no major cuts or fills proposed. Foundations are likely to consist of shallow continuous perimeter and spread footings with relatively light loads, and slab-on-grade elements where applicable. It is anticipated that loads will be typical for the type and materials of construction, and no unusually large or vibratory loads are expected.

MTC should be allowed to review the final plans and specifications for the project to ensure that the recommendations presented herein are appropriate. Recommendations and conclusions presented by this report will need to be re-evaluated in the event that changes to the proposed construction are made.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of our study was to explore subsurface conditions at the site and provide geotechnical recommendations for design and construction of the proposed developments. To evaluate subsurface soil and water conditions, MTC directed and logged excavator test pits, obtained soil samples, and utilized Wildcat Dynamic Cone Penetrometer (DCP) for bearing capacity evaluation as well as Kessler Dynamic Cone Penetrometer (kDCP) in the vicinity of the proposed roadways and parking areas in support of pavement development evaluation. Our scope of services was consistent with that presented in our Proposal for Geotechnical Engineering Services, dated June 28, 2016.

2.0 SITE EXPLORATION AND LABORATORY TESTING

2.1 SITE EXPLORATION

Our site exploration activities were performed on July 8, 11 and 12, 2016. Field methods involved an initial day of reconnaissance, mapping and staking of testing locations, along with conducting eight Wildcat Dynamic Cone Penetrometer (DCP) tests. The remaining two days involved directing and observing excavation of 17 machine-assisted test pits distributed among the proposed development areas, executed per the MTC Licensed Geologist's direction. Test pit locations focused on new construction areas within the site, with the goal of understanding general subsurface soil characteristics of the project site, as well as to sample soils for laboratory testing. DCP locations were primarily performed near test pit locations and between pits in order to confirm subsurface soil density/consistency and correlate with test pit soil observations. Two hand auger borings were advanced along the alignment of the south access road to confirm soil conditions in areas not readily accessible by machinery due to existing wetland and property boundary limits. In addition, four Kessler Dynamic Cone Penetrometer (kDCP) tests were performed to supplementally characterize in-situ soil strength conditions at representative locations among proposed road and parking pavement areas for evaluation of subgrade suitability and pavement design parameters.

Exploration locations were selected and field located by an MTC Licensed Geologist prior to and while on site to provide representative coverage as possible of site areas proposed for development. All explorations were monitored and documented by MTC personnel. Test pit excavations were performed under subcontract to MTC. Test pits were excavated to depths ranging from 3.5 to 4.7 feet below present grade (BPG), and all pits were terminated within resistant soil conditions exhibiting difficult excavation with small earthwork equipment. Hand auger borings were terminated upon reaching hand-operated refusal within dense or hard soil conditions at depths of 3.2 and 2.7 feet BPG.

Wildcat and Kessler DCP tests were advanced until reaching practical refusal on dense or hard soils. Eight Wildcat DCP tests were completed to termination depths ranging from approximately 2.5 to 4.5 feet BPG. Kessler DCP tests were advanced until reaching consistently high-strength soils, to maximum depths between 1.7 to 2.7 feet BPG.

Locations for explorations were based on pace-and-compass locating, GPS navigation and direct measurement with standard hand equipment. All test locations are shown on Appendix B, Figures 2B and 2C, within provided site plans of proposed development features. Additional information on the site exploration program is discussed with our exploration logs for the test pits and DCP results presented in Appendix C of this report.

2.2 LABORATORY TESTING

Laboratory tests were performed on selected soil samples in accordance with ASTM standards to determine index and engineering properties of the site soils. Tests included supplementary soil visual classification of collected samples, grain-size distribution tests (sieve and hydrometer analysis), Atterberg Limits analysis (Plasticity Index) and natural moisture content determination. Laboratory test results are presented on the test reports included in Appendix D.

3.0 EXISTING SITE CONDITIONS

3.1 SURFACE DESCRIPTION

The project site is located along the present eastern limit of the City of Mount Vernon, Washington in an upland area known commonly as the Skagit Highlands. The Plat of Skagit Highlands Division V, an existing single-family residential housing development, abuts the entire northern site boundary, with designated wetlands continuing out of the site on the western margins among adjacent forest land. Undeveloped forest and wetland areas comprise the remaining east and south property boundaries and adjacent areas to the main site interior. The site in entirety is roughly rectangular in shape at 15.2 acres, being around 1,100 feet east-west and 700 feet north-south. A narrow north-south strip of land of 0.75 acres size designated for roadway access from East Division Street north to the school location is roughly 700 feet long north-south and 50 feet wide east-west. Access to the site for MTC's exploration work was at the south terminus of Monarch Boulevard, near the intersection with Timber Ridge Drive, within the Skagit Highlands development. This location forms the secondary road access for the present development concept.

Within the site, mature second-growth forest comprised of fir, maple, cedar, alder, birch and cottonwood is prevalent. Trees generally stand straight and vertical and are up to three feet in diameter. Native understory of ferns, salal, snowberry and vine maple are omnipresent. Certain locations are grown thick with undergrowth, while other sections contain sparse low-lying growth due to tree canopy coverage. The property is generally without foot trails, excepting some irregular game paths. It is estimated that the area was logged 60 to 70 years ago based on decaying cedar stumps found during the site work.

Topography is generally level, with only a slight sloping trend to the northwest. Terrain is generally hummocky and gently rolling, with changes in elevation over the course of the building areas of less than ten feet. Beyond designated wetlands mentioned herein, there are no major bodies of water or seasonal channels found with the subject area. The ground surface was dry during the site visit in the summer season. The elevation of the project area is roughly 400 feet above sea level.

3.2 AREA GEOLOGY

The *Preliminary Geologic Map of the Mount Vernon 7½ Minute Quadrangle, Skagit County Washington* published by the U.S. Geological Survey indicates the project site is located completely within Quaternary continental glacial drift (Unit Qvt), described as Pleistocene-age Vashon Stade Glacial Till deposits (Dethier and Whetten, 1981). The *Washington Interactive Geologic Map* also depicts the site within an upland expanse of Vashon Stade Glacial Till (available from DNR, accessed online). The unit mantles commonly throughout much of Skagit County uplands. It is typified as unsorted, unstratified, compacted till consisting primarily of a matrix of sand, silt, and clay containing cobbles and boulders.

Shallow soils are mapped by the USDA NRCS *Web Soil Survey* as Tokul gravelly medial loam (0 to 8 percent slopes) for the entirety of the site. Tokul gravelly medial loam is formed on till plains and hillslopes, and is derived from volcanic ash mixed with loess over glacial till. This soil typically consists of gravelly medial loam and gravelly medial fine sandy loam over cemented glacial material at depths greater than about 33 inches, with organic topsoil in the upper 2 inches. The Tokul gravelly medial loam is moderately well drained in its upper stratigraphy, assigned to Hydrologic Group B. However, water transmission capacity of the most limiting layer is considered very low to moderately low (Ksat = 0 to 0.06 inches per hour). Depth to the seasonal water table (perched) is typically 18 to 36 inches, and the depth to a restrictive feature (cemented till) is typically between 20 to 39 inches.

Soil conditions encountered in the field generally consist of thin topsoils, cover deposits and weathered glacial soils of sandy silt to silt with gravel, transitioning to unweathered, compact and cemented silty sand to sandy silt with gravel at typical depths past approximately 2.0 to 2.5 feet below present grade (BPG). These conditions are representative of Vashon Stade glacial till deposits and undisturbed native cover deposits, and are thus consistent with area geology sources.

3.3 SOIL CONDITIONS

A general characterization of on-site soil units encountered during our exploration is presented below. The exploration logs in Appendix C present details of soils encountered at each exploration location.

The on-site soils are generally summarized as follows in stratigraphic order to depth:

- **Topsoil (OL-ML) – Silt:**
  Topsoil was observed at the surface at all testing locations throughout the project site. These cover soils were typically silt with some gravel and visible organic content. Organic material included duff, ferns, plants and roots. Topsoil was dark brown in color, soft and dry to damp. Thickness was typically about 0.4 to 0.8 feet.

- **Cover Soils & Weathered Glacial Deposits (ML) – Silt, Sandy Silt, Silt with Gravel:**
  Predominantly fine-grained cover soils and highly weathered or altered glacial deposits were encountered at all test pit locations beginning as shallow as 0.3 feet at HA-2 and as deep as 0.8 feet BPG at TP-2 beneath thin forest topsoils. The entirety of this unit displayed weathering alteration and exhibited strong oxidation patterns, with a typical medium stiff consistency that was locally soft or very soft by location or depth. Contents ranged from sandy silt to silt with gravel, with varying sand content. The unit was generally brown-orange in color and damp at the time of the investigation, however winter wetness or saturation is likely. Some to minor organics were observed. Gravel, when present, was approximately 2 inches in diameter and rounded, with rare cobbles up to 7 inches in diameter.

- **Unweathered Till Deposits (SM-ML) – Silty Sand to Sandy Silt with Gravel:**
  Resistant, cemented and compacted soils consisting of silty sand to sandy silt with gravel were encountered at all test pit and DCP locations beneath the weathered strata. Unweathered glacial soils were found at depths as shallow as 1.1 feet BPG and as deep as 3.0 feet BPG, but most commonly were present by 2.0 to 2.5 feet BPG. These soils were observed to be relatively uniform gray-brown in color, medium dense becoming hard/very dense below the upper horizon and damp to dry with moderate to strong mottling in some locations along the contact with the upper weathered unit. Gravel was typically rounded to sub-rounded and approximately 2 inches in diameter with some cobbles in select locations reaching 8 inches in diameter. Trace organics as roots were observed at the upper boundary in some locations, as well as boulders up to 2 feet in diameter. Exploration tests were terminated within this unit due to consistently very dense or hard conditions persisting to maximum depths explored.

3.4 GROUNDWATER CONDITIONS

No significant surface water features were observed on the site or in the close vicinity, excepting the designated wetland areas which appeared to be generally consistent with the provided mapping of these features. No standing water was observed in the wetland areas during our site work in the mid-summer season. The nearest bodies of water to the project site are the Nookachamps Creek 0.8 miles to the east, which has very low levels seasonally, and Big Lake separated geographically 2.4 miles to the southeast.

During field explorations, no water seepage was observed within any test pit or hand auger location. No water table was encountered by typical termination depths of 4.0 to 4.5 feet BPG at any test location. Given the timeframe of this investigation conducted in the mid-summer months, it is most likely that the observed dry conditions represent a seasonally reduced or baseline dry season condition. It is expected that winter and shoulder seasons will differ from that observed due to the consistent presence of the underlying restricting impermeable or very low permeability soils below cover deposits.

Soil mottling was observed at all test pits and was prevalent among weathered glacial soils above and at the contact with the cemented till deposits, but did not continue with depth. In this case, mottling coloration is suggestive of wetting and drying cycles within the upper soil column as shallow water is perched or migrates seasonally through relatively permeable upper stratigraphy, while downward migration is restricted. Mottling patterns were observed to be relatively distributed through the upper subsurface, though are likely also influenced by local variations in stratigraphy and topography. Considering the low permeability nature of the underlying intact till, and the presence of delineated wetlands in close proximity to the project site, some amount of perched water and shallow soil saturation is expected during the wet season, most especially near the contact with the basal till unit. Therefore, we interpret common seepage and potentially a perched water table condition should be anticipated for construction if work is conducted in the winter or spring season.

MTC's scope of investigation did not include observation and determination of seasonal variations, conclusive measurement or monitoring of groundwater elevations at the time of exploration, or determination of regional groundwater levels past the depths explored. Given the topography of the site area, known geology, and relationship to major surface water features in the vicinity, regional groundwater levels are anticipated to be below the realm of concern for this study.

4.0 KEY GEOLOGIC CONSIDERATIONS

This section discusses significant geotechnical aspects that must be addressed in project planning and design. These considerations form the basis for the geotechnical engineering design recommendations presented in Section 5.0 and construction recommendations presented in Section 6.0.

4.1 GENERAL SITE SOIL CONDITIONS

The results of MTC's investigation indicate undisturbed native soils consisting of resistant glacial till deposits are present at shallow depths residing below cover soils and weathered or altered glacially-derived soils. No apparent historic grade fills were present in excavations during our site visit. Organic topsoils and unsuitably loose or soft subsoils were generally among the upper 1.0 to 2.0 feet below the present site surface. Glacial soils include a weathered primarily fine-grained horizon among the upper approximately 0.5 to 2.0 feet of the profile, underlain by consistent unweathered silty sand to sandy silt with gravel. Soil consistency is on average medium stiff in the weathered horizon, with stiffness typically increasing with depth, although DCP data and test pit observations indicate some areas are locally soft or very soft in the upper subsurface. At the transition to unweathered soils, conditions become typically very stiff or medium dense then quickly dense or hard and brown in color below about 1.5 to 2.5 feet BPG. Unweathered glacial till composed of silty sand to sandy silt with gravel extends to maximum excavation depth explored at 4.7 feet BPG, and limited further excavation with small mobile equipment. Table 1 summarizes soils conditions encountered at each test pit and depicts organic soil depths as well as depths to prescribed foundation bearing soils corresponding to the unweathered till.

Table 1. Summary of Soil Stratigraphy Per Test Pit Location (depths in feet BPG)

Test Pit #	Organic Soil Depth	Weathered Soil	Glacial Till (Bearing Soil)
TP-1	0.6	0.6 - 2.3	2.3+
TP-2	0.8	0.8 - 2.0	2.0+
TP-3	0.5	0.5 - 2.1	2.1+
TP-4	0.5	0.5 - 1.5	1.5+
TP-5	0.5	0.5 - 1.8	1.8+
TP-6	0.7	0.7 - 2.1	2.1+
TP-7	0.5	0.5 - 2.4	2.4+
TP-8	0.4	0.4 - 1.1	1.1+
TP-9	0.4	0.4 - 1.4	1.4+
TP-10	0.6	N/A	0.6+
TP-11	0.4	0.4 - 2.3	2.3+
TP-12	0.6	0.6 - 1.7	1.7+
TP-13	0.5	0.5 - 2.3	2.3+
TP-14	0.4	0.4 - 3.0	3.0+
TP-15	0.5	0.5 - 2.5	2.5+
TP-16	0.6	0.6 - 1.3	1.3+
TP-17	0.5	0.5 - 1.6	1.6+

4.2 SCOPE OF SITE GRADING

A grading plan was not available to MTC at the time of this report. Based on discussions with the client and provided conceptual plans as well as observation of existing topography, this study assumes finished site grade will approximate current average grade. Therefore, depths referred to in this report are considered roughly equivalent to final depths, and the recommendations below assume only limited extents of cut and fill for local leveling purposes.

4.3 TEMPORARY EXCAVATION CUT SLOPES, SHORING, AND DEWATERING

Plans for excavation including temporary cut slopes and proposed shoring methods were not available to MTC at the time of report production. Most excavations are anticipated to be shallow. However, with excavations for foundations and utility improvements that may exceed 4 feet depth, it is possible that one or both techniques will be used. Section 6.3 below provides general recommendations for treatment of temporary excavations. MTC can provide further consultation, design, and evaluation services for cut slopes if desired prior to and during construction. If shoring is required beyond typical OSHA standards, MTC can provide geotechnical engineering services for shoring design upon request.

Dewatering to some extent may be necessary for shallow excavations, especially if construction occurs in the wet season or during prolonged wet weather due to perched water phenomenon and the interpreted very low infiltrating capacity of native soils. General recommendations for site preparation and wet weather construction are addressed in section 6.1.3 below. This study did not include a hydrogeologic evaluation necessary for accurate appraisal of site flow conditions or volume estimates. These findings shall be considered only generally suitable for planning and design of dewatering methods.

4.4 HYDROGEOLOGIC CONSIDERATIONS FOR STORMWATER DESIGN

The results of MTC's investigation indicate limiting factors are prevalent at the site expected to significantly hinder infiltration potential and restrict or prohibit feasible design scenarios for on-site infiltration. Major site limitations that must be taken into account include: 1) high potential for occurrence of seasonal shallow transient, trapped, or perched water, and 2) consistent presence of very low permeability unweathered compacted glacial till deposits beginning between 1.5 to 3.0 feet BPG throughout the site. Based on these limitations and as addressed further below, the site conditions do not appear generally amenable to conventional infiltration design or large-scale use of pervious pavement systems. It is possible that some low amount of infiltration could be gained by use of relatively small, decentralized bio-retention facilities, however these features would also be limited by the likelihood of shallow perched water in the winter season, and therefore may not be feasible for design per applicable standards. The native site conditions are inherently well suited for construction of in-ground detention facilities, which are commonly employed in the site vicinity. The unweathered till soils present at depth are typically considered suitable for use in low-permeability pond and berm construction.

5.0 DESIGN RECOMMENDATIONS

5.1 FOUNDATION FEASIBILITY

Two requirements must be fulfilled in design of foundations. First, loads must be less than the ultimate bearing capacity of foundation soils to maintain stability; and secondly, differential settlement must not exceed an amount that will produce adverse behavior of the structure. Allowable settlement is usually exceeded before bearing capacity considerations become important; thus, the allowable bearing pressure is normally controlled by settlement considerations including differential settlement. Excess settlement due to adverse soil conditions may be a result of shallow or deep soils, or a combination of both.

We assume the primary building structure will employ shallow continuous perimeter and spread footings with an interior slab-on-grade floor. Retaining foundation walls may be incorporated for leveling construction such as in hummocky areas of the building locations, or for deeper structural features such as underground concrete vault construction if utilized. MTC assumes foundations and floors will generally be placed with final grades near current site grade. Therefore, shallow conditions of the native soils are relevant to footing and slab-on-grade construction. In our opinion, a continuous perimeter and spread footing foundation and slab-on-grade style of construction appears suitable for use given the site conditions encountered and by following the recommendations in the sections below.

Native glacial soils consisting of very stiff/medium dense to hard/very dense sandy silt to silty sand with gravel (glacial till) encountered at and below likely footing grades throughout the site appear well suited for direct support of the proposed foundations. Cover soils consisting of native topsoils and subsoils, uncontrolled fills or disturbed soils, if present locally, and sensitive weathered soils of relatively low strength are not suitable to remain below the concentrated loads of foundations. We recommend unsuitable shallow soils be removed from footing areas in accordance with the recommendations below. Typical depth to prescribed bearing strata is anticipated to be between 1.5 to 2.5 feet BPG based on conditions at exploration locations. Local areas may require marginally greater depths to reach unweathered glacial till soils per the variations encountered in our site-wide testing program. Non-organic weathered glacial soils of verified suitably firm quality are considered generally suitable to remain below light-load slab-on-grade areas and appropriately designed pavement sections, assuming site preparations are completed as recommended herein.

Explorations of this study were limited to test pit excavations, DCP testing and hand auger borings, documenting generally very stiff to hard conditions to a maximum depth of 4.7 feet BPG, terminated due to resistant conditions. Given the anticipated building loads and style of construction, as well as the suitably hard conditions present to the maximum depth explored, excessive deep settlement does not appear to be a tangible risk to the proposed development. MTC may be contacted to perform additional exploration and engineering analysis for further assessment of deep soil conditions and settlement potential at the request of the client. The following recommendations presented in the remainder of this report pertain to shallow foundation construction and standard earthwork preparations. These recommendations are considered suitable for the proposed project design and are provided based on the results of site investigation to date.

5.2 FOUNDATION RECOMMENDATIONS

MTC recommends excavations for foundation elements be completed down to unweathered glacial till soils, thereby removing all organic-rich soils, unsuitably loose or soft cover soils, and potentially variable weathered deposits from the footing areas. We recommend foundations be placed on unweathered glacial till subgrade, or on structural fill placed over these soils if required to raise grade. Assuming site preparations are completed as described herein, we recommend the following:

- **Allowable Soil Bearing Capacity:**
  2,500 pounds per square foot (psf) for footings placed on intact native glacial till soils of suitably dense or hard consistency, or on compacted structural fill placed over these soils per the recommendations presented herein for *Structural Fill Materials and Compaction*.

  If structural fill is placed beneath footings for raising subgrade level or for backfill of overexcavated areas, a minimum 12-inch fill thickness is recommended for use.

  The allowable bearing capacity may be increased by 1/3 for transient loading due to wind and seismic events.

- **Minimum Footing Depth:**
  For a shallow perimeter and spread footing system, all exterior footings shall be embedded a minimum of 18 inches and all interior footings shall be embedded a minimum of 12 inches below the lowest adjacent finished grade, but not less than the depth required by design. However, all footings must penetrate to the prescribed bearing stratum cited above, and no footings should be founded in or above organic or loose/soft soils.

- **Minimum Footing Width:**
  Footings should be proportioned to meet stated bearing capacity and/or IBC current minimum requirements. For a shallow foundation system, continuous strip footings should be at minimum 16 inches wide and interior or isolated column footings at minimum 24 inches wide.

- **Estimated Settlements:**

  We estimate that the maximum settlements will be approximately 1 inch, or less, with a differential settlement of ½ inch, or less, over 50 linear feet. Settlement is anticipated to occur when the load is applied during construction.

- **Lateral Load Resistance:**

  Lateral loads can be resisted by passive pressure against buried portions of the foundation elements and sliding resistance along its base. We recommend an allowable lateral pressure equal to that generated by a fluid with an equivalent fluid weight of 200 pcf EFW. This value assumes footings are backfilled with structural fill and includes a factor of safety of two. The upper 18 inches of soil should be ignored unless the area is paved or covered with concrete, due to soil softening associated with freeze/thaw. If footing elements are planned to be placed directly against intact native soils at a given location, we recommend the allowable lateral pressure be reduced to 100 pcf EFW.

  Sliding resistance between footings and the foundation subgrade may be factored in terms of contribution to lateral resistance. For footings placed directly on native subgrade consisting of unweathered glacial till (silty sand to sandy silt with gravel), a maximum allowable coefficient of friction of 0.35 is recommended. This value may also be used for footings placed over structural fill. This value assumes concrete placed directly on the subgrade or structural fill pad and includes a factor of safety of 1.5.

- **Footing Drains:**

  Due to low permeability very dense/hard subgrade, MTC recommends exterior foundations employ footing drains to help maintain an unsaturated subgrade. Footing drains should employ 4-inch minimum perforated pipe and be backfilled with free-draining material (as specified below for wall drainage) wrapped in filter fabric. Footing drains should be tightlined separately from roof drains to a catch basin system or to a suitable permanent discharge point at least 10 feet from the structure. A schematic illustration of a typical footing drain is shown below.

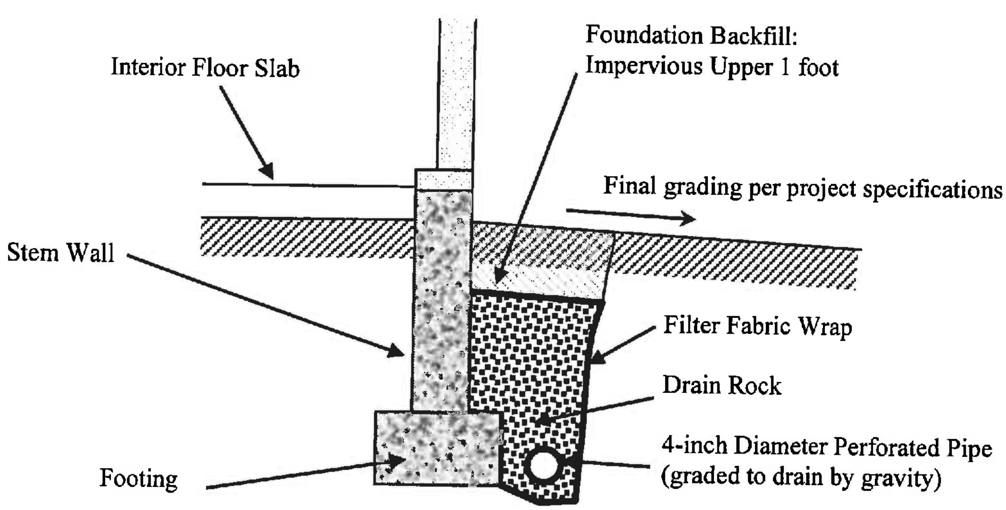


Illustration A. Footing Drain Schematic Profile

5.3 SLAB-ON-GRADE CONSTRUCTION

A slab-on-grade floor is assumed to be incorporated for building interiors. Based on our understanding of the project, interior floors are anticipated to be subject to light live loading from foot traffic and relatively light dead loads. Higher loads are assumed to be accounted for separately, such as for any slabs subject to traffic loading. MTC recommends the following activities and parameters for slab-on-grade design and construction intended to provide reinforcement against shallow soil variations and potential adverse effects of differential settlement. For the purpose of this report, we assume finished slab grade will be similar to or marginally above present grade for the below recommendations. If floor grades are planned to be substantially raised or lowered from existing grade, MTC can be contacted to confirm or provide revised or alternative recommendations based on a greater extent of site preparations.

- **Slab Subgrade Preparations:**

  All unsuitably soft, organic, or shallow yielding soils should be removed from beneath floor slabs. Existing weathered glacial soils of firm quality may be suitable to remain below slab-on-grade interiors and non-structural exterior flatworks, assuming soils are verified as firm and unyielding during construction. Local areas of excessively soft or loose subgrade will require additional overexcavation where encountered during slab preparations.

- **Base Pad:**

  An 18-inch minimum section of structural fill base is recommended to be installed beneath floor slabs to ensure a stable subgrade and adequate slab support over varying shallow conditions. Base pad material may consist of gravel borrow, as recommended herein for general structural fill application, or a similar material of equivalent function as approved by the geotechnical engineer. As noted below, capillary break material can account for the upper portion of the base section if composed of compacted angular material approved as structural fill.

  If final construction plans propose to place some slab-on-grade floors at deeper levels corresponding to unweathered glacial till subgrade, the base pad may be eliminated. In this case, a minimum 6-inch capillary break section is still recommended.

- **Subgrade Modulus:**

  A Subgrade Modulus (k) of 150 pci is recommended for use in design of interior slab-on-grade floors constructed over the prescribed base pad atop shallow weathered glacial soils of suitably firm quality.

  A Subgrade Modulus (k) of 200 pci is allowed for use in design of slabs constructed at greater depth directly over an intact glacial till subgrade and capillary break material.

- **Proof Roll:**

  Prior to placement of capillary break material and slab construction, the proposed slab subgrade or structural fill pad, if utilized, shall be proof-rolled to confirm no soft or deflecting areas are present. This is to ensure the existing base is evenly prepared and adequate for support of the slab. MTC recommends that we be contacted for observation of the proof roll and final visual confirmation of prepared base suitability. Areas of excessive rutting, pumping, or yielding shall be excavated and backfilled with new structural fill as described herein.

- **Capillary Break:**

  A capillary break is recommended to maintain a dry slab floor and reduce the potential for floor damage resulting from shallow perched water inundation. To provide a capillary moisture break, a 6-inch thick, properly compacted granular mat consisting of open-graded, free-draining angular aggregate is recommended below floor slabs. To provide additional slab structural support, and to substitute for a portion of a structural fill base pad where specified, MTC recommends the capillary break consist of crushed rock all passing the 1-inch sieve and no more than 3 percent (by weight) passing the U.S. No. #4 sieve, compacted in accordance with Section 6.2.2 below.

- **Vapor Barrier:**

  A vapor retarding membrane such as 10-mil polyethylene film should be placed beneath all floor slabs to prevent transmission of moisture through the slabs where floor coverings may be affected. Care should be taken during construction not to puncture or damage the vapor retarding membrane. To protect the membrane, a layer of sand no more than 2 inches thick may be placed over the membrane if desired.

- **Loaded Slabs and Structural Design Considerations:**

  For slabs proposed for loading due to heavier storage or interior vehicle parking/access, we recommend these slabs be designed for increased rigidity and self-support in order to help counteract the increased risk for differential settlement under higher loading conditions. MTC suggests at least a minimum unreinforced concrete structural section of 6.0 inches be employed, or as specified by the project engineer. It is generally recommended that these slabs be designed to incorporate reinforcing to help span variable soils and eliminate potential cracking.

  In addition, trafficked slabs may call for minimum structural fill sections to be placed to support traffic loads. The prescribed base pad section should be generally suited for lighter traffic loads beneath a structural slab. However, final slab design and specifications for structural fill reinforcement should be assessed by the project engineer based on the known structural or traffic loads available in final design. MTC recommends that we be contacted to review specifications for heavily loaded or trafficked areas if incorporated to the project.

5.4 RETAINING WALL DESIGN

The below recommendations pertain to the design of rigid, laterally loaded above-grade and buried retaining wall structures and foundations if required for the project. Values assume walls are backfilled with approved drainage fill and granular material, as applicable, and retaining a level backslope. The values are not universally applicable to exceedingly sloping backfills, backfills composed of non-granular soils, braced or tied-back walls, or for walls greater than 10 feet in height. MTC expressly recommends that we review final plans and specifications for retaining walls to ensure consistency with the recommendations presented herein, and to provide additional geotechnical consultation and recommendations as needed for final design and construction.

- **Wall Drainage:**

  To preclude build-up of hydrostatic pressure, we recommend a minimum width of 1 foot of clean, granular, free-draining material extend from the footing drain at the base of the wall to the ground surface immediately behind the wall. Native soils are not considered suitable as drainage material due to elevated fines content. Imported wall drain aggregate should conform to WSDOT Standard Specification 9-03.12(4) Gravel Backfill for Drains or 9-03.12(5) Gravel Backfill for Drywells, or equivalent as specified by the designer. A filter fabric suitable for use in soil separation and water transmission is recommended to be placed against the retained soil cut behind the wall to limit migration of fines into the drain corridor.

- **Backfill Soil – Structural Fill:**

  Where structural backfill is called for, soils used for wall backfill should be relatively granular with less than 5 percent fines (material passing the U.S. No. 200 sieve). Native site soils are not suitable for use as wall backfill. Wall backfill is considered Structural Fill, and additionally should conform to WSDOT Standard Specification 9-03.12(2) Gravel Backfill for Walls.

- **Backfill Compaction:**

  To prevent build-up of excess lateral pressures, over-compaction of structural fill behind walls if installed should be avoided. However, a lesser degree of compaction may permit excessive post-construction settlements. In order to limit wall pressures resulting from over-compaction of wall backfill, we recommend that backfill within 5 feet of a wall be compacted by small, hand-operated compaction equipment placed in 6- to 8-inch maximum loose lifts. Compaction efforts should begin along the fill edge closest to the wall and progress away from the structure.

- **Active and At-rest Pressures:**

  Yielding (cantilever) retaining walls should be designed to withstand an appropriate active lateral earth pressure, whereas non-yielding (restrained) walls should be designed to withstand an appropriate at-rest lateral earth pressure. The at-rest case is applicable where retaining wall movement is confined to less than 0.005 H, where H is the wall height. If greater movement is possible, the active case applies. A wall movement of about 0.02 H will be required to develop full active pressures. These pressures act over the entire back of the wall and vary with the backslope inclination.

For free-draining retaining walls up to 10 feet effective height (including backslope) and retaining native soils or imported structural fills, we recommend using the parameters for active and at-rest earth pressures (given as equivalent fluid unit weights) provided in Table 2.

Note: For undrained wall scenarios, if required, design loads should be compensated to account for saturated soil conditions and hydrostatic pressures per IBC. In this event, MTC should be contacted for further consultation and to confirm design parameters.

Table 2. Recommended Soil Parameters for Retaining Wall Design.

SOIL TYPE	CONDITION	UNIT WEIGHT (PCF)	ACTIVE PRESSURE*	AT-REST PRESSURE*
Weathered Glacial Soils	Retained	110	45	100
Intact Glacial Till	Retained	130	27	45
Structural Fill	Retained / Backfilled	125	30	55

* Noted in equivalent fluid pressure, based on depth below grade. Units of psf per foot.

5.5 SEISMIC DESIGN PARAMETERS AND LIQUEFACTION POTENTIAL

According to the *Liquefaction Susceptibility Map of Skagit, Washington* and the accompanying *Seismic Site Class Map* (Palmer et al., 2004), the site location is identified as having a *very low* liquefaction susceptibility. Liquefaction is a phenomenon associated with a subsurface profile of relatively loose, cohesionless soils saturated by groundwater. Under seismic shaking the pore pressure can exceed the soil's shear resistance and the soil 'liquefies', which may result in excessive settlements that are damaging to structures and disruptive to exterior improvements. The Seismic Site Class Map (Palmer et al., 2004) classifies the project area as Site Class C, representing a moderate potential for increased amplitude of ground shaking during a seismic event. Based on the results of site explorations, MTC interprets the site to have a very low risk of liquefaction due to the prevalence of very dense or hard sandy silt and silty sand with gravel glacial till deposits directly below cover soils.

The *USGS Seismic Design Map Tool* was used to determine site-specific seismic design coefficients and spectral response accelerations for the project site assuming design Site Class C, representing a subsurface profile (upper 100 feet) of generally very dense or hard soil conditions. Parameters in Table 3 were calculated using 2008 USGS hazard data and 2012/2015 International Building Code standards:

Table 3. Seismic Design Parameters – Site Class C

Mapped Acceleration Parameters (MCE horizontal)	S_S	1.060 g
	S_1	0.412 g
Site Coefficient Values	F_a	1.000
	F_v	1.388
Calculated Peak SRA	S_{MS}	1.060 g
	S_{M1}	0.572 g
Design Peak SRA (*2/3 of peak*)	S_{DS}	0.707 g
	S_{D1}	0.381 g
Seismic Design Category – Short Period (0.2 Second) Acceleration		D
Seismic Design Category – 1-Second Period Acceleration		D

5.6 INFILTRATION ANALYSIS & COMMENTARY

MTC was requested to assess general site conditions in terms of design considerations for potential on-site stormwater infiltration feasibility during the course of this Phase 1 geotechnical study. Projects in the feasibility or conceptual design stage are typically anticipated to incorporate on-site infiltration to the extent and use feasible for the existing subsurface conditions. We understand the project will be subject to infiltration design based on the Washington Department of Ecology *Stormwater Management Manual for Western Washington* (DoE SMMWW), 2012 edition.

As noted in Section 4.4, the results of MTC's investigation indicate site soil conditions are generally infeasible for conventional on-site infiltration design. This is due in combination to the likelihood of seasonal perched water presence at the site, and the presence of relatively impermeable consolidated and cemented glacial till throughout the site. Given these overall site limitations, our further characterization for infiltration potential was focused on assessing the possibility for limited use of shallow soils for near-surface design elements such as small bio-retention, rain gardens, and pervious pavement facilities.

During test pit excavations, MTC collected representative samples of soil horizons at various depths and locations from the upper subsurface of the site. Laboratory gradation analyses were completed including sieve and hydrometer tests for rate determination to supplement field observations and classifications. Results of laboratory testing in terms of applicable rate calculations (2012 DoE SMMWW methods) are summarized in Table 4 below.

For infiltration rate determination, gradation results were applied to the Massmann (2003) equation (1) to calculate Ksat representing the initial saturated hydraulic conductivity, as described in the 2012 DOE SMMWW Volume III 3.3.6.3.

(1) $$\log10(Ksat) = -1.57 + 1.90*D10 + 0.015*D60 - 0.013*D90 - 2.08*ff$$

Table 4 reports for each sample the input laboratory values and calculated Ksat. Corrected Ksat values presented below are a product of the initial Ksat and correction factor CFT. For a generalized design situation, we have applied a conservative site variability factor of CFv = 0.33 along with typical values of CFt = 0.4 (for the Grain Size Method) and CFm = 0.9 (assuming standard influent control).

(2) $$CFT = CFv \times CFt \times CFm = 0.33 \times 0.4 \times 0.9 = 0.12$$

Table 4. Results of Massmann Analysis

TP #	**Depth** *(BPG)*	USCS	D10	D60	D90	Ff (%)	**Ksat** *(inches/hour)*	**Corrected Ksat** *(inches/hour)*
12	**2.0**	SM	0.005	0.237	9.5	47.6	3.03	**0.36**
13	**2.0**	SM	0.005*	1.45	52.1	24.8	2.63	**0.32**
14	**1.0**	SM	0.005*	1.615	16.0	40.1	3.74	**0.45**

*Extrapolated from sieve data in comparison to similar soils, depths and locations.

Gradation Results Discussion

Grain size analysis methods based on 2012 calculation criteria yielded corrected Ksat values ranging from 0.32 to 0.45 inches/hour corresponding to native cover or weathered soils among 1 to 2 feet BPG and prior to contacting restrictive conditions. Calculations were not completed on soils corresponding to glacial till deposits, as it is our opinion that the in-situ character of these soils including their relatively impermeable quality (as evidenced by seasonal perched water and wetland features) is not accurately reflected by grain size results.

For application to an initial shallow design scenario, if feasible, we recommend considering a corrected Ksat maximum value of ***0.30 inches/hour***. This value represents the low end of the Table 4 values calculated using an additionally reduced correction factor accounting for a relatively high level of site variability between testing location, as was commonly observed in test pits. However, a final design application would most likely employ a further reduced rate in order to compensate for the minimal separation to seasonal water conditions and restrictive soils. It is the responsibility of the designer to account for all reductions required. Given that infiltration potential at the site is generally very low, we recommend any infiltration facility proposed for final project design undergo additional targeted investigation to confirm suitability, most likely including PIT methods and winter season exploration for direct assessment and measurement of actual infiltration capacity at the chosen location and depth.

Pervious Pavement Feasibility

In the course of this study, MTC was asked to consider the feasibility of pervious pavement design for the project site as a potential "Best Management Practice" (BMP). Design and feasibility criteria for pervious pavement systems is covered in the Department of Ecology SMMWW 2012, Volume V, BMP T5.15 Permeable Pavements. MTC reviewed this resource along with the project findings to date.

It is our opinion that, per BMP T5.15, the site conditions are generally considered infeasible for pervious pavement application for the following reasons. Based on the above analysis, soils tested in areas considered for permeable pavements at 1.0 to 2.0 feet BPG display a maximum corrected saturated hydraulic conductivity of Ksat = 0.3 inches per hour. The sampled soils represent an average condition, indicating that conditions can likely exist that have less than the minimum necessary Ksat values per BMP T5.15. In addition, native soils explored site-wide display indications of seasonal high water levels that may be as shallow as within 1.0 to 1.5 feet of the surface in winter months due to underlying "hardpan" conditions found commonly at shallow depths. This relatively impermeable shallow hardpan could also create saturated conditions within one foot of the bottom of the lowest gravel base course of the pervious pavement section, especially within proximity to established wetlands, assuming at-grade construction. We consider the above to be broadly applicable to shallow subsurface conditions within and adjacent to proposed pervious pavement sections at the project site, and therefore have determined that pervious pavement surfacing is considered infeasible per BMP T5.15 criteria.

Finally, Site Suitability Criteria (SSC) from Volume III, Section 3.3.7 of the 2012 SMMWW provides conditions that must be attained for suitability of site conditions. SSC-5—*Depth to Bedrock, Water Table or Impermeable Layer* states that facilities must be greater than or equal to 5 feet above the seasonal high water mark, bedrock or low permeable layer. Site existing soil conditions indicated a shallow depth to a restricting feature, even if a lesser separation of three feet is applied. SSC-6 covering in-situ treatment criteria states in the second parameter that depth of soil used for infiltration must typically be a minimum of 18 inches thick, which can be reduced to a minimum of 12-inch thickness for some pervious pavement applications. Conditions encountered in the field demonstrate a restrictive horizon at depth of 1.0 to 2.0 feet BPG. Due to soft or yielding shallow soils, we anticipate pavement sections will need to replace most or all of this upper horizon. The project situation does not appear to meet site suitability criteria assuming typical site preparations for pavement development required to ensure a stable and lasting surfacing.

5.7 PAVEMENT DESIGN & CONSTRUCTION DISCUSSION

5.7.1 CBR of Subgrade

MTC collected supplemental field data in support of initial pavement design analysis using Kessler DCP equipment, yielding data correlative with CBR values at locations distributed among proposed road corridors. Kessler DCP records blow-count values which are graphically interpreted to CBR values by depth and advancement. Results from all four tests were broadly consistent and concur with test pit observations and Wildcat DCP results in terms of general soil characteristics and depth of documented stratigraphy for shallow soils. Kessler DCP logs are attached in Appendix C.

Shallow soils recorded notably low CBR values varying from around 1 to between 3 to 5 maximum before increasing notably to values of around 10 and above below approximately 1.8 to 2.1 feet BPG. These results indicate it will be preferable to remove and replace the unsuitable as well as low strength soils present commonly in the upper approximately 1.5 to 2.0 feet of the subsurface in areas of pavement development, especially for primary entry/exit roads and anticipated higher traffic interior locations.

For an initial conservative design approach, we have utilized a bulk subgrade CBR = 3 for pavement section design, which would allow for weathered soils of firm quality to remain beneath the pavement section. This value assumes finished pavement grades will be similar to or nominally higher than existing grade, and that stripping will at minimum include topsoils and unsuitably soft subgrades as needed in all locations.

If greater excavation depths are assured in site preparation, higher values of CBR = 10 or greater will be suitable for pavement design use, and lesser section thicknesses may be suitable. MTC can be contacted for revised pavement section calculation if required based on the final project grading plan.

5.7.2 AASHTO Flexible Pavement Design

The conceptual site plan (Figure 2) indicates paved roads and parking with multiple levels of use. Heavier traffic loading including from daily school bus pick-up and drop-off activity is anticipated to occur along the entry/exit corridors as well as along designated loops fronting the building zone. Auto parking areas are generally separated from bus traffic zones and thus we assume will be subjected to a lesser degree of traffic loading.

In order to perform a preliminary pavement section design calculation, MTC has assigned representative traffic loading values (ESALs) of 150,000 and 25,000 for heavier-duty bus use corridors and for auto accesses and parking lots respectively. Values are based on our rough estimate of daily traffic common to school sites. For instance, the heavier-duty ESAL was estimated based on about 25 bus passes per day as well as some component of delivery trucks and small vehicles. Parking areas and their accesses are assumed to be subject to only auto traffic. We recommend assumed design ESALs be verified by the project team with information available later in the process to ensure the most appropriate design criteria is applied, and if necessary that pavement sections be reevaluated if anticipated traffic loads and usage areas differ from the presumed.

Calculations were performed per AASHTO Flexible Pavement Design methods. Resulting sections are summarized per ESAL value in Table 5 below. A reduction factor of 0.85 was used for the structural coefficient of the gravel base layer due to the potential for wet conditions from perched water inundation. The following other standard input parameters were used:

- Pavement Design Life = 20 years
- Terminal Serviceability Index = 2.0
- Reliability = 95
- Expected Growth Rate = 1%
- Subgrade CBR Value = 3

Table 5. Summary of Pavement Section Design Results (in inches)

Design Scenario	Pavement (1/2-inch HMA)	CSTC	Gravel Base	TOTAL
Heavy Access Corridors (ESAL = 150,000)	4	2	12	**18**
Car Access and Parking (ESAL = 25,000)	3	2	8	**13**

The calculated heavy access pavement structural section totals 18 inches minimum to meet the stated design criteria. This corresponds to our understanding of as-built roadway sections used adjacent to the site entries on Monarch Boulevard and East Division Street. Additionally, heavier-use pavements are commonly recommended to be placed to an 18-inch minimum thickness for frost-heave protection and general durability protection, especially where shallow perched water is a likely factor. Light traffic access and parking sections were calculated at 13 inches minimum thickness, although it may be preferred or defaulted to utilize a similar gravel base section as the heavy-duty section due to removal and replacement of unsuitable shallow soils.

These calculated sections should be considered preliminary until verifying the parameters, traffic loading, and assumed grading are applicable to final project design. We recommend pavement sections be reviewed by the civil designer, who may apply an alternative section for final project use based on the conditions reported herein and final design and construction preferences. MTC can be contacted to verify final design criteria, or to consult on alternative pavement sections including geotextile reinforcement or asphalt-treated base (ATB) if considered for use.

5.7.3 Rigid Pavements and Flatworks

Rigid pavement components are commonly utilized for portions of accesses and ancillary exterior improvements. The project civil engineer may reevaluate the below general recommendations for pavement thicknesses and base sections as necessary to ensure proper application to a given structure and use. MTC recommends that we be contacted for further consultation if the below sections are proposed to be reduced.

Concrete driveway aprons and curb alignments, if utilized, should consist of at least a minimum 6-inch thickness of unreinforced concrete pavement over structural base fill. Gravel base thickness should correspond to related location and anticipated traffic loading, and be increased as needed. For light traffic areas, we recommend an 8-inch minimum gravel base thickness (total 14-inch section) can be applied. The total section is roughly equivalent to that recommended above for flexible pavements. Heavier traffic areas should correspondingly include a minimum 12-inch gravel base section, with a greater thickness of concrete as necessary.

Concrete sidewalks, walkways and patios may consist of a minimum 4-inch section of plain concrete (unreinforced) installed over a 6-inch minimum compacted base of crushed rock over suitably firm subgrade. Base material directly below pavement for sidewalks should consist of ¾-inch minus crushed rock or approved equivalent, compacted to 95% of maximum dry density. At locations where grade has been raised with structural fill, a leveling section of 4-inch minimum crushed rock be used. Flatworks should employ frequent joint controls to limit cracking potential.

Specifications for concrete aprons and flatworks can be predetermined by the local municipality, and may conflict with the above. In this case, we recommend either adhering to the more stringent option, or contacting MTC for clarification. The above discussion should be considered as minimum development guidelines for general design use. The design engineer should confirm their suitability prior to incorporating into the final design.

6.0 CONSTRUCTION RECOMMENDATIONS

6.1 EARTHWORK

6.1.1 Excavation

Excavations can generally be performed with conventional earthmoving equipment such as bulldozers, scrapers, and excavators. Full-size equipment may be preferable or required for deeper excavations, due to the resistant nature of the glacial till soils.

Where possible, excavations made within about one foot of finished subgrade level should be performed with smooth edged buckets to minimize subgrade disturbance and the potential for softening to the greatest extent practical.

6.1.2 Subgrade Evaluation and Preparation

After excavations have been completed to the planned subgrade elevations, but before placing fill or structural elements, the exposed subgrade soils should be evaluated under the full-time observation and guidance of an MTC representative. Where appropriate, the subgrade should be proof-rolled with a minimum of two passes with a fully loaded dump truck, water truck or scraper. In circumstances where this seems unfeasible, an MTC representative may use alternative methods for subgrade evaluation.

Any loose soil should be compacted to a firm and unyielding condition and at least to 95 percent of the modified Proctor maximum dry density per ASTM D1557. Any areas that are identified as being soft or yielding during subgrade evaluation should be over-excavated to a firm and unyielding condition or to the depth determined by the geotechnical engineer. Where over-excavation is performed below a structure, the over-excavation area should extend beyond the outside of the footing a distance equal to the depth of the over-excavation below the footing. The over-excavated areas should be backfilled with properly compacted structural fill.

6.1.3 Site Preparation, Erosion Control and Wet Weather Construction

The primarily silty native soils among proposed excavation depths are highly moisture sensitive and will become soft and difficult to compact or traverse with construction equipment when wet. During wet weather, the contractor should take measures to protect the exposed subgrades and limit construction traffic during earthwork activities.

Once the geotechnical engineer or their representative has approved a subgrade, further measures should be implemented to prevent degradation or disturbance of the subgrade. These measures could include, but are not limited to, placing a layer of crushed rock or lean concrete on the exposed subgrade, or covering the exposed subgrade with a plastic tarp and keeping construction traffic off the subgrade.

Once subgrade has been approved, any disturbance because the subgrade was not protected should be repaired by the contractor at no cost to the owner.

During wet weather, earthen berms or other methods should be used to prevent runoff from draining into excavations. All runoff should be collected and disposed of properly. Measures may also be required to reduce the moisture content of on-site soils in the event of wet weather. These measures can include, but are not limited to, air-drying and soil amendment, etc.

Since the silty on-site soils will be difficult to work with during periods of wet weather due to elevated soil moisture content, and frozen soil is not suitable for use as structural fill, we recommend that earthwork activities generally take place in late spring, summer or early fall.

Dewatering efforts may be required depending on total excavation depth, season of construction, and weather conditions during earthwork. MTC recommends major earthwork activities take place during the dry season if possible to minimize the potential for seasonal high groundwater levels near proposed excavation depth, and to reduce seepage occurrences from perched water conditions. It should be understood that some amount of water seepage from shallow sources or perched lenses may be unavoidable year-round.

6.2 STRUCTURAL FILL MATERIALS AND COMPACTION

6.2.1 Materials

All material placed below structures or pavement areas should be considered structural fill. Structural fill material shall be free of deleterious material, have a maximum particle size of 4 inches, and be compactable to the required compaction level.

Excavated native cover soils and glacial deposits consisting primarily of silt, sandy silt and silty sand are not considered suitable for re-use as structural fill beneath buildings and pavement areas based on observed high fines content and consistency. Competent, non-organic native soils may be suitable for reuse as grade fill outside of structural areas, depending on project requirements and the season of construction. Native topsoil does not appear to be present to a sufficient degree for large-scale reuse among landscaping areas.

Imported material can be used as structural fill. Imported structural fill material should conform to Section 9-03.14(1), Gravel Borrow, of the most recent edition (at the time of construction) of the State of Washington Department of Transportation *Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT Standard Specifications)*. During warm, dry weather, it will likely be necessary to add water to fill soils after residing in stockpiles if stored on site. Material properties including moisture content shall meet project specifications for the intended use.

Controlled-density fill (CDF) or lean mix concrete can be used as an alternative to structural fill materials, except in areas where free-draining materials are required or specified.

Frozen soil is not suitable for use as structural fill. Fill material may not be placed on frozen soil.

The contractor should submit samples of each of the required earthwork materials to the geotechnical engineer for evaluation and approval prior to delivery to the site. The samples should be submitted at least 5 days prior to their delivery and sufficiently in advance of the work to allow the contractor to identify alternative sources if the material proves unsatisfactory.

6.2.2 Placement and Compaction

Prior to placement and compaction, structural fill should be moisture conditioned to within 3 percent of its optimum moisture content. Loose lifts of structural fill shall not exceed 8 inches in thickness; thinner lifts will be required for walk-behind or hand operated equipment.

All structural fill shall be compacted to a dense and unyielding condition and to a minimum percent compaction based on its modified Proctor maximum dry density as determined per ASTM D1557. Structural fill placed beneath each of the following shall be compacted to the indicated percent compaction:

Foundation and Floor Slab Subgrades:	95 Percent
Pavement Subgrades (upper 2 feet):	95 Percent
Pavement Subgrades (below 2 feet):	90 Percent
Utility Trenches (upper 4 feet):	95 Percent
Utility Trenches (below 4 feet):	90 Percent

We recommend that fill placed on slopes steeper than 3:1 (H:V) be 'benched' in accordance with hillside terraces entry of section 2-03.3(14) of the WSDOT Standard Specifications.

We recommend structural fill placement and compaction be observed on a full-time basis by an MTC representative. A sufficient number of tests shall be performed to verify compaction of each lift. The number of tests required will vary depending on the fill material, its moisture condition and the equipment being used. Initially, more frequent testing will be required while the contractor establishes the means and methods required to achieve proper compaction.

6.3 TEMPORARY EXCAVATIONS AND SLOPES

All excavations and slopes must comply with applicable local, state, and federal safety regulations. Construction site safety is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing soil type information solely as a service to our client for planning purposes. Under no circumstances should the information be interpreted to mean that MTC is assuming responsibility for construction site safety or the Contractor's activities. Such responsibility is not being implied or inferred.

Temporary excavations in the existing native silty cover and weathered soils should be inclined no steeper than 1.5H:1V, unless approved by the geotechnical engineer based on observation of actual encountered conditions at the time of construction. Deeper excavations within the intact glacial till may be inclined up to 1H:1V, or possibly greater if suitable conditions are verified within an open excavation during construction. Applying lesser grades may also be necessary depending on actual conditions encountered and the potential presence of water seepage. Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed near the top of any excavation. Where stability of adjoining walls or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning may be required to provide structural stability and to protect personnel working within the excavation. Earth retention, bracing, or underpinning required for the project (if any) should be designed by a professional engineer registered in the State of Washington.

Temporary excavations and slopes should be protected from weather by covering with plastic sheeting or similar impermeable material. Sheeting sections should overlap at least 12 inches and be tightly secured with sandbags, staking, or other means to prevent wind from exposing soils under the sheeting.

6.4 PERMANENT SLOPES

MTC recommends that new areas of permanent slopes including fill embankments be inclined no greater than 3H:1V. Permanent slopes should be planted with a deep-rooted, rapid-growth vegetative cover as soon as possible after completion of slope construction. Alternatively, the slope should be covered with plastic, straw, etc. until it can be landscaped.

6.5 UTILITY TRENCHES AND EXCAVATIONS

The contractor shall be responsible for safety of personnel working in utility trenches. Given that steep excavations in native soils may be prone to caving, we recommend all utility trenches, but particularly those greater than 4 feet in depth, be supported in accordance with state and federal safety regulations.

Pipe bedding material should conform to the manufacturer's recommendations and be worked around the pipe to provide uniform support. Cobbles or boulders exposed in the bottom of utility excavations should be covered with pipe bedding or removed to avoid inducing concentrated stresses on the pipe.

Trench backfill should be placed and compacted as structural fill as recommended in Section 6.2. Particular care should be taken to insure bedding or fill material is properly compacted to provide adequate support to the pipe. Jetting or flooding is not a substitute for mechanical compaction and should not be allowed.

7.0 ADDITIONAL RECOMMENDED SERVICES

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during construction to verify compliance with these recommendations. Testing and observations performed during construction should include, but not necessarily be limited to, the following:

- Observations and testing during site preparation, earthwork, structural fill, and pavement section placement,
- Consultation on temporary excavation cutslopes and shoring if needed,
- Testing and inspection of any concrete or masonry included in the final construction plans, and
- Geotechnical consultation as may be required prior to and during construction.

We strongly recommend that MTC be retained for the construction of this project to provide these and other services. Our knowledge of the project site and the design recommendations contained herein will be of benefit in the event that difficulties arise and either modifications or additional geotechnical engineering recommendations are required or desired. We can also, in a timely fashion observe the actual soil conditions encountered during construction, evaluate the applicability of the recommendations presented in this report to the soil conditions encountered, and recommend appropriate changes in design or construction procedures if conditions differ from those described herein.

We further recommend that project plans and specifications be reviewed by us to verify compatibility with our conclusions and recommendations.

Also, MTC retains fully accredited, WABO-certified laboratory and inspection personnel, and is available for this project's testing, observation and inspection needs. Information concerning the scope and cost for these services can be obtained from our office.

8.0 LIMITATIONS

Recommendations contained in this report are based on our understanding of the proposed development and construction activities, our field observations and exploration and our laboratory test results. It is possible that soil and groundwater conditions could vary and differ between or beyond the points explored. If soil or groundwater conditions are encountered during construction that vary or differ from those described herein, we should be notified immediately in order that a review may be made and supplemental recommendations provided. If the scope of the proposed construction, including the proposed loads or structural locations, changes from that described in this report, our recommendations should also be reviewed.

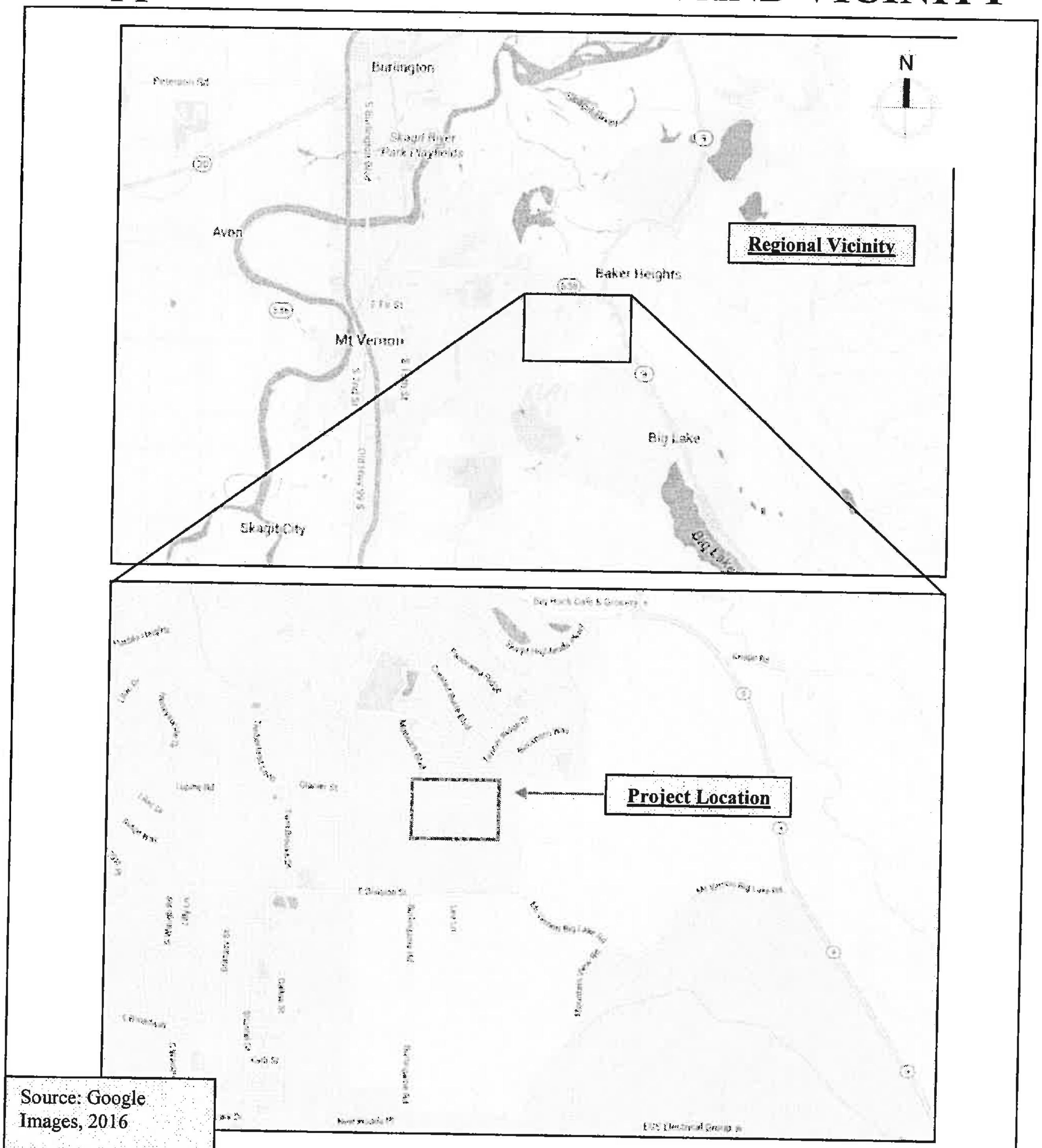
We have prepared this report in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our study. No warranty, express or implied, is made. The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be conducted by MTC during the construction phase in order to evaluate compliance with our recommendations. Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the author of this report, are only mentioned in the given standard; they are not incorporated into it or "included by referenced", as that latter term is used relative to contracts or other matters of law.

This report may be used only by the Mount Vernon School District and their design consultants and only for the purposes stated within a reasonable time from its issuance, but in no event later than 18 months from the date of the report. Note that if another firm assumes Geotechnical Engineer of Record responsibilities they need to review this report and either concur with the findings, conclusions, and recommendations or provide alternate findings, conclusions and recommendation under the guidance of a professional engineer registered in the State of Washington. The recommendations of this report are based on the assumption that the Geotechnical Engineer of Record has reviewed and agrees with the findings, conclusion and recommendations of this report.

Land or facility use, on- and off-site conditions, regulations, or other factors may change over time, and additional work may be required with the passage of time. Based on the intended use of the report, MTC may recommend that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Mount Vernon School District or anyone else will release MTC from any liability resulting from the use of this report by any unauthorized party and the Mount Vernon School District agrees to defend, indemnify, and hold harmless MTC from any claim or liability associated with such unauthorized use or non-compliance. We recommend that MTC be given the opportunity to review the final project plans and specifications to evaluate if our recommendations have been properly interpreted. We assume no responsibility for misinterpretation of our recommendations.

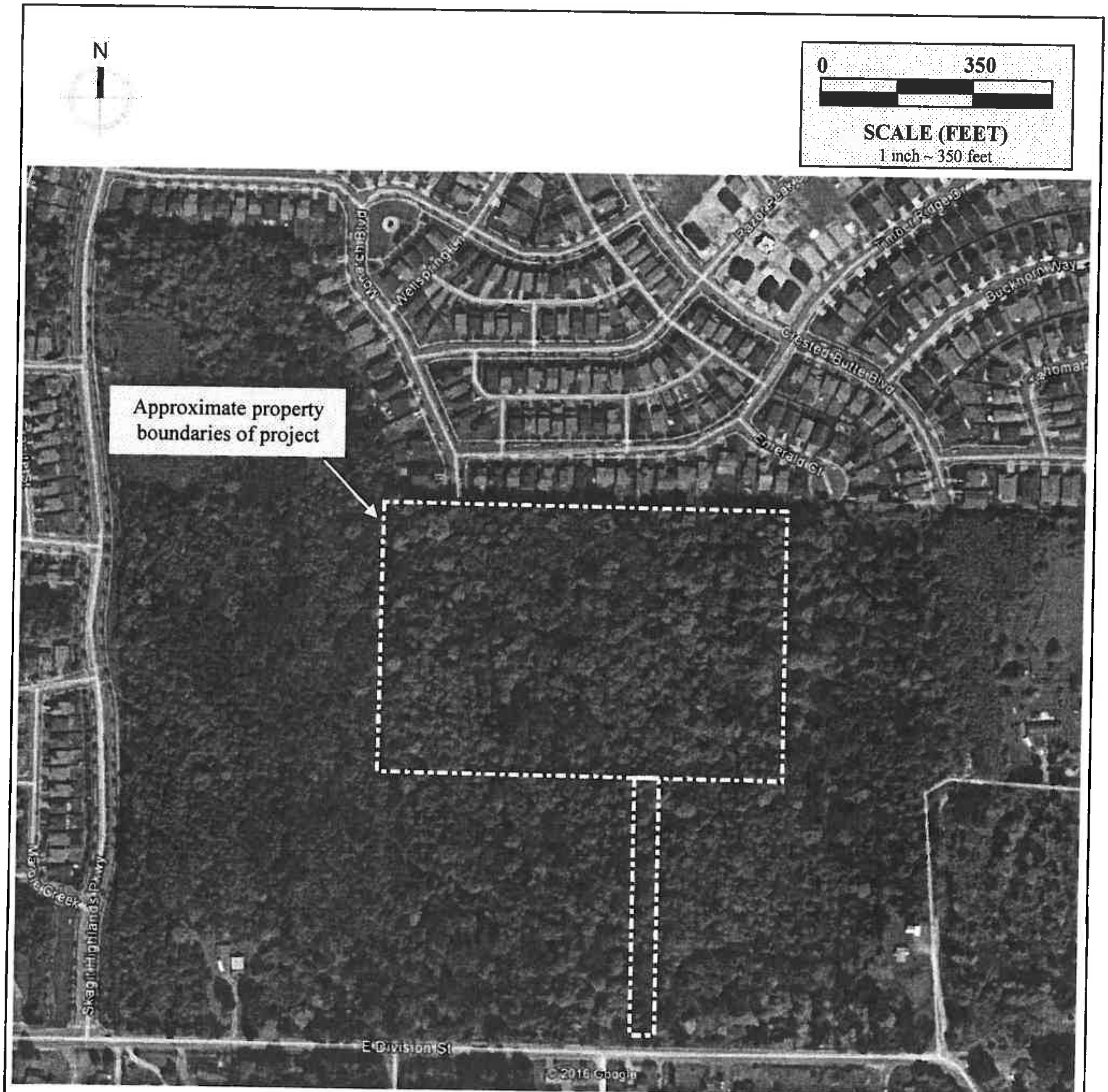
The scope of work for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

Appendix A. SITE LOCATION AND VICINITY



Source: Google Images, 2016

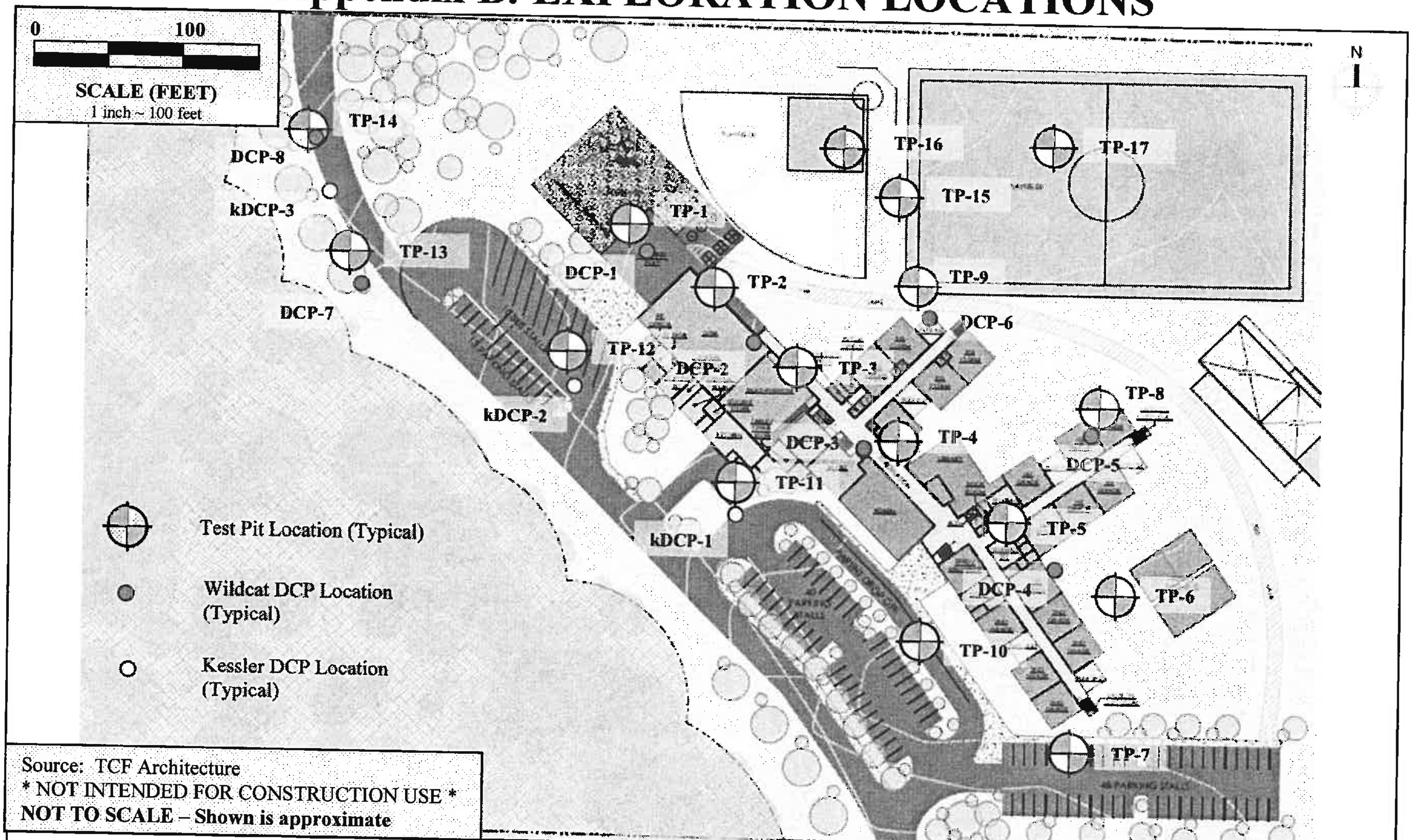
Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98226	Regional & Site Vicinity East Division Elementary Complex 5401 East Division Street Mount Vernon, WA	FIGURE 1



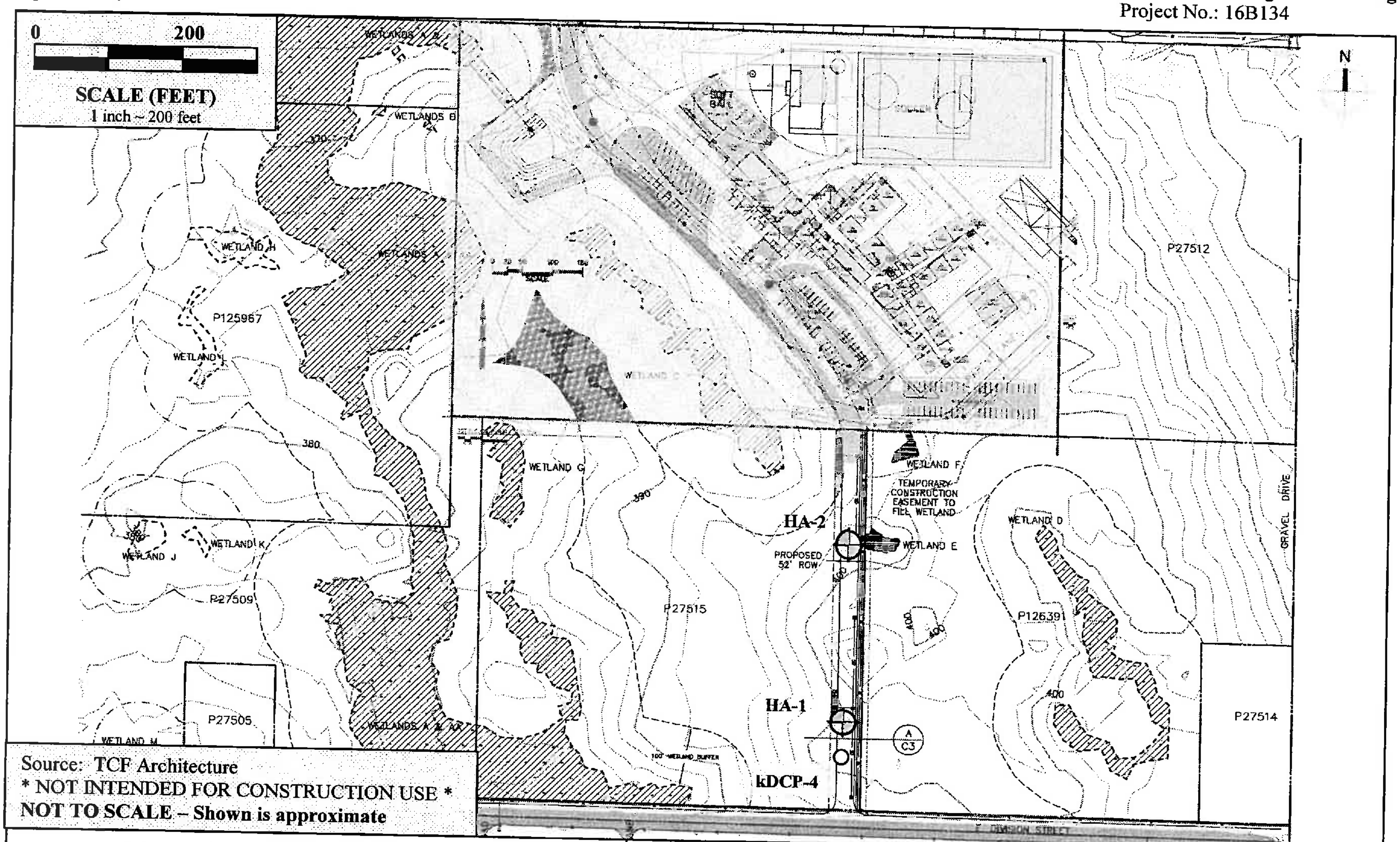
Source: Google Images, 2016

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98226	**Aerial Photo of Existing Conditions** East Division Elementary Complex 5401 East Division Street Mount Vernon, WA	**FIGURE** **2A**

Appendix B. EXPLORATION LOCATIONS



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Conceptual Site Plan with Test Locations** East Division Elementary Complex 5401 East Division Street Mount Vernon, WA	**FIGURE** **2B**



Source: TCF Architecture
* NOT INTENDED FOR CONSTRUCTION USE *
NOT TO SCALE – Shown is approximate

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Street Plan with Test Locations** East Division Elementary Complex 5401 East Division Street Mount Vernon, WA	**FIGURE** **2C**

Appendix C. EXPLORATION LOGS

Grab soil samples were collected from each exploration location by our field geologist during borehole advancement and test pit excavation. Soil samples collected during the field exploration were classified in accordance with ASTM D2487. All samples were placed in plastic bags to limit moisture loss, labeled, and returned to our laboratory for further examination and testing.

Exploration logs from test pits are shown in full in this Appendix. The explorations were monitored by our field geologist who examined and classified the materials encountered in accordance with the Unified Soil Classification System (USCS), obtained representative soil samples, and recorded pertinent information including soil sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence. Upon completion, test pits were backfilled with native soil tailings.

The stratification lines shown on the individual logs represent the approximate boundaries between soil types; actual transitions may be either more gradual or more severe. The conditions depicted are for the date and location indicated only, and it should not necessarily be expected that they are representative of conditions at other locations and times.

Penetrometer results from Wildcat DCP and Kessler DCP testing are also shown below. During wildcat penetrometer advancement, blow counts were recorded in 10 centimeter increments as a thirty-five-pound weight was dropped a distance of 15 inches. Blow counts were then converted to resistance (kg/cm^2), standard penetration blow counts (N-values), and corresponding soil consistency, as displayed on the logs.

Kessler Dynamic Cone Penetrometer (DCP) tests were conducted using KSE K-100 MD model Kessler DCP equipment to provide general soil strength data and CBR correlation for use in pavement design analysis. The KDCP is designed to generate a profile of correlative California Bearing Ratio versus depth and is operated by recording the number of blows required to advance a 0.8-inch diameter round tip probe for each successive 2-inch increment under the force of a free-falling hammer weighing 17.6 pounds and dropping 22.6 inches. The results of each KDCP test are presented in this Appendix. Accompanying blow count results is a graph of corresponding CBR values displayed by depth.

Unified Soil Classification System Chart

Major Divisions			Graph	USCS	Typical Description
Coarse Grained Soils More Than 50% Retained On No. 200 Sieve	**Gravel** More Than 50% of Coarse Fraction Retained On No. 4 Sieve	Clean Gravels		GW	Well-graded Gravels, Gravel-Sand Mixtures
				GP	Poorly-Graded Gravels, Gravel-Sand Mixtures
		Gravels With Fines		GM	Silty Gravels, Gravel-Sand-Silt Mixtures
				GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	Sand More Than 50% of Coarse Fraction Passing No. 4 Sieve	Clean Sands		SW	Well-graded Sands, Gravelly Sands
				SP	Poorly-Graded Sands, Gravelly Sands
		Sands With Fines		SM	Silty Sands, Sand-Silt Mixtures
				SC	Clayey Sands, Clay Mixtures
Fine Grained Soils More Than 50% Passing The No. 200 Sieve	**Silts & Clays**	Liquid Limit Less Than 50		ML	Inorganic Silts, rock Flour, Clayey Silts With Low Plasticity
				CL	Inorganic Clays of Low To Medium Plasticity
				OL	Organic Silts and Organic Silty Clays of Low Plasticity
	Silts & Clays	Liquid Limit Greater Than 50		MH	Inorganic Silts of Moderate Plasticity
				CH	Inorganic Clays of High Plasticity
				OH	Organic Clays And Silts of Medium to High Plasticity
Highly Organic Soils				PT	Peat, Humus, Soils with Predominantly Organic Content

Sampler Symbol Description

- Standard Penetration Test (SPT)
- Shelby Tube
- Grab or Bulk
- California (3.0" O.D.)
- Modified California (2.5" O.D.)

Stratigraphic Contact

- Distinct Stratigraphic Contact Between Soil Strata
- Gradual Change Between Soil Strata
- Approximate location of stratagraphic change

- Groundwater observed at time of exploration
- Measured groundwater level in exploration, well, or piezometer
- Perched water observed at time of exploration

Modifiers

Description	%
Trace	>5
Some	5-12
With	>12

Soil Consistency

Granular Soils		Fine-grained Soils	
Density	*SPT Blowcount*	*Consistency*	*SPT Blowcount*
Very Loose	0-4	Very Soft	0-2
Loose	4-10	Soft	2-4
Medium Dense	10-30	Firm	4-8
Dense	30-50	Stiff	8-15
Very Dense	> 50	Very Stiff	15-30
		Hard	> 30

Grain Size

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than a basketball
Cobbles		3 - 12"	3 - 12"	Fist to basketball
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb to fist
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea to thumb
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock salt to pea
	Medium	#40 - #10	0.017 - 0.079"	Sugar to rock salt
	Fine	#200 - #40	0.0029 - 0.017"	Flour to Sugar
Fines		Passing #200	< 0.0029"	Flour and smaller

Materials Testing & Consulting, Inc.	Exploration Log Key	FIGURE
777 Chrysler Drive Burlington, WA 98233	East Division Elementary Complex 5401 East Division Street Mount Vernon, WA	3

Materials Testing and Consulting 805 Dupont St, Suite 5 Bellingham, WA	Log of Test Pit TP-1
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : Covered Play Area Logged By : KP
MTC Project No. 16B134	

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
1–2	ML		SANDY SILT with GRAVEL, medium stiff to stiff, damp, some organics (roots), strong oxidation. ORANGE Boulder at 2.1', 15" diameter, subround.		X		
3–4	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, trace organics (roots), some mottling, gravel to 3" round. GRAY BROWN		X		
4			T.D. 4.0' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				
5							
6							

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Materials Testing and Consulting 805 Dupont St, Suite 5 Bellingham, WA	Log of Test Pit TP-2
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274 MTC Project No. 16B134	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : Gym Area Logged By : KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0–0.8	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
0.8–2	ML		SANDY SILT with GRAVEL, medium stiff to stiff, damp, strong organics (roots), strong oxidation. ORANGE				
2–4	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, trace organics (roots), some mottling, gravel to 3" round. GRAY BROWN		X (2.0–2.3)		
4					X (3.7–4.0)	29.5	6.9
4–6			T.D. 4.0' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				

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Materials Testing and Consulting 805 Dupont St, Suite 5 Bellingham, WA	Log of Test Pit TP-3
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : Multi-purpose Area Logged By : KP
MTC Project No. 16B134	

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
1	ML		SILT with GRAVEL, some sand, medium stiff, damp, strong organics (roots), strong oxidation. ORANGE		X		
2 3 4	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, trace organics (roots), some mottling, gravel to 3" round. GRAY BROWN		X		
5 6			T.D. 4.2' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				

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Materials Testing and Consulting 805 Dupont St, Suite 5 Bellingham, WA	Log of Test Pit TP-4
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274 MTC Project No. 16B134	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : Library Area Logged By : KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
1	ML		SILT with GRAVEL, some sand, medium stiff, damp, strong organics (roots), strong oxidation. ORANGE				
2–4	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, trace organics (roots), some mottling, gravel to 2" round, trace cobble 8" round. GRAY BROWN		☒ (≈2.8 ft) ☒ (≈4.1 ft)		
5–6			T.D. 4.6' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				

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Materials Testing and Consulting
805 Dupont St, Suite 5
Bellingham, WA

Log of Test Pit TP-5

MVSD East Division Elementary
5401 East Division Street
Mount Vernon, WA 98274

MTC Project No. 16B134

Date Started	: 07/11/16
Date Completed	: 07/12/16
Sampling Method	: Grab Samples
Location	: Life Skills Area
Logged By	: KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
1	ML		SILT with GRAVEL, some sand, medium stiff, damp, strong organics (roots), strong oxidation. ORANGE				
2–4	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, trace organics (roots), some mottling, gravel to 2" round, trace cobble 8" round. GRAY BROWN		X (~3)		
4					X	43.3	3.7
4–6			T.D. 4.0' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				

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Materials Testing and Consulting 805 Dupont St, Suite 5 Bellingham, WA	Log of Test Pit TP-6
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : SE Building Area Logged By : KP
MTC Project No. 16B134	

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
1	ML		SILT with GRAVEL, some sand, medium stiff, damp, strong organics (roots), strong oxidation. ORANGE				
2	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, trace organics (roots), some mottling, gravel to 2-3" round, trace cobble 8" subround. GRAY BROWN		X	34.8	9.8
3–4.5					X	35.5	10.5
4.5–6			T.D. 4.5' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				

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Materials Testing and Consulting 805 Dupont St, Suite 5 Bellingham, WA	Log of Test Pit TP-7
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274 MTC Project No. 16B134	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : SE Parking Area Logged By : KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
1–2	ML		SILT with GRAVEL, some sand, medium stiff, damp, some organics (roots), strong oxidation. ORANGE				
3–4	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, trace organics (roots), some mottling, gravel to 2" round, trace cobble 4" subround. GRAY BROWN		X (≈2.8'), X (≈4.0')		
5–6			T.D. 4.3' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				

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Materials Testing and Consulting
805 Dupont St, Suite 5
Bellingham, WA

Log of Test Pit TP-8

MVSD East Division Elementary
5401 East Division Street
Mount Vernon, WA 98274

MTC Project No. 16B134

Date Started	: 07/11/16
Date Completed	: 07/12/16
Sampling Method	: Grab Samples
Location	: NE Flex 1st Wing
Logged By	: KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
	ML		SILT with GRAVEL, some sand, trace cobbles up to 7" in diamter, medium stiff, damp, some organics (roots), strong oxidation. ORANGE-BROWN				
1 – 4.5	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, strong to moderate mottling throughout, gravel to 2" round. GRAY BROWN		X (approx. 2.5')		
4					X	47.5	3.1
4.5			T.D. 4.5' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				
5							
6							

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Materials Testing and Consulting 805 Dupont St, Suite 5 Bellingham, WA	Log of Test Pit TP-9
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : NE Flex KG Wing Logged By : KP
MTC Project No. 16B134	

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
1	ML		SILT with GRAVEL, some sand, medium stiff, damp, strong organics (roots), strong oxidation. ORANGE-BROWN				
2	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, trace organics, gravel to 3" round. BROWN				
					X	37.7	12.8
3							
			Trace cobbles				
4							
					X	42.4	14.6
5			T.D. 4.7' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				
6							

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Materials Testing & Consulting
Bellingham, WA
Geotechnical Services

Log of Test Pit TP-10

MVSD East Division Elementary
5401 East Division Street
Mount Vernon, WA 98274

MTC Project No. 16B134

Date Started	: 07/11/16
Date Completed	: 07/12/16
Sampling Method	: Grab Samples
Location	: South Central Parking Area
Logged By	: KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
1–4.5	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, strong to moderate mottling throughout, gravel to 2" subround. BROWN 2' boulder observed		X (approx. 2.5') X (approx. 4')		

T.D. 4.5' BPG
Test pit terminated on hard conditions.
No groundwater encountered during excavations.

Materials Testing & Consulting Bellingham, WA Geotechnical Services	Log of Test Pit TP-11
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274 MTC Project No. 16B134	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : NW of Parent Drop Off Zone Logged By : KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
1	ML		SILT with GRAVEL, some sand, medium stiff, damp, strong organics (roots), strong oxidation. ORANGE-BROWN				
2					X		
3	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, strong to moderate mottling throughout, rare cobble to 7" subround, trace organics (roots), gravel to 2-3" subround. GRAY BROWN		X		
4			T.D. 4.1' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				
5							
6							

Materials Testing and Consulting 805 Dupont St, Suite 5 Bellingham, WA	Log of Test Pit TP-12
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274 MTC Project No. 16B134	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : NW Parking Area Logged By : KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
1	ML		SANDY SILT with GRAVEL, medium stiff, damp, moderate organics (roots), strong oxidation, gravel to 1.5" round. ORANGE-BROWN				
2	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, strong mottling throughout. GRAY BROWN		X	47.6	12.8
3							
4					X	42.3	14.2
5			T.D. 4.2' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				
6							

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Materials Testing and Consulting 805 Dupont St, Suite 5 Bellingham, WA	Log of Test Pit TP-13
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274 MTC Project No. 16B134	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : West of NW Parking Area Logged By : KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, trace gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
1	ML		SANDY SILT with GRAVEL, medium stiff, damp, strong organics (roots). ORANGE-BROWN				
2					X	24.8	16.6
3	SM		SILTY SAND with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, some orange mottling, some organics (roots), gravel to 2" round. GRAY BROWN		X		
4			T.D. 3.5' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				
5							
6							

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Materials Testing and Consulting 805 Dupont St, Suite 5 Bellingham, WA	Log of Test Pit TP-14
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274 MTC Project No. 16B134	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : North Entrance Road Logged By : KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, some gravel, soft, dry to damp, strong organics (duff & roots). Dark BROWN				
	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff, damp, strong organics (roots), strong oxidation, gravel to 2" round, some cobbles to 8" round. ORANGE-BROWN				
1					X	40.1	16.3
2					X		
3	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, strong mottling throughout, trace organics (roots). GRAY BROWN				
					X		
4			T.D. 4.0' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				
5							
6							

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Materials Testing & Consulting Bellingham, WA Geotechnical Services	Log of Test Pit TP-15
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274 MTC Project No. 16B134	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : West Soccer Field Boundary Logged By : KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, some gravel, soft, dry to damp, strong organics (duff, roots, and ferns). Dark BROWN				
1, 2	ML		SILT, some gravel and sand, medium stiff, damp, some organics (roots), strong oxidation, gravel to 2" round. ORANGE-BROWN				
3, 4	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, strong to moderate mottling, gravel to 2" round. GRAY BROWN		X, X		
4			T.D. 4.0' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				
5, 6							

Materials Testing & Consulting Bellingham, WA Geotechnical Services	Log of Test Pit TP-16
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274 MTC Project No. 16B134	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : Grab Samples Location : Central Baseball Field Logged By : KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, some gravel, soft, dry to damp, strong organics (duff and roots). Dark BROWN				
1	ML		SILT with GRAVEL, some sand, medium stiff, damp, some organics (roots), strong oxidation, gravel to 2" round. ORANGE-BROWN				
2–4	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, strong to moderate mottling throughout, gravel to 2" round, some cobbles to 6" round, boulder to 18" round. GRAY BROWN		X (approx. 2.4'); X (approx. 3.6')		
4.2			T.D. 4.2' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				
5							
6							

Materials Testing & Consulting
Bellingham, WA
Geotechnical Services

Log of Test Pit TP-17

MVSD East Division Elementary
5401 East Division Street
Mount Vernon, WA 98274

MTC Project No. 16B134

Date Started	: 07/11/16
Date Completed	: 07/12/16
Sampling Method	: Grab Samples
Location	: Central Soccer Field
Logged By	: KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, some gravel, soft, dry to damp, strong organics (duff and roots). Dark BROWN				
1	ML		SANDY SILT to SILT with GRAVEL, medium stiff, damp, some organics (roots), strong oxidation. ORANGE-BROWN				
2–4	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, moderate mottling, trace organics (roots), gravel to 2" round, trace cobbles to 8" round, boulder to 14" subround. GRAY BROWN		X (≈2') / X (≈3.5')		
5–6			T.D. 4.2' BPG Test pit terminated on hard conditions. No groundwater encountered during excavations.				

Materials Testing & Consulting Bellingham, WA Geotechnical Services	Log of Hand Auger HA-1
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : NA Location : 175' N of Division Road Access Logged By : KP
MTC Project No. 16B134	

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0 – 0.8	OL-ML		TOPSOIL: SILT, soft, damp, strong organics (duff & roots) . Dark BROWN				
0.8 – 2	ML		SILT, some gravel and sand, medium stiff to stiff, damp, some organics (roots), strong oxidation, gravel to 2" round. ORANGE-BROWN				
2 – 3.2	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, trace organics (roots), some mottling, gravel to 3" round. GRAY BROWN				

T.D. 3.2' BPG
Hand Auger terminated on hard conditions.
No groundwater encountered during borings.

Materials Testing & Consulting Bellingham, WA Geotechnical Services	Log of Hand Auger HA-2
MVSD East Division Elementary 5401 East Division Street Mount Vernon, WA 98274	Date Started : 07/11/16 Date Completed : 07/12/16 Sampling Method : NA Location : Adjacent wetland E
MTC Project No. 16B134	Logged By : KP

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	OL-ML		TOPSOIL: SILT, soft, damp, strong organics (duff & roots) . Dark BROWN				
1	ML		SILT with GRAVEL, some sand, medium stiff to stiff, damp, some organics (roots), strong oxidation, gravel to 2" round, some cobbles to 4" subround. ORANGE-BROWN				
2	SM-ML		SILTY SAND to SANDY SILT with GRAVEL, medium stiff/dense to hard/very dense with depth, damp, trace organics (roots), some mottling, gravel to 2.5" subround. GRAY BROWN				
3			T.D. 2.7' BPG Hand Auger terminated on hard conditions. No groundwater encountered during borings.				
4							
5							
6							

WILDCAT DYNAMIC CONE LOG

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Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 16B134
DATE STARTED: 07-08-2016
DATE COMPLETED: 07-08-2016

HOLE #: DCP-1
CREW: KP
PROJECT: MVSD East Division Elementary
ADDRESS: 5401 East Division Street, Mount Vernon, WA
LOCATION: At TP-1

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	TESTED CONSISTENCY CLAY
-	2	8.9	••	2	VERY LOOSE	SOFT
-	3	13.3	•••	3	VERY LOOSE	SOFT
- 1 ft	2	8.9	••	2	VERY LOOSE	SOFT
-	3	13.3	•••	3	VERY LOOSE	SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 2 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 3 ft	0	0.0		0	VERY LOOSE	VERY SOFT
- 1 m	25	111.0	••••••••••••••••••••••••••••••••	-	DENSE	HARD
-	21	81.1	•••••••••••••••••••••••	23	MEDIUM DENSE	VERY STIFF
- 4 ft	21	81.1	•••••••••••••••••••••••	23	MEDIUM DENSE	VERY STIFF
-	50	193.0	••	-	VERY DENSE	HARD
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

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Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 16B134
DATE STARTED: 07-08-2016
DATE COMPLETED: 07-08-2016

HOLE #: DCP-2
CREW: KP
PROJECT: MVSD East Division Elementary
ADDRESS: 5401 East Division Street, Mount Vernon, WA
LOCATION: Between TP-1 and TP-2 on 140 degree bearing

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	TESTED CONSISTENCY CLAY
-	3	13.3	•••	3	VERY LOOSE	SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 1 ft	2	8.9	••	2	VERY LOOSE	SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
- 2 ft	15	66.6	•••••••••••••••	19	MEDIUM DENSE	VERY STIFF
-	19	84.4	•••••••••••••••••••	24	MEDIUM DENSE	VERY STIFF
-	25	111.0	•••••••••••••••••••••••••	-	DENSE	HARD
- 3 ft	39	173.2	•••••••••••••••••••••••••••••••••••	-	DENSE	HARD
- 1 m	44	195.4	•••••••••••••••••••••••••••••••••••	-	VERY DENSE	HARD
-	50	193.0	•••••••••••••••••••••••••••••••••••	-	VERY DENSE	HARD
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 16B134
DATE STARTED: 07-08-2016
DATE COMPLETED: 07-08-2016

HOLE #: DCP-3
CREW: KP
PROJECT: MVSD East Division Elementary
ADDRESS: 5401 East Division Street, Mount Vernon, WA
LOCATION: 25' NW of TP-4

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	TESTED CONSISTENCY CLAY
-	4	17.8		5	LOOSE	MEDIUM STIFF
-	6	26.6		7	LOOSE	MEDIUM STIFF
- 1 ft	8	35.5		10	LOOSE	STIFF
-	6	26.6		7	LOOSE	MEDIUM STIFF
-	2	8.9		2	VERY LOOSE	SOFT
- 2 ft	3	13.3		3	VERY LOOSE	SOFT
-	10	44.4		12	MEDIUM DENSE	STIFF
-	13	57.7		16	MEDIUM DENSE	VERY STIFF
- 3 ft	23	102.1		-	MEDIUM DENSE	VERY STIFF
- 1 m	26	115.4		-	DENSE	HARD
-	36	139.0		-	DENSE	HARD
- 4 ft	39	150.5		-	DENSE	HARD
-	45	173.7		-	DENSE	HARD
-	50	193.0		-	VERY DENSE	HARD
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 16B134
DATE STARTED: 07-08-2016
DATE COMPLETED: 07-08-2016

HOLE #: DCP-4
CREW: KP
PROJECT: MVSD East Division Elementary
ADDRESS: 5401 East Division Street, Mount Vernon, WA
LOCATION: Between TP-5 and TP-6

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	TESTED CONSISTENCY CLAY
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 1 ft	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
-	17	75.5	••••••••••••••••••••	21	MEDIUM DENSE	VERY STIFF
- 2 ft	26	115.4	••••••••••••••••••••••••••••••••	-	DENSE	HARD
-	44	195.4	••	-	VERY DENSE	HARD
-	50	222.0	••	-	VERY DENSE	HARD
- 3 ft						
- 1 m						
- 4 ft						
- 5 ft						
- 6 ft						
- 2 m						
- 7 ft						
- 8 ft						
- 9 ft						
- 3 m 10 ft						
- 11 ft						
- 12 ft						
- 4 m 13 ft						

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Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 16B134
DATE STARTED: 07-08-2016
DATE COMPLETED: 07-08-2016

HOLE #: DCP-5
CREW: KP
PROJECT: MVSD East Division Elementary
ADDRESS: 5401 East Division Street, Mount Vernon, WA
LOCATION: At TP-8

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	TESTED CONSISTENCY CLAY
-	2	8.9	••	2	VERY LOOSE	SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
- 1 ft	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
-	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
- 2 ft	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	25	111.0	••••••••••••••••••••••••••••••••	-	DENSE	HARD
- 3 ft	47	208.7	••	-	VERY DENSE	HARD
- 1 m	50	222.0	••	-	VERY DENSE	HARD
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
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-						
- 8 ft						
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-						
- 9 ft						
-						
-						
- 3 m 10 ft						
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-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 16B134
DATE STARTED: 07-08-2016
DATE COMPLETED: 07-08-2016

HOLE #: DCP-6
CREW: KP
PROJECT: MVSD East Division Elementary
ADDRESS: 5401 East Division Street, Mount Vernon, WA
LOCATION: At TP-9

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	TESTED CONSISTENCY CLAY
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
- 1 ft	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
- 2 ft	6	26.6	••••••	7	LOOSE	MEDIUM STIFF
-	9	40.0	•••••••••••	11	MEDIUM DENSE	STIFF
-	26	115.4	••••••••••••••••••••••••••••••••••	-	DENSE	HARD
- 3 ft	50	222.0	•••	-	VERY DENSE	HARD
- 1 m						
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 16B134
DATE STARTED: 07-08-2016
DATE COMPLETED: 07-08-2016

HOLE #: DCP-7
CREW: KP
PROJECT: MVSD East Division Elementary
ADDRESS: 5401 East Division Street, Mount Vernon, WA
LOCATION: At TP-13

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	TESTED CONSISTENCY CLAY
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
- 1 ft	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
- 2 ft	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	11	48.8	••••••••••••••	13	MEDIUM DENSE	STIFF
-	42	186.5	••	-	VERY DENSE	HARD
- 3 ft	50	222.0	••	-	VERY DENSE	HARD
- 1 m						
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

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Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 16B134
DATE STARTED: 07-08-2016
DATE COMPLETED: 07-08-2016

HOLE #: DCP-8
CREW: KP
PROJECT: MVSD East Division Elementary
ADDRESS: 5401 East Division Street, Mount Vernon, WA
LOCATION: At TP-14

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	TESTED CONSISTENCY CLAY
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 ft	2	8.9	••	2	VERY LOOSE	SOFT
-	3	13.3	•••	3	VERY LOOSE	SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 2 ft	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
-	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	3	13.3	•••	3	VERY LOOSE	SOFT
- 3 ft	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
- 1 m	20	88.8	•••••••••••••••••••••••••	25	MEDIUM DENSE	VERY STIFF
-	50	193.0	••	-	VERY DENSE	HARD
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

WILDCAT.XLS

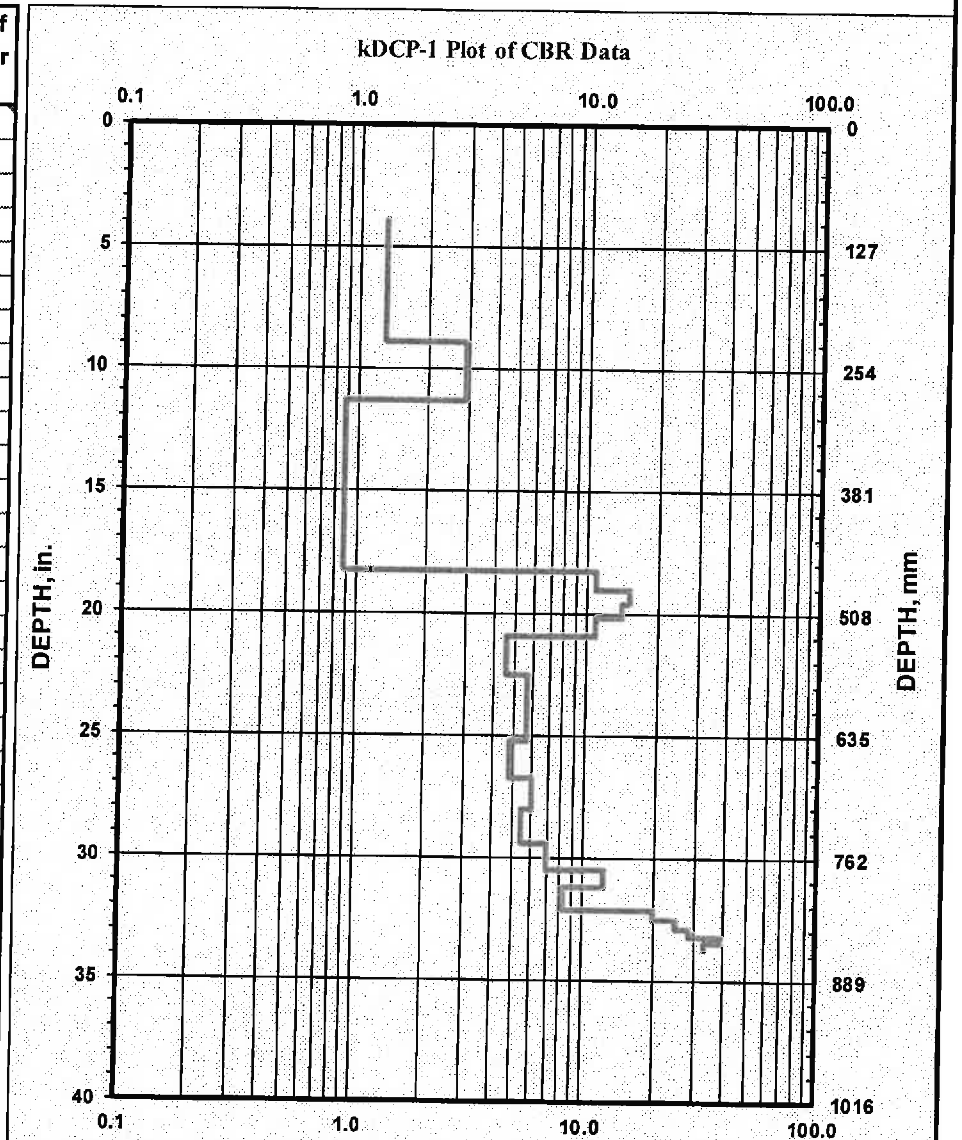
CBR Log of KDCP-1

Project: *MVSD E. Division Elementary Phase 1*
Location: Adjacent to TP-11, 20' South
Date: 12-Jul-16
Soil Type(s): SM-ML

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	100	1
1	226	1
1	287	1
1	465	1
1	484	1
1	498	1
1	513	1
1	532	1
1	573	1
1	607	1
1	641	1
1	680	1
1	712	1
1	747	1
1	775	1
1	792	1
1	816	1
1	827	1
1	836	1
1	844	1
1	850	1
1	857	1



CBR Log of KDCP-2

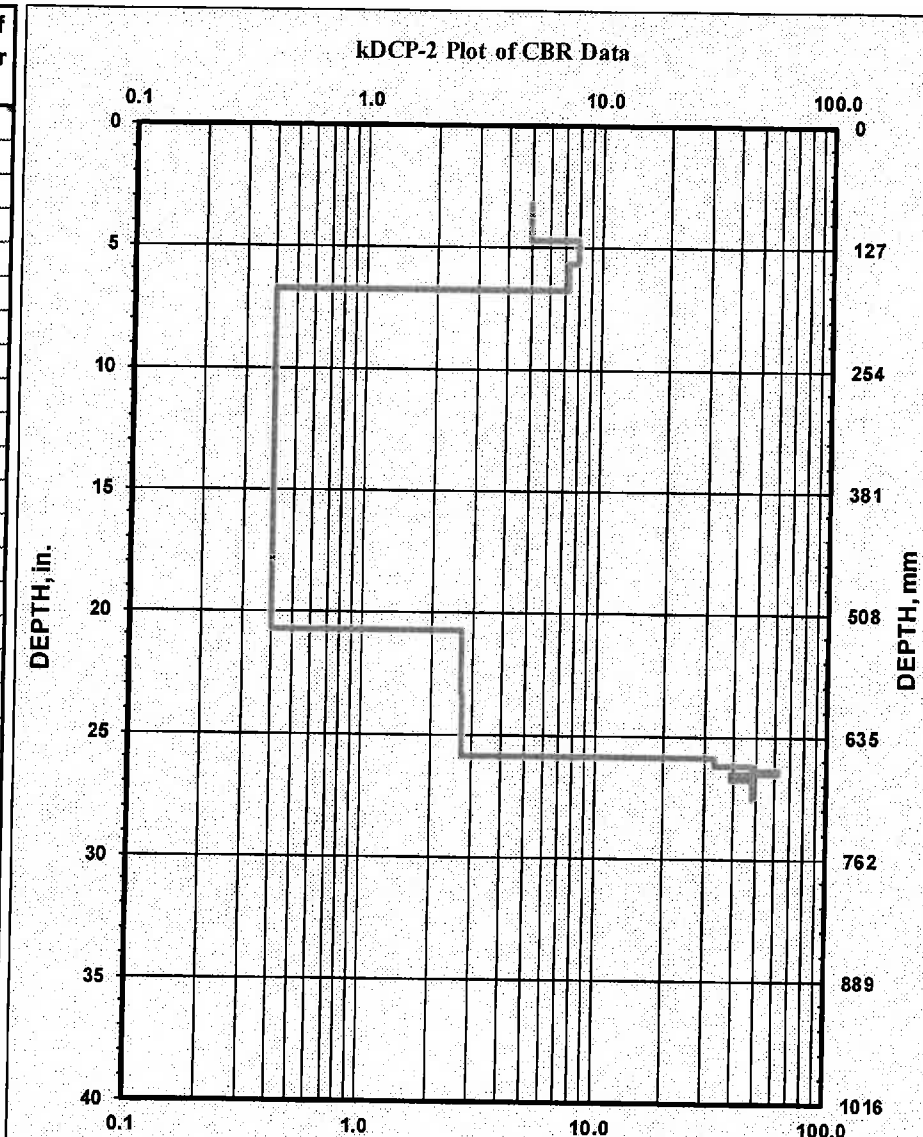
Project: *MVSD E. Division Elementary Phase 1* **Date:** 12-Jul-16

Location: Adjacent to TP-14, 30' South **Soil Type(s):** SM-ML

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	82	1
1	120	1
1	145	1
1	172	1
1	527	1
1	593	1
1	658	1
1	665	1
1	670	1
1	674	1
1	680	1
1	685	1
1	690	1
1	695	1
1	700	1



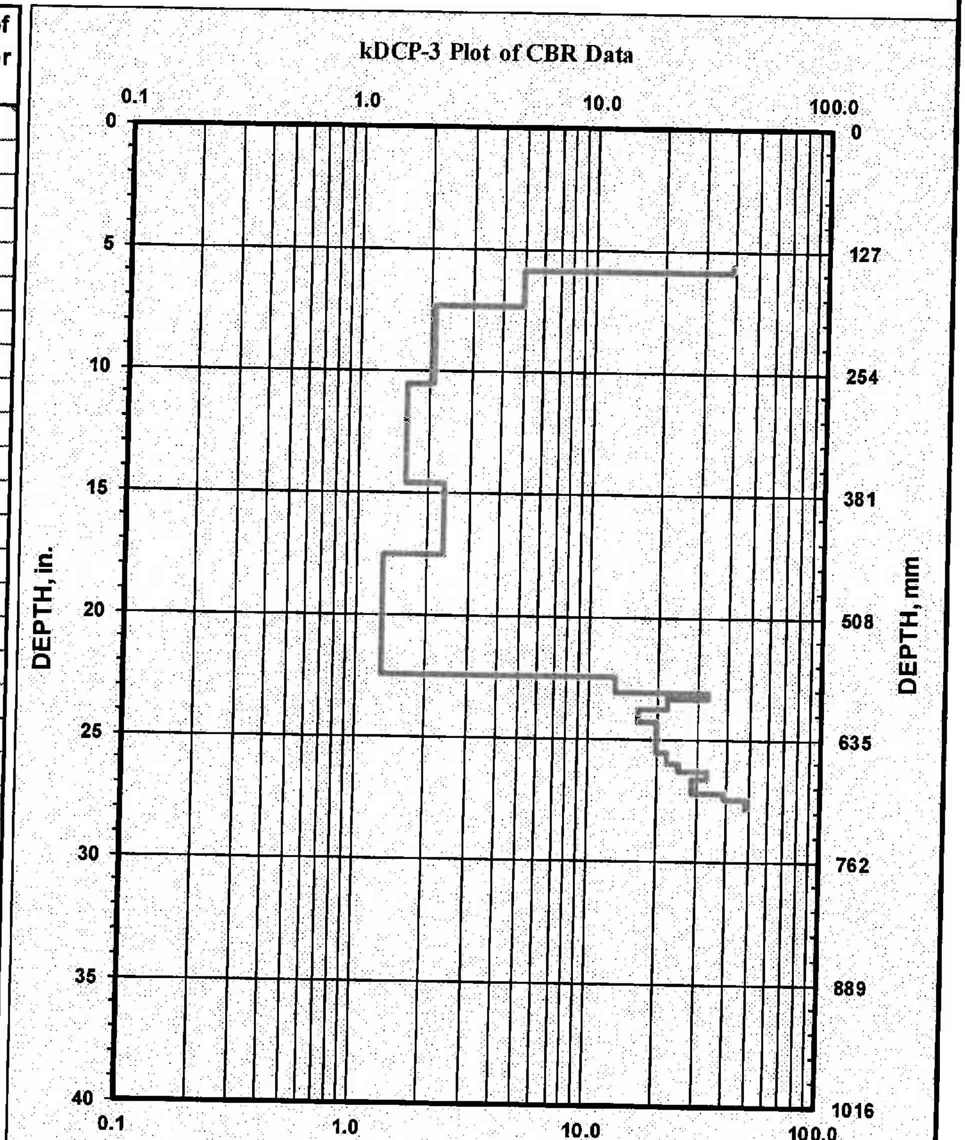
CBR Log of KDCP-3

Project: *MVSD E. Division Elementary Phase 1*
Date: 12-Jul-16
Location: Between TP-13 & TP-14
Soil Type(s): SM-ML

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	143	1
1	149	1
1	187	1
1	269	1
1	372	1
1	446	1
1	571	1
1	587	1
1	594	1
1	604	1
1	617	1
1	628	1
1	639	1
1	650	1
1	660	1
1	669	1
1	676	1
1	684	1
1	692	1
1	698	1
1	703	1
1	708	1



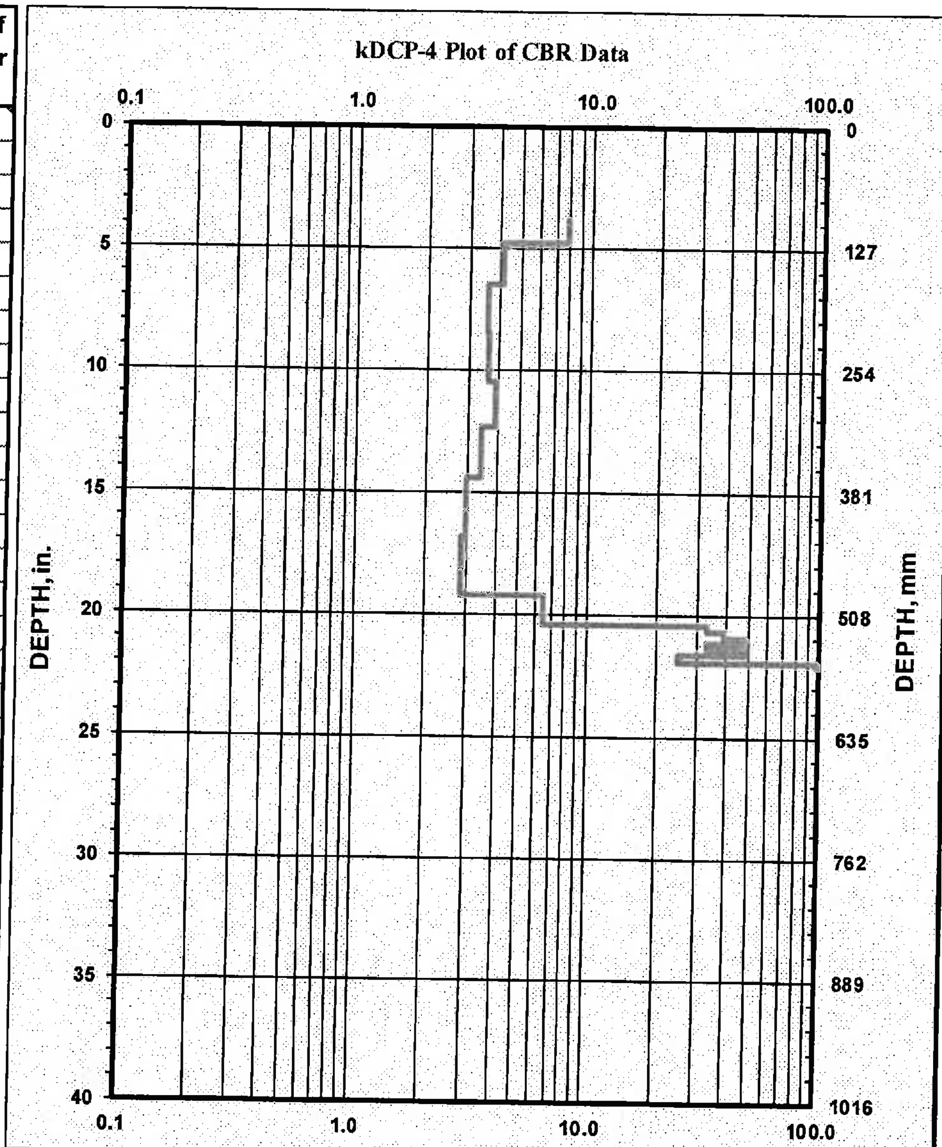
CBR Log of KDCP-4

Project: *MVSD E. Division Elementary Phase 1* **Date:** 12-Jul-16
Location: Adjacent to HA-1, Division St Access **Soil Type(s):** SM-ML

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	97	1
1	122	1
1	166	1
1	217	1
1	267	1
1	314	1
1	367	1
1	427	1
1	489	1
1	519	1
1	526	1
1	532	1
1	537	1
1	544	1
1	549	1
1	558	1
1	559	1
1	560	1
1	561	1
1	562	1



Appendix D. LABORATORY RESULTS

Laboratory tests were conducted on several representative soil samples to better identify the soil classification of the units encountered and to evaluate the material's general physical properties and engineering characteristics. A brief description of the tests performed for this study is provided below. The results of laboratory tests performed on specific samples are provided at the appropriate sample depths on the individual boring logs. However, it is important to note that these test results may not accurately represent in situ soil conditions. All of our recommendations are based on our interpretation of these test results and their use in guiding our engineering judgment. MTC cannot be responsible for the interpretation of these data by others.

Soil samples for this project will be retained for a period of 30 days following completion of this report, unless we are otherwise directed in writing.

SOIL CLASSIFICATION

Soil samples were visually examined in the field by our geologist at the time they were obtained. They were subsequently packaged and returned to our laboratory where they were reexamined and the original description checked and verified or modified. With the help of information obtained from the other classification tests, described below, the samples were described in general accordance with ASTM Standard D2487. The resulting descriptions are provided at the appropriate locations on the individual exploration logs, located in Appendix C, and are qualitative only.

GRAIN-SIZE DISTRIBUTION & PLASTICITY INDEX

Grain-size distribution analyses were conducted in general accordance with ASTM Standard D422 on representative soil samples to determine the grain-size distribution of the on-site soil. In addition, soil liquid and plastic limits and plasticity index were determined with ASTM Standard D4318 on representative fine-grained samples. The information gained from these analyses allows us to provide a description and classification of the in-place materials. In turn, this information helps us to understand engineering properties of the soil and thus how the in-place materials will react to conditions such as heavy seepage, traffic action, loading, potential liquefaction, and so forth. The results are presented in this Appendix.

NATURAL MOISTURE CONTENT

Moisture content tests were performed in general accordance with ASTM Standard D2216 on representative soil samples to approximately ascertain the in-place moisture content of soil samples at the times they were collected. The information obtained assists us by providing qualitative information regarding soil compactability. The results are presented in this Appendix.

Sieve Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-2 @ 4.0'
Sample#: B16-0739

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 14-Jul-16
Tested By: C. Meredith

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel
Sample Color:
brown

ACCREDITED

ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

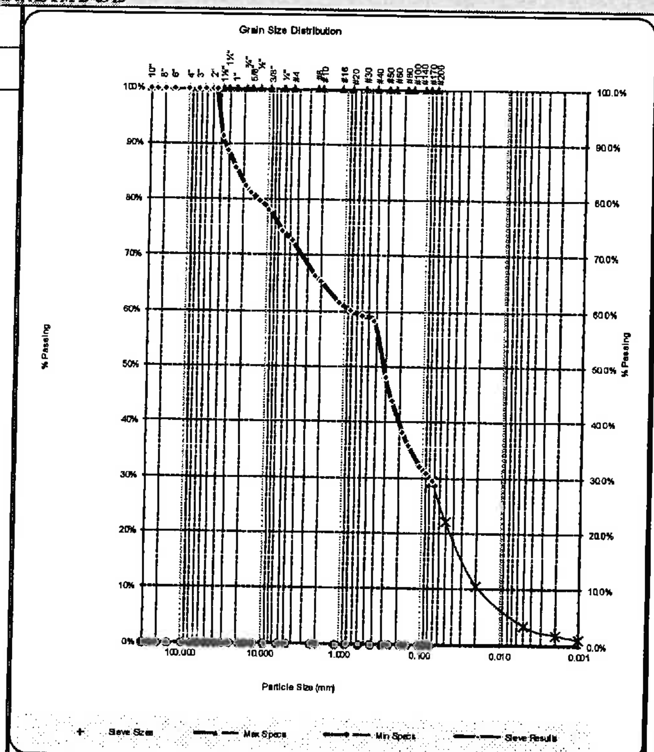
$D_{(5)}$ = 0.013 mm
$D_{(10)}$ = 0.025 mm
$D_{(15)}$ = 0.038 mm
$D_{(30)}$ = 0.081 mm
$D_{(50)}$ = 0.324 mm
$D_{(60)}$ = 0.801 mm
$D_{(90)}$ = 34.479 mm
Dust Ratio = 40/79

% Gravel = 27.4%
% Sand = 43.1%
% Silt & Clay = 29.5%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, C_C = 0.32
Coeff. of Uniformity, C_U = 31.55
Fineness Modulus = 2.96
Plastic Limit = n/a
Moisture %, as sampled = 6.9%
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50	91%	91%	100.0%	0.0%
1.25"	31.50		89%	100.0%	0.0%
1.00"	25.00	86%	86%	100.0%	0.0%
3/4"	19.00	82%	82%	100.0%	0.0%
5/8"	16.00		81%	100.0%	0.0%
1/2"	12.50	80%	80%	100.0%	0.0%
3/8"	9.50	78%	78%	100.0%	0.0%
1/4"	6.30		74%	100.0%	0.0%
#4	4.75	73%	73%	100.0%	0.0%
#8	2.36		66%	100.0%	0.0%
#10	2.00	65%	65%	100.0%	0.0%
#16	1.18		62%	100.0%	0.0%
#20	0.850		60%	100.0%	0.0%
#30	0.600		59%	100.0%	0.0%
#40	0.425	58%	58%	100.0%	0.0%
#50	0.300		48%	100.0%	0.0%
#60	0.250		44%	100.0%	0.0%
#80	0.180		38%	100.0%	0.0%
#100	0.150		36%	100.0%	0.0%
#140	0.106		32%	100.0%	0.0%
#170	0.090		31%	100.0%	0.0%
#200	0.075	30%	30%	100.0%	0.0%



Comments: ______

Reviewed by: ______

Materials Testing & Consulting, Inc.
777 Chrysler Drive
Burlington, WA 98233

Lab Sample: TP-2 @ 4.0'
Mount Vernon School District
East Division Elementary
Mount Vernon, WA

FIGURE
4

Hydrometer Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-2 @ 4.0'
Sample#: B16-0739

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 14-Jul-16
Tested By: C. Meredith

ASTM D 2487 Soils Classification
SM, Silty Sand with Gravel
Sample Color
brown

ASTM D-422, HYDROMETER ANALYSIS

Assumed Sp Gr: 2.70
Sample Weight: 50.38 grams
Hydroscopic Moist.: 6.93%
Adj. Sample Wgt: 47.11 grams

ACCREDITED
Certificate # 1366.01, 1366.02

Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter
2	13	17.8%	0.0358 mm
5	9	12.4%	0.0231 mm
15	5	6.9%	0.0137 mm
30	4	5.5%	0.0097 mm
60	3	4.1%	0.0069 mm
250	2	2.7%	0.0034 mm
1440	1	1.4%	0.0014 mm

% Gravel: 27.4%
% Sand: 43.1%
% Silt: 26.2%
% Clay: 3.4%

Liquid Limit: n/a
Plastic Limit: n/a
Plasticity Index: n/a

ASTM C-136

Sieve Analysis
Grain Size Distribution

Sieve Size	Percent Passing	Soils Particle Diameter
3.0"	100%	75.000 mm
2.0"	100%	50.000 mm
1.5"	100%	37.500 mm
1.25"	91%	31.500 mm
1.0"	89%	25.000 mm
3/4"	82%	19.000 mm
5/8"	81%	16.000 mm
1/2"	80%	12.500 mm
3/8"	78%	9.500 mm
1/4"	74%	6.300 mm
#4	73%	4.750 mm
#10	65%	2.000 mm
#20	60%	0.850 mm
#40	58%	0.425 mm
#100	36%	0.150 mm
#200	29.5%	0.075 mm
Silts	29.2%	0.074 mm
	22.1%	0.050 mm
	10.5%	0.020 mm
Clays	3.4%	0.005 mm
	1.8%	0.002 mm
Colloids	1.0%	0.001 mm

USDA Soil Textural Classification

	Particle Size
% Sand:	2.0 - 0.05 mm
% Silt:	0.05 - 0.002 mm
% Clay:	< 0.002 mm

USDA Soil Textural Classification
Sandy Loam

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	Lab Sample: TP-2 @ 4.0' Mount Vernon School District East Division Elementary Mount Vernon, WA	FIGURE 5

ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils

Project: East Division St Elementary **Project #:** 16B134 **Client:** Mt. Vernon School District **Source:** TP-3 @ 3.5' **Sample #:** B16-0740	**Date Received:** 12-Jul-16 **Sampled By:** K. Parker **Date Tested:** 14-Jul-16 **Tested By:** M. Carrillo	**Unified Soils Classification System, ASTM D-2487** No Data Provided **Sample Color** brown

Liquid Limit Determination

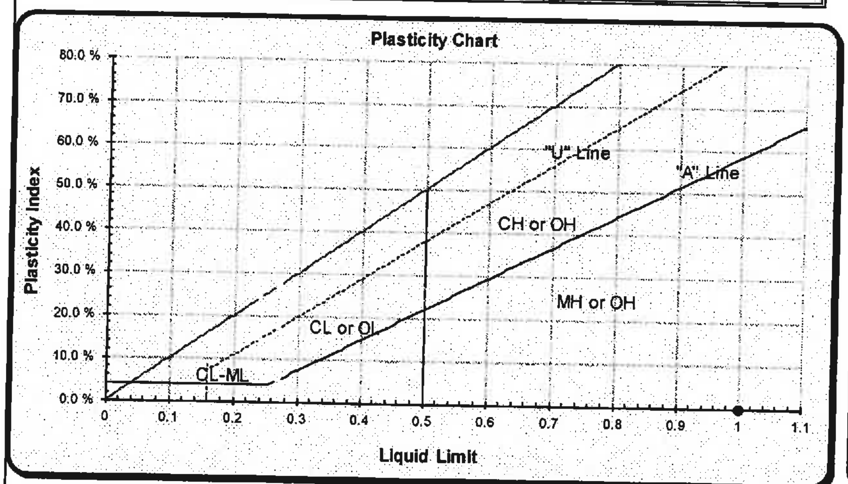
	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:						
Weight of Dry Soils + Pan:						
Weight of Pan:						
Weight of Dry Soils:						
Weight of Moisture:						
% Moisture:						
Number of Blows:						

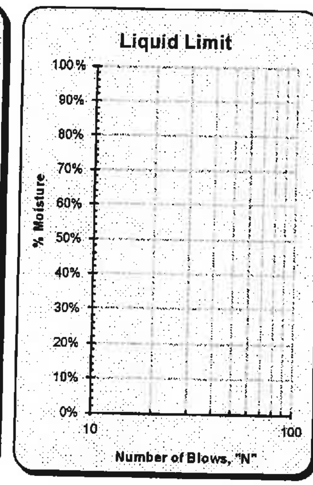
Liquid Limit @ 25 Blows:	N/A
Plastic Limit:	N/A
Plasticity Index, I_P:	N/A

Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:						
Weight of Dry Soils + Pan:						
Weight of Pan:						
Weight of Dry Soils:						
Weight of Moisture:						
% Moisture:						

ACCREDITED
Certificate #: 1366.01, 1366.02





Comments: Sample B16-0740 is nonplastic as it does not roll down to 1/8"

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-3 @ 3.5'** Mount Vernon School District East Division Elementary Mount Vernon, WA	**FIGURE** **6**

Sieve Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-5 @ 4.0'
Sample#: B16-0741

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 14-Jul-16
Tested By: C. Meredith

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
brown

ACCREDITED

ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

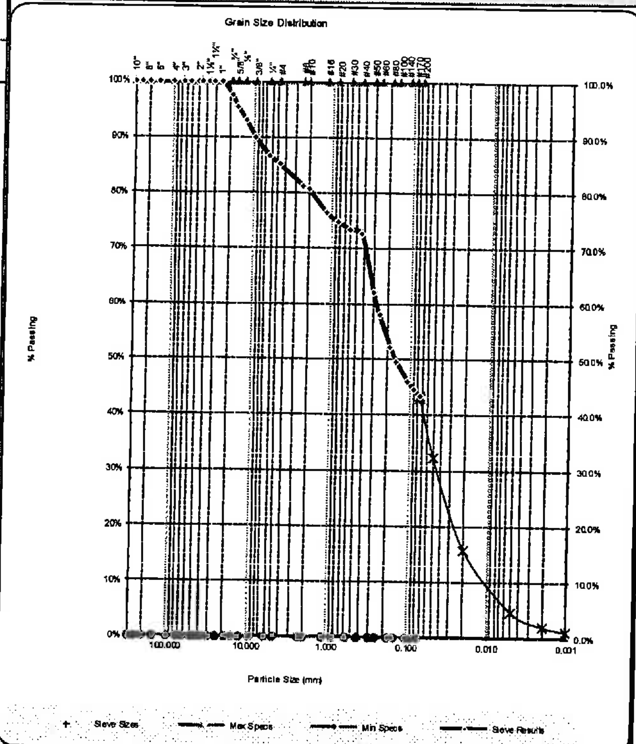
$D_{(5)}$ = 0.009 mm
$D_{(10)}$ = 0.017 mm
$D_{(15)}$ = 0.026 mm
$D_{(30)}$ = 0.052 mm
$D_{(50)}$ = 0.155 mm
$D_{(60)}$ = 0.274 mm
$D_{(90)}$ = 9.546 mm
Dust Ratio = 40/67

% Gravel = 14.9%
% Sand = 41.8%
% Silt & Clay = 43.3%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, C_C = 0.57
Coeff. of Uniformity, C_U = 15.85
Fineness Modulus = 1.84
Plastic Limit = n/a
Moisture %, as sampled = 3.7%
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
3/4"	19.00	97%	97%	100.0%	0.0%
5/8"	16.00		95%	100.0%	0.0%
1/2"	12.50	93%	93%	100.0%	0.0%
3/8"	9.50		90%	100.0%	0.0%
1/4"	6.30		87%	100.0%	0.0%
#4	4.75	85%	85%	100.0%	0.0%
#8	2.36		81%	100.0%	0.0%
#10	2.00	81%	81%	100.0%	0.0%
#16	1.18		76%	100.0%	0.0%
#20	0.850		75%	100.0%	0.0%
#30	0.600		73%	100.0%	0.0%
#40	0.425	73%	73%	100.0%	0.0%
#50	0.300		62%	100.0%	0.0%
#60	0.250		58%	100.0%	0.0%
#80	0.180		52%	100.0%	0.0%
#100	0.150		50%	100.0%	0.0%
#140	0.106		46%	100.0%	0.0%
#170	0.090		45%	100.0%	0.0%
#200	0.075	43%	43%	100.0%	0.0%



Comments:

Reviewed by:

Materials Testing & Consulting, Inc.
777 Chrysler Drive
Burlington, WA 98233

Lab Sample: TP-5 @ 4.0'
Mount Vernon School District
East Division Elementary
Mount Vernon, WA

FIGURE
7

Hydrometer Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-5 @ 4.0'
Sample#: B16-0741

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 14-Jul-16
Tested By: C. Meredith

ASTM D 2487 Soils Classification
SM, Silty Sand
Sample Color
brown

ASTM D-422, HYDROMETER ANALYSIS

Assumed Sp Gr: 2.70
Sample Weight: 51.25 grams
Hydroscopic Moist.: 3.72%
Adj. Sample Wgt: 49.41 grams

Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter
2	15	25.8%	0.0352 mm
5	11	17.8%	0.0229 mm
15	7	11.3%	0.0135 mm
30	6	9.7%	0.0096 mm
60	4	6.5%	0.0069 mm
250	2	3.2%	0.0034 mm
1440	1	1.6%	0.0014 mm

% Gravel: 14.9%
% Sand: 41.9%
% Silt: 38.5%
% Clay: 4.7%

Liquid Limit: n/a
Plastic Limit: n/a
Plasticity Index: n/a

ASTM C-136

Sieve Analysis
Grain Size Distribution

Sieve Size	Percent Passing	Soils Particle Diameter
3.0"	100%	75.000 mm
2.0"	100%	50.000 mm
1.5"	100%	37.500 mm
1.25"	100%	31.500 mm
1.0"	100%	25.000 mm
3/4"	97%	19.000 mm
5/8"	95%	15.000 mm
1/2"	93%	12.500 mm
3/8"	90%	9.500 mm
1/4"	87%	6.300 mm
#4	85%	4.750 mm
#10	81%	2.000 mm
#20	75%	0.850 mm
#40	73%	0.425 mm
#100	50%	0.150 mm
#200	43.3%	0.075 mm
Silts	42.5%	0.074 mm
	32.4%	0.050 mm
	15.5%	0.020 mm
Clays	4.7%	0.005 mm
	2.1%	0.002 mm
Colloids	1.1%	0.001 mm

USDA Soil Textural Classification

		Particle Size
% Sand:	[illegible]	2.0 - 0.05 mm
% Silt:	[illegible]	0.05 - 0.002 mm
% Clay:	[illegible]	< 0.002 mm

USDA Soil Textural Classification
Sandy Loam

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	Lab Sample: TP-5 @ 4.0' Mount Vernon School District East Division Elementary Mount Vernon, WA	FIGURE 8

Sieve Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-6 @ 2.5'
Sample#: B16-0742

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 14-Jul-16
Tested By: C. Meredith

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
brown

ACCREDITED

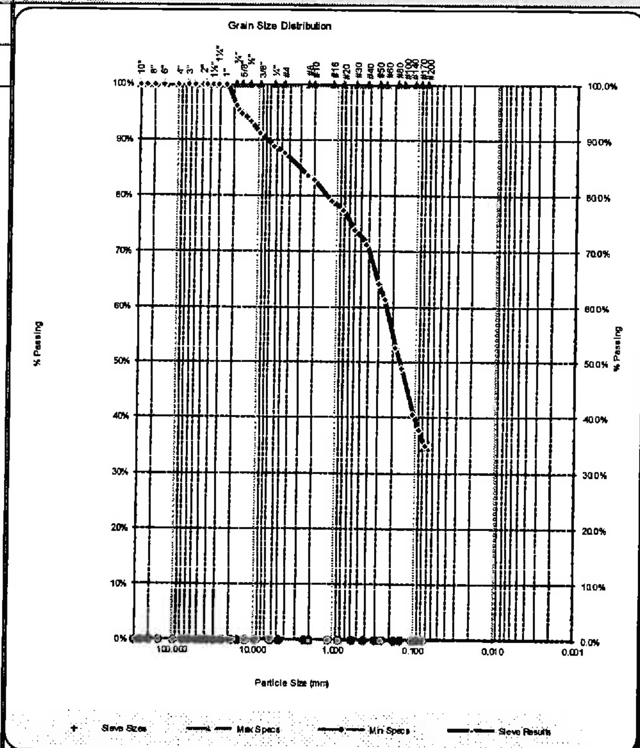
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ = 0.011 mm	% Gravel = 12.4%	Coeff. of Curvature, C_C = 0.81
$D_{(10)}$ = 0.022 mm	% Sand = 52.9%	Coeff. of Uniformity, C_U = 11.11
$D_{(15)}$ = 0.032 mm	% Silt & Clay = 34.8%	Fineness Modulus = 1.76
$D_{(30)}$ = 0.065 mm	Liquid Limit = n/a	Plastic Limit = n/a
$D_{(50)}$ = 0.160 mm	Plasticity Index = n/a	Moisture %, as sampled = 9.8%
$D_{(60)}$ = 0.240 mm	Sand Equivalent = n/a	Req'd Sand Equivalent =
$D_{(90)}$ = 7.971 mm	Fracture %, 1 Face = n/a	Req'd Fracture %, 1 Face =
Dust Ratio = 41/84	Fracture %, 2+ Faces = n/a	Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
3/4"	19.00	96%	96%	100.0%	0.0%
5/8"	16.00		95%	100.0%	0.0%
1/2"	12.50	93%	93%	100.0%	0.0%
3/8"	9.50		91%	100.0%	0.0%
1/4"	6.30		89%	100.0%	0.0%
#4	4.75	88%	88%	100.0%	0.0%
#8	2.36		83%	100.0%	0.0%
#10	2.00	83%	83%	100.0%	0.0%
#16	1.18		79%	100.0%	0.0%
#20	0.850	77%	77%	100.0%	0.0%
#30	0.600		74%	100.0%	0.0%
#40	0.425	71%	71%	100.0%	0.0%
#50	0.300		64%	100.0%	0.0%
#60	0.250	61%	61%	100.0%	0.0%
#80	0.180		53%	100.0%	0.0%
#100	0.150	49%	49%	100.0%	0.0%
#140	0.106		41%	100.0%	0.0%
#170	0.090		38%	100.0%	0.0%
#200	0.075	35%	35%	100.0%	0.0%



Comments:

Reviewed by: [signature]

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-6 @ 2.5'** Mount Vernon School District East Division Elementary Mount Vernon, WA	**FIGURE** **9**

Sieve Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-6 @ 4.3'
Sample#: B16-0743

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 14-Jul-16
Tested By: C. Meredith

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel
Sample Color:
brown

ACCREDITED

ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

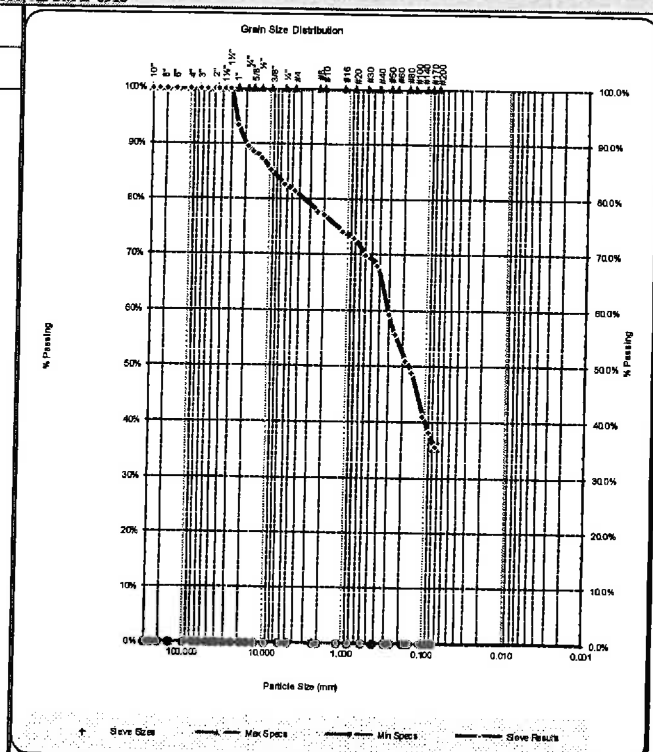
$D_{(5)}$ = 0.011 mm
$D_{(10)}$ = 0.021 mm
$D_{(15)}$ = 0.032 mm
$D_{(30)}$ = 0.063 mm
$D_{(50)}$ = 0.167 mm
$D_{(60)}$ = 0.311 mm
$D_{(90)}$ = 19.918 mm
Dust Ratio = 23/44

% Gravel = 18.5%
% Sand = 46.0%
% Silt & Clay = 35.5%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, C_C = 0.61
Coeff. of Uniformity, C_U = 14.74
Fineness Modulus = 2.14
Plastic Limit = n/a
Moisture %, as sampled = 10.5%
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	93%	93%	100.0%	0.0%
3/4"	19.00	89%	89%	100.0%	0.0%
5/8"	16.00		88%	100.0%	0.0%
1/2"	12.50	87%	87%	100.0%	0.0%
3/8"	9.50		85%	100.0%	0.0%
1/4"	6.30		83%	100.0%	0.0%
#4	4.75	81%	81%	100.0%	0.0%
#8	2.36		78%	100.0%	0.0%
#10	2.00	77%	77%	100.0%	0.0%
#16	1.18		74%	100.0%	0.0%
#20	0.850	73%	73%	100.0%	0.0%
#30	0.600		70%	100.0%	0.0%
#40	0.425	68%	68%	100.0%	0.0%
#50	0.300		59%	100.0%	0.0%
#60	0.250		56%	100.0%	0.0%
#80	0.180		51%	100.0%	0.0%
#100	0.150	49%	49%	100.0%	0.0%
#140	0.106		41%	100.0%	0.0%
#170	0.090		38%	100.0%	0.0%
#200	0.075	35%	35%	100.0%	0.0%



Comments:

Reviewed by:

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-6 @ 4.3'** Mount Vernon School District East Division Elementary Mount Vernon, WA	**FIGURE** **10**

Sieve Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-8 @ 4.0'
Sample#: B16-0744

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 14-Jul-16
Tested By: C. Meredith

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
brown

ACCREDITED

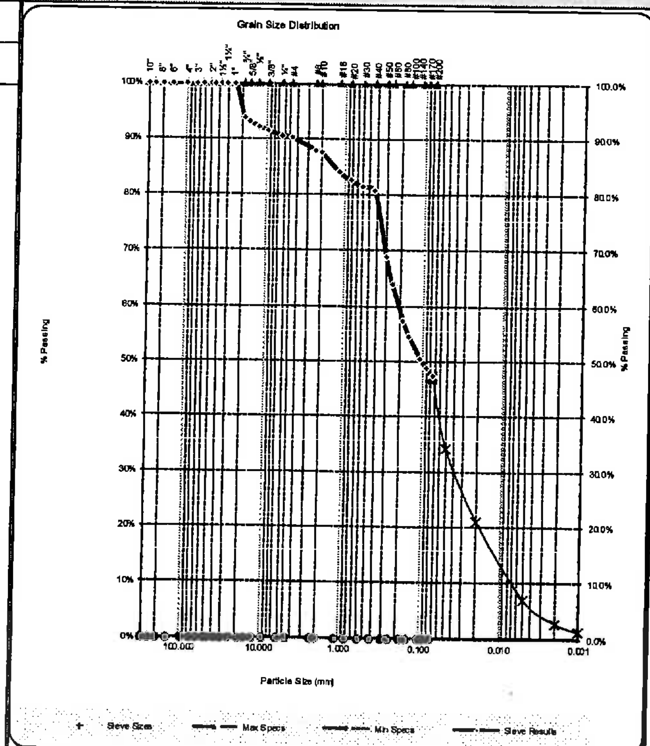
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ = 0.008 mm	% Gravel = 9.9%	Coeff. of Curvature, C_C = 0.69
$D_{(10)}$ = 0.016 mm	% Sand = 42.7%	Coeff. of Uniformity, C_U = 13.11
$D_{(15)}$ = 0.024 mm	% Silt & Clay = 47.5%	Fineness Modulus = 1.48
$D_{(30)}$ = 0.047 mm	Liquid Limit = n/a	Plastic Limit = n/a
$D_{(50)}$ = 0.102 mm	Plasticity Index = n/a	Moisture %, as sampled = 3.1%
$D_{(60)}$ = 0.207 mm	Sand Equivalent = n/a	Req'd Sand Equivalent =
$D_{(90)}$ = 4.597 mm	Fracture %, 1 Face = n/a	Req'd Fracture %, 1 Face =
Dust Ratio = 10/17	Fracture %, 2+ Faces = n/a	Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
3/4"	19.00	94%	94%	100.0%	0.0%
5/8"	16.00		93%	100.0%	0.0%
1/2"	12.50	92%	92%	100.0%	0.0%
3/8"	9.50		91%	100.0%	0.0%
1/4"	6.30		91%	100.0%	0.0%
#4	4.75	90%	90%	100.0%	0.0%
#8	2.36		88%	100.0%	0.0%
#10	2.00	88%	88%	100.0%	0.0%
#16	1.18		84%	100.0%	0.0%
#20	0.850		83%	100.0%	0.0%
#30	0.600		81%	100.0%	0.0%
#40	0.425	81%	81%	100.0%	0.0%
#50	0.300		69%	100.0%	0.0%
#60	0.250		64%	100.0%	0.0%
#80	0.180		57%	100.0%	0.0%
#100	0.150		55%	100.0%	0.0%
#140	0.106		50%	100.0%	0.0%
#170	0.090		49%	100.0%	0.0%
#200	0.075	47%	47%	100.0%	0.0%



Comments:

Reviewed by:

Materials Testing & Consulting, Inc.
777 Chrysler Drive
Burlington, WA 98233

Lab Sample: TP-8 @ 4.0'
Mount Vernon School District
East Division Elementary
Mount Vernon, WA

FIGURE
11

Hydrometer Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-8 @ 4.0'
Sample#: B16-0744

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 14-Jul-16
Tested By: C. Meredith

ASTM D 2487 Soils Classification
SM, Silty Sand
Sample Color
brown

ASTM D-422, HYDROMETER ANALYSIS

Assumed Sp Gr : 2.70
Sample Weight: 50.64 grams
Hydroscopic Moist.: 3.13%
Adj. Sample Wgt : 49.10 grams

ACCREDITED
Certificate #: 1366.01, 1366.02

Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter
2	15	26.5%	0.0353 mm
5	13	23.0%	0.0226 mm
15	9	15.9%	0.0134 mm
30	7	12.4%	0.0096 mm
60	5	8.8%	0.0068 mm
250	3	5.3%	0.0034 mm
1440	1	1.8%	0.0014 mm

% Gravel: 9.9%
% Sand: 42.7%
% Silt: 40.5%
% Clay: 7.0%

Liquid Limit: n/a
Plastic Limit: n/a
Plasticity Index: n/a

ASTM C-136

Sieve Analysis
Grain Size Distribution

Sieve Size	Percent Passing	Soils Particle Diameter
3.0"	100%	75.000 mm
2.0"	100%	50.000 mm
1.5"	100%	37.500 mm
1.25"	100%	31.500 mm
1.0"	100%	25.000 mm
3/4"	94%	19.000 mm
5/8"	93%	16.000 mm
1/2"	92%	12.500 mm
3/8"	91%	9.500 mm
1/4"	91%	6.300 mm
#4	90%	4.750 mm
#10	88%	2.000 mm
#20	83%	0.850 mm
#40	81%	0.425 mm
#100	55%	0.150 mm
#200	47.5%	0.075 mm
Silts	46.9%	0.074 mm
	34.2%	0.050 mm
	20.9%	0.020 mm
Clays	7.0%	0.005 mm
	2.8%	0.002 mm
Colloids	1.2%	0.001 mm

USDA Soil Textural Classification

	Particle Size
% Sand:	2.0 - 0.05 mm
% Silt:	0.05 - 0.002 mm
% Clay:	< 0.002 mm

USDA Soil Textural Classification
Sandy Loam

Materials Testing & Consulting, Inc.
777 Chrysler Drive
Burlington, WA 98233

Lab Sample: TP-8 @ 4.0'
Mount Vernon School District
East Division Elementary
Mount Vernon, WA

FIGURE
12

Sieve Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-9 @ 2.5'
Sample#: B16-0745

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 14-Jul-16
Tested By: C. Meredith

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
brown

ACCREDITED

ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

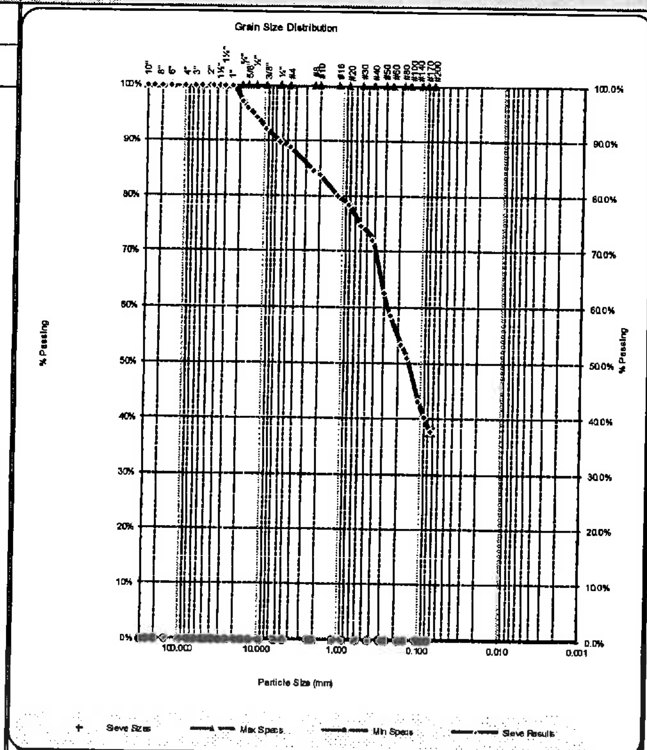
$D_{(5)}$ = 0.010 mm
$D_{(10)}$ = 0.020 mm
$D_{(15)}$ = 0.030 mm
$D_{(30)}$ = 0.060 mm
$D_{(50)}$ = 0.145 mm
$D_{(60)}$ = 0.268 mm
$D_{(90)}$ = 6.579 mm
Dust Ratio = 23/44

% Gravel = 11.3%
% Sand = 51.0%
% Silt & Clay = 37.7%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, C_C = 0.67
Coeff. of Uniformity, C_U = 13.47
Fineness Modulus = 1.70
Plastic Limit = n/a
Moisture %, as sampled = 12.8%
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
3/4"	19.00	97%	97%	100.0%	0.0%
5/8"	16.00		96%	100.0%	0.0%
1/2"	12.50	94%	94%	100.0%	0.0%
3/8"	9.50		92%	100.0%	0.0%
1/4"	6.30		90%	100.0%	0.0%
#4	4.75	89%	89%	100.0%	0.0%
#8	2.36		84%	100.0%	0.0%
#10	2.00	84%	84%	100.0%	0.0%
#16	1.18		80%	100.0%	0.0%
#20	0.850	78%	78%	100.0%	0.0%
#30	0.600		75%	100.0%	0.0%
#40	0.425	72%	72%	100.0%	0.0%
#50	0.300		62%	100.0%	0.0%
#60	0.250		59%	100.0%	0.0%
#80	0.180		53%	100.0%	0.0%
#100	0.150	51%	51%	100.0%	0.0%
#140	0.106		43%	100.0%	0.0%
#170	0.090		40%	100.0%	0.0%
#200	0.075	38%	38%	100.0%	0.0%



All results apply only to actual locations and materials tested. As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

Comments:

Reviewed by:

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-9 @ 2.5'** Mount Vernon School District East Division Elementary Mount Vernon, WA	**FIGURE** **13**

Sieve Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-9 @ 4.2'
Sample#: B16-0746

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 14-Jul-16
Tested By: C. Meredith

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
brown

ACCREDITED

ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

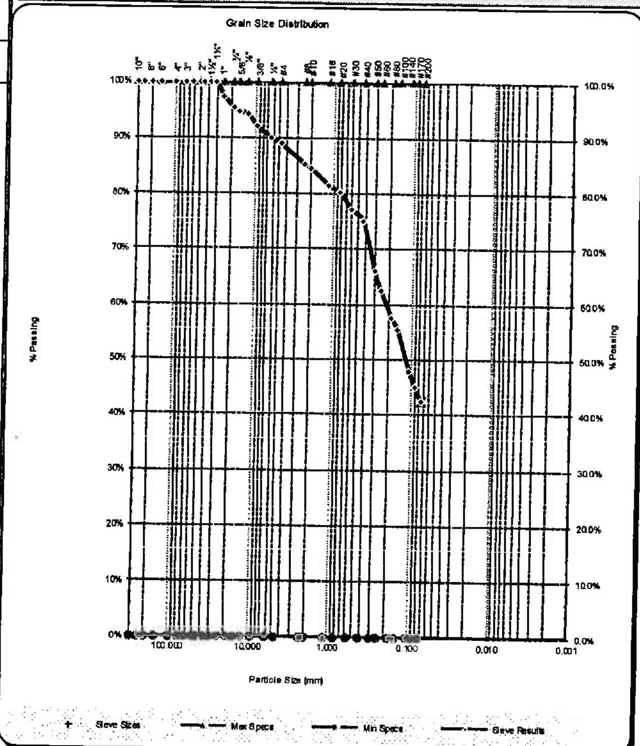
$D_{(5)}$ = 0.009 mm
$D_{(10)}$ = 0.018 mm
$D_{(15)}$ = 0.027 mm
$D_{(30)}$ = 0.053 mm
$D_{(50)}$ = 0.119 mm
$D_{(60)}$ = 0.214 mm
$D_{(90)}$ = 6.386 mm
Dust Ratio = 13/23

% Gravel = 11.1%
% Sand = 46.5%
% Silt & Clay = 42.4%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, C_C = 0.74
Coeff. of Uniformity, C_U = 12.13
Fineness Modulus = 1.58
Plastic Limit = n/a
Moisture %, as sampled = 14.6%
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	97%	97%	100.0%	0.0%
3/4"	19.00	95%	95%	100.0%	0.0%
5/8"	16.00		95%	100.0%	0.0%
1/2"	12.50	94%	94%	100.0%	0.0%
3/8"	9.50		92%	100.0%	0.0%
1/4"	6.30		90%	100.0%	0.0%
#4	4.75	89%	89%	100.0%	0.0%
#8	2.36		85%	100.0%	0.0%
#10	2.00	85%	85%	100.0%	0.0%
#16	1.18		82%	100.0%	0.0%
#20	0.850	80%	80%	100.0%	0.0%
#30	0.600		77%	100.0%	0.0%
#40	0.425	75%	75%	100.0%	0.0%
#50	0.300		66%	100.0%	0.0%
#60	0.250		63%	100.0%	0.0%
#80	0.180		58%	100.0%	0.0%
#100	0.150	55%	55%	100.0%	0.0%
#140	0.106		48%	100.0%	0.0%
#170	0.090		45%	100.0%	0.0%
#200	0.075	42%	42%	100.0%	0.0%



Comments:

Reviewed by: [signature]

Materials Testing & Consulting, Inc.
777 Chrysler Drive
Burlington, WA 98233

Lab Sample: TP-9 @ 4.2'
Mount Vernon School District
East Division Elementary
Mount Vernon, WA

FIGURE
14

Sieve Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-12 @ 2.0'
Sample#: B16-0943

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 10-Aug-16
Tested By: C. Meredith

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
gray

ACCREDITED

ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

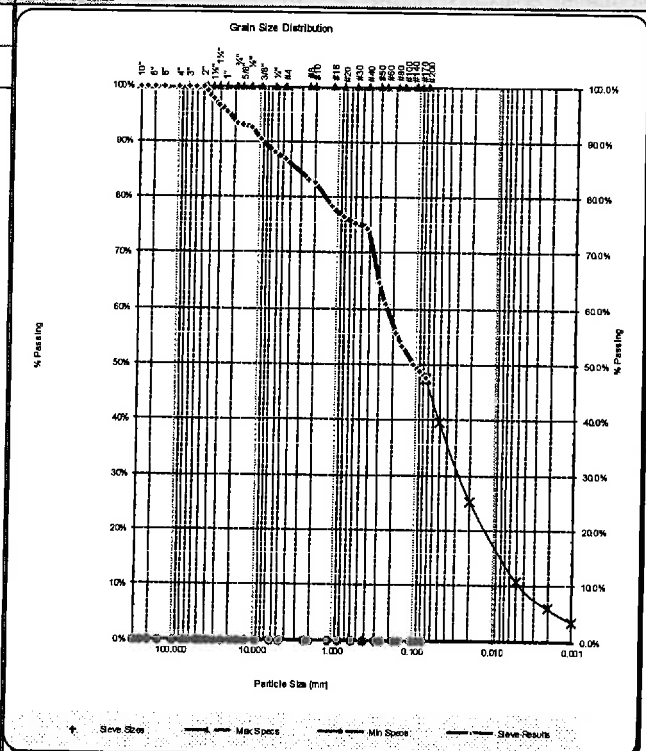
$D_{(5)}$ = 0.008 mm
$D_{(10)}$ = 0.016 mm
$D_{(15)}$ = 0.024 mm
$D_{(30)}$ = 0.047 mm
$D_{(50)}$ = 0.106 mm
$D_{(60)}$ = 0.237 mm
$D_{(90)}$ = 9.069 mm
Dust Ratio = 59/92

% Gravel = 13.2%
% Sand = 39.2%
% Silt & Clay = 47.6%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, C_C = 0.60
Coeff. of Uniformity, C_U = 15.07
Fineness Modulus = 1.75
Plastic Limit = n/a
Moisture %, as sampled = 12.8%
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		99%	100.0%	0.0%
1.50"	37.50		98%	100.0%	0.0%
1.25"	31.50		97%	100.0%	0.0%
1.00"	25.00	95%	95%	100.0%	0.0%
3/4"	19.00	93%	93%	100.0%	0.0%
5/8"	16.00		93%	100.0%	0.0%
1/2"	12.50	93%	93%	100.0%	0.0%
3/8"	9.50		90%	100.0%	0.0%
1/4"	6.30		88%	100.0%	0.0%
#4	4.75	87%	87%	100.0%	0.0%
#8	2.36		83%	100.0%	0.0%
#10	2.00	83%	83%	100.0%	0.0%
#16	1.18		78%	100.0%	0.0%
#20	0.850		77%	100.0%	0.0%
#30	0.600		75%	100.0%	0.0%
#40	0.425	74%	74%	100.0%	0.0%
#50	0.300		65%	100.0%	0.0%
#60	0.250		61%	100.0%	0.0%
#80	0.180		56%	100.0%	0.0%
#100	0.150		53%	100.0%	0.0%
#140	0.106		50%	100.0%	0.0%
#170	0.090		49%	100.0%	0.0%
#200	0.075	48%	48%	100.0%	0.0%



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-12 @ 2.0'** Mount Vernon School District East Division Elementary Mount Vernon, WA	**FIGURE** **15**

Hydrometer Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-12 @ 2.0'
Sample#: B16-0943

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 10-Aug-16
Tested By: C. Meredith

ASTM D 2487 Soils Classification
SM, Silty Sand
Sample Color
gray

ASTM D-422, HYDROMETER ANALYSIS

Assumed Sp Gr : 2.70
Sample Weight: 50.54 grams
Hydroscopic Moist.: 1.86%
Adj. Sample Wgt : 49.62 grams

ACCREDITED
Certificate #: 1366.01, 1366.02

Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter
2	21	34.6%	0.0341 mm
5	16	26.4%	0.0222 mm
15	13	21.4%	0.0131 mm
30	10	16.5%	0.0094 mm
60	8	13.2%	0.0067 mm
250	5	8.2%	0.0033 mm
1440	3	4.9%	0.0014 mm

% Gravel: 13.2%
% Sand: 39.2%
% Silt: 37.0%
% Clay: 10.7%

Liquid Limit: n/a
Plastic Limit: n/a
Plasticity Index: n/a

ASTM C-136

Sieve Analysis
Grain Size Distribution

Sieve Size	Percent Passing	Soils Particle Diameter
3.0"	100%	75.000 mm
2.0"	100%	50.000 mm
1.5"	100%	37.500 mm
1.25"	98%	31.500 mm
1.0"	97%	25.000 mm
3/4"	93%	19.000 mm
5/8"	93%	16.000 mm
1/2"	93%	12.500 mm
3/8"	90%	9.500 mm
1/4"	88%	6.300 mm
#4	87%	4.750 mm
#10	83%	2.000 mm
#20	77%	0.850 mm
#40	74%	0.425 mm
#100	53%	0.150 mm
#200	47.6%	0.075 mm
Silts	47.3%	0.074 mm
	39.7%	0.050 mm
	25.2%	0.020 mm
Clays	10.7%	0.005 mm
	6.0%	0.002 mm
Colloids	3.5%	0.001 mm

USDA Soil Textural Classification

	Particle Size
% Sand:	2.0 - 0.05 mm
% Silt:	0.05 - 0.002 mm
% Clay:	< 0.002 mm

USDA Soil Textural Classification
Loam

All results apply only to actual locations and materials tested. As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	Lab Sample: TP-12 @ 2.0' Mount Vernon School District East Division Elementary Mount Vernon, WA	FIGURE 16

Sieve Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-12 @ 4.0'
Sample#: B16-0747

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 14-Jul-16
Tested By: C. Meredith

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
brown

ACCREDITED

ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

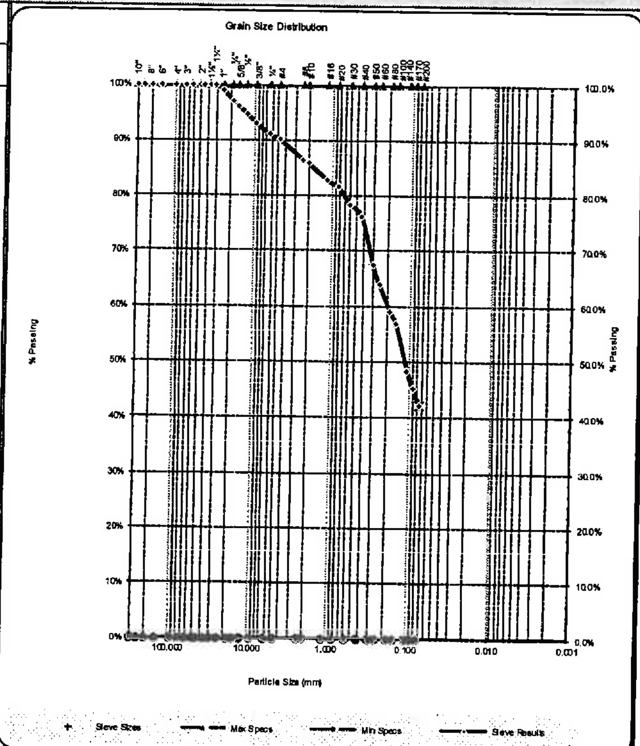
$D_{(5)}$ = 0.009 mm
$D_{(10)}$ = 0.018 mm
$D_{(15)}$ = 0.027 mm
$D_{(30)}$ = 0.053 mm
$D_{(50)}$ = 0.115 mm
$D_{(60)}$ = 0.195 mm
$D_{(90)}$ = 4.695 mm
Dust Ratio = 51/92

% Gravel = 9.9%
% Sand = 47.8%
% Silt & Clay = 42.3%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, C_C = 0.82
Coeff. of Uniformity, C_U = 11.01
Fineness Modulus = 1.48
Plastic Limit = n/a
Moisture %, as sampled = 14.2%
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	99%	99%	100.0%	0.0%
3/4"	19.00	97%	97%	100.0%	0.0%
5/8"	16.00		96%	100.0%	0.0%
1/2"	12.50	95%	95%	100.0%	0.0%
3/8"	9.50		93%	100.0%	0.0%
1/4"	6.30		91%	100.0%	0.0%
#4	4.75	90%	90%	100.0%	0.0%
#8	2.36		86%	100.0%	0.0%
#10	2.00	86%	86%	100.0%	0.0%
#16	1.18		83%	100.0%	0.0%
#20	0.850	82%	82%	100.0%	0.0%
#30	0.600		78%	100.0%	0.0%
#40	0.425	76%	76%	100.0%	0.0%
#50	0.300		67%	100.0%	0.0%
#60	0.250		64%	100.0%	0.0%
#80	0.180		59%	100.0%	0.0%
#100	0.150	57%	57%	100.0%	0.0%
#140	0.106		48%	100.0%	0.0%
#170	0.090		45%	100.0%	0.0%
#200	0.075	42%	42%	100.0%	0.0%



Comments: ______________________

Reviewed by: ______________________

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-12 @ 4.0'** Mount Vernon School District East Division Elementary Mount Vernon, WA	**FIGURE** **17**

Sieve Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-13 @ 2.0'
Sample#: B16-0944

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 10-Aug-16
Tested By: C. Meredith

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel
Sample Color:
brown

ACCREDITED

ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

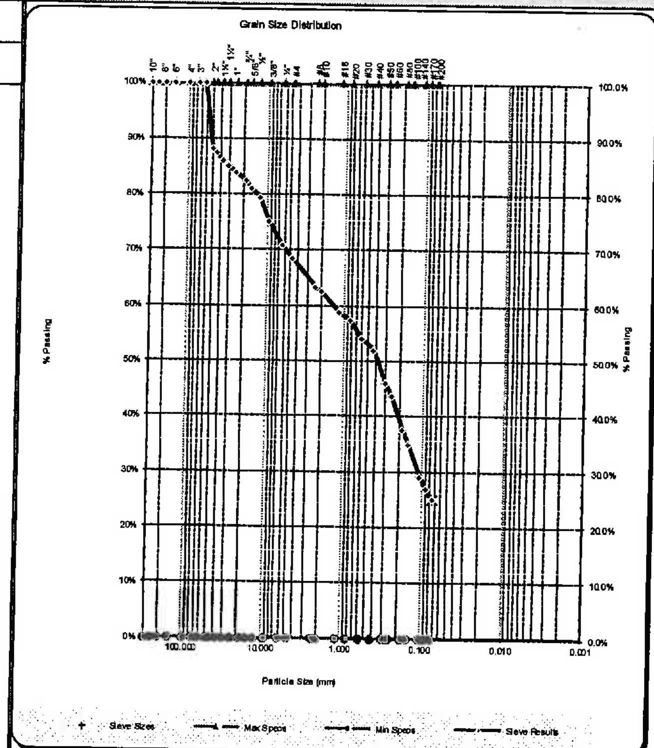
$D_{(5)}$ = 0.015 mm
$D_{(10)}$ = 0.030 mm
$D_{(15)}$ = 0.045 mm
$D_{(30)}$ = 0.114 mm
$D_{(50)}$ = 0.386 mm
$D_{(60)}$ = 1.450 mm
$D_{(90)}$ = 52.087 mm
Dust Ratio = 47/98

% Gravel = 31.5%
% Sand = 43.7%
% Silt & Clay = 24.8%
Liquid Limit = n/a
Plasticity Index = n/a
Sand Equivalent = n/a
Fracture %, 1 Face = n/a
Fracture %, 2+ Faces = n/a

Coeff. of Curvature, C_C = 0.30
Coeff. of Uniformity, C_U = 48.01
Fineness Modulus = 3.29
Plastic Limit = n/a
Moisture %, as sampled = 16.6%
Req'd Sand Equivalent =
Req'd Fracture %, 1 Face =
Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	88%	88%	100.0%	0.0%
1.75"	45.00		87%	100.0%	0.0%
1.50"	37.50		86%	100.0%	0.0%
1.25"	31.50		85%	100.0%	0.0%
1.00"	25.00	84%	84%	100.0%	0.0%
3/4"	19.00	82%	82%	100.0%	0.0%
5/8"	16.00		81%	100.0%	0.0%
1/2"	12.50	79%	79%	100.0%	0.0%
3/8"	9.50		75%	100.0%	0.0%
1/4"	6.30		71%	100.0%	0.0%
#4	4.75	69%	69%	100.0%	0.0%
#8	2.36		63%	100.0%	0.0%
#10	2.00	62%	62%	100.0%	0.0%
#16	1.18		59%	100.0%	0.0%
#20	0.850	57%	57%	100.0%	0.0%
#30	0.600		54%	100.0%	0.0%
#40	0.425	52%	52%	100.0%	0.0%
#50	0.300		46%	100.0%	0.0%
#60	0.250	44%	44%	100.0%	0.0%
#80	0.180		38%	100.0%	0.0%
#100	0.150	35%	35%	100.0%	0.0%
#140	0.106		29%	100.0%	0.0%
#170	0.090		27%	100.0%	0.0%
#200	0.075	25%	25%	100.0%	0.0%



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-13 @ 2.0'** Mount Vernon School District East Division Elementary Mount Vernon, WA	**FIGURE** **18**

Sieve Report

Project: East Division St Elementary
Project #: 16B134
Client: Mt. Vernon School District
Source: TP-14 @ 1.0'
Sample#: B16-0945

Date Received: 12-Jul-16
Sampled By: K. Parker
Date Tested: 10-Aug-16
Tested By: C. Meredith

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel
Sample Color:
red/brown

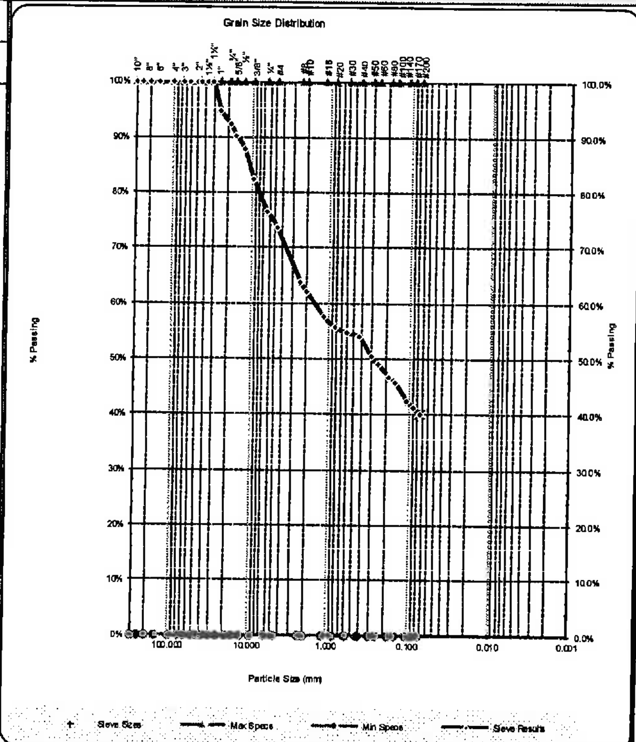
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ = 0.009 mm	% Gravel = 26.3%	Coeff. of Curvature, C_C = 0.10
$D_{(10)}$ = 0.019 mm	% Sand = 33.5%	Coeff. of Uniformity, C_U = 86.46
$D_{(15)}$ = 0.028 mm	% Silt & Clay = 40.1%	Fineness Modulus = 2.79
$D_{(30)}$ = 0.056 mm	Liquid Limit = n/a	Plastic Limit = n/a
$D_{(50)}$ = 0.280 mm	Plasticity Index = n/a	Moisture %, as sampled = 16.3%
$D_{(60)}$ = 1.615 mm	Sand Equivalent = n/a	Req'd Sand Equivalent =
$D_{(90)}$ = 15.666 mm	Fracture %, 1 Face = n/a	Req'd Fracture %, 1 Face =
Dust Ratio = 32/43	Fracture %, 2+ Faces = n/a	Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	95%	95%	100.0%	0.0%
3/4"	19.00	92%	92%	100.0%	0.0%
5/8"	16.00		90%	100.0%	0.0%
1/2"	12.50	88%	88%	100.0%	0.0%
3/8"	9.50		82%	100.0%	0.0%
1/4"	6.30		77%	100.0%	0.0%
#4	4.75	74%	74%	100.0%	0.0%
#8	2.36		64%	100.0%	0.0%
#10	2.00	62%	62%	100.0%	0.0%
#16	1.18		58%	100.0%	0.0%
#20	0.850	56%	56%	100.0%	0.0%
#30	0.600		55%	100.0%	0.0%
#40	0.425	54%	54%	100.0%	0.0%
#50	0.300		51%	100.0%	0.0%
#60	0.250	49%	49%	100.0%	0.0%
#80	0.180		47%	100.0%	0.0%
#100	0.150	46%	46%	100.0%	0.0%
#140	0.106		42%	100.0%	0.0%
#170	0.090		41%	100.0%	0.0%
#200	0.075	40%	40%	100.0%	0.0%



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	Lab Sample: TP-14 @ 1.0' Mount Vernon School District East Division Elementary Mount Vernon, WA	FIGURE 19

ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils

Project: East Division St Elementary	**Date Received:** 12-Jul-16	**Unified Soils Classification System, ASTM D-2487**	
Project #: 16B134	**Sampled By:** K. Parker	No Data Provided	
Client: Mt. Vernon School District	**Date Tested:** 14-Jul-16	**Sample Color**	
Source: TP-17 @ 3.5'	**Tested By:** M. Carrillo	brown	
Sample #: B16-0748			

Liquid Limit Determination

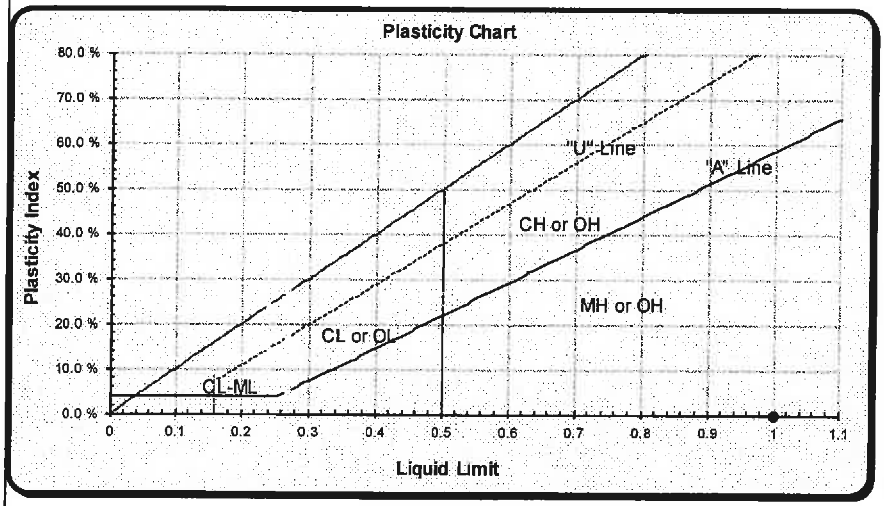
	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:						
Weight of Dry Soils + Pan:						
Weight of Pan:						
Weight of Dry Soils:						
Weight of Moisture:						
% Moisture:						
Number of Blows:						

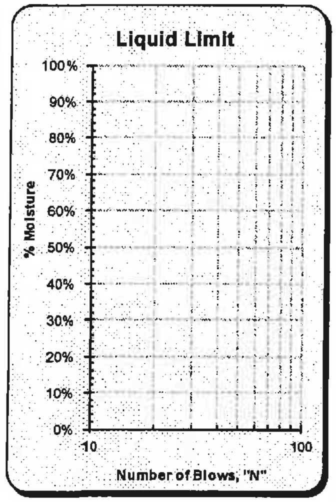
Liquid Limit @ 25 Blows:	N/A
Plastic Limit:	N/A
Plasticity Index, I_P:	N/A

Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:						
Weight of Dry Soils + Pan:						
Weight of Pan:						
Weight of Dry Soils:						
Weight of Moisture:						
% Moisture:						

ACCREDITED
Certificate #: 1366.01, 1366.02





Comments: B16-0748 is nonplastic as it does not roll down to 1/8"

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-17 @ 3.5'** Mount Vernon School District East Division Elementary Mount Vernon, WA	**FIGURE** **20**