GEOTECHNICAL REPORT

for

Nevada Stateline to Stateline Bikeway South Demonstration Project

Stateline, Nevada

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March 2011

JN: 7649.001

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For
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Stateline, Nevada

INTRODUCTION

This report presents the results of Lumos & Associates, Inc. (Lumos) geotechnical investigation for the proposed Nevada Stateline to Stateline Bikeway, South Demonstration Project, to be located in Stateline, Nevada.

The project will consist of an approximately three (3) – miles of paved shared-use path beginning on Lake Parkway at the California/Nevada state line on the south shore of Lake Tahoe and ending at U.S. 50 approximately 0.3 miles north of the entrance to Round Hill Pines Beach. The proposed bikeway will include areas of cut and fill, creek crossings using bridges and raised boardwalks, and new structures and improvements such as a restroom, a parking lot, and retaining walls as required. Structural loads are assumed to be light for the improvements, though occasional use by an ACS Type 3 Wildland Fire Engine (H-10 or H-20) in emergency situations is anticipated.

The purpose of our investigation was to characterize the existing site geology, soil conditions, describe onsite soils, determine their engineering properties as they relate to the proposed construction, identify any adverse geologic, soil or groundwater conditions and to provide geotechnical recommendations to assist in the design of the proposed structures and improvements. The current scope of geotechnical work did not include any soil and/or groundwater analysis to assess the absence or presence of contamination.

This report concludes with recommendations for site grading, foundation recommendations, footing area preparation, concrete slab placement, exterior flatwork, pavement structural section, and drainage recommendations.

In addition, information such as logs of all exploratory excavations, laboratory test data, allowable soil bearing capacities, estimated total and differential settlements and lateral earth pressures are provided in this report.

The recommendations contained herein have been prepared based on our understanding of the proposed construction, as outlined above. Re-evaluation of the recommendations presented in this report should be conducted after the final site grading and construction plans are completed, if there are any variations from the assumptions described herein. If changes are made after re-evaluation, those updates shall be included in the final bid documents.

It is possible that subsurface discontinuities are concealed between and beyond exploration points. Such discontinuities are beyond the evaluation of the Engineer at this time. No guarantee of the consistency of site geology and sub-surface soil conditions is implied or intended.

GEOLOGIC SETTING

575 to 270 million years ago, during the Paleozoic Era sediments from the North American continent were deposited on the continental shelf in an area now occupied by the Sierra Nevada Mountains. Near the end of the Paleozoic Era the North American plate began to drift west, away from Pangea. As the North American plate collided with the eastward drifting Pacific Plate, subduction of Pacific Plate below the North American Plate began. As subducted materials reached sufficient temperatures and pressures to form magma, molten material began to rise and intruded the overlying sedimentary rocks, cooling and creating the Sierra Nevada Batholith.

Starting approximately 130 million years ago, through uplift and erosion, the granites of the Sierra Nevada Batholith became exposed. Approximately 30 million years ago episodes of volcanism covered the Sierra Nevada. About 10 million years ago, normal faulting along a series of parallel faults caused uplift, tilting and down drop of fault bound blocks. Uplifted blocks created the Carson Range to the east and the Sierra Nevada to the west. The Lake Tahoe Basin is an extensional basin, created by a series of down to the east normal faults.

Ancestral Lake Tahoe was formed when volcanic eruptions blocked the basin’s outlet to the north and allowed the basin to capture water. As the lake filled the Truckee River became the lake’s only and present outlet, which is located within modern-day Tahoe City.

Modern Lake Tahoe has been sculpted by surrounding glaciers throughout the most recent ice age. Glacial activities have caused the lake level to significantly fluctuate over time. Several ice dams in the Truckee River Canyon have allowed the lake to fill to a maximum of approximately 800 feet above its current level. Evidence of ancestral shorelines can be found in sedimentary terraces flanking the basins slopes. Additionally, when ice dams floated and broke apart, channels were eroded through glacial debris and large boulders can be found downstream of the lakes outlet.

The surface geology of this project has been mapped by George J. Saucedo (2005). The mapping indicates that much of the proposed bikeway is underlain by Quaternary deposits and Cretaceous age granitic rocks (See Plate 3).

SEISMIC CONSIDERATIONS

Stateline, similar to many areas of Nevada and California is located near active faults, which are capable of producing significant earthquakes. Douglas County is an area that may experience major damage due to earthquakes of large magnitude.

Stateline is located within the Sierra Nevada and historically major earthquakes with magnitudes greater than 6.0 have occurred within 30 miles of the site. Fault mapping by the U.S. Geological Survey website (2011) shows Holocene faulting (considered active) within 5 miles of the site (See Plate 4). No active Holocene faulting is known to cross the project alignment.

Seismic concerns for this site are not unlike other sites in the Douglas County area. No evidence of active Holocene (<11,000 years) age faulting was found along the alignment, nor has any evidence of on-site faulting been observed. However, due to the proximity of the site to a number of known faults considered active, strong seismic shaking should be anticipated during the life of the proposed project.

Liquefaction is the phenomena where loose sands lose their shear strength when subjected to cyclic loading and become unstable. Ground shaking events may provide that type of cyclic loading. Liquefaction potential for this site is considered moderate, but for improvements of this nature (bike path with associated improvements) a detailed liquefaction analysis is not the standard of practice and is not recommended.

Ground lurching is the horizontal movement of soil, sediments, or fill located on relatively steep embankments as a result of seismic activity, forming irregular ground surface cracks.

IBC 2006: The mapped maximum considered earthquake spectral response acceleration at short periods (S_S) is 1.50 corresponding to a 0.2 second spectral response acceleration at 5 percent of critical damping and for a Site Class B (IBC Figure 1615(3)). The mapped maximum considered earthquake spectral response acceleration at a 1-second period (S_1) is 0.576g corresponding to 1.0 second spectral response acceleration at 5 percent of critical damping and for a Site Class B (IBC Figure 1615(4)). The site is considered to be a stiff soil profile, corresponding to a Site Class D (IBC Table 1615.1.1). Therefore, the spectral response accelerations must be adjusted for site class effects. The site coefficient for spectral response accelerations adjustment at short periods (F_a) is 1.0 (IBC Table 1615.1.2(1)). The site class effect for spectral response accelerations adjustment at 1-second periods (F_v) is 1.5 (IBC Table 1615.1.2(1)). The maximum considered earthquake spectral response acceleration parameter for short period (S_{MS}) is 1.50 and for 1-second period (S_{M1}) is 0.864g. This corresponds to design spectral response acceleration parameters of 1.00g for short period (S_{DS}) and of 0.576g for 1-second period (S_{D1}).

It is emphasized that the above values are the minimum requirements intended to maintain public safety during strong ground shaking. These minimum requirements are meant to safeguard against loss of life and major structural failures, but are not intended to prevent damage or insure the functionality of the structure during and/or after a large seismic event. Additionally, they do not protect against damage to non-structural components of a structure or flatwork / other improvements adjacent to a structure.

Note: the locally adopted Building Code may be updated during the life of this project; this report should be updated to reflect any changes relating to its contents, if necessary, prior to construction.

SITE CONDITIONS AND FIELD EXPLORATION

The field investigation included a site reconnaissance and subsurface exploration. During the site reconnaissance, surface conditions were noted and the locations of exploratory excavations were determined. Excavation locations were established using field survey techniques.

The northern area of the proposed bike path crosses terrain on the west side of Round Mound that is moderately steep while the southern area south of Elks Point Road is relatively flat lying. At the time of our investigation in October, 2010, the vegetation consisted of native grasses, brush, and trees.

Utilizing a rubber-tire backhoe, 15 exploratory excavations were dug to a depth of 15 feet below ground surface (bgs) or refusal. Excavation locations are shown on Plates 2.1 and 2.2.

The subsurface soils were continuously logged and visually classified in the field by our Field Technician in accordance with the Unified Soil Classification System (USCS). Representative samples were transported to our materials testing laboratory for testing and additional analysis. Testpits were backfilled per the standards of the Tahoe Regional Planning Agency.

Onsite subsurface soils generally consisted of fill consisting of silty sand and native silty sands. Areas of vegetation had topsoil to up to 1 foot.

Two six inch asphalt cores were taken on Laura Drive. Asphalt thicknesses ranged from 2 to 4 inches thick with 0 to 6 inches of aggregate base and silty sand subgrade.

Groundwater was measured at 5 feet and 14 feet bgs in two testpits, groundwater levels are expected to fluctuate with seasonal precipitation and changes in creek levels.

FIELD AND LABORATORY TEST DATA

Field data was developed from samples taken and tests conducted during the field exploration and laboratory testing phases of this project. Samples were recovered from testpits at intervals or when material conditions permitted.

Laboratory tests performed on representative samples included Atterberg Limits, sieve analyses (including fines), native moisture, Resistance value (R-Value), pH, soluble sulfates, and resistivity. Much of this data is displayed on the “logs” of the exploratory borings to facilitate correlation. Field descriptions presented on the logs have been modified, where appropriate, to reflect laboratory test results. The logs of the exploratory boring and test pits are included in Appendix A of this report as Plates A-1 through A-15. A legend of the logs is presented as Plate A-16.

Individual laboratory test results are presented in Appendix B as Plates B-1 through B-3. Laboratory testing was performed per ASTM standards, except when test procedures are briefly described and no ASTM standard is specifically referenced in the report. Atterberg limits were determined using the dry method of preparation. Analytical testing was conducted by Atlas Laboratories and is presented in plate B-4.

DISCUSSION AND RECOMMENDATIONS

General

From a geotechnical viewpoint, the alignment is considered suitable for the proposed improvements when prepared as recommended herein.

During earthwork, any existing improvements within the proposed development should be demolished and removed off site or salvaged, if to remain. All unsuitable material and any soil with organics should be excavated and removed off site or set aside. Any loose, undocumented fill or otherwise disturbed soils in the proposed structure footprints should be over excavated and re-compacted prior to receiving any properly compacted fill.

General Site Grading

All existing improvements except those to be salvaged should be demolished and removed off-site. Demolition/salvage activities, where applicable, should be conducted in general accordance with the specifications presented in Appendix C of this report and/or the project specifications. All other improvements to remain should be properly designated and protected during construction of the proposed new improvements.

All unsuitable materials such as asphalt concrete, old concrete foundations, utilities, underground irrigation systems, sod, root-laden soils and other vegetation, ect. currently onsite should be removed before grading begins. Note that recovered materials maybe recycled as indicated in appendix C. After all removals of appropriate existing improvements have been competed, clearing and grubbing is anticipated to be as much as six (6) inches.

Removals for rough grading for improvements should be such that all structure foundations (not supported by piers) are supported on a properly moisture conditioned and properly compacted subgrade documented by Lumos. Unless required otherwise, removals should extend horizontally beyond the perimeter of the proposed structures footprint a distance of four (4) feet or as required by the design or limited by permits. Pavement covered areas should be supported on at least 1 foot of scarified, in place, properly moisture conditioned and properly compacted subgrade. Removals and scarification shall extend horizontally beyond the edge of the pavement section a minimum of 18 inches.

Excavated soils free from organics, debris or otherwise suitable material and with particles no larger than 3 inches in maximum dimension may be stockpiled and moisture conditioned for later use as compacted fill provided it meets the criteria for fill soils.

Exposed soils to receive fill should be scarified to a minimum of 1 foot, moisture conditioned to within 2 percent of optimum and re-compacted to 90% of the ASTM D1557 standard.

Pumping or yielding conditions may be encountered in the deeper excavations, particularly during construction activities or after wet periods. If yielding or pumping conditions are encountered, the soils should be stabilized by one of the following options. These options are: (1) Scarify the soils in place, allow them to dry, and re-compact; (2) Stabilizing with a geotextile fabric and aggregate base; and (3) stabilizing with a geogrid and a specified fill. Brief descriptions of these stabilizing options are presented below:

1. This option requires that the soils be scarified in place and allowed to dry. Re-compaction of these soils should be conducted as stated in this report.

Note that this option is typically only useful for relative minor shallow stabilization, only when there is a surface stabilization issue.

2. This option involves grading the site to a relatively smooth surface condition and compacting the surface as much as practical without causing further pumping. A geotextile non-woven fabric (Mirafi 180N or equivalent) should be placed as specified by the manufacturer. No traffic or other action should be allowed directly on the fabric, which may cause it to deflect/deform. The fabric should be covered, as specified by the manufacturer, with at least 12 inches of Class 2 aggregate base or 4-inch minus pit-run angular rock. Test sections should be conducted to determine the minimum thickness and/or layers required for stabilization. Stabilization should be evaluated by proof-rolling commensurate with the equipment used, and under the supervision and approval by a Lumos representative. **NOTE:** This option may require over-excavation to maintain appropriate grading elevations.
3. This option involves grading the site to a relatively smooth surface condition and compacting the surface as much as practical without causing further pumping. For fine-grained soils (more than 50% passing the #200 sieve), a separation fabric may be required to prevent migration of fines into the stabilization section. If required, it should consist of a filter fabric (Mirafi 140N or equivalent). In addition, approximately 2 to 3 inches of preferred specified fill (See Table 1) may be required, if practical, on the existing surface or filter fabric across the entire area to be stabilized prior to placing the geogrid.

Table 1: Preferred Specified Fill Gradation

Sieve Size	% Passing
1- ½″	100
¾″	50-100
#4	25-50
#40	10-20
#100	5-15
#200	Less than 10

A geogrid (Tensar BC1100 or equivalent) should be placed as recommended by the manufacturer. No traffic or other action should be allowed directly on the grid, which may cause it to deflect/deform. The grid should be covered as recommended by the manufacturer with at least 8 to 12 inches of preferred specified fill (See Table 1). Test sections should be used to determine the minimum thickness and/or layers required for stabilization. Static rather than vibratory equipment should be used. Stabilization should be evaluated by proof-rolling commensurate with the equipment used, and under the supervision and approval by a Lumos representative. If the fill thickness required for stabilization is greater than 12 inches, then a filter fabric (Mirafi 140N or equivalent) should be placed at the top of the preferred fill to prevent piping of fines from the covering soils into the preferred fill matrix. **NOTE:** This option may also require over excavation to maintain appropriate grading elevations and may not be as effective as option 2 under shallow groundwater conditions.

Saturated and seeping conditions may be encountered in areas of high groundwater in the area of the proposed parking lot and restroom, particularly during the spring thaw period. Due to these relatively shallow depths to ground water a French drain system should be utilized in order to reduce the possibility of ground water affecting performance of the parking lot and restroom structure. This French drain should extend around the northern and eastern sides for the proposed parking area and tie into the drop inlet area on the western side.

The French drain system should consist of a 4-inch slotted pipe placed in a trench having a minimum depth of two (2) feet and lined with filter fabric (Mirafi 140N or equivalent) and back filled with drain rock such that the drainpipe is surrounded by a minimum of 6 inches of drain rock. The drainpipe trench and connections should be built in such a way that the filter fabric covers all sides, top, and bottom and does not allow infiltration of any soils. A French drain system is most effective if placed such that it collects the water prior to it entering the project area and thus is typically placed around the upslope edges, unless on-site conditions exhibit isolated seepages. The French drain system should slope to an appropriate daylight location and/or drainage outlet feature. The pipe extending from the French Drain to the outlet may be a solid wall pipe to help prevent saturation of the unsaturated soils. This French drain system must not be placed under or within two feet of the structure footprint.

Properly compacted fill soils to be used on the site should consist of non-expansive materials similar to the on site soils (LL less than 40 and a PI less than 12 or Expansion Index less than 20), should be free of contaminants, organics (less than 2 percent), rubble, or natural rock larger than 3 inches in the largest dimension. Import fill soils should be tested and approved prior to being placed or delivered on-site.

Fill should be placed only on properly moisture conditioned and properly compacted sub-grade or on compacted fill in loose lifts not exceeding eight (8) inches, the fill should be moisture conditioned to within 2% of optimum and compacted to 90% relative compaction (as determined by the ASTM D1557 standard). Note: verification of moisture and relative compaction is required prior to pouring footings. If slopes to receive fill are steeper than 5:1 the existing slope shall be horizontally benched. The bench shall be at least one (1) equipment width wide and slope at least one percent (1%) into the existing slope.

Fill material should not be placed, spread or compacted while the ground is frozen or during unfavorable weather conditions. When site grading is interrupted by rain, grading or filling operations should not resume until a Lumos representative approves the moisture content and density conditions of the subgrade or previously placed fill.

Water should not be allowed to pond on pavements or adjacent to structures, and measures should be taken to reduce surface water infiltration into the foundations soils.

A Resident Engineer and/or qualified inspector should be present during site clearing, excavation, and grading operations to ensure that any unforeseen or concealed site conditions are identified and properly mitigated, and to test and observe earthwork construction. This testing and observation is an integral part of our services as acceptance of earthwork construction and it is dependent upon compaction and stability of the subgrade soils. The soils engineer may reject any material that does not meet compaction and stability requirements. Further, recommendations in this report are provided upon the assumption that earthwork construction will conform to recommendations set forth in this section of the report.

FOUNDATION DESIGN CRITERIA

Helical Piers

Helical Piers may be considered for support of the proposed boardwalk to limit disturbance to the meadow area. Design factors include constructability, subsurface materials, structural load, soil capacity, and groundwater conditions.

Downward capacity is developed from toque which should reach a minimum of 1000 ft-lb with a minimum 10" helix and minimum 1½" shaft embedded a minimum of 5 feet. Actual pier capacity may be limited by structural considerations such as the strength of the pier as a structural element. Uplift capacities may be assumed to be one-half of the downward capacities. Angled piers may be used for cross bracing purposes if the boardwalk is a few feet above ground.

If piers are properly constructed, settlement of piers under the proposed loads is estimated to be less than 1 inch.

Drilled piers should be placed as recommended in Appendix D, "Guide Specifications for Helical Pier Installation."

Pier installation must be carefully monitored by Lumos to confirm that piers are properly constructed.

Spread Footings

Conventional spread footings with slab-on-grade founded on properly moisture conditioned and properly compacted soil, as recommended above, may be used to support the proposed building.

Spread footings: Footings founded on at least 12 inches of properly moisture conditioned and properly compacted soil may be designed for a net allowable bearing pressure of 2,000 pounds per square foot (psf), assuming 24 inches of all around minimum confinement is provided and the frost depth embedment requirement is met.

If fill is placed to bring building pads to design grade, no footings should be founded within a distance of at least one third of the total height of fill (H/3) placed from the face of the slope or equal to the depth of compacted fill below the bottom of footing, whichever is greater. In drainage areas, no footings should be located or founded above a 1:1 (horizontal:vertical) plane drawn up from the toe of slopes, outside edge of drainage conduits, or drainage ditches, to avoid loss of bearing strength of supporting soils. No drainage or water diverting conduits other than associated utilities should be allowed underneath building footprints.

Footing Settlements: the maximum anticipate settlements under static conditions for continuous or isolated footings bearing on no more than 5 feet of properly compacted fill and designed for a 2000 psf bearing pressure is estimated to be ¾ to 1 inch. Differential settlements are generally expected to be half of the total settlements. Settlements in granular soils are primarily expected to occur shortly after dead and sustained live loads are applied.

Lateral Loading: resistance to lateral loads can be provided by friction acting at the base of foundations and by passive earth resistance. A coefficient of friction of 0.45 may be assumed at the base of footings. An allowable passive earth resistance of 200 psf per foot of depth may be used for the sides of footings poured against properly compacted fill. Passive resistance should not exceed 2000 psf. The at-rest lateral earth pressure can be calculated utilizing an equivalent fluid pressure of 60 psf.

Dynamic Factors: Vertical and lateral bearing values indicated above are for total dead load and frequently applied live loads. If normal code requirements are applied for design, the above vertical bearing and passive resistance values may be increased by 33 percent for short duration loading due to wind or seismic forces. The Dynamic Lateral earth force shall be calculated utilizing the following equation:

$$\text{Dynamic Lateral Force} = P_E = 10\ H^2$$

This force acts at .6H above the wall base. This force is in addition to the static forces discussed in other sections of this report.

Drainage: Backfill adjacent to the proposed building perimeter should be properly compacted to minimize any water infiltration toward the foundation soils and under the concrete slab-on-grade or raised floor (if any).

Moist conditions should be anticipated over time under the building footprint due to landscape irrigation and precipitation. It is recommended that the exterior of the building be graded in such a way as to provide positive drainage away from foundations.

RETAINING WALLS

Retaining structures should be designed to resist the appropriate lateral earth pressures. Cantilevered walls, which are able to deflect at least 0.01 radians, can be designed using an equivalent fluid (backfill) unit weight of 40 pounds-per-cubic-foot (pcf). However, if the wall is fixed against rotation, the wall should be designed using an equivalent fluid (backfill) unit weight of 60 pcf. These design parameters are based upon the assumption that walls retain only level backfill and no hydrostatic pressures will be present. Any other surcharge pressures should be added to the above recommended lateral earth pressures.

Retaining walls should be backfilled with free draining granular material that extends vertically to the bottom of the stem and laterally at least 6 inches beyond the face of the stem (wall) wrapped with a Mirafi 140N or equivalent non-woven filter fabric. Weep holes should be provided on the walls at regular intervals, or a slotted drain pipe placed at the bottom of the wall (bottom of granular material) to relieve any possible buildup of hydrostatic pressure. Backfill material within two (2) feet of the wall should be compacted with hand-held equipment to at least 90% to the maximum ASTM D1557 standard.

CONCRETE SLAB DESIGN

Interior Concrete Slab-On-Grade: Interior concrete slabs should be underlain with at least six (6) inches of Class 2 Aggregate Base, compacted to a minimum of ninety-five percent (95%) and supported on at least 6 inches of properly compacted fill. A Vapor Barrier (VB) is to be used if the project has a vapor sensitive covering or a humidity controlled area. The VB should be placed directly under the slab, above the dry granular material if the slab has a vapor sensitive covering. The vapor barrier should be a synthetic plastic sheeting at least ten (10) mils thick conforming to ATSM E 1745. Such products include: Moistop, Vapor Block, Perminator and Vapor Flex. The VB needs to be overlapped per ACI or manufactures recommendation when one sheet's width will not cover the area.

Slab thickness design should be based on a Modulus of Subgrade Reaction equal to two hundred (200) pounds-per-cubic-inch (pci) for construction on 24 inches of properly compacted fill. Reinforcement of concrete slabs should be as specified by the Project Structural Engineer.

Exterior Concrete Slab-On-Grade: Concrete slabs on grade for vehicular traffic, driveways and sidewalks should be underlain with at least four (4) inches of Class 2 aggregate base. All subgrade and fill material should be placed and prepared as described in the "General Site Grading" section of this report, while the aggregate base material should be compacted to at least 95% of the ASTM D1557 standard.

PAVEMENT DESIGN

Within paved areas, at least the upper 12 inches of on-site soils should be scarified, moisture conditioned and recompacted to a minimum of 90 percent of the laboratory maximum density as determined by the ASTM D1557 standard. Subgrade preparation and/or fill placement should be conducted as described in the "General Site Grading" section of this report. The pavement structural section for pedestrian/bike path, auto/light truck, and heavy truck driveway and parking areas assuming an R-value of 40 (based on soil classification) is provided in Table 2, "Recommended Asphalt Pavement Section". A Traffic Index (TI) value of 4.5 was also assumed for the bikeway with occasional maintenance / wild land fire truck loads and the parking area with auto/light truck pavement loads. Aggregate base should consist of Class 2 material and meet the requirements of the latest edition of the Standard Specifications for Public Works Construction. Aggregate base material should be compacted to at least 95% of the laboratory maximum density, as determined by the ASTM D1557 standard.

TABLE 2

RECOMMENDED ASPHALT PAVEMENT SECTION *

Pavement Area	**Minimum Asphalt Pavement (inches) (inches)**	**Minimum Aggregate Base (inches)**	**Properly Compacted Subbase/Fill (inches)**
Parking areas and Path with Maintenance Vehicles (TI = 4.5)	3	6	12

* Asphalt Pavement Section presented above is based upon use of on-site granular soils as the subgrade material with an R-value of at least 40.

Loading areas and garbage collection areas experience very high wheel loads. These areas either should have an additional 2 inches of asphalt concrete, or be constructed using a 6-inch thick concrete slab with steel reinforcement.

Asphalt concrete, should be compacted to between 92 and 97 percent of the Rice theoretical maximum density. Asphalt grade should be AC 20P or PG 64-28 utilizing Type 1 (½”) Bituminous paving aggregates.

Laura Drive will have bike lane signage and marking added for this project. This road is highly alligator cracked and will have a relatively rough ride for bicyclists. To help provide a smoother surface for this roadway a scrub-seal may be added to the surface or complete roadway rehabilitation may be considered and designed.

CORROSION AND CHEMICAL ATTACK

On-site soils have a negligible soluble sulfate content of less than 0.1%. According ACI 318, no specific type of cement is required for concrete in direct contact with on-site soils. However, as a minimum, Type II or IP cement should be used. The onsite soils have a pH value of 9.50, and a resistivity of 14,000 ohm-cm, which indicates the soils have low corrosivity.

All exterior concrete should have a maximum water-cement ratio of 0.55, and comply with all other ACI recommendations for concrete placed in areas subject to freezing. A minimum compressive strength of 4,000 psi is recommended for exterior concrete.

SLOPE STABILITY AND EROSION CONTROL

The results of our exploration and calculations confirm that 1½:1 (H:V) maximum slopes will be stable for on site materials both in cut and fill. Note, to utilize slopes of 1½:1, mechanical stabilization of the slope face will be required.

EXCAVATION

On site soils are anticipated to be excavatable with conventional construction equipment in the gently sloping areas. However, in the steeper areas large boulders and/or bedrock will be encountered that may require large excavation equipment. Wet conditions may be encountered in low areas, along drainage ditches and/or after periods of heavy precipitation. Compliance with applicable OSHA regulations for excavation trenching should be enforced for Type C soils. Excavated soils should be suitable for backfill and capping of utility trenches. However, native soils may not meet the minimum requirements for bedding and aggregate base should be imported, where required.

MOISTURE PROTECTION, EROSION AND DRAINAGE

The finish surface around all structures should slope away from the structure and toward appropriate drop inlets or other surface drainage devices. It is recommended that within ten (10) feet of the structures a minimum slope of two percent (2%) be used for soil subgrades and one percent (1%) be used for pavements. These grades should be maintained for the life of the structures.

Landscaping and downspouts should be planned to prevent excessive watering or runoff adjacent to foundations. Backfill adjacent to the proposed structure perimeter should be properly compacted to minimize any water infiltration toward the foundation soils and under the concrete slab-on-grade.

CONSTRUCTION SPECIFICATIONS

All work on site shall be governed by the latest edition of the IBC and the Standard Specifications for Public Works Construction as accepted by Douglas County, except where modified herein.

LIMITATIONS

This report has been prepared in accordance with the currently accepted engineering practices in Nevada. The analysis and recommendations in this report are based upon exploration performed at the locations shown on the site plan, the proposed improvements as described in the Introduction section of this report and upon the property in its condition as of the date of this report. Lumos makes no guarantee as to the continuity of conditions as subsurface variations may occur between or beyond exploration points and over time. Any subsurface variations encountered during construction should be immediately reported to Lumos so that, if necessary, Lumos' recommendations may be modified.

This report has been prepared for and provided directly to the Client, and any and all use of this report is expressly limited to the exclusive use of the Client. The Client is responsible for determining who, if anyone, shall be provided this report, including any designers and subcontractor's whose work is related to this project. Should the Client decide to provide this report to any other individual or entity, Lumos shall not be held liable for any use by those individuals or entities to whom this report is provided. The Client agrees to indemnify, defend and hold harmless Lumos, its agents and employees from any claims resulting from unauthorized users.

This report shall not be utilized to create a maximum cost estimate for the costs associated with construction as costs may vary depending upon any subsurface variations encountered. Further, this report is not intended for, nor should it be utilized for, bidding purposes. All additional plans and specifications should be submitted to Lumos for review, comment and approval, prior to submission of such plans or specifications to the building department or commencement of construction pursuant to such plans or specifications. A failure to submit to Lumos additional plans and specifications related to this report, thereafter relied upon by any person, shall be deemed an unauthorized use of this report. Any unauthorized use of this report, including bidding, releases Lumos from any and all liability related to the unauthorized use. The Client agrees to indemnify, defend and hold harmless Lumos, its agents and employees from any and all claims, causes of action or liability arising from any claims resulting from an unauthorized use of this report.

As explained above, subsurface variations may exist and as such, beyond the express findings located in this report, no warranties express, or implied, are made by this report. No affirmation of fact, including but not limited to statements regarding suitability for use or performance shall be deemed to be a warranty of guaranty for any purpose.

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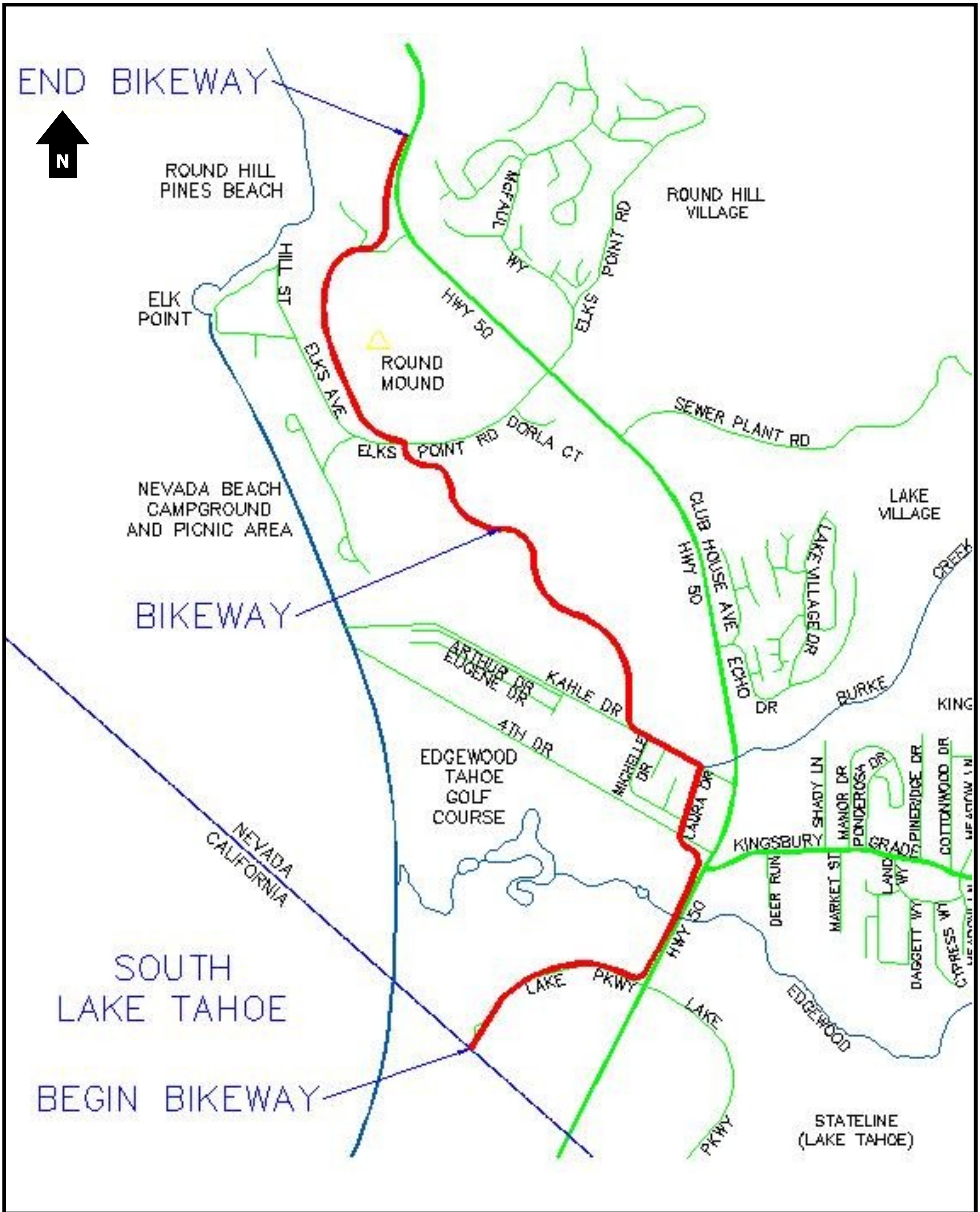

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South Demonstration Project

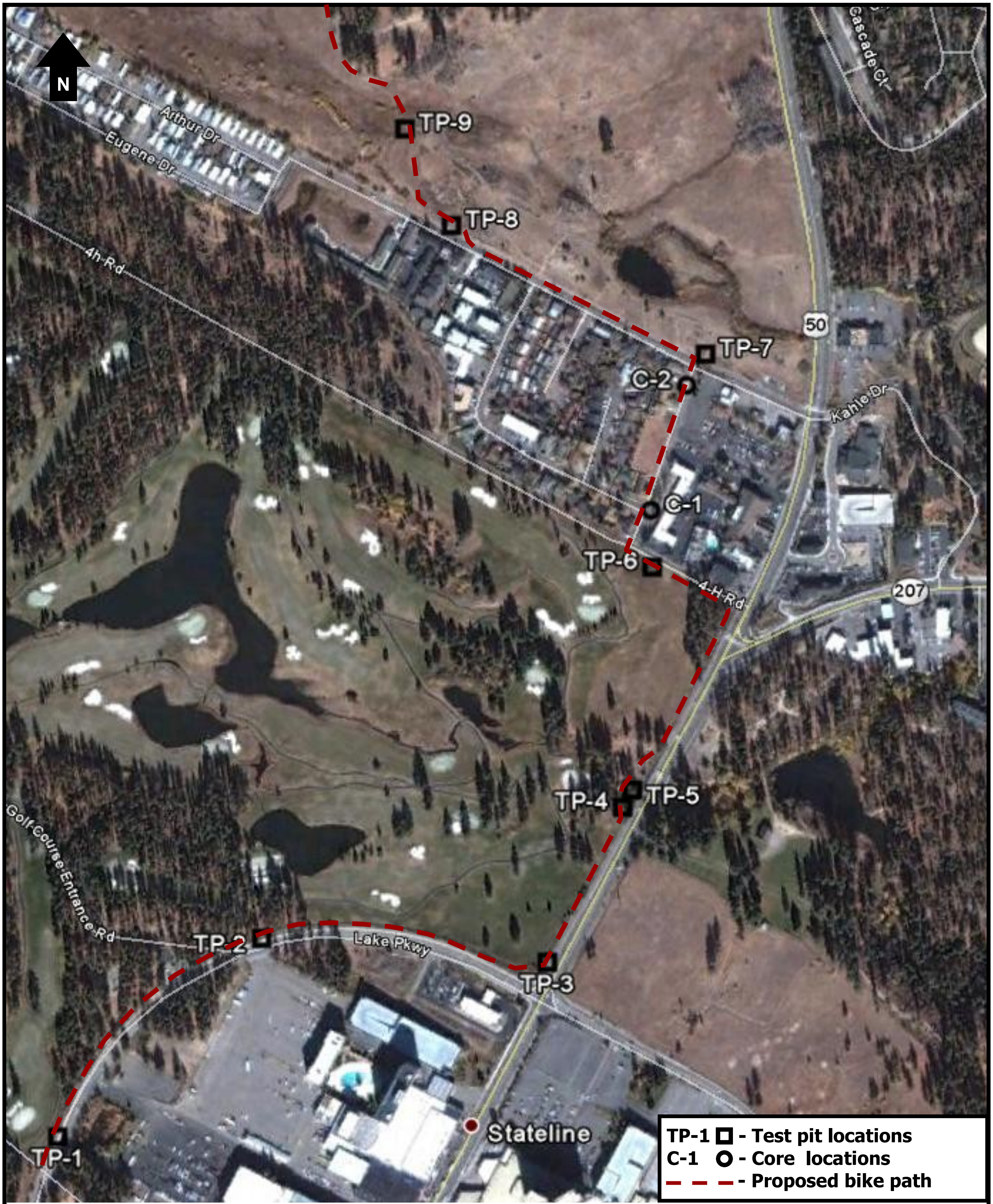
PROJECT LOCATION

Job Number: 7649.001

Date: January 26, 2011

PLATE

1



TP-1 ☐ - Test pit locations
C-1 ○ - Core locations
— — — - Proposed bike path

From: Google Earth

Not to Scale

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South Demonstration Project

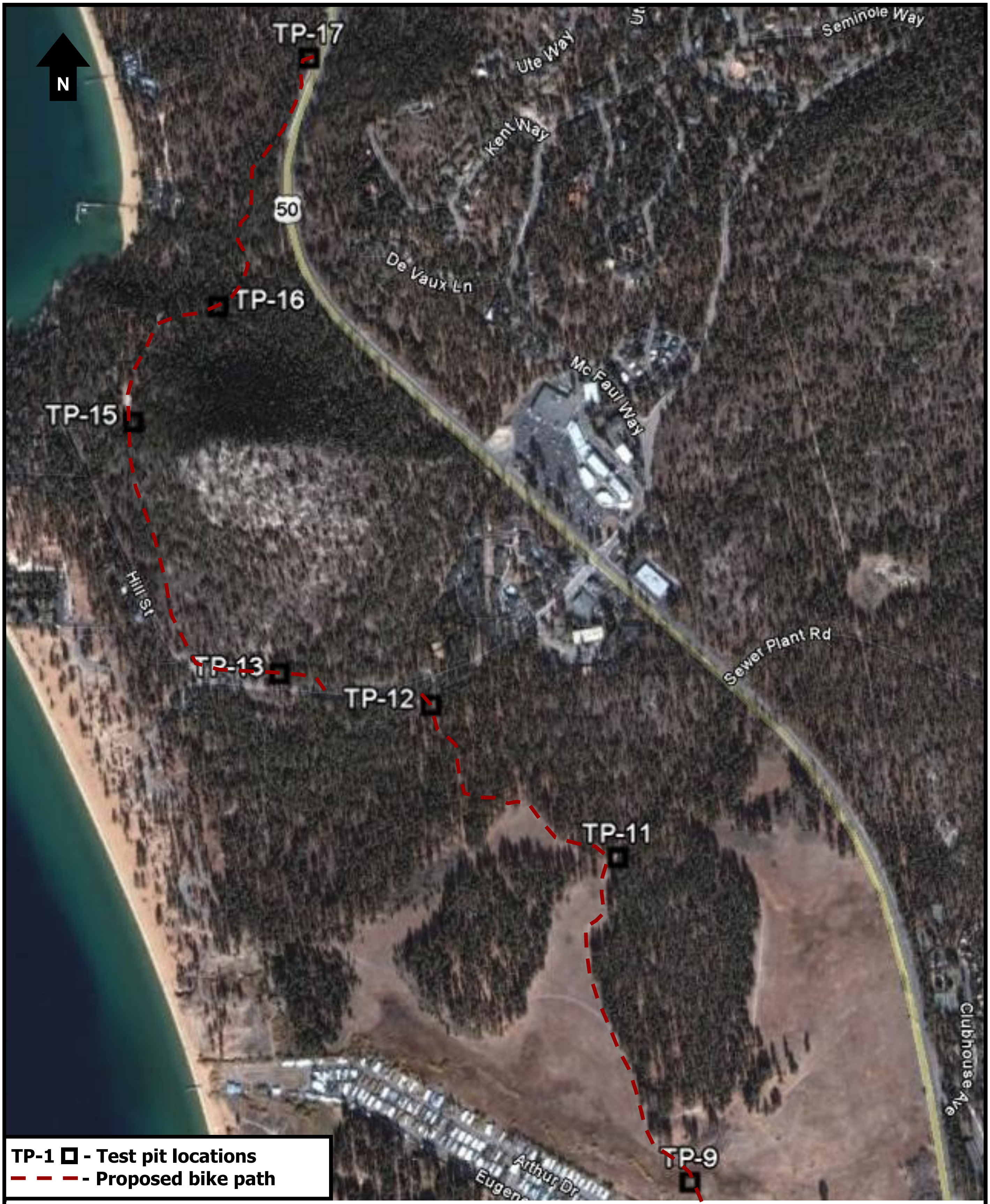
TEST PIT LOCATIONS

Job Number: 7649.001

Date: January 26, 2011

PLATE

2.1



TP-1 ☐ - Test pit locations
– – – - Proposed bike path

From: Google Earth

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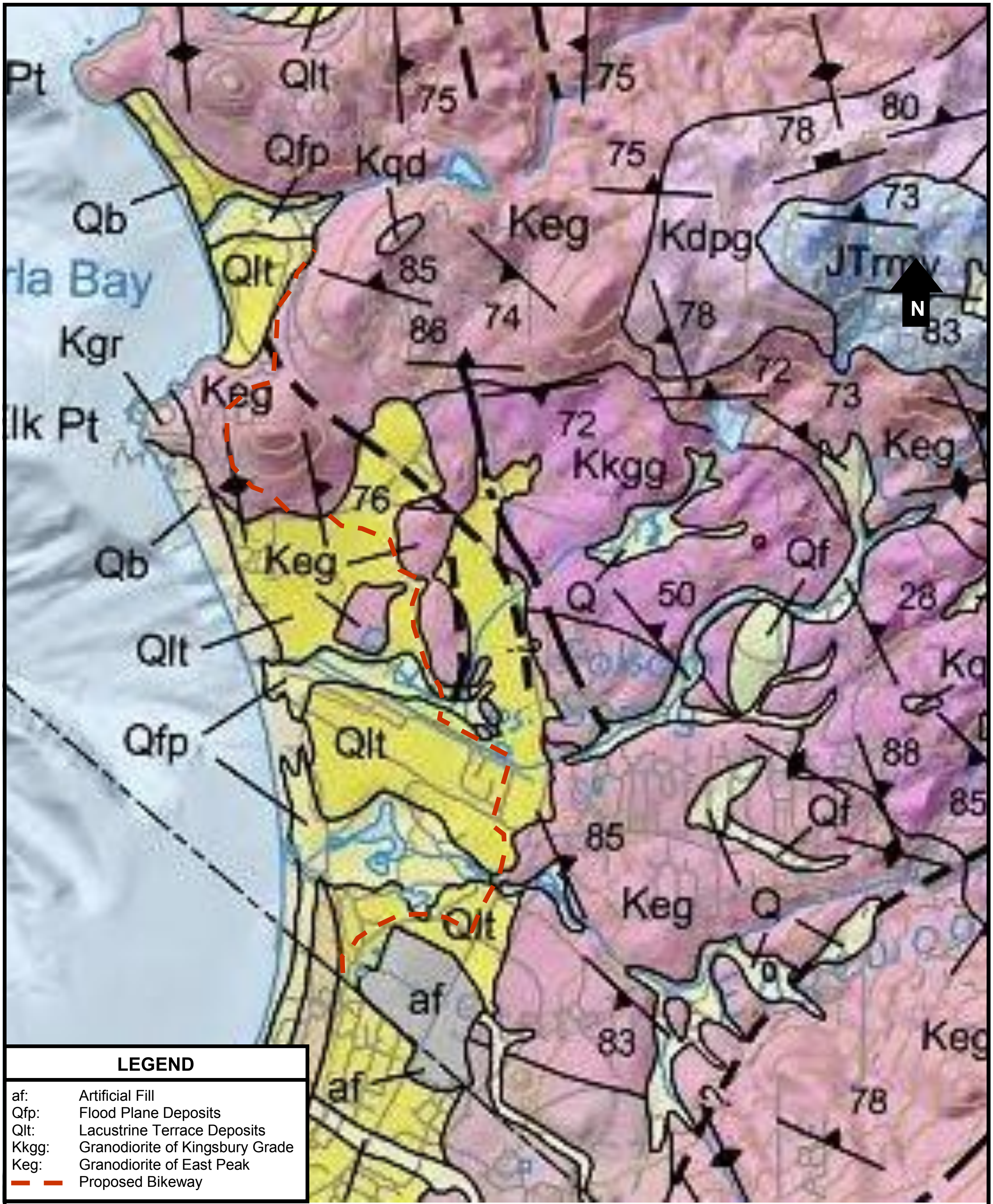
TEST PIT LOCATIONS

Job Number: 7649.001

Date: January 26, 2011

PLATE

2.2



LEGEND

af:	Artificial Fill
Qfp:	Flood Plane Deposits
Qlt:	Lacustrine Terrace Deposits
Kkgg:	Granodiorite of Kingsbury Grade
Keg:	Granodiorite of East Peak
– –	Proposed Bikeway

From: USGS, Geologic Map of the Lake Tahoe Basin, California and Nevada by TLT. Grose, 1986. By: George J. Saucedo, 2005.

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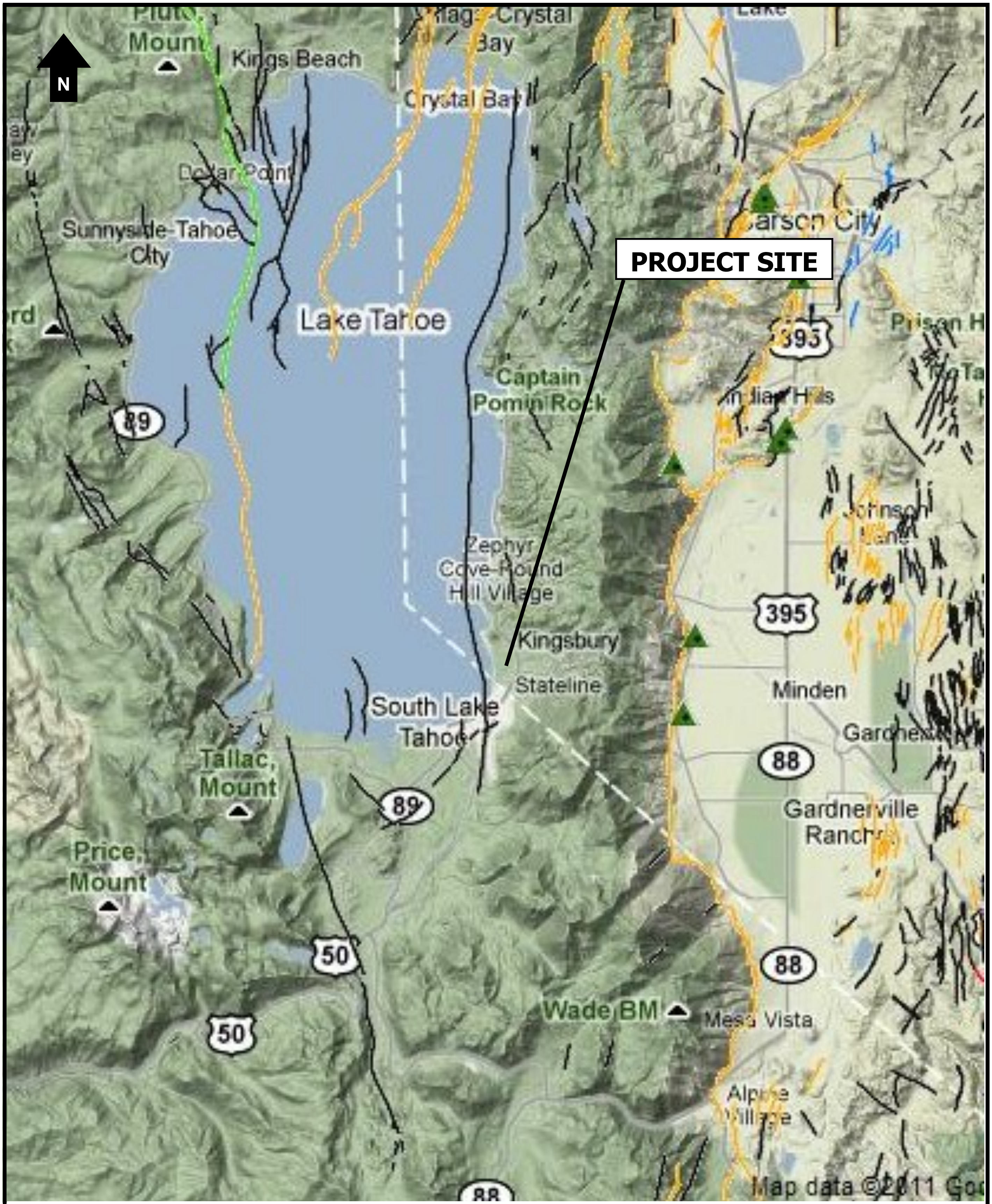
GEOLOGY MAP

Job Number: 7649.001

Date: March 1, 2011

PLATE

3



From: USGS Quaternary Fault and Fold database.

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South Demonstration Project Geotech

FAULT MAP

Job Number: 7873.000

Date: March 24, 2011

PLATE

4

Appendix A

TEST PIT No. TP-1

Logged By: **C. Borean**
Date Logged: **10-11-10**
Drill Type: **Backhoe**
Total Depth: **5.8 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

☰ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
	▨		FILL - Silty Sand trace Gravel, strong brown (7.5YR 4/6), slightly moist, moderately dense.										
1													
2													
3		B							3	80	17		
			@ 3.5' Asphalt concrete, approximately 0.2' thick.										
4													
5													

Test pit terminated at 5.8 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001
Date: January 2011

PLATE

A-1

TEST PIT No. TP-2

Logged By:	**C. Borean**	Total Depth:	**5.2 feet**
Date Logged:	**10-11-10**	Water Depth:	**No groundwater encountered**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

☰ Percolation Test ☒ Split Spoon Z Ziplock Sample
⧓ California Sampler B Bulk Sample ▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
	▨		FILL - Well graded Sand with Silt, brownish yellow (10YR 6/6), slightly moist, moderately dense.				NP	NP		90	10		
1	⠿		Silty Sand trace Gravel, reddish brown (5YR 4/6), slighty moist, moderately dense.										
2	⠿												
3	⠿						24	2	4	74	22		
4	⠿												
5	⠿												

Test pit terminated at 5.2 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001 Date: January 2011

PLATE

A-2

TEST PIT No. TP-3

Logged By: **C. Borean**
Date Logged: **10-11-10**
Drill Type: **Backhoe**

Total Depth: **1.9 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

☰ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
1	▨		FILL - Silty Sand with Gravel, dark brown (10YR 3/3), moist, loose. Practical refusal at 1.9' on utilities.										

Test pit terminated at 1.9 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001
Date: January 2011

PLATE

A-3

TEST PIT No. TP-4

Logged By: **C. Borean**
Date Logged: **10-11-10**
Drill Type: **Backhoe**

Total Depth: **4.1 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

☰ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
1	░		Silty Sand, yellowish brown, moist, loose to moderately dense.										
2 3 4	▨		Weathered granitic bedrock, gray, becoming medium dense to dense. Practical refusal at 4.1', difficult digging.										

Test pit terminated at 4.1 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001
Date: January 2011

PLATE

A-4

TEST PIT No. TP-5

Logged By:	**C. Borean**	Total Depth:	**3.4 feet**
Date Logged:	**10-11-10**	Water Depth:	**No groundwater encountered**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

☰ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
	░		Litter/Duff										
1	░		TOPSOIL - Silty Sand, yellowish brown, moist, loose to moderately dense.				NP	NP			11		
2 3	▨		Weathered granitic bedrock/boulders, gray, moderately dense to dense. Practical refusal at 3.4', difficult digging.										

Test pit terminated at 3.4 feet.
Test pit backfilled with excavated soils without compaction certification.

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Date: January 2011

PLATE

A-5

TEST PIT No. TP-6

Logged By: **C. Borean**
Date Logged: **10-11-10**
Drill Type: **Backhoe**
Total Depth: **12 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

☰ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
			Sitlty Sand trace Gravel, dark brown (7.5YR 3/3), moist, moderately dense.										
1													
2		B							6	75	19		
3													
4			Old turf line and buried topsoil. Silty Sand with Clay, black, moist, common rootlets, soft.										
5			Silty Sand trace Gravel, brown (7.5 YR 4/3), slightly moist, moderately dense.										
6													
7													
8		B							4	85	11		
9													
10													
11													
12													

Test pit terminated at 12 feet.
Test pit backfilled with excavated soils without compaction certification.

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Job Number: 7649.001
Date: January 2011

PLATE

A-6

TEST PIT No. TP-7

Logged By:	**C. Borean**	Total Depth:	**15 feet**
Date Logged:	**10-11-10**	Water Depth:	**14 feet ±**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

▤ Percolation Test
☒ Split Spoon
Z Ziplock Sample
▼ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
0			Silty Sand trace Gravel, dark brown (7.5YR 3/2), moist, loose.										
1													
2			Silty Sand, very dark gray (10YR 3/1), moist, moderately dense.										
3		B					27	3		73	27		
4													
5			Sandy Clay, very fine grained, black (10YR 2/1), moist, soft, medium plasticity. Sandy Silt, dark brown (7.5YR 3/2), moist, trace redox, slight mottling.										
6													
7													
8		B									28		
9													
10													
11			Clayey Sand, very dark brown, wet, soft, buried wood.										
12													
13													
14			▼ Seepage.										
15													

Test pit terminated at 15 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001 Date: January 2011

PLATE

A-7

TEST PIT No. TP-8

Logged By: **C. Borean**
Date Logged: **10-11-10**
Drill Type: **Backhoe**
Total Depth: **5.3 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

▤ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
			FILL - Silty Sand trace Gravel, dark reddish brown (5YR 3/2), slightly moist, loose.										
1			Clayey Sand, very dark grayish brown, moist, moderately dense, some roots to 2" dia.										
2 3			Sandy Clay, brown (7.5YR 4/2), moist, moderately dense, some mottling to 5mm, yellowish red (5YR 5/8).										
4 5			Clayey Sand, grayish brown (10YR 5/2), moist, moderately dense, some mottling strong brown (7.5YR 5/6).										

Test pit terminated at 5.3 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001
Date: January 2011

PLATE
A-8

TEST PIT No. TP-9

Logged By:	**C. Borean**	Total Depth:	**10 feet**
Date Logged:	**10-11-10**	Water Depth:	**5 feet ±**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

☰ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
			Clayey Sand, very dark gray (7.5YR 3/1), moist, loose.										
1			Clayey Sand, very dark grayish brown (10YR 3/2), moist, moderately dense.										
2													
3		B	Sandy Clay, very fine grained, very dark gray with lenses of fine grained sand, light gray, wet, soft.				38	13	1	60	39		
4			Clayey Sand, gray, wet, moderately dense.										
5			▼ Seepage.										
6													
7		B							4	77	20		
8													
9													
10													

Test pit terminated at 10 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001
Date: January 2011

PLATE

A-9

TEST PIT No. TP-11

Logged By:	**C. Borean**	Total Depth:	**5.7 feet**
Date Logged:	**10-13-10**	Water Depth:	**No groundwater encountered**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

▤ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
1			Silty Sand, dark yellowish brown (10YR 4/6), moist, loose.										
2 3 4 5			Silty Sand, pale brown (10YR 6/3), moist, moderately dense.										

Test pit terminated at 5.7 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001

Date: January 2011

PLATE

A-10

TEST PIT No. TP-12

Logged By: C. Borean
Date Logged: 10-11-10
Drill Type: Backhoe
Total Depth: 4.8 feet
Water Depth: No groundwater encountered
Ground Elev.: Not Surveyed

☰ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
	▨		TOPSOIL - Silty Sand, brown, moist, loose.										
1 2 3 4	▨		Silty Sand, yellowish red (5YR 4/6), moderately dense.										

Test pit terminated at 4.8 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001

Date: January 2011

PLATE

A-11

TEST PIT No. TP-13

Logged By: **C. Borean**
Date Logged: **10-11-10**
Drill Type: **Backhoe**

Total Depth: **7.4 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

☰ Percolation Test	☒ Split Spoon
Z Ziplock Sample	⧓ California Sampler
B Bulk Sample	▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
1 2 3 4 5 6	▨		FILL - Silty Sand, brown (7.5YR 4/3), moist, moderately dense, miscellaneous debris common natural wood debris.				NP	NP		84	16		
7	⠿		Silty Sand, gray, slightly moist, dense.										

Test pit terminated at 7.4 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001
Date: January 2011

PLATE
A-12

TEST PIT No. TP-15

Logged By: **C. Borean**
Date Logged: **10-11-10**
Drill Type: **Backhoe**
Total Depth: **7.3 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

▤ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
1	▨		TOPSOIL/FILL - Silty Sand trace Gravel, brown (10YR 4/3), moist, moderately dense.										
2 3 4 5 6 7	⁘		Silty Sand trace gravel, very pale brown (10YR 7/4), slightly moist, medium dense.										

Test pit terminated at 7.3 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001
Date: January 2011

PLATE
A-13

TEST PIT No. TP-16

Logged By:	**C. Borean**	Total Depth:	**5.3 feet**
Date Logged:	**10-11-10**	Water Depth:	**No groundwater encountered**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

▤ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
			Silty Sand, light yellowish brown (2.5Y 6/4), dry moderately dense.										
1													
2													
3													
			Decomposed Granite "freshens", becoming dense.										
4													
5													

Test pit terminated at 5.3 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001
Date: January 2011

PLATE
A-14

TEST PIT No. TP-17

Logged By:	**C. Borean**	Total Depth:	**5.4 feet**
Date Logged:	**10-12-10**	Water Depth:	**No groundwater encountered**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

☰ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧗ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
	▩	B	FILL - Silty Sand trace Gravel, dark brown, (7.5 YR 3/3), moist, moderately dense.				NP	NP	5	72	23		
1 2 3 4 5	⁙		Silty Sand trace gravel, strong brown (7.5 YR 4/6), slightly moist, moderately dense, some roots to 3/8" dia.										

Test pit terminated at 5.4 feet.
Test pit backfilled with excavated soils without compaction certification.

LUMOS_TP_FULL_PAGE 7649001.GPJ US_LAB.GDT 1/13/11

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001 Date: January 2011

PLATE

A-15

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	○	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
			●	GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	●	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			▨	GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	⁘	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			⁘	SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	SM	SILTY SANDS, SAND - SILT MIXTURES
			▨	SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▥	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			▤	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▥	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY
			▨	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			≋	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Other Tests

AN	ANALYTICAL TEST (pH, Soluble Sulfate, and Resistivity)
C	CONSOLIDATION TEST
DS	DIRECT SHEAR TEST
MD	MOISTURE DENSITY CURVE

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LEGEND

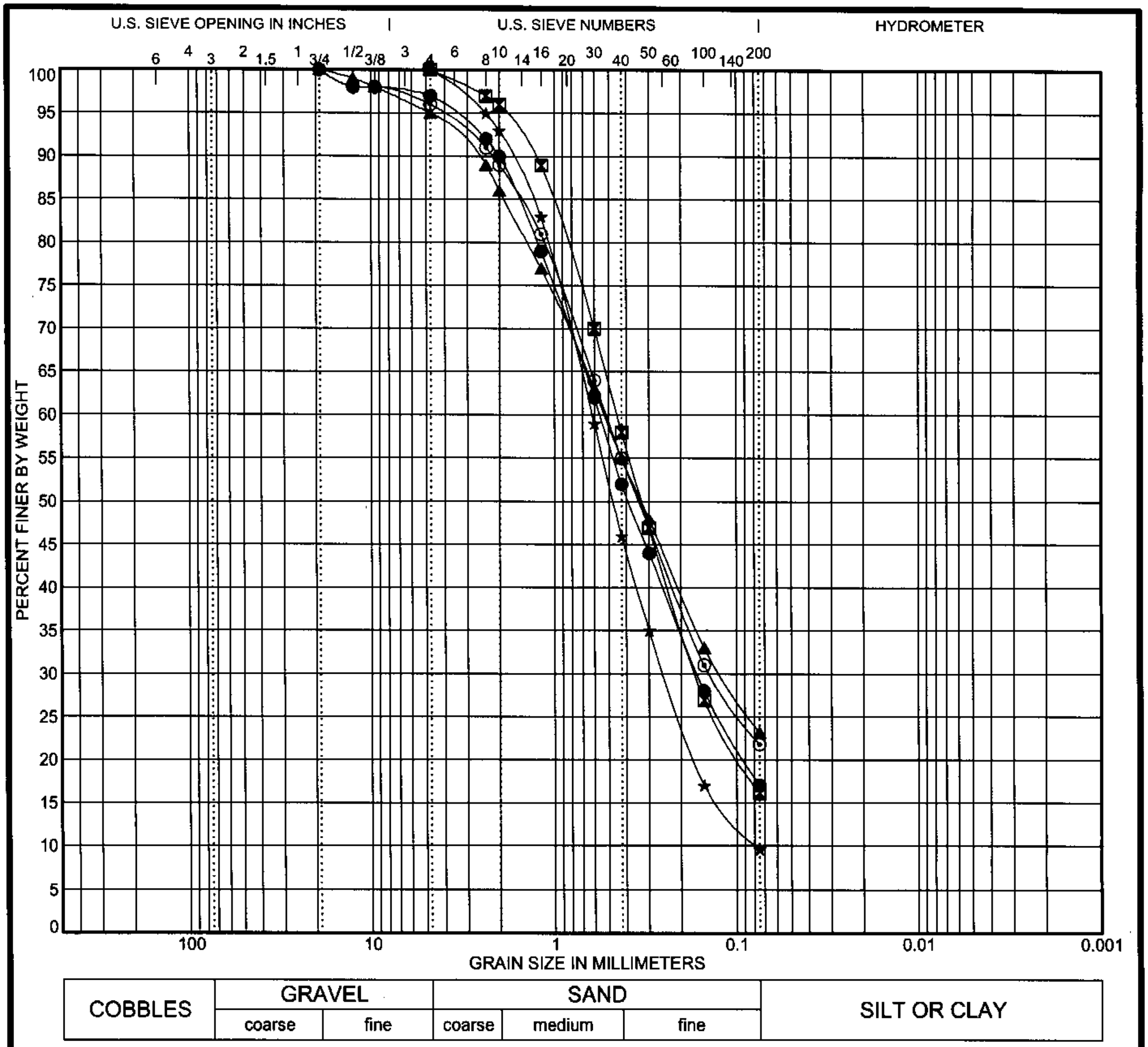
Job Number: 7649.001

Date: February 2011

PLATE

A-16

Appendix B



Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	TP-1	0.0	SILTY SAND (SM)					
⊠	TP-13	0.0	SILTY SAND(SM)	NP	NP	NP		
▲	TP-17	0.0	SILTY SAND(SM)	NP	NP	NP		
★	TP-2	0.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP	1.27	7.93
⊙	TP-2	1.0	SILTY SAND(SM)	24	22	2		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-1	0.0	19	0.56	0.164		3	80	17	
⊠	TP-13	0.0	4.75	0.45	0.166			84	16	
▲	TP-17	0.0	19	0.527	0.121		5	72	23	
★	TP-2	0.0	4.75	0.617	0.247	0.078		90	10	
⊙	TP-2	1.0	19	0.515	0.139		4	74	22	

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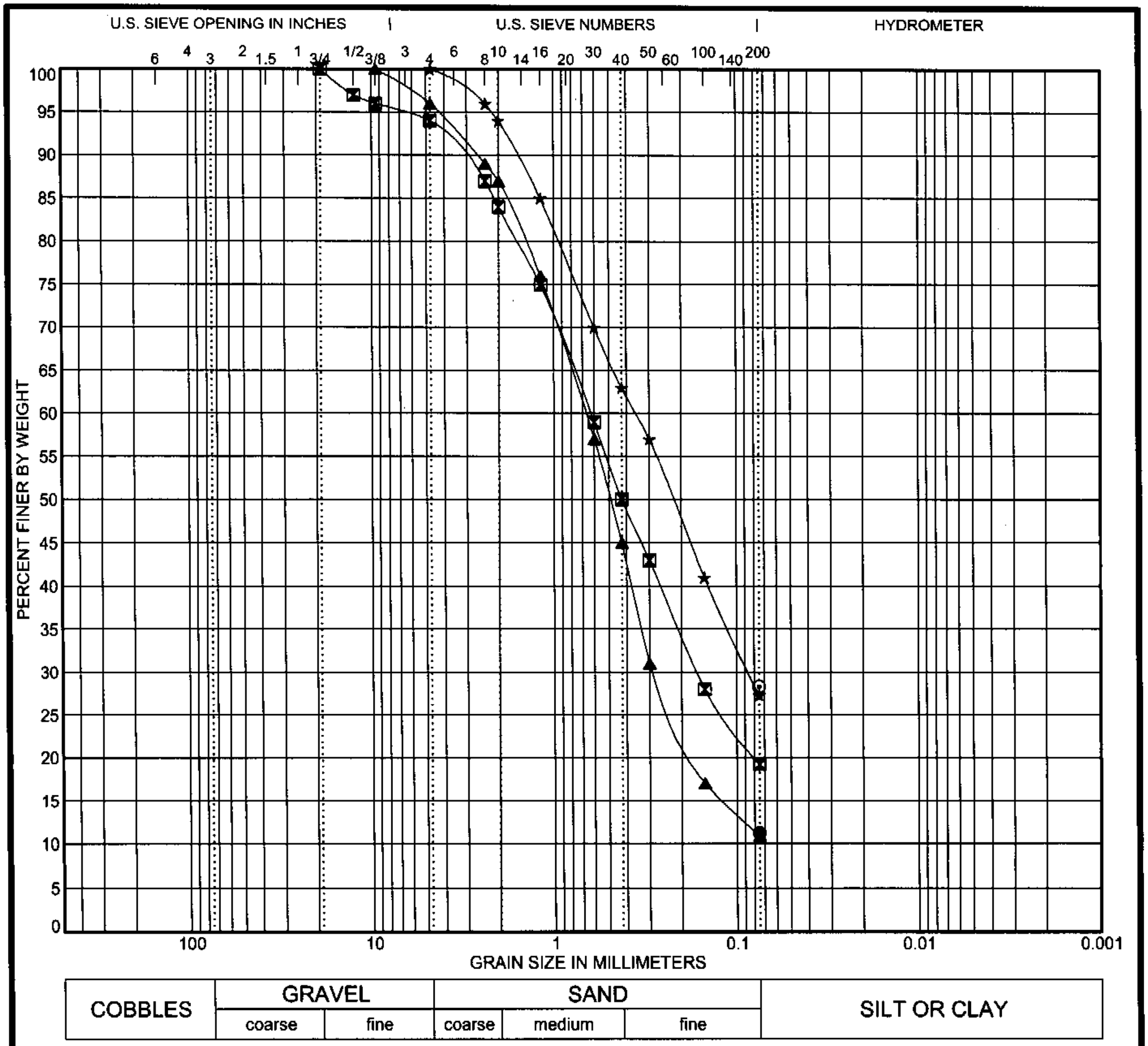
GRAIN SIZE DISTRIBUTION

Job Number: 7649.001

Date: December 2010

PLATE

B-1.1



Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	TP-5	0.4	SILTY SAND (SM)	**NP**	**NP**	**NP**		
☒	TP-6	0.0	SILTY SAND (SM)					
▲	TP-6	4.5	SILTY SAND (SM)				**1.80**	**9.86**
★	TP-7	2.0	SILTY SAND(SM)	**27**	**24**	**3**		
⊙	TP-7	5.0	SILTY SAND (SM)					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-5	0.4	**0.075**						**11**	
☒	TP-6	0.0	**19**	**0.626**	**0.165**		**6**	**75**	**19**	
▲	TP-6	4.5	**9.5**	**0.668**	**0.286**		**4**	**85**	**11**	
★	TP-7	2.0	**4.75**	**0.357**	**0.086**			**73**	**27**	
⊙	TP-7	5.0	**0.075**						**28**	

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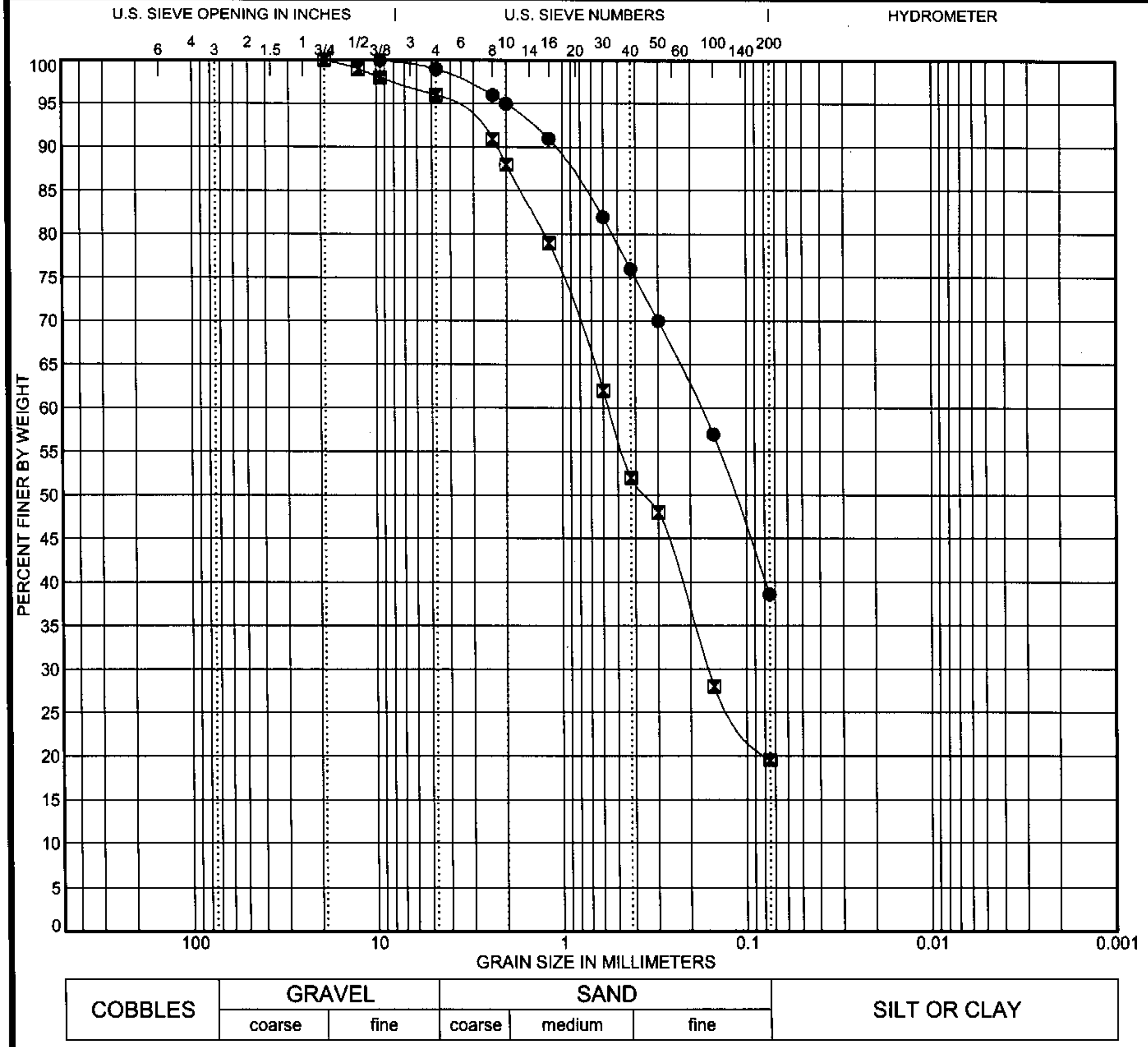
GRAIN SIZE DISTRIBUTION

Job Number: 7649.001
Date: December 2010

PLATE

B-1.2

LUMOS STREET GRAIN SIZE 7649001.GPJ US LAB.GDT 12/20/10



Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	TP-9	2.7	SILTY SAND(SM)	38	25	13		
☒	TP-9	3.5	SILTY SAND (SM)					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-9	2.7	9.5	0.176			1	60	39	
☒	TP-9	3.5	19	0.56	0.161		4	77	20	

LUMOS_STREET_GRAIN_SIZE_7649001.GPJ_US_LAB.GDT 12/20/10

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South Demo Geotech

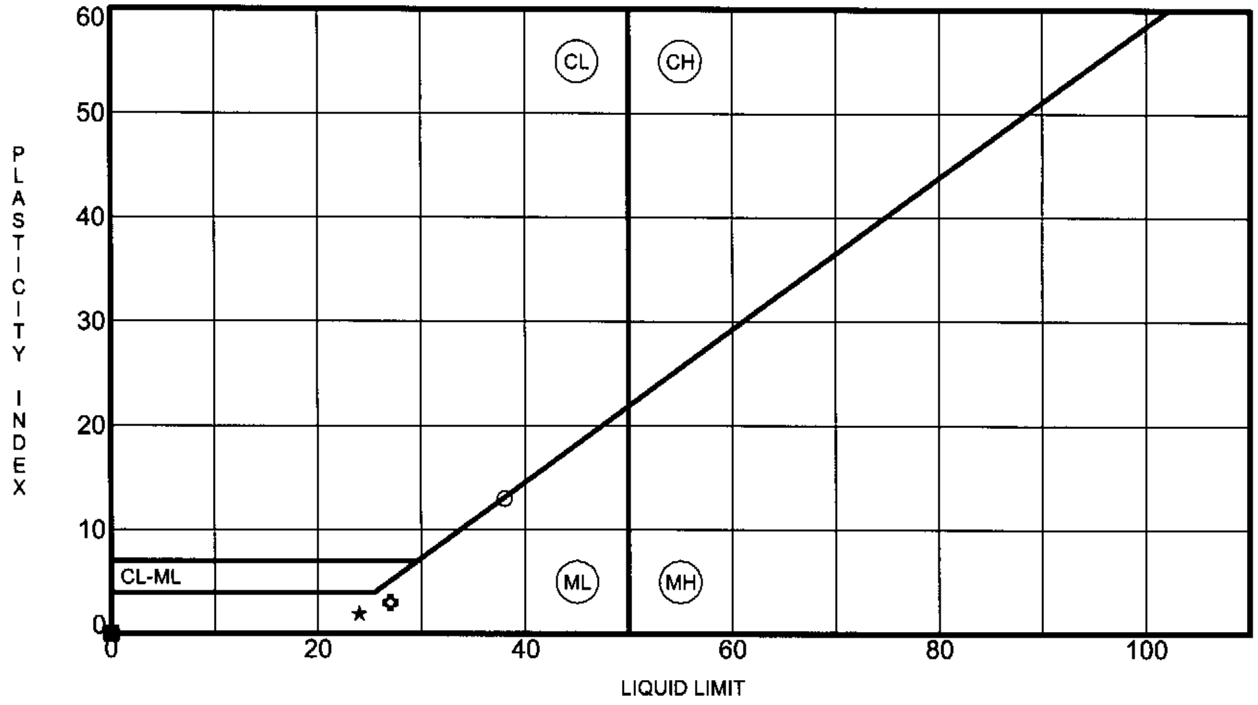
GRAIN SIZE DISTRIBUTION

Job Number: 7649.001

Date: December 2010

PLATE

B-1.3



	Specimen Identification		LL	PL	PI	Fines	Classification
●	TP-13	0.0	**NP**	**NP**	**NP**	**16**	SILTY SAND(SM)
⊠	TP-17	0.0	**NP**	**NP**	**NP**	**23**	SILTY SAND(SM)
▲	TP-2	0.0	**NP**	**NP**	**NP**	**10**	WELL-GRADED SAND with SILT(SW-SM)
★	TP-2	1.0	**24**	**22**	**2**	**22**	SILTY SAND(SM)
⊙	TP-5	0.4	**NP**	**NP**	**NP**	**11**	SILTY SAND (SM)
✿	TP-7	2.0	**27**	**24**	**3**	**27**	SILTY SAND(SM)
○	TP-9	2.7	**38**	**25**	**13**	**39**	SILTY SAND(SM)

LUMOS STREET ATTERBERG LIMIT 7649001.GPJ US LAB.GDT 12/20/10

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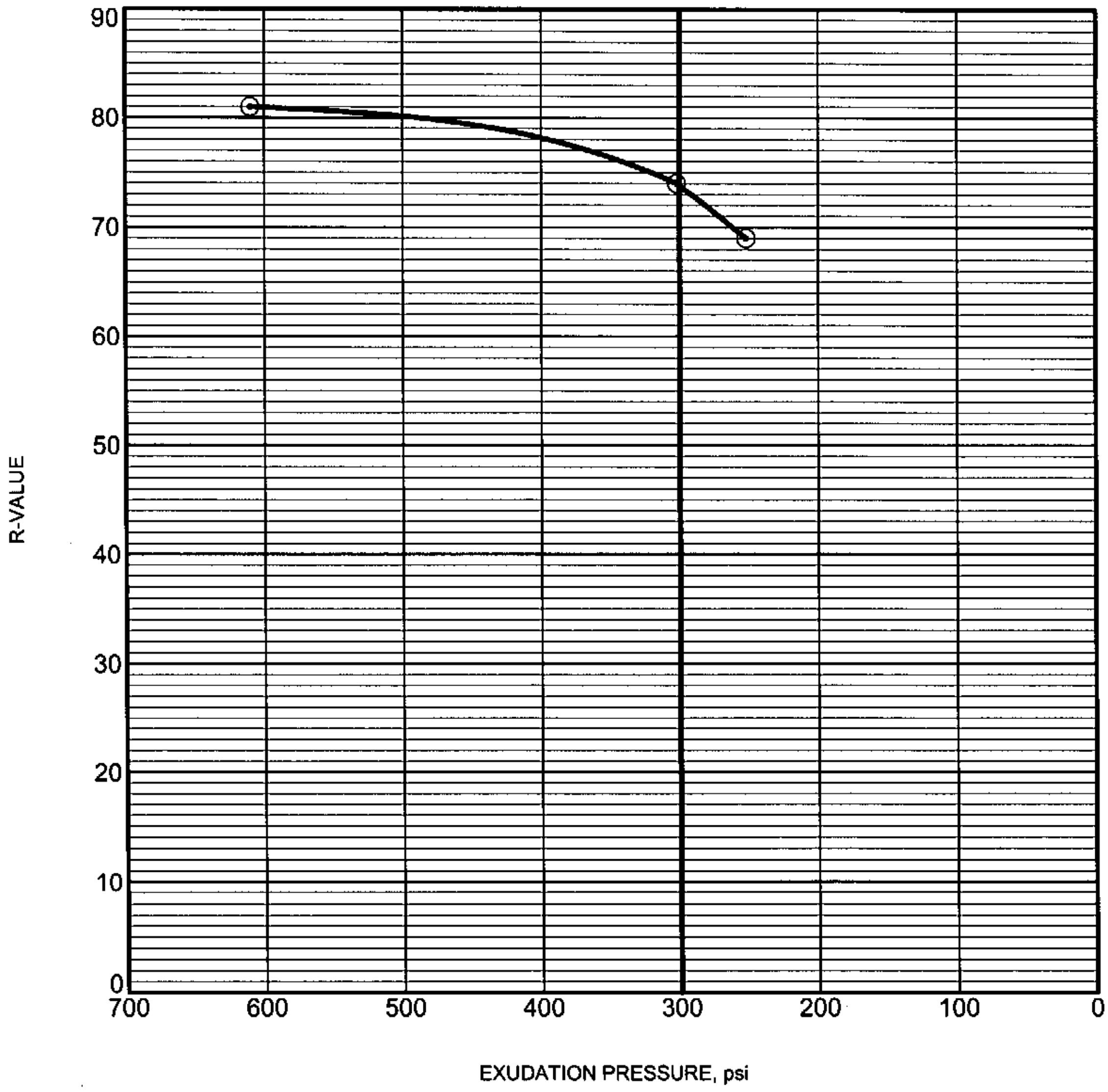
ATTERBERG LIMITS' RESULTS

Job Number: 7649.001

Date: December 2010

PLATE

B-2



Test Data

Specimen No.	Water Content (%)	Dry Density (pcf)	Expansion (psf)	Exudation (psi)	Test R-Value*
1	11.5	121.2	0.0	610.0	81.0
2	12.5	120.2	0.0	302.0	74.0
3	13.5	118.5	0.0	252.0	69.0

* Reported values have been corrected for sample height, where required.

Test Result

Specimen Identification		Classification	R-Value
TP-2	0.0	WELL-GRADED SAND with SILT(SW-SM)	74

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RESISTANCE VALUE TEST

Job Number: 7649.001 Date: March 2011

PLATE

B-3

Atlas Consultants, Inc.

6000 S. Eastern Avenue, Suite 10J • Las Vegas, Nevada 89119
(702) 383-1199 • Fax (702) 383-4983

CHEMICAL
PHYSICAL

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AMERICAN SOCIETY FOR
TESTING MATERIALS

LABORATORY NO:	16051(a)	**DATE:**	December 21, 2010
SAMPLE:	Soil	**P.O.:**	
MARKED:	6869.00	**LAB ID:**	
SUBMITTED BY:	Lumos-Chico	**SOIL SIEVE =**	-10
ANALYZED BY:	Kurt D. Ergun		

REPORT OF DETERMINATION

BORING NUMBER	TP-5					
DEPTH (feet)	0.4-1.3					
pH VALUE	9.50					
SULFATE (mg/Kg)	83					
RESISTIVITY (Ohm-cm)	14,000					

Kurt D. Ergun

LABORATORY DIRECTOR

NOTES:

1. The soil:water extract ratio was 1:5, the results are in mg/Kg in the soil.
2. The standard methods used for the determinations are AWWA 4500 H pH Value, AWWA 4500-SO_4 E Turbidimetric and ASTM G 57 Resistivity.

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South Demonstration Project

Analytical Results

Job Number: 7649.001

Date: March 1, 2011

PLATE

B-4

Appendix C

SPECIFICATIONS FOR DEMOLITION

Demolition shall include the removal of all designated structures/improvements to be removed, i.e. existing structures, asphalt pavements, utilities, pipes and unsuitable material within the project area. Excavations caused by removal of existing structure/improvements and utilities shall be cleared of all waste, debris and loose/unstable soils and refilled with properly compacted fill, as specified under the "General Site Grading" section of this report. All fill compaction should be performed under observation and testing by the Geotechnical Engineer.

Broken concrete, asphalt and other materials shall be considered waste and shall be removed from the site.

Any existing drain lines, wires, utilities, etc., which are to remain on the site shall be protected from damage. Buried drain lines, pipe conduits, utilities, etc. which are necessarily cut shall be either carefully and permanently capped at the property line as specified by the County Engineer or re-routed as necessary. Utility lines not specifically noted for disposition, but which are encountered in the work shall be capped, extended, protected or re-routed as necessary for completion of the work, as directed.

All work shall be performed in accordance with the Federal Occupational Safety and Health Administration, the local Division of Occupational Safety and Health requirements, and applicable ordinances of the governing municipality.

Care shall be taken not to damage adjoining utilities or structures to remain after completion of the work. Finished work damaged by operations during demolition and site preparation shall be repaired or replaced to the satisfaction of the Owner at no cost to the Owner.

All materials resulting from demolition and site preparation not designated by the Owner to be recovered or to be relocated by the Contractor, shall be removed promptly and disposed of off the site.

Upon completion of demolition and site preparation, the site shall be "raked clean", if applicable, and all waste, rubble, debris, etc. shall be removed and disposed of off the site.

Appendix D

GUIDE SPECIFICATIONS FOR HELICAL PIER INSTALLATION

1. Pier installation shall be preformed during continuous observation by Lumos & Associates Inc. (Lumos) to confirm that the recommended earth materials are penetrated, that the dimensions of the installed piers are as indicated on the foundation plan, and that pier installation has been performed as specified. The contractor shall provide access and necessary facilities, at contractor expense, to accommodate pier observation.

2. Pier installation shall be performed such that compliance with all safety rules and requirements is achieved. Equipment, reinforcement, and other items required for installation shall be kept a safe distance from all utility lines.

3. Helical piers shall be designed and installed as foundations to support the boardwalk in accordance with the design loads specified on the approved construction drawings. The Contractor shall submit signed shop drawings, including material sizing, design calculations, and installation procedures from manufacturer, for approval prior to installation. The helical piers shall conform to the manufacturer's specifications.

4. Piers shall be located as indicated on the drawings. Any pier installed off plan centerlines may require reconstruction. The cost of work or materials resulting from correcting an error in location of piers shall be borne by the contractor.

5. Skewed helical piers shall be provided for stability in accordance with manufacturer's recommendations.

6. Pier tip shall extend a minimum of five feet below existing grade, unless otherwise approved by Lumos. In the event that rock material is encountered prior to achieving full depth, the contractor shall adjust pier placement and/or dowel the vertical support into the rock in a manner acceptable to the Structural Engineer and/or Lumos.

7. Any piers deemed defective shall be replaced with substitute piers as directed by the Structural Engineer. The cost of installation of such substitute piers shall be borne by the contractor. Costs associated with analysis and design of substitute piers shall also be borne by the contractor.

Appendix E

SOILS/HYDROLOGIC SCOPING REPORT

for

Nevada Stateline to Stateline Bikeway
South Demonstration Project

Stateline, Nevada

Prepared for:

Tahoe Regional Planning Agency
P.O. Box 5310
Stateline, Nevada 89449

Prepared by:

LUMOS & ASSOCIATES, INC.
800 E. College Pkwy,
Carson City, NV 89706
Tel: (775) 883-7707
Fax: (775) 883-7114

March 2011

JN: 7649.001

SOILS/HYDROLOGY SCOPING REPORT
For
NEVADA STATELINE TO STATELINE BIKEWAY
SOUTH DEMONSTRATION PROJECT
Stateline, Nevada

Submitted herein are the results of Lumos & Associates, Inc. (Lumos) soils/hydrology scoping report for the proposed South Demonstration Project in Stateline, NV (Plates 1 & 2). The project will consist of an approximately three (3) mile stretch of paved shared use-path beginning on Lakeview Parkway at the California/Nevada state line on the south shore of Lake Tahoe and ending at U.S. 50 approximately 0.3 miles north of the entrance of Round Hill Pines Beach. The proposed bikeway will include areas of cut and fill, creek crossings using bridges and raised boardwalks, and new structures and improvements such as a restroom, a parking lot, and retaining walls as required. The proposed path crosses Douglas County APN's 1318-15-401-001, 1318-22-001-001, 1318-22-001-002, 1318-22-001-009, 1318-22-002-017, 1318-27-001-001 and 1318-27-001-004.

In October of 2010 Lumos utilized a rubber-tired backhoe to examine subsurface soil conditions. Within the project site seven (7) test pits were excavated to a maximum depth of fifteen (15) feet below ground surface (bgs) or practical refusal for soil/hydro observation. Excavation locations are shown on Plates 2.1 and 2.2. It should be noted that this field investigation was conducted in tandem with Lumos' geologic field investigation. While fifteen (15) test pit locations are represented on plates 2.1 and 2.2, only the seven logs that are required for this investigation, namely TP-4 to TP-9 and TP-15 are included in this report. Subsurface materials were continuously logged and visually classified in the field by our Field Technician in accordance with the Unified Soil Classification System (USCS). Representative soils samples were collected at various intervals shown on the logs (Appendix A). All test pits were backfilled with excavated material without compaction certification.

Three supplemental hand auger borings were excavated in the area of the proposed restroom structure and parking lot near the north east corner of the US 50/Kahle Drive intersection. Hand auger locations and logs are located in Appendix A of this report.

Subsurface materials generally consist of layers of dark reddish brown fill, topsoil and native layers of dark brown to grayish brown silty sand.

Groundwater, in the form of seepage was encountered in TP-7 at 14 feet bgs and TP-9 at 5 feet bgs.

Evidence of seasonal high groundwater in the form of oxidation and reduction was observed in test pits TP-7 through TP-9 and hand augers HA-1 through HA-3. No evidence of seasonal high groundwater was observed in test pits TP-4 through TP-6 and TP-15. Table-1 lists our estimated seasonal high groundwater depths below existing ground surface based on our observations and interpretations. A TRPA representative collected field notes and soil samples during the excavation of some test pits. It should be noted that Lumos' logs were compiled from detailed observations and logging within the excavation with a cleaned trench wall.

Table 1

Interpreted Depth to Seasonal High Groundwater

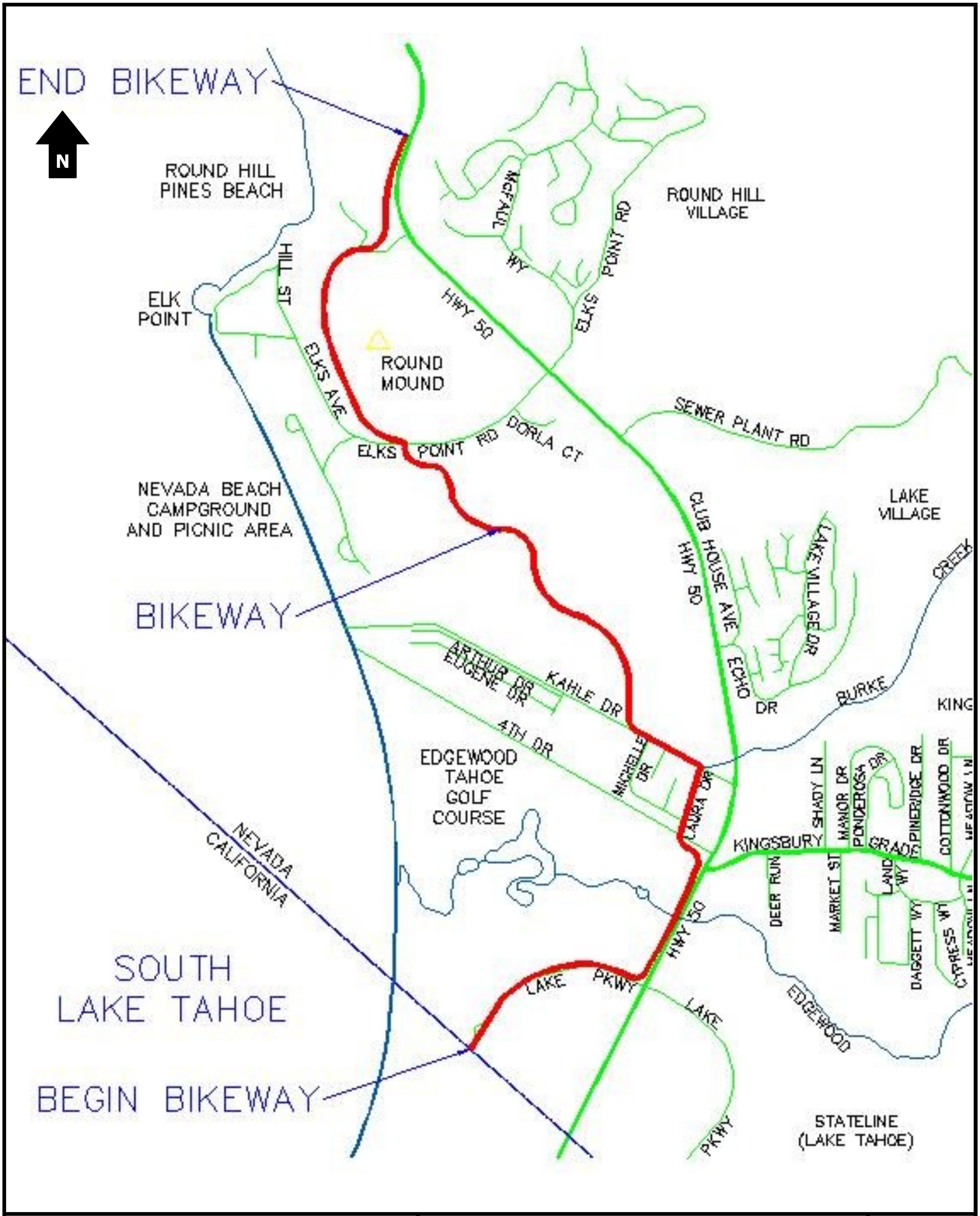
TP-7	60″ bgs
TP-8	18″ bgs
TP-9	12″ bgs
HA-1	36″ bgs
HA-2	30″ bgs
HA-3	16″ bgs

If you have any questions or require and additional information, please contact the undersigned at (530) 899-9503.

PROFESSIONAL ENGINEER - STATE OF NEVADA
DAVID A.
SULLIVAN
3-2-11
CIVIL
Exp. 6-30-12
No. 15445

David A. Sullivan, MBA, PE
Construction Services Engineer
Lumos & Associates, Inc.

Chad Borean
Engineering Technician
Lumos & Associates, Inc.



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South Demonstration Project

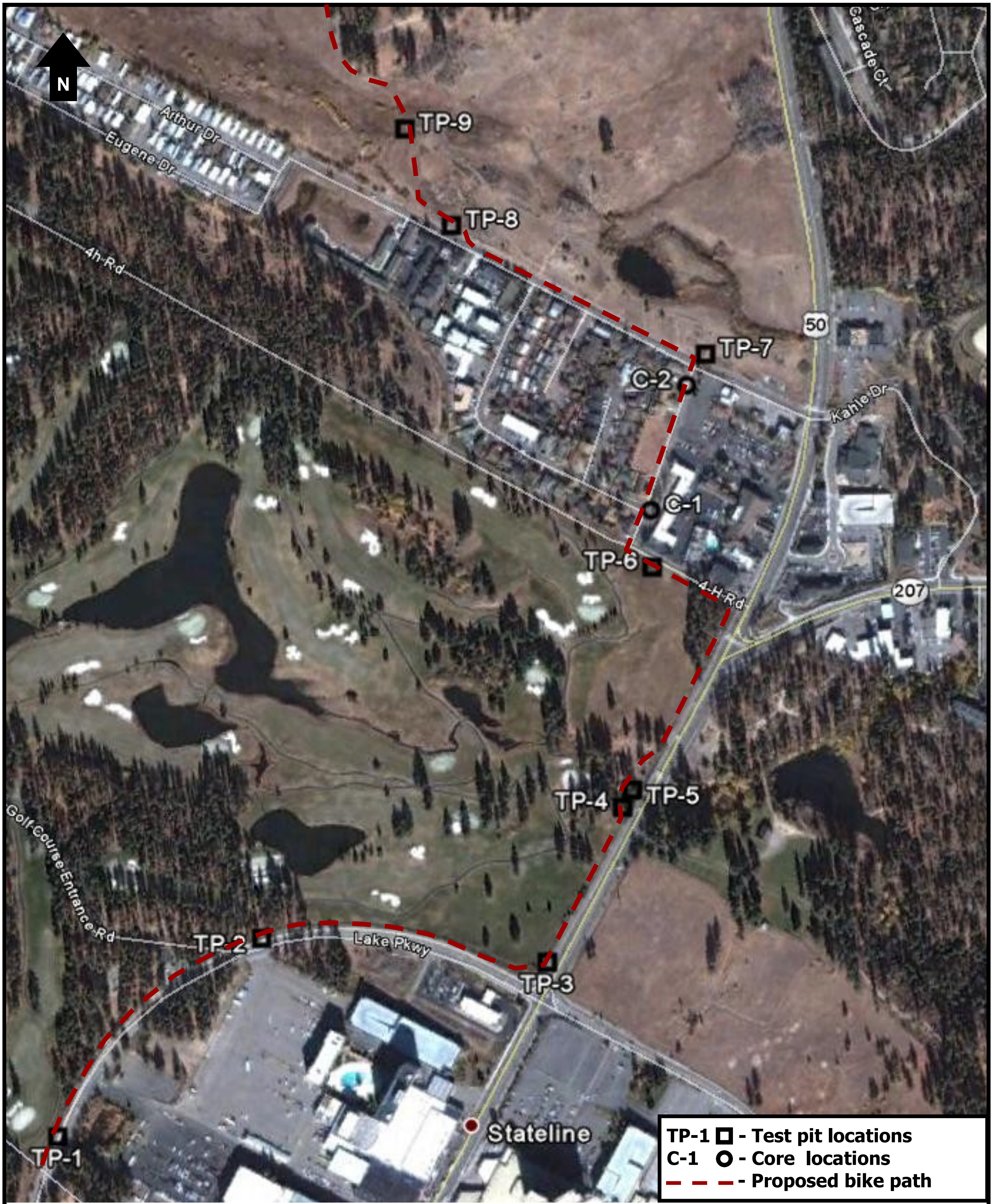
PROJECT LOCATION

Job Number: 7649.001

Date: January 26, 2011

PLATE

1



From: Google Earth

Not to Scale

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South Demonstration Project

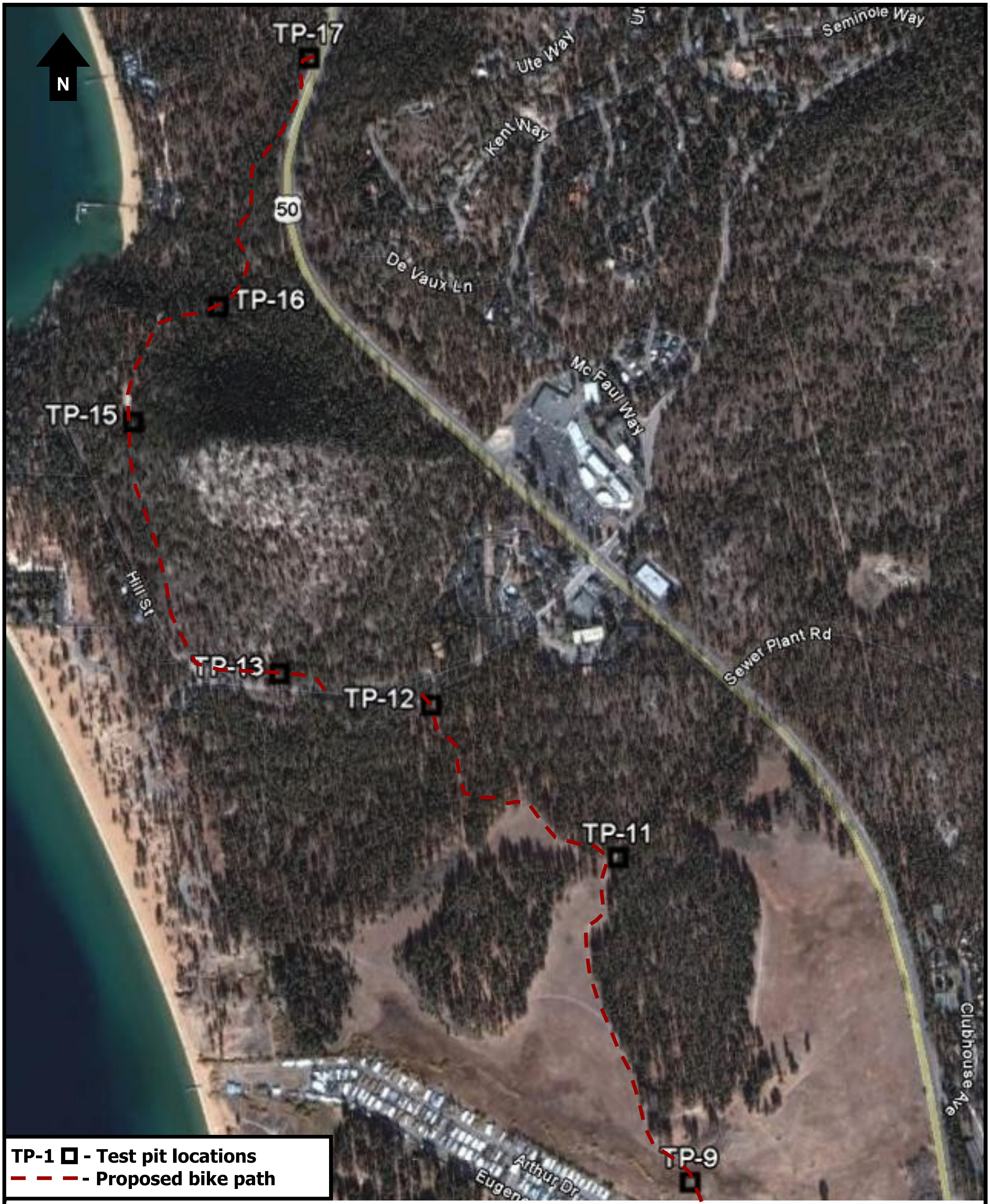
TEST PIT LOCATIONS

Job Number: 7649.001

Date: January 26, 2011

PLATE

2.1



From: Google Earth

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TEST PIT LOCATIONS

Job Number: 7649.001

Date: January 26, 2011

PLATE

2.2

Appendix A

TEST PIT No. TP-4

Logged By:	**C. Borean**	Total Depth:	**4.1 feet**
Date Logged:	**10-11-10**	Water Depth:	**No groundwater encountered**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

☰ Percolation Test	☒ Split Spoon	Z Ziplock Sample
⧗ California Sampler	B Bulk Sample	▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
1	░	Z	Silty Sand, yellowish brown, moist, loose to moderately dense.										
2	▨		Weathered granitic bedrock, gray, becoming medium dense to dense. Practical refusal at 4.1', difficult digging.										
3	▨	Z											
4	▨												

Test pit terminated at 4.1 feet.
Test pit backfilled with excavated soils without compaction certification.

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South Demostration Project

LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001

Date: February 2011

PLATE

A-1

TEST PIT No. TP-5

Logged By:	**C. Borean**	Total Depth:	**3.4 feet**
Date Logged:	**10-11-10**	Water Depth:	**No groundwater encountered**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

▤ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
			Litter/Duff										
1		Z	TOPSOIL - Silty Sand, yellowish brown, moist, loose to moderately dense.				NP	NP			11		
2 3		Z	Weathered granitic bedrock/boulders, gray, moderately dense to dense. Practical refusal at 3.4', difficult digging.										

Test pit terminated at 3.4 feet.
Test pit backfilled with excavated soils without compaction certification.

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South Demostration Project

LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001
Date: February 2011

PLATE
A-2

TEST PIT No. TP-6

Logged By: C. Borean
Date Logged: 10-11-10
Drill Type: Backhoe
Total Depth: 12 feet
Water Depth: No groundwater encountered
Ground Elev.: Not Surveyed

- ▤ Percolation Test
- ☒ Split Spoon
- Z Ziplock Sample
- ⧗ California Sampler
- B Bulk Sample
- ▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
			Sitlty Sand trace Gravel, dark brown (7.5YR 3/3), moist, moderately dense.										
1													
2		Z							6	75	19		
3													
			Old turf line and buried topsoil. Silty Sand with Clay, black, moist, common rootlets, soft.										
4													
		Z	Silty Sand trace Gravel, brown (7.5 YR 4/3), slightly moist, moderately dense.										
5													
6													
7													
8		Z							4	85	11		
9													
10													
11													
12													

Test pit terminated at 12 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001
Date: February 2011

PLATE

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TEST PIT No. TP-7

Logged By:	**C. Borean**	Total Depth:	**15 feet**
Date Logged:	**10-11-10**	Water Depth:	**14 feet ±**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

☰ Percolation Test
☒ Split Spoon
Z Ziplock Sample
■ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
			Silty Sand trace Gravel, dark brown (7.5YR 3/2), moist, loose.										
1		Z											
2			Silty Sand, very dark gray (10YR 3/1), moist, moderately dense.										
3		Z					27	3		73	27		
4													
5			Sandy Clay, very fine grained, black (10YR 2/1), moist, soft, medium plasticity. Sandy Silt, dark brown (7.5YR 3/2), moist, trace redox, slight mottling.										
6													
7													
8		Z									28		
9													
10													
11			Clayey Sand, very dark brown, wet, soft, buried wood.										
12													
13		Z											
14			▼ Seepage.										
15													

Test pit terminated at 15 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001

Date: February 2011

TEST PIT No. TP-8

Logged By:	**C. Borean**	Total Depth:	**5.3 feet**
Date Logged:	**10-11-10**	Water Depth:	**No groundwater encountered**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

☰ Percolation Test
☒ Split Spoon
Z Ziplock Sample
⧓ California Sampler
B Bulk Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
	▩		FILL - Silty Sand trace Gravel, dark reddish brown (5YR 3/2), slightly moist, loose.										
1	▨	Z	Clayey Sand, very dark grayish brown, moist, moderately dense, some roots to 2" dia.										
2 3	⁘	Z	Sandy Clay, brown (7.5YR 4/2), moist, moderately dense, some mottling to 5mm, yellowish red (5YR 5/8).										
4 5	▨	Z	Clayey Sand, grayish brown (10YR 5/2), moist, moderately dense, some mottling strong brown (7.5YR 5/6).										

Test pit terminated at 5.3 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

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Date: February 2011

PLATE
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TEST PIT No. TP-9

Logged By:	**C. Borean**	Total Depth:	**10 feet**
Date Logged:	**10-11-10**	Water Depth:	**5 feet ±**
Drill Type:	**Backhoe**	Ground Elev.:	**Not Surveyed**

☰ Percolation Test	☒ Split Spoon	Z Ziplock Sample
⧓ California Sampler	B Bulk Sample	▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
			Clayey Sand, very dark gray (7.5YR 3/1), moist, loose.										
1 2			Clayey Sand, very dark grayish brown (10YR 3/2), moist, moderately dense. Trace faint mottling.										
3		B	Sandy Clay, very fine grained, very dark gray (7.5YR 3/1) with lenses of fine grained sand, light gray, wet, soft. Some mottling to 5 mm, yellowish red (5YR 5/8).				38	13	1	60	39		
4			Clayey Sand, gray, wet, moderately dense.										
5			▼ Seepage.										
6													
7		B							4	77	20		
8													
9													
10													

Test pit terminated at 10 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001
Date: February 2011

PLATE

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TEST PIT No. TP-15

Logged By: **C. Borean**
Date Logged: **10-11-10**
Drill Type: **Backhoe**

Total Depth: **7.3 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

☰ Percolation Test	☒ Split Spoon	Z Ziplock Sample
⧗ California Sampler	B Bulk Sample	▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Other Tests (See Legend)
1	▨	Z	TOPSOIL/FILL - Silty Sand trace Gravel, brown (10YR 4/3), moist, moderately dense.										
2 3 4 5 6 7	░	Z	Silty Sand trace gravel, very pale brown (10YR 7/4), slightly moist, medium dense.										

Test pit terminated at 7.3 feet.
Test pit backfilled with excavated soils without compaction certification.

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LOG OF EXPLORATORY TEST PIT

Job Number: 7649.001 Date: February 2011

PLATE

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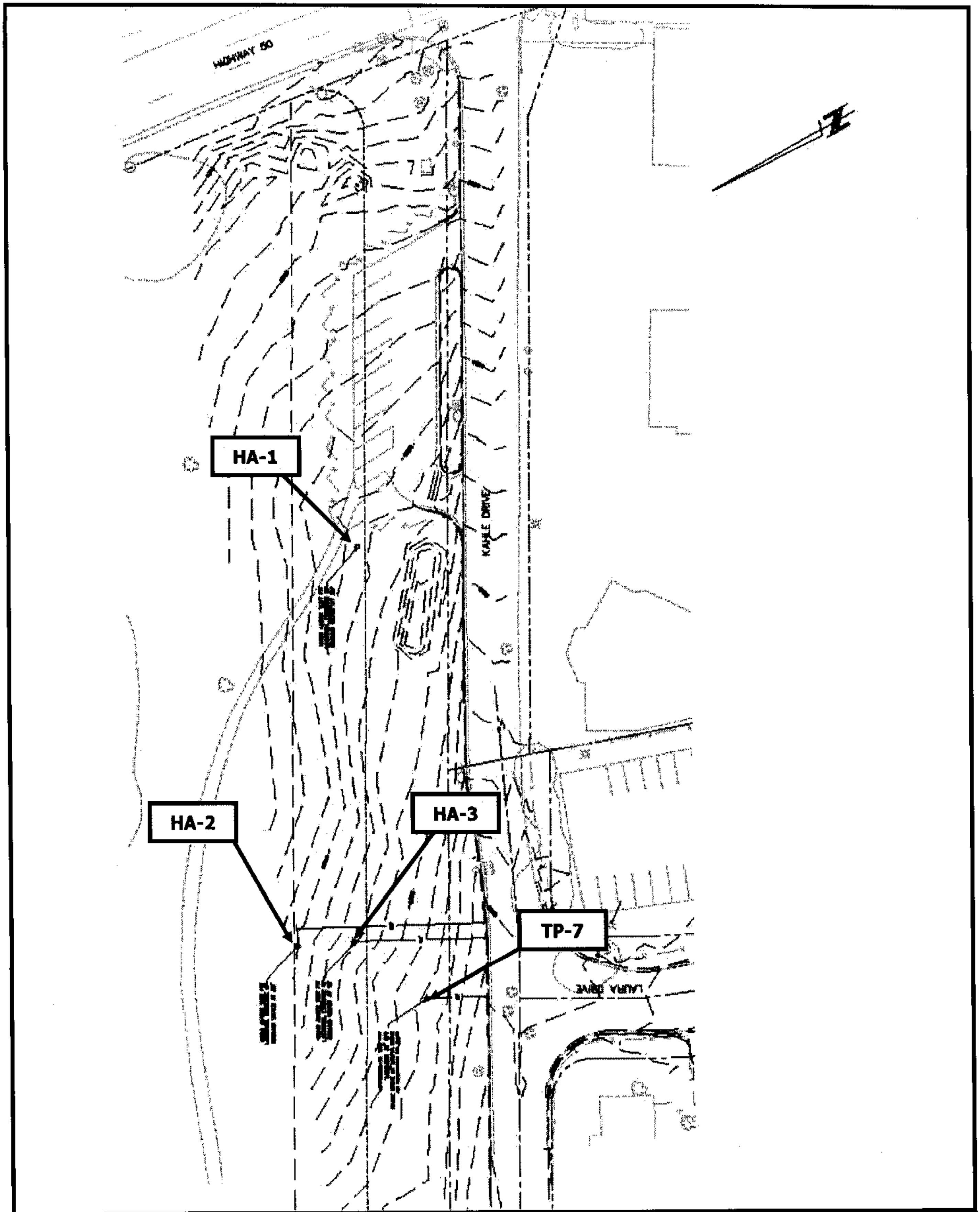
Appendix B



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South Demonstration Project

Hand Auger Locations

Job Number: 7649.001

Date: March 1, 2011

PLATE

1

Sheet 1 of 1

BORING No. HA-1

Logged By: **B. McRae**
Date Logged: **2-8-11**
Drill Type: **Hand Auger**

Total Depth: **3.3 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

■ Shelby Tube
☒ Standard Split Spoon (SPT)
⧗ California Sampler
⧗ Modified California
B Bag Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	CBR	Other Tests (See Legend)
	▨		Silty Sand, some Clay, dark brown, wet.										
1	▨												
2	▨												
3	▨		3.3										
			Clayey Sand, dark brown, wet. Light brown mottling, rust lenses. Boring terminated at 3.3 feet. Boring backfilled with drill cuttings and tamped at the surface.										

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LOG OF EXPLORATORY BORING

Job Number: 7649.001
Date: March 2011

PLATE

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Sheet **1** of **1**

BORING No. HA-2

Logged By: **B. McRae**
Date Logged: **2-8-11**
Drill Type: **Hand Auger**

Total Depth: **1.3 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

■ Shelby Tube
☒ Standard Split Spoon (SPT)
⧗ California Sampler
⧗ Modified California
B Bag Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	CBR	Other Tests (See Legend)
1	▨		Silty Clayey Sand, light brown, moist. 1.4										
			Silty Clayey Sand, light brown, moist. Light brown mottling, rust lenses. Boring terminated at 1.3 feet. Boring backfilled with drill cuttings and tamped at the surface.										

Sheet 1 of 1

BORING No. HA-3

Logged By:	**B. McRae**	Total Depth:	**2.5 feet**
Date Logged:	**2-8-11**	Water Depth:	**No groundwater encountered**
Drill Type:	**Hand Auger**	Ground Elev.:	**Not Surveyed**

■ Shelby Tube
☒ Standard Split Spoon (SPT)
⧗ California Sampler
⧗ Modified California
B Bag Sample
▼ Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	CBR	Other Tests (See Legend)
1 2	⁖		Silty Sand, some Clay, dark brown, wet. 2.5										
			Silty Sand, trace Clay, medium brown, moist. Light brown motteling, rust lenses. Boring terminated at 2.5 feet. Boring backfilled with drill cuttings and tamped at the surface.										

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LOG OF EXPLORATORY BORING

Job Number: 7649.001

Date: March 2011

PLATE

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