Appendix D

Geotechnical Investigation

Project No. T2860-22-01
January 30, 2020

Candice Fenton
Michael Baker International
40810 County Center Drive, Suite 200
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Subject: ADDENDUM LETTER
TEMECULA PARK AND RIDE IMPROVEMENTS
TEMECULA PARKWAY AND WABASH LANE
TEMECULA, CALIFORNIA

Reference: Geocon West, Inc, 2019, *Geotechnical Investigation, Temecula Park and ride Improvements, Temecula Parkway and Wabash Lane, Temecula, California*, Project Number T2860-22-01, dated August 23.

Ms. Fenton:

We have prepared this addendum letter to the referenced report to include pavement recommendations for a Traffic Index (TI) of 12 for Temecula Parkway. Table 3 in our original report used a TI of 10 for Temecula Parkway. The table below includes the pavement section based on a TI of 12 and laboratory tested R-value of 17.

RECOMMENDED CONVENTIONAL PAVEMENT DESIGN SECTIONS

Location	Subgrade R-Value	Traffic Index (TI) / Roadway Classification	Asphalt Concrete (inches)	Aggregate Base (inches)
Temecula Parkway	17	12.0 / Principal Arterial	8.0	23.0

Should you have any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON WEST, INC.

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LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon West, Inc. should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon West, Inc.

2. This report is issued with the understanding that it is the responsibility of the owner, or of their representative, to ensure that the information and recommendations contained herein are brought to the attention of the engineer and contractor for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

4. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

Project No. T2860-22-01
August 23, 2019

Candice Fenton
Michael Baker International
40810 County Center Drive, Suite 200
Temecula, CA 92591-6022

Subject: GEOTECHNICAL INVESTIGATION
TEMECULA PARK AND RIDE IMPROVEMENTS
TEMECULA PARKWAY AND WABASH LANE
TEMECULA, CALIFORNIA

Mrs. Fenton:

In accordance with our January 31, 2018 Proposal and the March 13, 2019 Subconsultant Agreement, Geocon West, Inc. (Geocon) has prepared this report of our geotechnical investigation for the Temecula Park and Ride Improvements project along Temecula Parkway and Wabash Lane in the City of Temecula, California. The approximate limits of the project are depicted on the attached *Vicinity Map* (see Figure 1). This report presents a summary of the methods used to explore the subsurface geologic conditions, measurements of the existing pavement section thicknesses, results of the field and laboratory testing, and geotechnical recommendations for design and construction of the project.

PROJECT UNDERSTANDING

Temecula Parkway and Wabash Lane are asphalt paved roadways with raised medians dividing the travel ways. Temecula Parkway has three travel lanes in each direction, and the westbound direction has a merge lane for traffic turning left from Wabash Lane. Wabash Lane has one travel lane in each direction, and the center median is landscaped. The site of the park and ride improvements consists of a vacant parcel on the east side of the existing park and ride lot. The parcel slopes to the southeast and is covered in weeds. Curb and gutter border the site along Temecula Parkway.

The project includes construction of a new access road to the existing park and ride on the northeast side of Temecula Parkway, beginning across from Wabash Lane. The new access road is anticipated to be constructed near existing grades, with cuts and fill less than 5 feet in depth and thickness expected during earthwork. Additional site improvements include modifying the existing median to an eastbound turn pocket, a signalized intersection at Wabash Lane, and restriping of the intersection. Stormwater mitigation best management practice (BMP) devices are proposed along Temecula Parkway southwest of the proposed access road.

Based on the widths of the existing roadways, we have assumed that Wabash Lane is a local street, and Temecula Parkway is a Principal Arterial in accordance with City of Temecula *Standard No. 113.*

The recommendations presented herein are based on analysis of the data obtained during this investigation and our experience with similar soil and geologic conditions. If project details vary significantly from those described herein, Geocon should be contacted to determine the necessity for review and possible revision of this report.

SCOPE OF SERVICES

The purpose of the investigation was to excavate test pits to evaluate subsurface conditions and core the existing pavement sections to measure aggregate base and asphalt concrete thicknesses at various roadway locations, conduct percolation testing, collect samples of the subgrade soil for laboratory testing, and provide geotechnical recommendations for construction of the planned improvements. Our scope of services included the following:

- Marked the proposed exploration locations and notified Underground Service Alert (USA) to locate and mark utilities in the proposed investigation area.
- Obtained an encroachment permit from the City of Temecula.
- Provided traffic control for the field investigation.
- Excavated two test pits, two pavement cores, a hand auger boring, and percolation test holes to observe subsurface geological conditions, existing pavement thicknesses, and collect disturbed bulk samples for laboratory testing. In-situ moisture and densities were measured in the test pits with a nuclear moisture/density gauge.
- Performed laboratory testing of select soils samples which included maximum dry density and optimum moisture, R-value, and sieve analysis.
- Prepared this written report presenting our findings, conclusions and recommendations.

FIELD EXPLORATION AND LABORATORY TESTING

The park and ride improvements subsurface investigation was conducted on August 24 and 25, 2019 by excavating two geotechnical test pits and two percolation test holes utilizing a rubber tire backhoe, coring the roadway using a 6-inch diameter diamond-tip core barrel, and advancing a hand auger excavation. The explorations extended to depths ranging between approximately 2½ to 15 feet below the existing ground surface in areas of the planned improvements to observe the subsurface geologic conditions, existing pavement thickness, and collect disturbed bulk samples for laboratory testing. The approximate locations of the exploratory borings and cores are depicted on the *Geologic Map* (see Figure 2).

The soil conditions encountered in the explorations were visually examined, classified and logged in general accordance with the Unified Soil Classification System (USCS). Logs of the explorations are presented on Figures A-1 through A-7 in Appendix A. Measurements of the pavement sections encountered in Temecula Parkway are presented in Table 1. The logs and pavement measurements depict the soil and geologic conditions encountered and the depth at which samples were obtained.
No groundwater or saturated soils were encountered within the explorations for this project.

We encountered 8 inches of asphalt concrete within the road cores along Temecula Parkway. Aggregate base was encountered below the pavement surface and extended to approximately 2½ feet where refusal was encountered to the hand excavation tools. Undocumented artificial fill was encountered within the test pits and hand auger to depths of approximately 1½ to 3 feet below the existing ground surface. The undocumented fill consists of yellowish brown to olive brown silty sand with varying amounts of gravel. The fill is medium dense to dense and dry to moist.

Young alluvial valley deposits were encountered beneath the surficial fill in test pits TP-1 and TP-2 and percolation test holes P-1 and P-2 and extends to the bottom of the explorations at depths of 5 to 15. The alluvium consists of yellowish brown to dark brown, poorly graded to silty sand, clayey sand, and sandy silt, with varying amounts of gravel. The sandy alluvium is loose to dense and dry to moist, while the silt is stiff to very stiff and damp to moist.

TABLE 1
EXISTING CONDITIONS

Location	Core	Measured Asphalt Concrete Thickness (in)	Measured Aggregate Base Thickness (in)
Temecula Parkway	C-1	8	>22
Temecula Parkway	C-2	8	>22

Laboratory tests were performed on selected soil samples obtained during the investigation in accordance with current, generally accepted test methods of ASTM International (ASTM) or other suggested procedures. We analyzed selected soil samples for maximum dry density and optimum moisture content, R-Value, and sieve analysis. The results of the laboratory tests are presented on Figures B-1 to B-5 in Appendix B.

INFILTRATION RATE TESTING

Percolation testing was conducted in accordance with the procedures in *Riverside County Flood Control and Water Conservation District LID BMP, Appendix A* (Handbook) at locations selected by the design team. The infiltration test locations are depicted on the *Geologic Map* (see Figure 2). Logs of the infiltration test holes are included as Figures A-3 and A-4.

The test holes were excavated to depths of approximately 4 feet below the existing ground surface and the last foot of depth was hand excavated. Two inches of gravel was placed at the bottom of each test hole and a perforated pipe was placed atop the gravel to keep the hole open. Gravel was placed around the test hole, and the test pit excavation was backfilled. The test locations were pre-saturated approximately 24 hours prior to testing. Infiltration data sheets are presented on Figures A-8 and A-9. Results of the converted percolation test rates to infiltration test rates are presented in Table 2 below. The Handbook requires a factor of safety of 3 be applied to the values below based on the test method used.

TABLE 2
INFILTRATION TEST RATES

PARAMETER	P-1	P-2
Depth (inches)	57	57
Test Type	Normal	Normal
Change in head over time: ΔH (inches)	0.6	0.6
Average head: Havg (in)	4.5	6.9
Time Interval (minutes): Δt (minutes)	30	30
Radius of test hole: r (inches)	4	4
Tested Infiltration Rate: It (inches/hour)	0.37	0.27

CONCLUSIONS AND RECOMMENDATIONS

We did not encounter soil or geologic conditions that would preclude the construction of the proposed improvements provided the recommendations presented herein are followed and implemented during construction.

New Pavements – Conventional Pavement

New pavements should be constructed to meet the current minimum structural section thickness found in the City of Temecula *Pavement Design Requirements, Standard No. 115*. Based on the City standard, we have included a design Traffic Index (TI) of 6.0 (local streets) for Wabash Lane and the park and ride access road based on the roadway widths, and we have included a TI of 10.0 (Principal Arterial) for Temecula Parkway. We have also included a TI of 8.0 in the event that Wabash Lane or the park and ride access road are classified as a collector roadway. Geocon should be contacted for additional recommendations if other TI's apply.

The following preliminary pavement sections in Table 3 are recommended, where new asphalt concrete pavements are planned. Pavement thicknesses were evaluated following procedures outlined in the referenced Caltrans *Highway Design Manual*. Laboratory test results indicated subgrade R-values of 6 in the park and ride access road and 17 for Wabash Lane, which we used to evaluate the pavement sections. Final pavement sections should be evaluated based on R-value testing of the soils encountered at the pavement subgrade during construction.

TABLE 3
RECOMMENDED CONVENTIONAL PAVEMENT DESIGN SECTIONS

Location	Subgrade R-Value	Traffic Index (TI) / Roadway Classification	Asphalt Concrete (inches)	Aggregate Base (inches)
Park and Ride Access Road	6	6.0 / Local Street	4.0	12.0
		8.0 / Collector or Secondary Arterial	6.0	16.0
Wabash Lane	17	6.0 / Local Street	4.0	9.0
		8.0 / Collector or Secondary Arterial	6.0	13.0
Temecula Parkway	17	10.0 / Principal Arterial	6.0	20.0

Asphalt concrete should conform to Section 203-6 of the Greenbook. Aggregate base materials should conform to the requirements for Crushed Aggregate Base (CAB) or Crushed Miscellaneous Base (CMB) should conform to Sections 200-2.2 and 200-2.4, respectively, of the Greenbook.

A rigid Portland cement concrete (PCC) pavement section may be placed in roadways, driveway aprons, and cross gutters. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute *Report ACI 330R Guide for Design and Construction of Concrete Parking Lots* using the parameters presented in Table 4.

TABLE 4
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of subgrade reaction, k	50 pci
Modulus of rupture for concrete, M_R	500 psi
Traffic Category, TC	B, C, and D
Average daily truck traffic, ADTT	25, 300 and 700

Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 5.

TABLE 5
RIGID PAVEMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Roadways with light traffic and parking areas (TC=B)	7.0
Roadways with medium truck traffic (TC=C)	8.0
Roadways with heavy truck traffic (TC=D)	9.0

The PCC pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density at or slightly above optimum moisture content. This pavement section is based on a minimum concrete compressive strength of approximately 3,000 psi (pounds per square inch). Base material will not be required beneath concrete improvements.

A thickened edge or integral curb should be constructed on the outside of concrete slabs subjected to wheel loads. The thickened edge should be 1.2 times the slab thickness or a minimum thickness of 2 inches, whichever results in a thicker edge, and taper back to the recommended slab thickness 4 feet behind the face of the slab (e.g., a 9-inch-thick slab would have an 11-inch-thick edge). Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

In order to control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab in accordance with the referenced ACI report.

The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of pavements. Ponding of water on or adjacent to the pavement will likely result in saturation of the subgrade materials and subsequent cracking, subsidence and pavement distress. If planters are planned adjacent to paving, consideration should be given to extending the perimeter curb at least 6 inches below the bottom of the aggregate base to minimize the introduction of water beneath the paving.

New Pavements – Concrete Pavers

Prefabricated concrete pavers (80 mm thick) may be utilized to support traffic loading in local streets with light traffic if constructed over 1 inch of leveling sand underlain by a properly prepared subgrade and aggregate base per the following table. Based on the laboratory testing of the site soils, we have used an R-value of 6 for preliminary design. The final pavement design should be based on R-value testing of soils at the subgrade following grading at the site. The aggregate base should be compacted to at least 95 percent relative compaction as determined by ASTM D1557 (latest edition). Pavers should be constructed in accordance with the manufacture's guidelines.

TABLE 6
RECOMMENDED PAVEMENT DESIGN SECTIONS

Location	Estimated Traffic Index (TI)	Prefabricated Concrete Paver (inches)	Class 2 Aggregate Base (inches)
Local Street / Light Traffic	6.0	3⅛	14.0

Where concrete pavers will be placed in pedestrian walkway areas, and will not be subject to vehicle loading, the inclusion of a 8-inch thick layer of base over properly compacted subgrade underlying the pavers is acceptable from a geotechnical standpoint.

Where different pavement sections are to be constructed adjacent to each other, it is recommended that consideration be given to the use of deepened base sections to maintain a uniform base thickness and avoid stepped cuts for placement of base material. This condition is anticipated to occur at the transition across the areas.

Rehabilitation of Existing Pavements – Temecula Parkway

The field exploration indicates that the existing pavement structural sections along Temecula Parkway consist of 8 inches of asphalt concrete over at least 22 inches of aggregate base. Based on the pavement section measurements and the assumed R-value of the subgrade, the existing pavement sections would be expected to provide the design traffic index of 10.0. Our observations during our field work indicate that the existing roadway exhibits low to moderate distress in the form of longitudinal cracking and weathering. If a new pavement surface is warranted, the roadway can be rehabilitated by milling and overlaying the roadway with a new asphalt concrete wearing surface.

To rehabilitate the existing pavements, the existing asphalt surface should be milled to a depth of at least 2 inches and replaced with a new asphalt concrete pavement wearing surface. The roadway should be milled in accordance with Section 302-1 of the current edition of the Greenbook. The asphalt concrete overlay should be placed in accordance with Section 302-5 of the current edition of the Greenbook and as required by the City of Temecula standards.

The new overlay will provide a new pavement surface and extend pavement life, but deeper distress within the pavement can propagate up through the pavement surface. The mill and overlay option should be considered as part of a pavement preservation plan that will require future maintenance.

Isolated areas along the milled pavement surface that need deep patching may be encountered during remediation. The bottom of the milled asphalt should be observed by a representative of Geocon for voids or cracks in the paving and additional recommendations provided as needed. High severity distress areas should be dug out and replaced with new asphalt concrete. Cracks greater than 1/8 inch should be sealed with Crafco Polyflex Type 3 or similar sealant. Prior to sealing, the cracks should be cleaned, and vegetation removed. The sealant should be installed in accordance with the manufacturer's recommendations.

At the base of the new 2-inch asphalt pavement layer, the pavement can be reinforced with a paving mat, such as a Mirafi TruPave (or equivalent) interlayer to reinforce the pavement, mitigate the propagation of cracking, and extend the anticipated pavement life. If used, the paving mat should be installed in accordance with the manufacturer's guidelines and the Construction Guidelines in *Chapter 12, Interlayers*, of Volume 1 of the *Caltrans Maintenance Technical Advisory Guide (MTAG)*.

Asphalt concrete should conform to Section 203-6 of the Greenbook. Asphalt concrete should be compacted to at least 95 percent of the Hveem density as evaluated by ASTM D1561. Testing of the asphalt concrete should be performed during rehabilitation to verify relative compaction.

Earthwork

Earthwork for the roadway improvements should be performed in accordance with the City of Temecula *Standard Drawings*.

Prior to commencing earthwork, a preconstruction conference should be held at the site with the City inspector, City engineer, earthwork contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the improvement plans can be discussed at that time.

Site preparation should begin with the removal of deleterious material, debris and vegetation. The depth of removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

For the grading of the new access road, the previously placed undocumented fill and upper portion of alluvium should be removed to expose competent alluvium with a minimum in-situ relative compaction of 85 percent as determined by ASTM D1557. Areas of loose, dry, or compressible oils, if encountered, will require deeper excavation and processing prior to fill placement. The engineering geologist should evaluate the actual depth of removal during grading operations. The bottom of the excavations should be scarified to a depth of at least 1 foot, moisture conditioned at 0 to 2 percent above optimum moisture content, and compacted to 90 percent of the maximum dry density as determined by ASTM 1557.

The site should be brought to finish grade elevations with fill compacted in layers. Layers of fill should be no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density, at 0 to 2 percent above optimum moisture content, as determined by ASTM D1557. The upper 12 inches of subgrade in areas of vehicular traffic should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density, at 0 to 2 percent above optimum moisture content, as determined by ASTM D1557. Fill materials placed below the recommended moisture content may require additional moisture conditioning prior to placing additional fill.

If perched groundwater, wet, or saturated materials are encountered, extensive drying and mixing with dryer soil will be required. The excavated materials should then be moisture conditioned as necessary to the recommended optimum moisture content prior to placement as compacted fill.

Where relatively loose, soft, or wet soils are encountered in the site excavations, subgrade stabilization may be required prior to placing fill or installing utilities. Where required, subgrade stabilization can be achieved by over excavating the loose or soft materials and replacing with compacted fill, placing 3-inch diameter rock in the soft bottom and working it into soil until it is stabilized, or placing gravel wrapped in filter fabric at the bottom of the excavation. Recommendations for stabilizing excavation bottoms should be based on an evaluation in the field by Geocon at the time of construction.

If needed, import fill should consist of granular materials with “low” expansion potential (EI of 50 or less), should not be corrosive, generally free of deleterious material and rock fragments larger than 6 inches, and should be compacted as recommended herein. Geocon should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to evaluate its suitability as fill material.

Utility Trench Backfill

Utility trenches should be properly backfilled in accordance with the requirements of City of Temecula and the latest edition of the *Standard Specifications for Public Works Construction* (Greenbook). The pipes should be bedded with well graded crushed rock or clean sands (Sand Equivalent greater than 30) to a depth of at least 1 foot over the pipe as evaluated by the project civil engineer. The use of open graded crushed rock is only acceptable if used in conjunction with filter fabric to prevent the gravel from having direct contact with soil. The remainder of the trench backfill may be derived from onsite soil or approved import soil, compacted as necessary, until the required compaction is obtained. The use of 2-sack slurry and controlled low strength material (CLSM) are also acceptable as backfill. However, consideration should be given to the possibility of differential settlement where the slurry ends and earthen backfill begins. These transitions should be minimized, and additional stabilization should be considered at these transitions.

Utility excavation bottoms must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon), prior to placing bedding materials, fill, gravel, or concrete.

Miscellaneous Foundations

Foundations for small structures such as landscape or retaining walls may be supported on conventional foundations following remedial grading and bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed or is undesirable, such as adjacent to utilities or property lines, foundations may derive support in the undisturbed alluvial soils found at or below a depth of 24 inches, and should be deepened as necessary to maintain a minimum 12-inch embedment into undisturbed alluvial soils. Foundation excavations must be observed and approved by a Geocon representative.

Miscellaneous foundations deriving support in newly placed engineered fill may be designed for a bearing value of 1,500 psf, and should be a minimum of 18 inches in width, 12 inches in depth below the lowest adjacent grade and 12 inches into the recommended bearing material. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces. Figure 3 presents a wall/column footing dimension detail depicting lowest adjacent grade. Steel reinforcement for the spread footings should be designed by the project structural engineer.

Foundation excavations should be observed by the Geotechnical Engineer (a representative of Geocon), prior to the placement of reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated.

Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation subgrade soil should be moisturized to maintain a moist condition prior to placement of concrete.

Geocon should be consulted to provide additional design parameters as required by the structural engineer.

Concrete Flatwork

Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein assuming the subgrade materials possess an Expansion Index of 50 or less. Subgrade soils should be compacted to 90 percent relative compaction at a moisture content 0 to 2 percent above optimum as determined by ASTM D1557. Slab panels should be a minimum of 4 inches thick and when in excess of 8 feet square should be reinforced with No. 3 reinforcing bars spaced 24 inches center-to-center in both directions to reduce the potential for cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the earthwork section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be verified prior to placing concrete. Base materials will not be required below concrete improvements.

Even with the incorporation of the recommendations of this report, the exterior concrete flatwork has a potential to experience some uplift due to expansive soil beneath grade or differential settlement. The steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork.

The recommendations presented herein are intended to reduce the potential for cracking of exterior slabs as a result of differential movement. However, even with the incorporation of the recommendations presented herein, concrete slabs will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

Conventional Retaining Walls

The recommendations presented below are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 5 feet. In the event that walls higher than 5 feet are planned, Geocon should be contacted for additional recommendations.

Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2:1 (horizontal to vertical), an active soil pressure of 60 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an EI of 50 or less. For walls where backfill materials do not conform to the criteria herein, Geocon should be consulted for additional recommendations.

Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, the walls should be designed for a soil pressure equivalent to the pressure exerted by a fluid density of 55 pcf.

Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and waterproofed as required by the project architect. The soil immediately adjacent to the backfilled retaining wall should be composed of free draining material completely wrapped in Mirafi 140N (or equivalent) filter fabric for a lateral distance of 1 foot for the bottom two-thirds of the height of the retaining wall. The upper one-third should be backfilled with less permeable compacted fill to reduce water infiltration. Alternatively, a drainage panel, such as a Miradrain 6000 or equivalent, can be placed along the back of the wall. Typical retaining wall drainage details are shown on Figure 4. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted backfill (EI of 50 or less) with no hydrostatic forces or imposed surcharge load. If conditions different than those described are expected or if specific drainage details are desired, Geocon should be contacted for additional recommendations.

Lateral Design

Resistance to lateral loading may be provided by friction acting at the base of foundations, slabs and by passive earth pressure. A passive pressure exerted by an equivalent fluid weight of 300 pcf with a maximum earth pressure of 3,000 psf should be used for the design of footings or shear keys poured neat against newly compacted fill. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

If friction is to be used to resist lateral loads, an allowable coefficient of friction between newly compacted fill soil and concrete of 0.35 should be used for design. When combining passive pressure and friction for lateral resistance, the passive component should be reduced by one-third.

Temporary Excavations

The recommendations included herein are provided for stable excavations. It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project.

Temporary excavations should be made in conformance with OSHA requirements and as directed by the assigned competent person in the field (contractor). In general, special shoring requirements may not be necessary if temporary excavations will be less than 4 feet in height. Temporary excavations greater than 4 feet in height, however, should be sloped back at an appropriate inclination. These excavations should not be allowed to become saturated or to dry out. Surcharge loads should not be permitted to a distance equal to the height of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

Where there is insufficient space for sloped excavations, shoring or trench shields should be used to support excavations. Shoring may also be necessary where sloped excavation could remove vertical or lateral support of existing improvements, including existing utilities and adjacent structures.

Where sloped embankments are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary construction embankments are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces. The contractor’s competent person should inspect the soils exposed in the cut slopes during excavation in accordance with OSHA regulations so that modifications of the slopes can be made if variations in the soil conditions occur.

Site Drainage and Moisture Protection

Proper site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices.

Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

Landscaping planters adjacent to paved areas have the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Where landscaping is planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material.

If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to infiltration areas. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeology study at the site. Down-gradient and adjacent structures may be subjected to seeps, movement of foundations and slabs, or other impacts as a result of water infiltration.

Plan Review

Geocon should review the improvement plans for project prior to final submittal to verify that the plans have been prepared in substantial conformance with the recommendations of this report. Additional analyses may be required after review of the project plans.

Should you have any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON WEST, INC.

REGISTERED PROFESSIONAL ENGINEER
CHET E. ROBINSON
No. 2890
GEOTECHNICAL
STATE OF CALIFORNIA

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LISA A. BATTIATO
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CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Chet E. Robinson
GE 2890

Lisa A. Battiato
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LCW:CER:LAB:hd

Attachments: LIMITATIONS AND UNIFORMITY OF CONDITIONS
LIST OF REFERENCES

MAPS AND ILLUSTRATIONS
- Figure 1, Vicinity Map
- Figure 2, Geologic Map
- Figure 3, Wall / Column Footing Detail
- Figure 4, Typical Retaining Wall Drain Detail

APPENDIX A
- Figures A-1 to A-7, Logs of Field Explorations
- Figures A-8 and A-9, Percolation Test Reports

APPENDIX B
- Figure B-1, Laboratory Test Results
- Figure B-2, Modified Compaction Test of Soils
- Figures B-3 to B-5, Grain Size Distribution

Distribution: Addressee (Email)

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon West, Inc. should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon West, Inc.

2. This report is issued with the understanding that it is the responsibility of the owner, or of their representative, to ensure that the information and recommendations contained herein are brought to the attention of the engineer and contractor for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

4. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

REFERENCES

1. American Concrete Institute, 2008, Report 330R-08, *Guide for the Design and Construction of Concrete Parking Lots*, undated.

2. California Department of Transportation (Caltrans), 2015, *Highway Design Manual*, dated July 1.

3. California Department of Transportation (Caltrans), Division of engineering Services, Materials engineering and Testing Services, 2018, *Corrosion Guidelines, Version 3.0*, dated March.

4. California Department of Transportation (Caltrans), 2010, Standard Specifications.

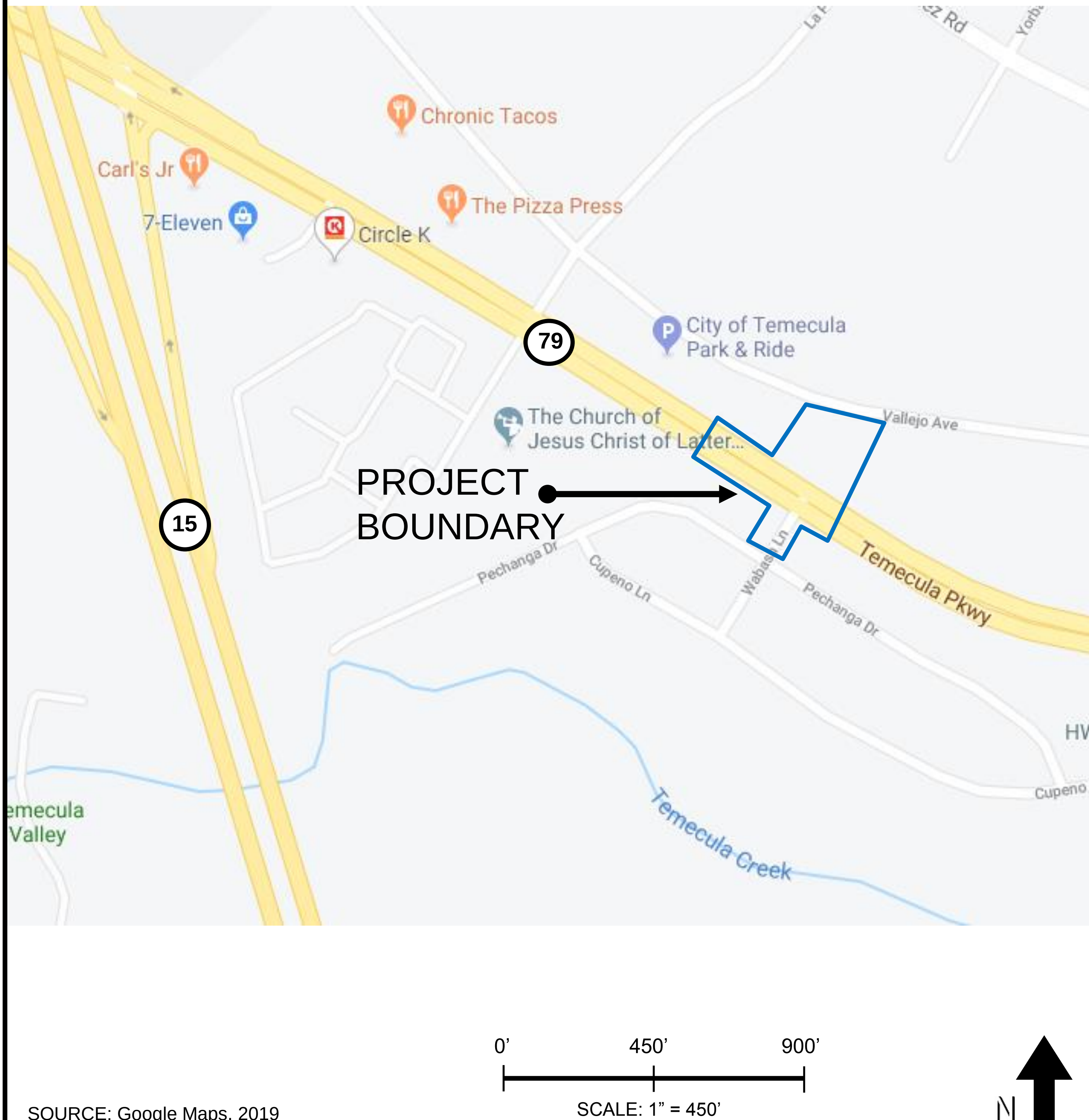
5. California Department of Transportation (Caltrans), 2008, Maintenance Technical Advisory Guide, Volume I – Flexible Pavement Preservation, Second Edition, dated March 7.

6. Google Inc., 2019, Google Earth Pro, Version 7.3.2.5487.

7. Michael Baker International, 2019, *Traffic Signal and Park and Ride Access Improvements*, dated June 20.

8. Public Works Standards, Inc., 2015, *"Greenbook" Standard Specifications for Public Works Construction*, Published by BNI Building News.

9. Temecula, 2011, *Improvement Standard Drawings*, dated October.



SOURCE: Google Maps, 2019

VICINITY MAP

GEOCON
WEST, INC.
GEOTECHNICAL ENVIRONMENTAL MATERIALS
78-075 MAIN STREET, SUITE G-203, LA QUINTA, CA 92253
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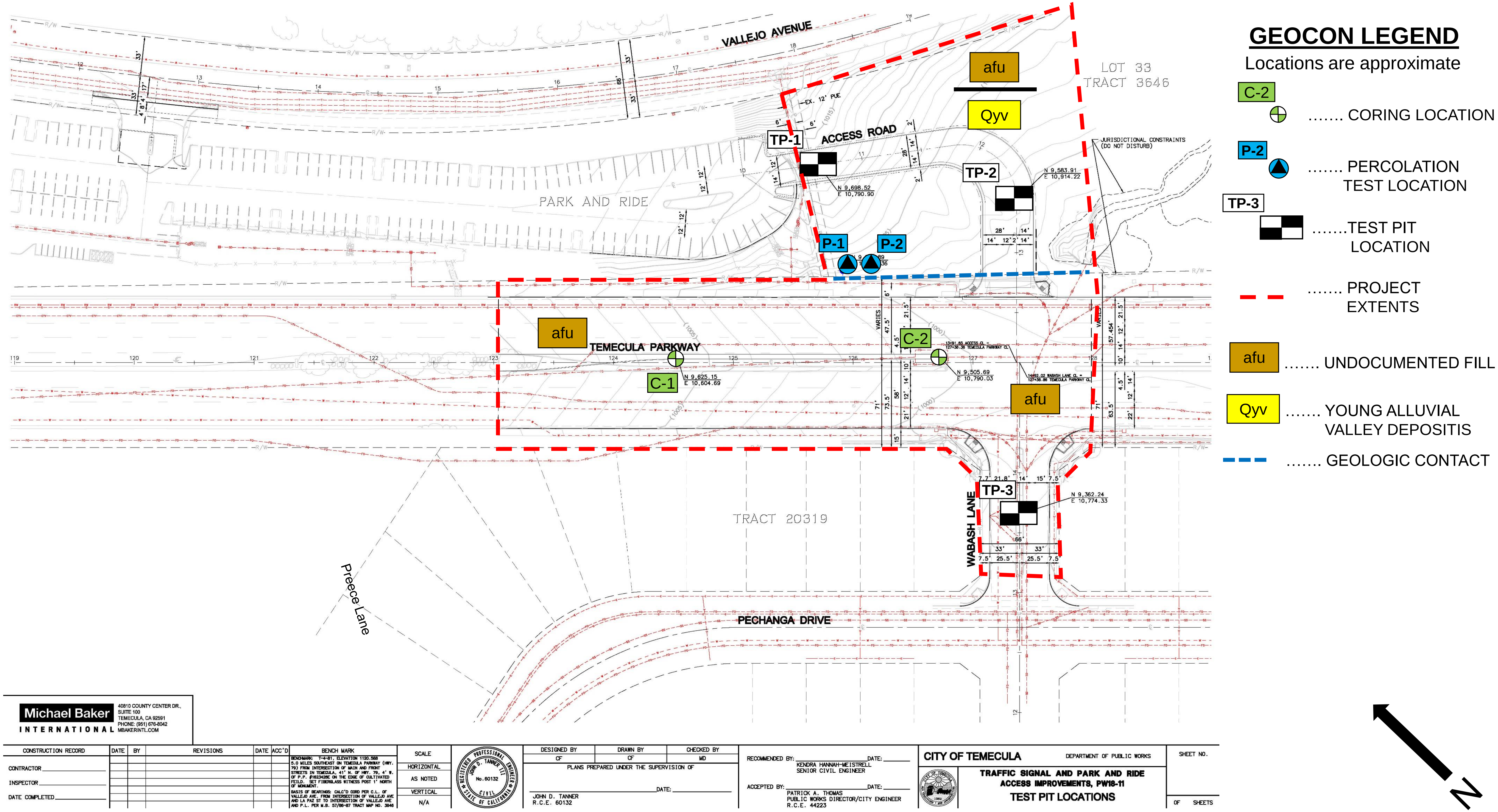
GEOTECHNICAL INVESTIGATION
TEMECULA PARK AND RIDE IMPROVEMENTS
TEMECULA PARKWAY AND WABASH LANE
TEMECULA, CALIFORNIA

LCW			AUGUST, 2019	PROJECT NO. T2860-22-01	FIG. 1



Source: Michael Baler International, *Traffic Signal and Park and Ride Access Improvements*, dated June 20, 2019.

0' 75' 150'

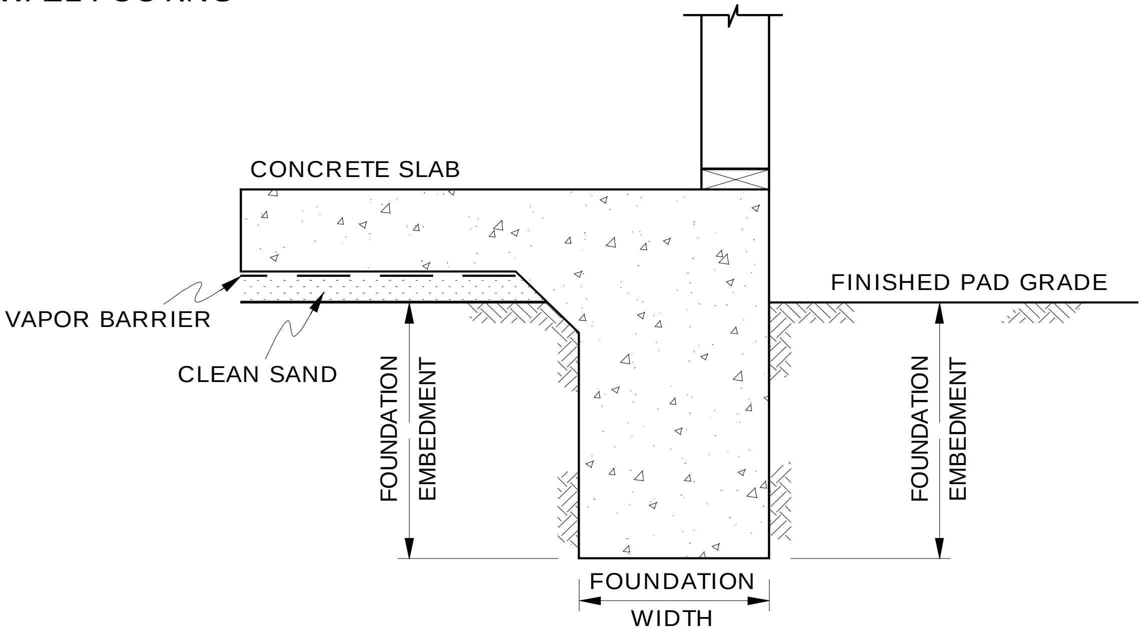
SCALE: 1" = 75'

GEOCON WEST, INC.
GEOTECHNICAL, ENVIRONMENTAL, MATERIALS
41571 CORNING PLACE #101, MURRIETA, CALIFORNIA 92562
PHONE 951-304-2300 FAX 951-304-2392

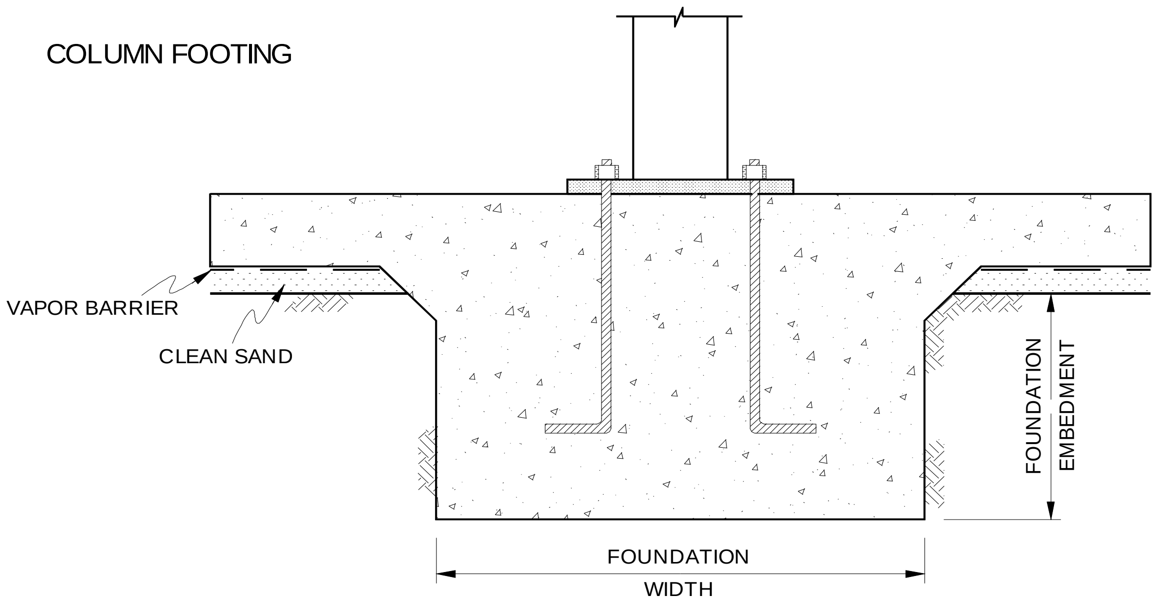
GEOLOGIC MAP		
GEOTECHNICAL INVESTIGATION TEMECULA PARK AND RIDE IMPROVEMENTS TEMECULA PARKWAY AND WABASH LANE TEMECULA, CALIFORNIA		
AUGUST 2019	PROJECT NO. T2860-22-01	FIG. 2

LCW

WALL FOOTING



COLUMN FOOTING



NOTE: SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

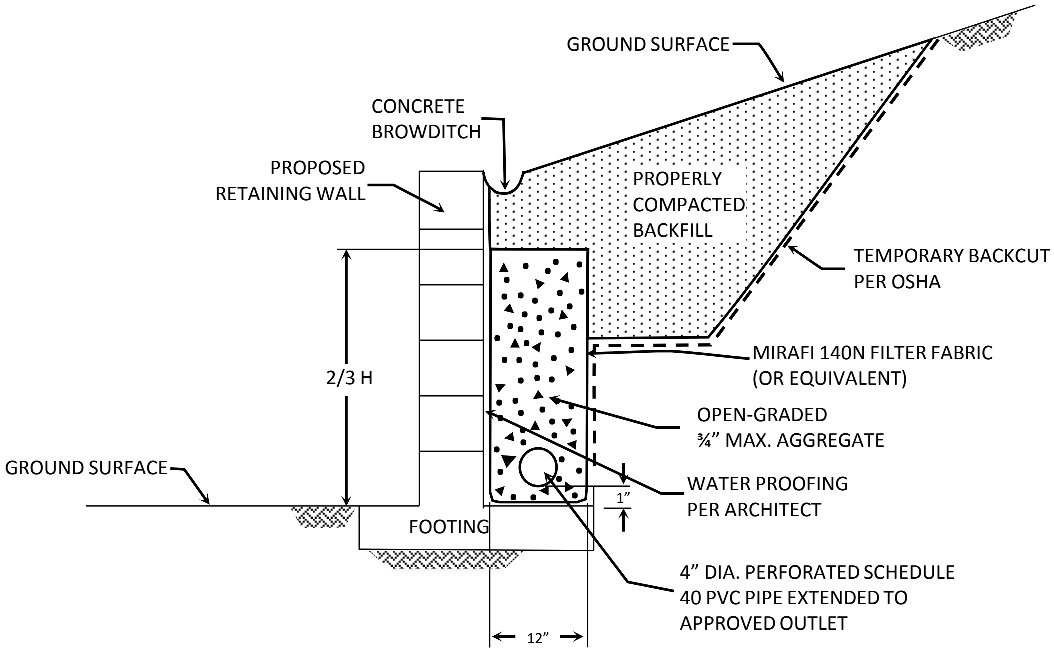
NO SCALE

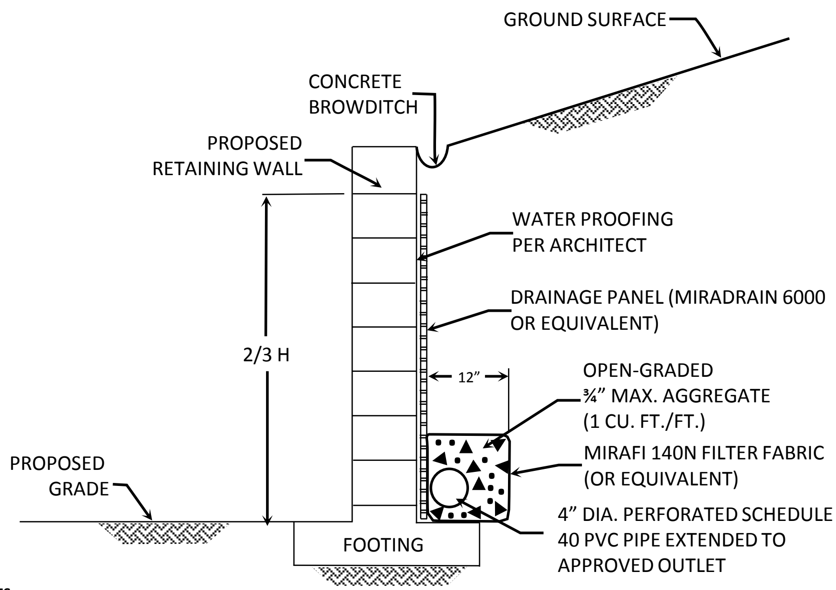
GEOCON WEST, INC.
GEOTECHNICAL ENVIRONMENTAL MATERIALS
41571 CORNING PLACE, SUITE 101, MURRIETA, CA 92562-7065
PHONE 951-304-2300 FAX 951-304-2392

WALL / COLUMN FOOTING DETAIL

TEMECULA PARK AND RIDE IMPROVEMENTS
TEMECULA PARKWAY AND WABASH LANE
TEMECULA, CALIFORNIA

CER			AUGUST 2019	PROJECT NO. T2860-22-01	FIG. 3





NOTES:

DRAIN SHOULD BE UNFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPIMG

CONCRETE BROW DITCH RECOMMENDED FOR SLOPE HEIGHTS
GREATER THAN 6 FEET

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

GEOCON WEST, INC.
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PHONE 951-304-2300 FAX 951-304-2392

TEMECULA PARK AND RIDE IMPROVEMENTS
TEMECULA PARKWAY AND WABASH LANE
TEMECULA, CALIFORNIA

CER			AUGUST 2019	PROJECT NO. T2860-22-01	FIG. 4

APPENDIX A

PROJECT NO. T2860-22-01

TEST PIT TP-1

ELEV. (MSL.) 1012 DATE COMPLETED 7/25/2019

EQUIPMENT Rubber Tire Backhoe BY: A. SHOASHEKAN

DEPTH IN FEET	SAMPLE NO. (BULK / DR/SPT)	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL (afu)** Silty SAND with few gravel, dense, dry, yellowish brown; fine to medium sand; few coarse sand; porous; grass and weeds at surface			
	TP-1 @ 1'							
2							121.5	3.7
4				SW	**YOUNG ALLUVIAL VALLEY DEPOSITS (Qyv)** Well-graded SAND with some gravel, loose, damp, yellowish brown; fine to coarse sand; some cobbles and boulders			
	TP-1 @ 5'				-decrease in cobbles and boulders		93.6	4.0
6								
					Total Depth = 7.5' Groundwater not encountered Moisture and density results via nuclear density gauge Backfilled with cuttings 7/25/2019		106.2	9.2

Figure A-1,
Log of Test Pit TP-1, Page 1 of 1

T2860-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2860-22-01

TEST PIT TP-2

ELEV. (MSL.) **1001** DATE COMPLETED **7/25/2019**

EQUIPMENT **Rubber Tire Backhoe** BY: **A. SHOASHEKAN**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2	TP-2 @ 1'			SM	**UNDOCUMENTED FILL (afu)** Silty SAND, medium dense, dry, yellowish brown; fine to coarse sand; debris; grass and weeds at surface			
2 – 4				SC	**YOUNG ALLUVIAL VALLEY DEPOSITS (Qyv)** Clayey SAND, dense, moist, dark brown; fine to medium sand with little coarse sand; porous		112.4	10.0
6				SW	Well-graded SAND, medium dense, damp, yellowish brown; fine to coarse sand; cobbles encountered		107.2	4.5
8 – 10				SP	Poorly-graded SAND, medium dense, moist, dark yellowish brown; coarse sand; boulders encountered		106.6	8.3
12				ML	Sandy SILT, stiff, moist, olive brown; fine sand; trace pores -decrease in boulders			
14				SP	Poorly-graded SAND with little gravel, medium dense, moist, olive brown; fine to medium sand with some coarse sand			

Total Depth = 15'
Groundwater not encountered
Moisture and density results via nuclear density gauge
Backfilled with cuttings 7/25/2019

Figure A-2,
Log of Test Pit TP-2, Page 1 of 1

T2860-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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TEST PIT P-1

ELEV. (MSL.) **1004** DATE COMPLETED **7/25/2019**

EQUIPMENT **Rubber Tire Backhoe** BY: **A. SHOASHEKAN**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL (afu)** Silty SAND, medium dense, dry, yellowish brown; fine to medium sand with little coarse sand; friable upper 1 foot; grass and roots			
2				ML	**YOUNG ALLUVIAL VALLEY DEPOSITS (Qyv)** Sandy SILT, very stiff, damp, dark brown; fine to medium sand; calcium carbonate stringers; porous			
4	P-1 @ 4'							

Total Depth = 5'
Groundwater not encountered
Backfilled with cuttings 7/25/2019

Figure A-3,
Log of Test Pit P-1, Page 1 of 1

T2860-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

TEST PIT P-2

ELEV. (MSL.) **1003** DATE COMPLETED **7/25/2019**

EQUIPMENT **Rubber Tire Backhoe** BY: **A. SHOASHEKAN**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL (afu)** Silty SAND, medium dense, dry, yellowish brown; fine to coarse sand with little coarse sand; friable upper 1 foot; grass and weeds at surface; porous			
2				SM	**YOUNG ALLUVIAL VALLEY DEPOSITS (Qyv)** Silty SAND, medium dense, dry, yellowish brown; fine to coarse sand with little coarse sand; porous			
4	P-2 @ 4'				-becomes damp			

Total Depth = 5'
Groundwater not encountered
Backfilled with cuttings 7/25/2019

Figure A-4,
Log of Test Pit P-2, Page 1 of 1

T2860-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

DEPTH IN FEET	SAMPLE NO.	BULK	DR/SPT	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	HAND PIT HA-1 ELEV. (MSL.)______ DATE COMPLETED 7/24/2019 EQUIPMENT HAND AUGER BY: A. SHOASHEKAN	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
							MATERIAL DESCRIPTION			
0						SM	**UNDOCUMENTED FILL (afu)** Silty SAND, medium dense, moist, olive brown; fine to medium sand with little coarse sand; cobbles encountered; roots present in the upper 1.5 feet			
2	HA-1 @ 1.5'									8.2
							Total Depth = 2.5' Groundwater not encountered Backfilled with cuttings 7/24/2019 Refusal with hand auger			

Figure A-5,
Log of Hand Pit HA-1, Page 1 of 1

T2860-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2860-22-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	CORE C-1 ELEV. (MSL.) 1006 DATE COMPLETED 7/24/2019 EQUIPMENT CORING MACHINE BY: A. SHOASHEKAN	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**ASPHALT CONCRETE-8 inches**			
2	C-1 @ 1'			SP-SM	**AGGREGATE BASE** Poorly-graded SAND with silt and gravel, dense, moist, olive gray			
					Total Depth = 2.5' Groundwater not encountered Backfilled with cuttings 7/24/2019 Refusal with hand auger			

Figure A-6,
Log of Core C-1, Page 1 of 1

T2860-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2860-22-01

CORE C-2

ELEV. (MSL.) 1000 DATE COMPLETED 7/24/2019

EQUIPMENT CORING MACHINE BY: A. SHOASHEKAN

DEPTH IN FEET	SAMPLE NO.	BULK	DR/SPT	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0							**ASPHALT CONCRETE-8 inches**			
2	C-2 @ 1'					SP-SM	**AGGREGATE BASE** Poorly-graded SAND with silt and gravel, dense, moist, olive gray; fine to coarse sand			

Total Depth = 2.5'
Groundwater not encountered
Backfilled with cuttings 7/24/2019
Refusal with hand auger

Figure A-7,
Log of Core C-2, Page 1 of 1

T2860-22-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PERCOLATION TEST REPORT

Project Name:	Temecula Park and Ride	**Project No.:**	T2860-22-01
Test Hole No.:	P-1	**Date Excavated:**	7/25/2019
Length of Test Pipe:	57.0 inches	**Soil Classification:**	SC
Height of Pipe above Ground:	0.0 inches	**Presoak Date:**	7/25/2019
Depth of Test Hole:	57.0 inches	**Perc Test Date:**	7/26/2019
Check for Sandy Soil Criteria Tested by:	ATS	**Percolation Tested by:**	ATS

Water level measured from BOTTOM of hole

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Level (in)	Final Water Level (in)	Δ in Water Level (in)	Percolation Rate (min/inch)
1	7:53 AM 8:18 AM	25	25	5.4	0.6	4.8	5.2
2	8:19 AM 8:44 AM	25	50	5.4	1.2	4.2	6.0

Soil Criteria: Normal

Percolation Test

Reading No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Head (in)	Final Water Head (in)	Δ in Water Level (in)	Percolation Rate (min/inch)
1	8:46 AM 9:16 AM	30	30	5.4	1.8	3.6	8.3
2	9:20 AM 9:50 AM	30	60	5.4	2.4	3.0	10.0
3	9:53 AM 10:23 AM	30	90	5.4	3.6	1.8	16.7
4	10:25 AM 10:55 AM	30	120	5.4	3.6	1.8	16.7
5	10:56 AM 11:26 AM	30	150	5.4	3.6	1.8	16.7
6	11:28 AM 11:58 AM	30	180	5.4	3.6	1.8	16.7
7	12:00 PM 12:30 PM	30	210	5.4	4.2	1.2	25.0
8	12:31 PM 1:01 PM	30	240	5.4	4.2	1.2	25.0
9	1:02 PM 1:32 PM	30	270	5.4	4.8	0.6	50.0
10	1:33 PM 1:53 PM	20	290	5.4	4.8	0.6	33.3
11	1:56 AM 2:26 AM	30	320	5.4	4.8	0.6	50.0
12	2:28 AM 2:58 AM	30	350	5.4	4.8	0.6	50.0

Infiltration Rate (in/hr):	0.37
Radius of test hole (in):	4
Average Head (in):	4.5

Figure A-8

PERCOLATION TEST REPORT							
Project Name:		Temecula Park and Ride			**Project No.:**		T2860-22-01
Test Hole No.:		P-2			**Date Excavated:**		7/25/2019
Length of Test Pipe:			57.0	inches	**Soil Classification:**		SM
Height of Pipe above Ground:			0.0	inches	**Presoak Date:**		7/25/2019
Depth of Test Hole:			57.6	inches	**Perc Test Date:**		7/26/2019
Check for Sandy Soil Criteria Tested by:				ATS	**Percolation Tested by:**		ATS
Water level measured from BOTTOM of hole							
Sandy Soil Criteria Test							
Trial No.	**Time**	**Time Interval (min)**	**Total Elapsed Time (min)**	**Initial Water Level (in)**	**Final Water Level (in)**	**Δ in Water Level (in)**	**Percolation Rate (min/inch)**
1	7:57 AM 8:22 AM	25	25	7.2	6.0	1.2	20.8
2	8:24 AM 8:49 AM	25	50	7.2	6.6	0.6	41.7
		Soil Criteria: Normal					
Percolation Test							
Reading No.	**Time**	**Time Interval (min)**	**Total Elapsed Time (min)**	**Initial Water Head (in)**	**Final Water Head (in)**	**Δ in Water Level (in)**	**Percolation Rate (min/inch)**
1	8:50 AM 9:20 AM	30	30	7.2	6.0	1.2	25.0
2	9:22 AM 9:52 AM	30	60	7.2	6.0	1.2	25.0
3	9:54 AM 10:24 AM	30	90	7.2	6.0	1.2	25.0
4	10:27 AM 10:57 AM	30	120	7.2	6.6	0.6	50.0
5	10:58 AM 11:28 AM	30	150	7.2	6.6	0.6	50.0
6	11:30 AM 12:00 PM	30	180	7.2	6.6	0.6	50.0
7	12:02 PM 12:32 PM	30	210	7.2	6.6	0.6	50.0
8	12:33 PM 1:03 PM	30	240	7.2	6.6	0.6	50.0
9	1:04 PM 1:34 PM	30	270	7.2	6.6	0.6	50.0
10	1:35 PM 1:55 PM	30	300	7.2	6.6	0.6	50.0
11	1:58 PM 2:28 PM	30	330	7.2	6.0	1.2	25.0
12	3:00 PM 3:30 PM	30	360	7.2	6.6	0.6	50.0
Infiltration Rate (in/hr):			0.27				
Radius of test hole (in):			4				**Figure A-9**
Average Head (in):			6.9				

APPENDIX B

SUMMARY OF LABORATORY R-VALUE TEST RESULTS
ASTM D2844

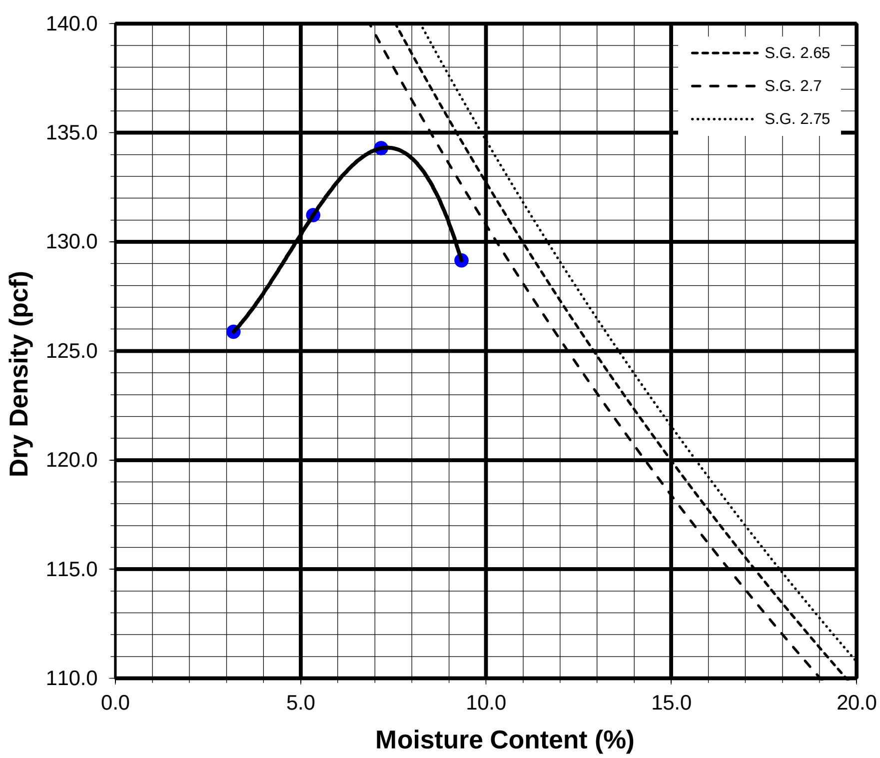
Sample No.	R-Value
TP-2 @ 1-5’	6
HA-1 @ 1.5-2.5’	17

Sample No:

TP-1@1-3'	Silty SAND (SM), yellowish brown

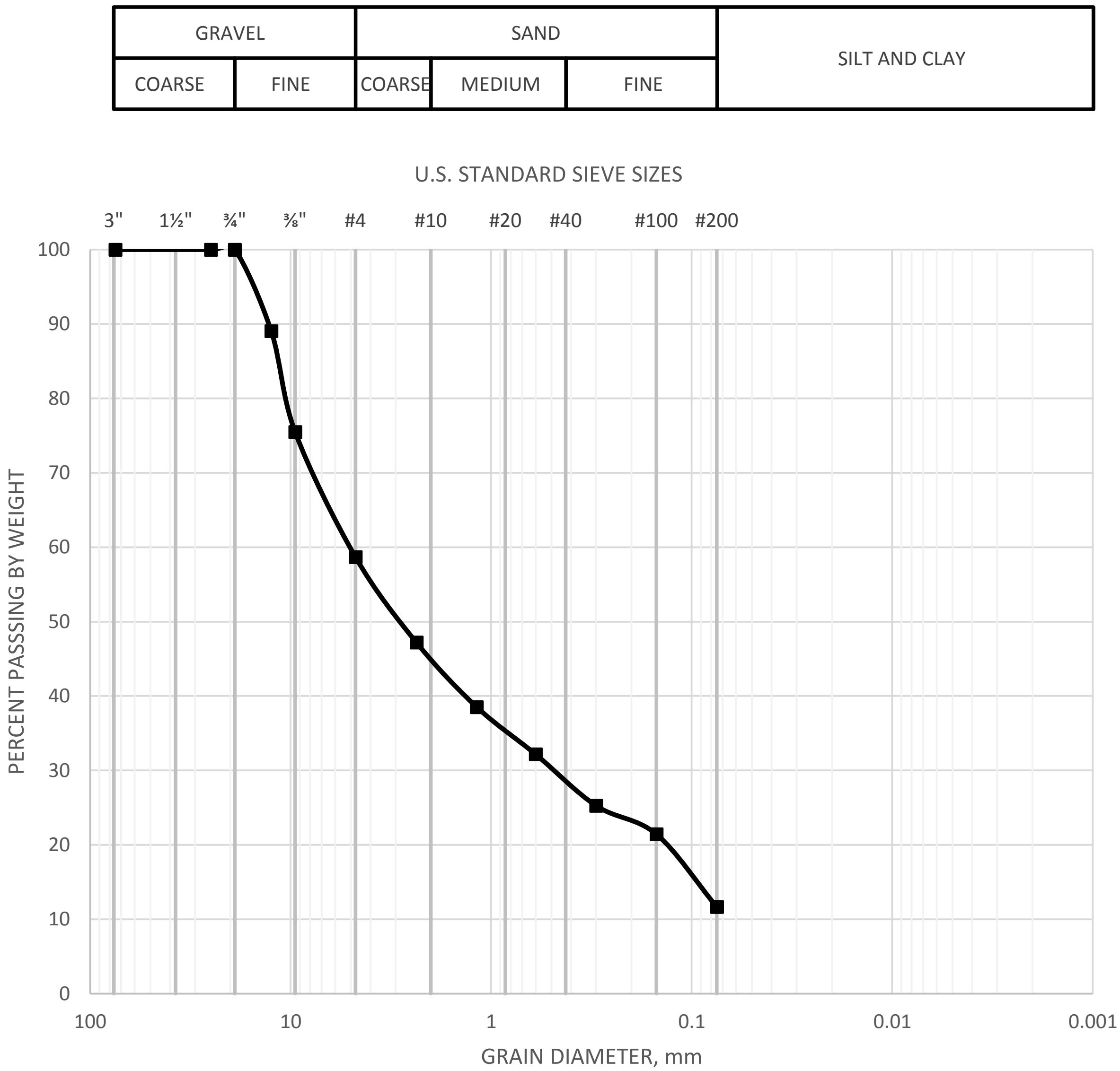
TEST NO.		1	2	3	4	5	6
Wt. Compacted Soil + Mold	(g)	6370	6456	6415	6244		
Weight of Mold	(g)	4282	4282	4282	4282		
Net Weight of Soil	(g)	2088	2174	2133	1962		
Wet Weight of Soil + Cont.	(g)	728.7	752.7	757.3	753.4		782.2
Dry Weight of Soil + Cont.	(g)	704.7	719.6	714.8	738.1		775.0
Weight of Container	(g)	255.3	258.1	259.6	258.3		259.4
Moisture Content	(%)	5.3	7.2	9.3	3.2		1.4
Wet Density	(pcf)	138.2	143.9	141.2	129.9		
Dry Density	(pcf)	131.2	134.3	129.2	125.9		0.0

Maximum Dry Density (pcf)	**134.4**	**Optimum Moisture Content (%)**	**7.4**



Preparation Method: A

GEOCON	**MODIFIED COMPACTION TEST OF SOILS**	Project No.: T2860-22-01
	ASTM D-1557	TEMECULA PARK AND RIDE IMPROVEMENTS TEMECULA PARKWAY AND WABASH LANE TEMECULA, CALIFORNIA
	Checked by: CER	Aug 19 — Figure B-2



SAMPLE	CLASSIFICATION	D60	D30	D10
C-1@8-30"	Poorly graded SAND with silt and gravel (SP-SM), olive gray	5.0	0.49	

GEOCON

GRAIN SIZE DISTRIBUTION

ASTM D-422

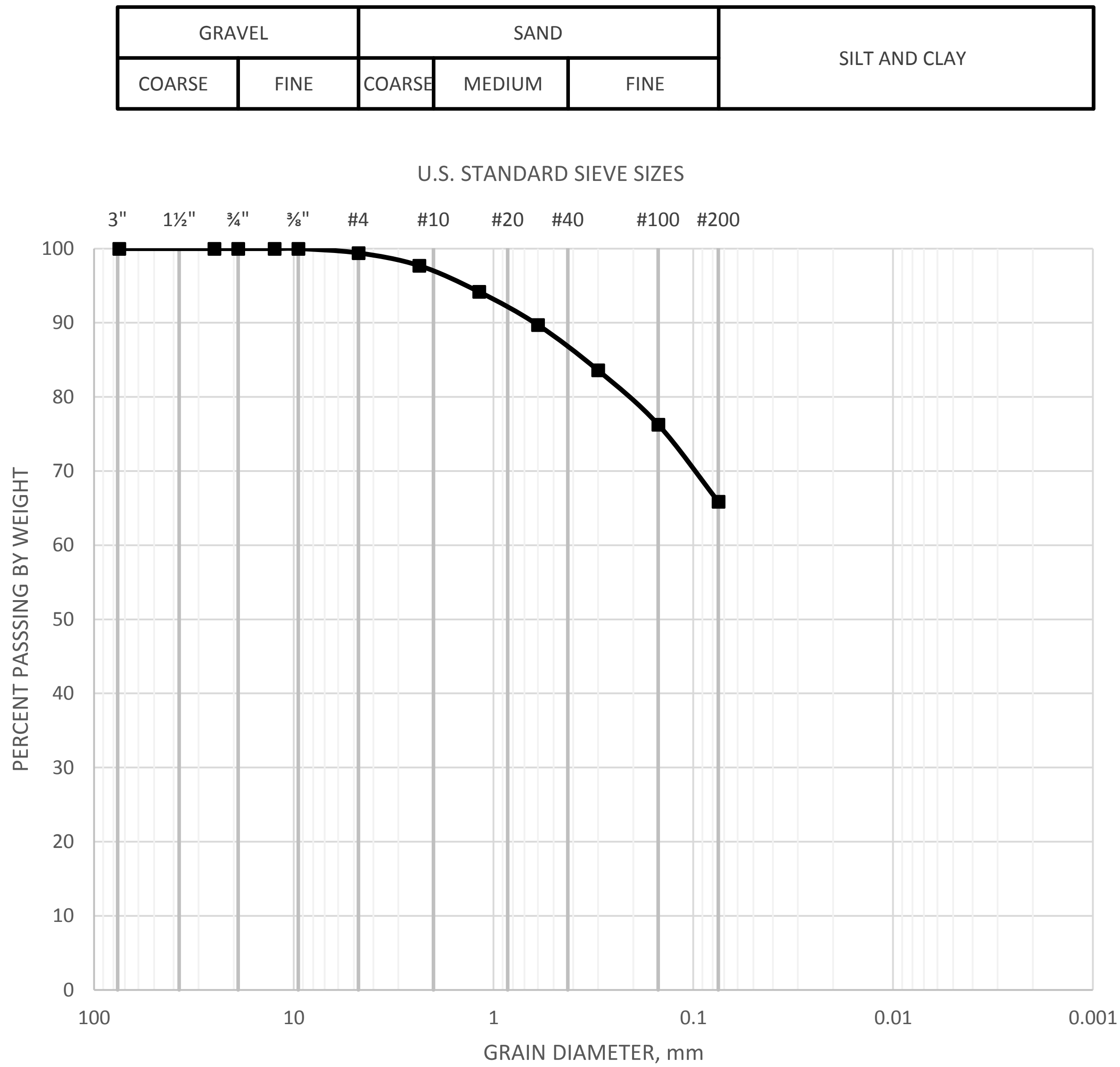
Checked by: CER

Project No.: T2860-22-01

TEMECULA PARK AND RIDE IMPROVEMENTS
TEMECULA PARKWAY AND WABASH LANE
TEMECULA, CALIFORNIA

Aug 19

Figure B-3



SAMPLE	CLASSIFICATION	D60	D30	D10
P-1@4-5'	Sandy SILT (ML), dark brown			

GEOCON

GRAIN SIZE DISTRIBUTION

ASTM D-422

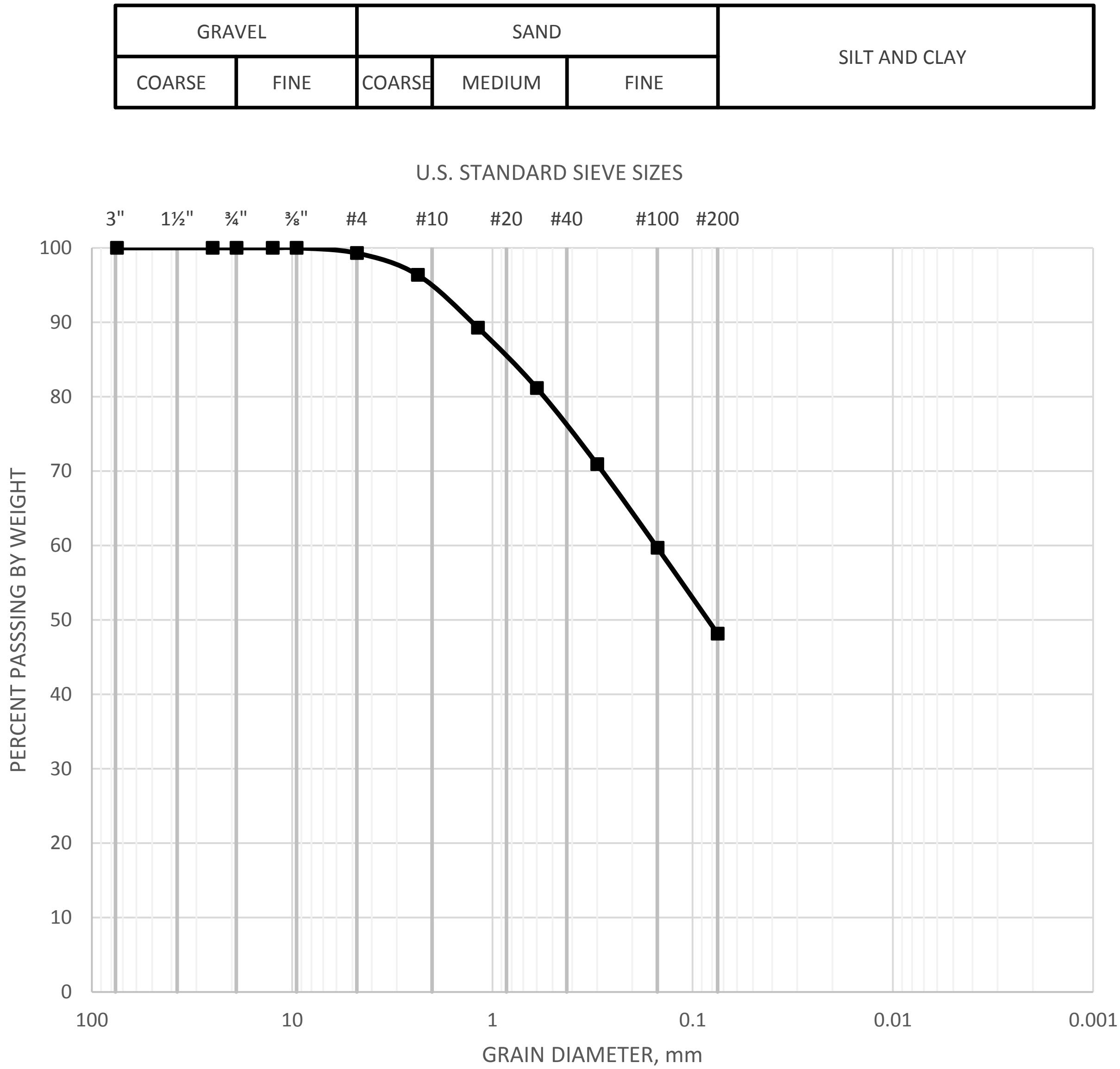
Checked by: CER

Project No.: T2860-22-01

TEMECULA PARK AND RIDE IMPROVEMENTS
TEMECULA PARKWAY AND WABASH LANE
TEMECULA, CALIFORNIA

Aug 19

Figure B-4



SAMPLE	CLASSIFICATION	D60	D30	D10
P-2@4-5'	Silty SAND (SM), yellowish brown	0.15		

GEOCON

GRAIN SIZE DISTRIBUTION

ASTM D-422

Checked by: CER

Project No.: T2860-22-01

TEMECULA PARK AND RIDE IMPROVEMENTS
TEMECULA PARKWAY AND WABASH LANE
TEMECULA, CALIFORNIA

Aug 19

Figure B-5