LGC GEO-ENVIRONMENTAL, INC.

UPDATED PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED 17-ACRE MULTI-USE "SKYLINE VILLAGE" DEVELOPMENT, LOCATED AT WEST CHASE DRIVE AND FOOTHILL PARKWAY IN THE CITY OF CORONA, RIVERSIDE COUNTY, CALIFORNIA; APNS: 275-050-014-6 AND 275-080-041-3

Dated: July 16, 2020
Project No. G19-1802-10

Prepared For:

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LGC GEO-ENVIRONMENTAL, INC.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING

July 16, 2020 Project No. G19-1802-10

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Subject: Updated Preliminary Geotechnical Investigation Report for the Proposed 17-Acre Multi-Use "Skyline Village" Development, Located at West Chase Drive and Foothill Parkway in the City of Corona, Riverside County, California; APNs: 275-050-014-6 and 275-080-041-3.

LGC Geo-Environmental, Inc. (LGC) is pleased to submit herewith our updated preliminary geotechnical investigation report for the proposed 17-acre multi-use "Skyline Village" development located at West Chase Drive and Foothill Parkway in the city of Corona, Riverside County, California; APNs: 275-050-014-6 and 275-080-041-3. This report has been updated to address the revised civil engineering design for this site. This report presents the results of our research of published geologic/geotechnical reports and/or maps, review of aerial photographs, field exploration, geologic mapping, and laboratory testing; in addition to our geotechnical and geologic judgment, opinions, conclusions and preliminary recommendations associated with the proposed multi-use development.

Based on the results of our field exploration, geologic mapping, laboratory testing, geologic and geotechnical engineering evaluations, along with review of published literature and the preliminary grading plan, it is our opinion that the subject site is suitable for the proposed multi-use development, provided that the recommendations presented herein are utilized during design and implemented during grading and construction. LGC should review all pertinent grading plans, as well as any foundation/structural plans when these become available, and revise the recommendations presented herein, if necessary.

It has been a pleasure to be of service to you during the design stages of this project. If you have any questions regarding the contents of this report or require additional information, please do not hesitate to contact us.

Respectfully submitted,

LGC Geo-Environmental, Inc.

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1.0 INTRODUCTION

This report presents the results of LGC Geo-Environmental, Inc.'s (LGC) preliminary geotechnical investigation report for the proposed 17-acre multi-use "Skyline Village" development located at West Chase Drive and Foothill Parkway in the city of Corona, Riverside County, California. The purposes of this geotechnical investigation are to determine the nature of surface and subsurface soil conditions, evaluate the soil characteristics, and provide geotechnical recommendations with respect to grading, construction, foundation design, and other relevant aspects to the proposed development. The referenced Conceptual Grading Plan, which was provided, was utilized as the base map for our Geotechnical Map (Plate 1) of the site.

Our scope of services consists of:

- Review of available previous geologic/geotechnical literature, geologic maps, and aerial photographs pertinent to the site (Appendix A).
- Geologic mapping of the site.
- Subsurface exploration consisting of the sampling and logging of eight (8) trenches to depths of approximately 5 feet to 14 feet, using a backhoe. Logs of the trenches are presented in Appendix B, with approximate locations depicted on the Geotechnical Map (Plate 1). The trenches were excavated to evaluate the general characteristics of the subsurface geologic/geotechnical conditions on the subject project site including classification of site soil, determination of depth to groundwater (if present), and to obtain representative soil samples.
- Laboratory testing of representative soil samples obtained during our current subsurface exploration (Appendix C). Laboratory tests included maximum dry density and optimum moisture content, expansion index, sulfate content, chloride content, pH/Resistivity, direct shear, and R-value.
- Geotechnical engineering and geologic analysis of the data with respect to the proposed 17-acre multi-use development.
- Preparation of this report presenting our findings, conclusions and preliminary geotechnical design recommendations for the proposed development; including General Earthwork and Grading Specifications (Appendix D).

1.1 Proposed Construction and Grading

The revised referenced "Conceptual Grading Plan", prepared by KWC Engineering (KWC, 2020), indicates that the proposed multi-use development will be comprised of three parcels, with Parcels 1 and 2 are proposed for commercial development and are located closer to Foothill Parkway. A total of 41 condominiums within 6 complexes are proposed in Parcel 3 on the westerly portion of the site, which are identified as C1 through C6 on the updated Conceptual Grading Plan (Plate 1).

More specifically, one commercial building (A), storage containers and five kiosks are proposed in Parcel 1. Parcel 2 indicates one commercial building (B) is proposed in this area. Parcel 3 contains the six proposed condominium complexes (C1 through C6), a pool, pool/recreational building and spa building.

A large 75 ± foot high cut slope is proposed along the westerly half of the southern property line and incorporates a 25-foot-high retaining wall at the toe. Another large retaining wall approximately 35 feet in height is proposed at the northern property line. Two approximately 8-foot retaining walls are proposed near the western property line and southern property line. Associated interior roadways and parking areas are also proposed for this development.

The site will require extensive export of soil to achieve a balanced cut to fill quantity. When a final rough grading plan is available, LGC should review and make any additional recommendations as required.

1.2 Location and Site Description

The subject site is irregular in shape and is located to the southwest of the intersection of West Chase Drive and Foothill Parkway in the city of Corona, Riverside County, California. The site is bounded on the north and west by vacant lots, on the south by a plant nursery, and on the east by Foothill Parkway. The general location and configuration of the site is shown on the Site Location Map (Figure 1).

FIGURE 1
SITE LOCATION MAP

Project Name	GF INVESTMENTS
Project No.	G19-1802-10
Geol./ Eng.	MB/LC
Scale	NOT TO SCALE
Date	JULY 2020

1.3 Topography and Drainage

Onsite surface elevations range from approximately 1,250 feet above mean sea level (msl) at the southerly property line to approximately 1,100 feet above msl in the northeast at the existing drainage inlet. Local drainage is generally directed away from the flattened ridge top in all directions and towards the northeast at the base of the ridge to existing storm drain inlet near the northerly property line.

1.4 Existing Improvements and Vegetation

The subject site is a vacant property with a graded ridge top (approximately 1,225 feet above msl elevation) and an approximately 130-foot high fill slope with associated terrace drains bordering the graded ridge top. A paved path leads onto the site from Foothill Parkway which transitions to a dirt path near the northern perimeter of the site. Annual weeds are abundant on the project site, along with trees, shrubs, and debris.

1.5 Research of Previous Geological and Geotechnical Data

This firm researched and reviewed the geotechnical and fault study report from LGC Inland (2004) along with unpublished geotechnical and geologic reports, maps, and data. Based on this firm's research, pertinent information was incorporated into the conclusions and recommendations presented in our report.

2.0 FIELD INVESTIGATION

2.1 Geologic Mapping

Surface geologic mapping of the site and accessible surrounding areas was accomplished by a geologist from this firm on December 9, 2019, utilizing the referenced "Conceptual Grading Plan" for plotting geologic units. This information is plotted on the enclosed Geotechnical Map (Plate 1).

2.2 Field Exploration

Subsurface exploration was performed on December 9, 2019 and December 10, 2019, which involved the excavation of eight (8) exploratory trenches (Trenches TR-1 through TR-8) to depths ranging from approximately 5 feet to 14 feet utilizing a rubber tire backhoe.

Prior to our subsurface work, an underground utilities clearance was obtained from Underground Services Alert of Southern California. At the conclusion of the subsurface exploration, all of the exploratory trenches were backfilled with on-site materials with some compactive effort. Minor settlement of the backfill soil may occur over time.

Earth materials encountered within the trenches were classified and logged by a geologist from LGC in accordance with the visual-manual procedures of the Unified Soil Classification System. The approximate locations of the exploratory trenches are shown on the Geotechnical Map (Plate 1) and descriptive logs are presented in Appendix B.

Bulk samples of soil associated with the initial subsurface exploration were collected for laboratory testing. Bulk samples consisted of selected soil materials obtained at various depth intervals from the exploratory trenches.

2.3 Laboratory Testing

During our subsurface exploration, relatively undisturbed and bulk samples were retained for laboratory testing. Laboratory testing was performed on selected representative samples of onsite soil materials and included maximum dry density and optimum water content, expansion index, sulfate content, chloride content, pH, resistivity, shear strength, and R-Value. A brief description of the laboratory test criteria and test data are presented in Appendix C. In-situ water contents and dry densities are included in the exploration trench logs (Appendix B).

3.0 FINDINGS

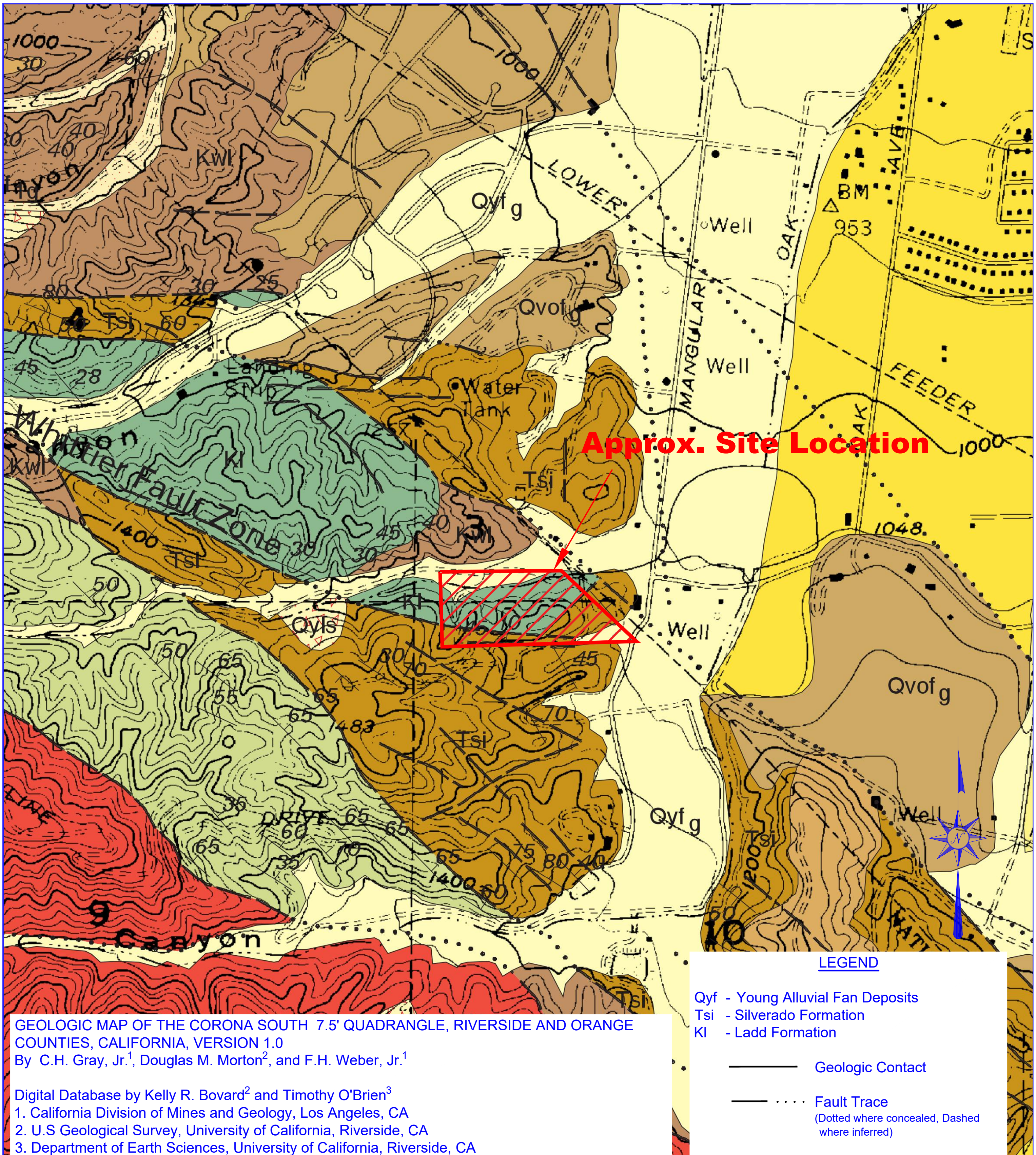
3.1 Regional Geologic Setting

Regionally, the site is located in the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges are characterized by steep, elongated valleys that trend west to northwest. The northwest-trending topography is controlled by the Elsinore Fault Zone, which extends from the San Gabriel River Valley southeasterly to the United States/Mexico border. The Santa Ana Mountains lie along the western side of the Elsinore Fault Zone, while the Perris Block is located along the eastern side of the fault zone. The mountainous regions are underlain by Pre-Cretaceous, metasedimentary and metavolcanic rocks and Cretaceous plutonic rocks of the Southern California Batholith. Holocene to Pleistocene-aged alluvium overlie Quaternary and Tertiary rocks, which are generally comprised of non-marine sediments consisting of sandstone, mudstones, conglomerates, and occasional volcanic units. A map of the regional geology is presented on the Regional Geologic Map (Figure 2).

3.2 Local Geology and Soil Conditions

Based on our review of available geological and geotechnical literature, current field mapping, and exploratory trenches conducted at the site, it is our understanding that the site is primarily underlain by compacted artificial fill, young alluvial fan deposits, Silverado Formation bedrock, and Ladd Formation bedrock. Each unit is described in greater detail below and presented within the exploratory trench logs (Appendix B). The approximate locations of the observed geologic units are depicted on the Geotechnical Map (Plate 1).

- Artificial Fill, Undocumented (Afu) – Undocumented artificial fill was encountered in trenches TR-5 through TR-7 to depths ranging from existing ground surface to 2.0 feet below the surface. These materials consisted of unconsolidated clayey sand which was various shades of brown, orange, and red, damp to moist, loose to medium dense and fine to medium grained. Localized gravel, cobbles, roots and debris was also observed.
- Artificial Fill, Compacted (Afc) – Compacted artificial fill was encountered in trenches TR-1, TR-4, and TR-8 to depths ranging from the existing ground surface to 2.0 feet below the surface. These materials consisted of silty sand and clayey sand which was various shades of brown, orange, and red, damp to moist, loose to medium dense and fine to coarse grained. Localized gravel, cobbles, and roots were also encountered.
- Young Alluvial Fan Deposits (Qyf) – Young alluvial fan deposits were observed at depths ranging from approximately 2.0 feet to 14.0 feet below the surface in trenches TR-4 through TR-7, below the compacted artificial fill. The alluvium generally consists of alternating layers of poorly-graded sand, well-graded sand, silty sand, and clayey sand, and is various shades of brown, yellow, and gray, dry to moist and loose to medium dense. The material was also noted to be fine to coarse grained with gravel and cobbles, localized boulders, roothairs, pinhole porosity, and oxidation staining.
- Silverado Formation (Tsi) – Paleocene-aged Silverado Formation was encountered in trenches TR-1, TR-2, and TR-8 both at the ground surface and below the compacted artificial fill. This bedrock is generally a clayey to silty sandstone and is characterized as being various shades of red, gray, and brown, dry to damp, moderately hard to hard, and fine to coarse grained with subangular to subrounded gravel and cobbles.
- Ladd Formation (Kl) – Cretaceous-aged Ladd Formation was encountered in trenches TR-1, TR-3, TR-6, TR-7, and TR-8 at the ground surface and below the compacted artificial fill. The bedrock is generally a clayey to silty sandstone and is characterized as being various shades of white, gray, orange, and brown; dry to damp, moderately hard to hard, with subangular to subrounded gravel, cobbles, and boulders.



GEOLOGIC MAP OF THE CORONA SOUTH 7.5' QUADRANGLE, RIVERSIDE AND ORANGE COUNTIES, CALIFORNIA, VERSION 1.0
By C.H. Gray, Jr.[1], Douglas M. Morton[2], and F.H. Weber, Jr.[1]

Digital Database by Kelly R. Bovard[2] and Timothy O'Brien[3]
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3. Department of Earth Sciences, University of California, Riverside, CA

LEGEND

Qyf - Young Alluvial Fan Deposits
Tsi - Silverado Formation
Kl - Ladd Formation

Geologic Contact

Fault Trace
(Dotted where concealed, Dashed where inferred)

FIGURE 2
REGIONAL GEOLOGIC MAP

Project Name	GF INVESTMENTS
Project No.	G19-1802-10
Geologist	MB
Scale	NOT TO SCALE
Date	JULY 2020

3.3 Landslides

Our investigation did not indicate the presence of landslides on or directly adjacent to the site.

3.4 Groundwater

Groundwater was not encountered during the subsurface exploration.

A review of the California Department of Water Resources, Water Data Library online database indicates the presence of groundwater approximately 2.3 miles away from the general site area at approximately 198 feet below the existing ground surface according to historical records at an elevation of approximately 729 feet above mean sea level (Well ID: Station 338729N1175842W001).

3.5 Caving

Caving was not encountered in the exploratory trenches.

3.6 Surface Water

Surface water runoff relative to project design is within the purview of the project civil engineer and should be designed to be directed away from all structures and walls in accordance with the latest California Building Code (CBC) requirements.

3.7 Faulting

The geologic structure of the Southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. Faults, such as the Whittier, Elsinore, San Jacinto and San Andreas, are major faults in this system and are known to be active and may produce moderate to strong ground shaking during an earthquake. In addition, the San Andreas, Elsinore and San Jacinto faults are known to have ruptured the ground surface in historic times.

The following table is comprised of a list of the significant faults located within 20 miles of the proposed project site. We have also included the Maximum Earthquake Magnitude predicted for each of these faults.

TABLE 1
Significant Faults in Proximity of the Project Site

ABBREVIATED FAULT NAME	*APPROXIMATE DISTANCE (mi)*	*MAXIMUM EARTHQUAKE MAGNITUDE (Mw)*
Chino-Central Ave. (Elsinore)	1.9	6.7
Elsinore-Glen Ivy	2.0	6.8
Whittier	2.7	6.8
Elysian Park Thrust	17.7	6.7
San Jose	18.8	6.5

Source: EQFAULT for Windows Version 3.00b

A previous fault investigation conducted by LGC Inland (2004) concluded that non-active or potentially active faulting related to unnamed faults (determined to be the Tin Mine fault by LGC, 2020) are known to transect the site (Appendix A). A portion of the site does lie within an Alquist-Priolo Earthquake Fault Hazard Zone as defined by the State of California in the Alquist-Priolo Earthquake Fault Hazard Zoning Act. According to LGC Inland (2004), the potential for damage because of minor secondary co-seismic, ground surface rupture is considered a possibility since non-active or potentially active faults are known to cross the site. A separate geologic fault evaluation was conducted by this firm (Appendix A) and concluded that no active faulting transects the site.

3.8 Seismicity

Secondary effects of seismic shaking resulting from large earthquakes on the major faults in the southern California region, which may affect the site, include soil liquefaction and dynamic settlement. Liquefaction is a seismic phenomenon in which loose, saturated, granular soil behave similarly to a fluid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: 1) shallow groundwater; 2) low density non-cohesive (granular) soil; and 3) high-intensity ground motion. Studies indicate that saturated, loose to medium dense, near surface cohesionless soil exhibit the highest liquefaction potential; while dry, dense, cohesionless soil and cohesive soil exhibit low to negligible liquefaction potential.

Due to the shallow depth of bedrock, dense alluvium, and groundwater depth being greater than 50 feet, the potential for liquefaction is considered insignificant for the subject site.

Other secondary seismic effects include shallow ground rupture, seiches, and tsunamis. In general, these secondary effects of seismic shaking are a possibility throughout the Southern California region and are dependent on the distance between the site and causative fault and the onsite geology. A risk assessment of these secondary effects is provided in the following sections.

3.9 Earthwork and Structural Settlements

The results of our subsurface exploration and laboratory testing indicate that the site is underlain by approximately 1.0 foot to 3.0 feet of potentially compressible soil, consisting of undocumented artificial fill. These materials exhibit the potential to settle under the surcharge of proposed fill loads, anticipated future structural loads, and improvements.

Where overexcavation to competent underlying bedrock is accomplished, total static settlement from the earthwork and from proposed fill loads is estimated to be 3/4-inch total and 1/2-inch differential over 30 feet.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 General

Based on the results of our current geotechnical investigation, it is our opinion that the proposed multi-use development, as indicated on the referenced conceptual grading plan, is feasible from a geotechnical and geologic standpoint, provided that the following recommendations are incorporated into the design criteria and project specifications. When final grading plans for the site and foundation/structural plans for the proposed development are available, a comprehensive plan review should be performed by this firm. Depending on the results, additional recommendations may be necessary for geotechnical design parameters for both earthwork and foundations. Grading should be conducted in accordance with the latest edition of CBC, local codes, the recommendations within this report, and future plan reviews. It is also our opinion that the proposed construction and grading will not adversely impact the geologic stability of adjoining properties.

The following is a summary of the primary geotechnical factors determined from our geotechnical investigation.

- Based on our current subsurface exploration and review of pertinent geological maps and reports, the site is underlain by compacted artificial fill, young alluvial fan deposits, and in-situ bedrock of Silverado Formation and Ladd Formation.
- There are not any known landslides impacting the site.

- Groundwater is not considered a constraint for the proposed multi-use development.
- Non-active or potentially active faults are known to exist on the site.
- Laboratory test results of the upper soil (compacted artificial fill and weathered bedrock) indicate a very low expansion potential and negligible potential for soluble sulfate effects on normal concrete and chloride effects on reinforcing steel.
- Laboratory test results of the soil encountered indicated a mild corrosion potential to buried metals.
- The majority of the site is underlain by approximately 1.0 foot to 2.0 feet of potentially compressible artificial fill and portions of the upper alluvium which may be prone to potentially intolerable post-grading settlement under the surcharge of the future proposed fill loads and/or structural loads. These materials should be overexcavated to underlying competent soils or bedrock.
- From a geotechnical perspective, the existing onsite soil appears to be suitable material for use as fill, provided the soil are relatively free from rocks (larger than 6 inches in maximum dimension), construction debris, and organic material. It is anticipated that the onsite soil may be excavated with conventional heavy-duty construction equipment.
- The proposed 75± foot high north facing cut slope along the southern property line should be further evaluated utilizing a bucket auger and downhole logging by a geologist (See Figure 3, Geologic Cross Section A-A').

5.0 GEOLOGIC CONSIDERATIONS

5.1 Slopes

Natural slopes and existing cut/fill slopes exist on the project site. To better assess the slopes and slope stability, LGC recommends additional investigation of these slopes utilizing a bucket auger with future down-hole logging of these excavations by a geologist.

5.2 Faulting

Geologic hazards due to secondary fault rupture are known to be present on the subject site. Inactive to potentially active faulting related to the Tin Mine fault was observed within fault trenches located within the site. The fault trenches and approximate fault locations are shown on the Geotechnical Map (Plate 1). No fault setbacks were previously recommended or are required for potentially active faults for the proposed development.

5.3 Groundwater

Adverse effects on the proposed development resulting from groundwater are not anticipated.

5.4 Subsidence

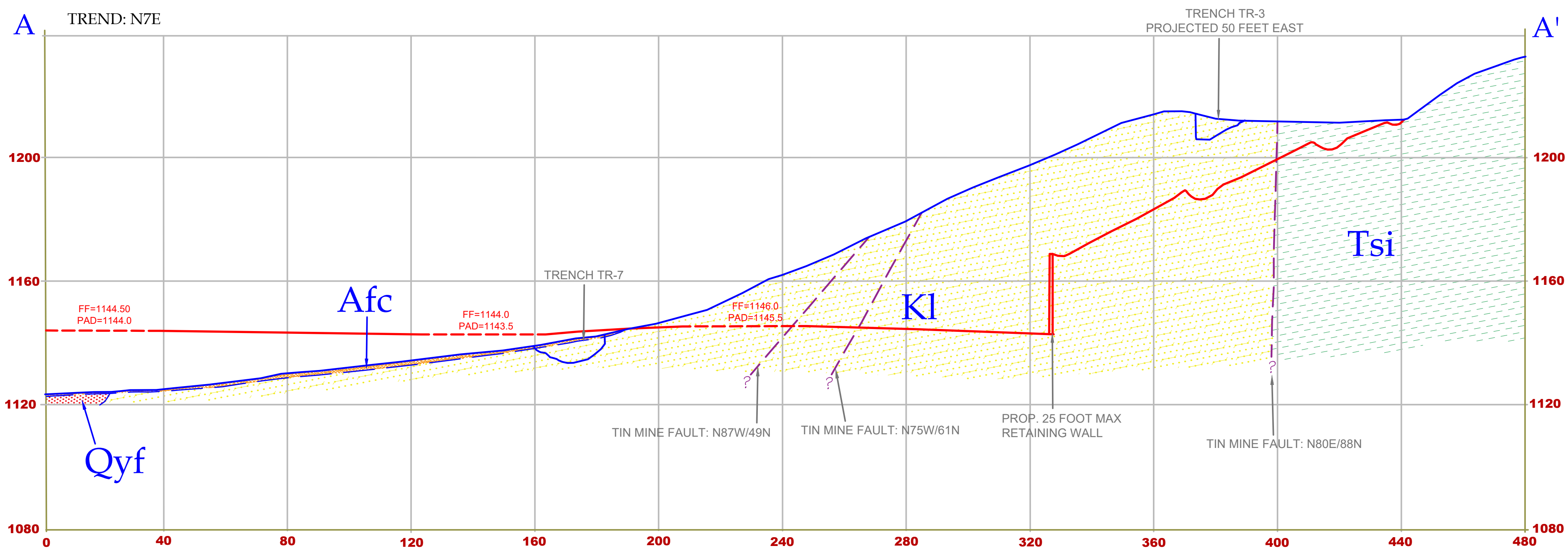
In consideration of the anticipated grading, recommended overexcavations and subsurface material types and soil conditions, unfavorable ground subsidence is not anticipated.

5.5 Landsliding

Landslides or surface failures were not observed on or directly adjacent to the site. As a result, the possibility of the site being affected by landsliding is not anticipated.

5.6 Ground Rupture

Secondary ground rupture from potentially active faulting could possibly occur on site from the presence of observed, potentially active faulting related to the Tin Mine fault. Cracking from shaking from distant seismic events is not considered a significant hazard, although it is a possibility at any site.



Geologic Earth Units

Afc - Artificial Fill, Compacted
Qyf - Young Alluvial Fan Deposits
Kl - Ladd Formation
Tsi - Silverado Formation

Symbols

- Geologic Contact
- Fault Trace
- Existing Topography
- Proposed Slope Grade

0 50' 100'

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FIGURE 3
CROSS SECTION A-A'
APNs 275-050-014-6 and 275-080-041-3, Located at West Chase Drive and Foothill Parkway
City of Corona, County of Riverside, State of California

Name:	GF Investments
Project No.	G19-1802-10
Client:	GF Investments, LLC
Scale:	1"= 50'
Date:	July 2020
Reference:	KWC Engineers, Conceptual Grading Plan, Skyline Village Project, Scale 1"=40' dated 12/10/19

5.7 Tsunamis and Seiches

Based on the elevation and location of the proposed development on the site with respect to sea level and its distance from large open bodies of water, the potential for seiches and/or tsunamis is not considered to be a possibility.

5.8 Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similarly to a fluid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: 1) shallow groundwater; 2) low density non-cohesive (granular) soil; and 3) high-intensity ground motion. Studies indicate that saturated, loose to medium dense, near surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential. Bedrock was found as shallow as 0.5 feet in Trench TR-1 and TR-2. With shallow bedrock, the potential for liquefaction is considered nil.

6.0 SEISMIC-DESIGN CONSIDERATIONS

6.1 Ground Motions

The site will probably experience ground shaking from moderate to large size earthquakes during the life of the proposed development. Furthermore, it should be recognized that the Southern California region is an area of high seismic risk, and that it is not considered feasible to make structures totally resistant to seismic-related hazards.

Structures within the site should be designed and constructed to resist the effects of seismic ground motions as provided in the 2019 CBC, Section 1613. The method of design is dependent on the seismic zoning, site characterizations, occupancy category, building configuration, type of structural system, and building height.

The following seismic design parameters, presented in Table 2, were developed based on the CBC 2019 and should be used for the proposed habitable structures. A site coordinate of 33.8440° N, 117.6036° W was used to derive the seismic parameters presented below. The derived value for Mean Peak Ground Acceleration (PGAm) is shown in the following table as 1.15.

TABLE 2
Seismic Design Soil Parameters

SEISMIC DESIGN SOIL PARAMETERS **(2019 CBC Section 1613)**	
Site Class Definition ASCE 7; Chapter 20 (Table 20.3-1)	D
Mapped Spectral Response Acceleration Parameter S_s (for 0.2 second) (Figure 1613.5.3.(1)	2.49
Mapped Spectral Response Acceleration Parameter, S_1 (for 1.0 second) (Figure 1613.5.3.(2)	0.94
Site Coefficient F_a (short period) [Table 1613.3.3.(1)]	1.00
Site Coefficient F_v (1-second period) [Table 1613.3.3.(2)]	1.50
Adjusted Maximum Considered Earthquake (MCE) Spectral Response Acceleration Parameter S_{MS} (short period) (Eq. 16-37)	2.49
Adjusted Maximum Considered Earthquake (MCE) Spectral Response Acceleration Parameter S_{M1} (1-second period) (Eq. 16-38)	1.41
Design Spectral Response Acceleration Parameter, S_{DS} (short period) (Eq. 16-39)	1.85
Design Spectral Response Acceleration Parameter, S_{D1} (1-second period) (Eq. 16-40)	0.94
Mean Peak Ground Acceleration (PGA_m)	1.15
Long-period transition period in seconds (T_L)	8.0
Probabilistic risk-targeted ground motion (SsRT) (0.2 second) (S_sRT)	2.67
Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration (SsUH)	2.95
Factored deterministic acceleration value (0.2 second) (S_sD)	2.49
Probabilistic risk-targeted ground motion (1.0 second) (S_1RT)	0.94
Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration (S_1UH)	1.05
Factored deterministic acceleration value (1.0 second) (S_1D)	0.99
Factored deterministic peak acceleration value (PGA_d)	1.05
Mapped value of risk coefficient at short periods (C_{RS})	0.90
Mapped value of risk coefficient at period of 1 second (C_{R1})	0.89

6.2 Secondary Seismic Hazards

Secondary effects of seismic activity normally considered as possible hazards to a site include several types of ground failure, as well as induced flooding. Various general types of ground failures which might occur as a consequence of severe ground shaking of the site include liquefaction, landsliding, ground subsidence, ground lurching, and shallow ground rupture. The probability of occurrence of each type of ground failure depends on the severity of the earthquake, distance from faults, topography, subsoils and groundwater conditions, in addition to other factors. Based on the depth to groundwater, proposed grading and recommended overexcavation of potentially compressible materials within areas of proposed development, the secondary effects of liquefaction are considered unlikely.

Seismically induced flooding, which might be considered a potential hazard to a site, normally includes flooding due to a tsunami (seismic sea wave), a seiche (i.e., a wave-like oscillation of the surface of water in an enclosed basin that may be initiated by a strong earthquake) or failure of a major reservoir or retention structure upstream of the site. Since the site is located several miles inland from the nearest coastline of the Pacific Ocean and the site elevation is approximately 1,100 feet above msl at lowest point, there is no potential for seismically induced flooding from a tsunami. Since enclosed bodies of water do not lie adjacent to the site, the potential for induced flooding at the site due to a seiche is also considered nonexistent.

7.0 GEOTECHNICAL DESIGN PARAMETERS

7.1 Shrinkage/Bulking and Subsidence

Volumetric changes in earth quantities will occur when excavated onsite soil are replaced as properly compacted fill. The following table, Table 3, is an estimate of the shrinkage and bulking factors for the various geologic units present onsite. These estimates are based on in-place densities of the various materials and on the estimated average degree of relative compaction that will be achieved during grading.

TABLE 3
Estimated Shrinkage/Bulking

GEOLOGIC UNIT	*SHRINKAGE/BULKING PERCENT*
Artificial Fill, Compacted (Afc)	0%-5%
Young Alluvial Fan Deposits (Qyf)	5%-15%
Silverado Formation (Tsi)	0%-5% (Bulking)
Ladd Formation (Kl)	0%-5% (Bulking)

Subsidence of the alluvium deposits is estimated to be approximately 0.10 to 0.20 feet.

The above estimates of shrinkage are intended as an aid for project engineers in determining earthwork quantities. **However, these estimates should be used with some caution since they are not absolute values.** These are preliminary rough estimates which may vary with depth of removal, stripping losses, field conditions at the time of grading, etc. Handling losses, and reduction in volume due to removal of oversized material, are not included in the estimates.

7.2 Compressible/Collapsible Soil

The results of our laboratory testing indicate that the near surface existing undocumented artificial fill and compacted artificial fill are susceptible to varying degrees of intolerable settlement when a load is applied, or the soil is saturated. Consequently, these materials should be collectively overexcavated to underlying competent fill, alluvial fan deposits, or bedrock, and replaced as engineered compacted fill. The recommended depth of removals are indicated in the accompanying Geotechnical Map (Plate 1).

8.0 SITE EARTHWORK

8.1 General Earthwork and Grading Specifications

Earthwork and grading should be performed in accordance with applicable requirements of the 2019 CBC, grading code of the City of Corona, and in accordance with the following recommendations prepared by this firm. Grading should also be performed in accordance with the applicable provisions of the attached "General Earthwork and Grading Specifications" prepared by LGC (Appendix D), unless specifically revised or amended herein. In case of conflict, the following recommendations shall supersede those included in as part of Appendix D.

8.2 *Geotechnical Observations and Testing*

Prior to the start of grading, a meeting should be held at the site with the owner, developer, grading contractor, civil engineer and geotechnical consultant to discuss the work schedule and geotechnical aspects of the grading. Rough grading, which includes clearing, overexcavation, scarification/processing and fill placement, should be accomplished under the full-time observation and testing of the geotechnical consultant. Fills should not be placed without prior approval from the geotechnical consultant.

A representative of the project geotechnical consultant should also be present onsite during grading operations to document proper placement and compaction of fills, as well as to document excavations and compliance with the other recommendations presented herein.

8.3 *Clearing and Grubbing*

The project geotechnical consultant or his qualified representative should be notified at the appropriate times to provide observation and testing services during clearing and grubbing operations to observe and document compliance with the above recommendations. In addition, buried structures, unusual or adverse soil conditions encountered that are not described or anticipated herein should be brought to the immediate attention of the geotechnical consultant.

8.4 *Overexcavation and Ground Preparation*

The site is underlain by approximately 1.0 foot to 3.0 feet of compressible undocumented artificial fill, weathered compacted artificial fill and portions of the upper alluvium which is considered unsuitable for support of fill, structures, and/or improvements, and should be overexcavated to expose underlying competent alluvium or bedrock. Overexcavation must provide at least 2 feet to 3 feet or more of compacted fill below finished grade within areas of proposed structures or walls. Therefore, those areas should be overexcavated to at least 2 feet to 3 feet or more below proposed grade. Actual depths of overexcavation should be evaluated upon review of final grading and foundation plans, as well as during grading on the basis of observations and testing during grading by the project geotechnical consultant.

Across the site are twelve (12) trenches that were excavated in 2004 and 2019. These trenches range in depths of 5 feet to 14 feet. The locations of the trenches can be found on the Geotechnical Map (Plate 1), and should be reexcavated and replaced as compacted fill, if not accomplished during previous rough grading operations.

Prior to placing engineered fill, exposed bottom surfaces in each overexcavated area should first be scarified to a depth of approximately 6 inches, watered or air-dried as necessary to achieve a uniform water content of optimum or higher and then compacted in place to a relative compaction of 90 percent or more (based on American Standard of Testing and Materials [ASTM] Test Method D1557).

The estimated locations, extent, and approximate depths for overexcavation of unsuitable materials are indicated on the enclosed Geotechnical Map (Plate 1). The geotechnical consultant should be provided with appropriate survey staking during grading to document that depths and/or locations of recommended overexcavation are adequate.

Sidewalls for overexcavations greater than 5 feet in height should not be steeper than 1:1 horizontal to vertical (h:v) and should be periodically slope-boarded during the excavation to remove loose surficial debris and facilitate mapping. Flatter excavations may be necessary for stability.

The grading contractor will need to consider appropriate measures necessary to excavate existing improvements adjacent to the site without endangering them from caving or sloughing.

8.5 Fill Suitability

Soil materials excavated during grading are generally considered suitable for use as compacted fill provided that they do not contain significant amounts of trash, vegetation, organic material, construction debris, and oversize material.

8.6 Oversized Material

Oversized material that may be encountered during grading, greater than 8 inches, should be reduced in size or removed from the site

8.7 Cut/Fill Transitions and Differential Fill Thicknesses

To mitigate distress to structures related to the potential adverse effects of excessive differential settlement, cut/fill transitions should be eliminated from all building areas where the depth of fill placed within the "fill" portion exceeds proposed footing depths. The entire structure should be founded on a uniform bearing material. This should be accomplished by overexcavating the "cut" portion and replacing the excavated materials as properly compacted fill. Recommended depths of overexcavation are provided in the following table:

Cut/Fill Transition

DEPTH OF FILL ("fill" portion)	*DEPTH OF OVEREXCAVATION ("cut" portion)*
Up to 5 feet	Equal Depth
5 to 10 feet	5 feet
Greater than 10 feet	One-half the maximum thickness of fill placed on the "fill" portion (20 feet maximum)

Overexcavation of the "cut" portion should extend beyond the perimeter building lines to a horizontal distance equal to the depth of overexcavation or to a minimum distance of 5 feet, whichever is greater.

8.8 Benching

Where compacted fills are to be placed on natural slope surfaces inclining at 5:1 (h:v) or greater, the ground should be excavated to create a series of level benches, which are at least a minimum height of 4 feet, excavated into competent bedrock or existing compacted engineered materials. Typical benching details are described in the attached LGC "General Earthwork and Grading Specifications" (Appendix D).

8.9 Fill Placement

Fills should be placed in lifts not greater than 6 inches in uncompacted thickness, watered or air-dried as necessary to achieve a uniform moisture content of at least optimum moisture content, and then compacted in place to relative compaction of 90 percent or more. Fills should be maintained in a relatively level condition. The laboratory maximum dry density and optimum moisture content for each change in soil type should be determined in accordance with ASTM Test Method D1557.

8.10 Inclement Weather

Inclement weather may cause rapid erosion during mass grading and/or construction. Proper erosion and drainage control measures should be taken during periods of inclement weather in accordance with City of Corona, Riverside County, and California State requirements.

9.0 SLOPE CONSTRUCTION

9.1 Slope Stability

Any proposed fill slopes constructed at a 2:1 horizontal to vertical (h:v) orientation or flatter should be grossly stable.

Portions of any proposed cut slopes may expose low-density, compacted artificial fill as well as significant layers of relatively non-cohesive alluvium deposits which will likely require stabilization by overexcavation and replacement with compacted fill. During the grading plan review stages, a detailed slope stability investigation and analysis will be required to evaluate the stability and buttress design for the 75 ± foot high north facing cut slope along the southern property line.

9.2 Temporary Excavations

Temporary excavations varying up to a height of approximately 5 feet or more below existing grades will be necessary to accommodate the recommended overexcavation of the unsuitable soil materials. Based on the physical properties of the onsite soil, temporary excavations exceeding 5 feet in height should be cut back at a ratio of 1:1 (h:v) or flatter, for the duration of the overexcavation and recompaction of unsuitable soil material. Temporary slopes excavated at the above slope configurations are expected to remain stable during grading operations. However, the temporary excavations should be observed by a representative of the project geotechnical consultant for any evidence of potential instability. Depending on the results of these observations, revised slope configurations may be necessary. Job safety is the sole responsibility of the contractor or sub-contractor.

Other factors which should be considered with respect to the stability of the temporary slopes include construction traffic and storage of materials on or near the tops of the slopes, construction scheduling, presence of nearby walls or structures on adjacent properties, and weather conditions at the time of construction. Applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act of 1970, and the Construction Safety Act should also be followed.

10.0 POST-GRADING CONSIDERATIONS

10.1 Control of Surface Water and Drainage Control

Positive-drainage devices such as sloping sidewalks, graded-swales, and/or area drains, should be provided to collect and direct water away from the structure and any slopes. Neither rain nor excess irrigation water should be allowed to collect or pond against the building foundations. Drainage should be directed to adjacent driveways, adjacent streets or storm-drain facilities and maintained at all times. The site is in a semi-arid climate area, from a geotechnical standpoint, the ground surface adjacent to the structures should be sloped at a gradient of at least 2 percent for a distance of at least 10 feet. The graded lot should be further maintained by a swale or drainage path at a gradient of at least 1 percent. Where necessary, drainage paths may be shortened by use of area drains and collector pipes.

Planters with open bottoms adjacent to buildings should be avoided. Planters should not be designed adjacent to buildings unless provisions for drainage are made, such as catch basins, liners, and/or area drains. Over watering must be avoided.

10.2 Utility Trenches

Utility-trench backfill within roadways, utility easements, under walls, sidewalks, driveways, floor slabs and any other structures or improvements should be compacted. The onsite soil should generally be suitable as trench backfill provided the soil is screened of rocks and other material over 3 inches in diameter and organic matter. Trench backfill should be compacted in uniform lifts (generally not exceeding 6 inches to 8 inches in uncompacted thickness) by mechanical means to at least 90 percent relative density (per ASTM Test Method D1557).

Where onsite soils are utilized as backfill, mechanical compaction should be used. Density testing, along with probing, should be performed by the project geotechnical consultant or his representative, to document proper compaction.

If trenches are shallow, the use of conventional equipment may result in damage to the utilities. Clean sand, having a sand equivalent (SE) of 30 or greater should be used to bed and shade the utilities. Sand backfill should be densified. The densification may be accomplished by jetting or flooding and then tamping to ensure adequate compaction. A representative from LGC should observe, probe, and test the backfill to verify compliance with the project specifications.

Utility-trench sidewalls deeper than 5 feet should be laid back at a ratio of 1:1 (h:v) or flatter or braced. A trench box may be used in lieu of shoring. If shoring is anticipated, LGC should be contacted to provide design parameters.

To avoid point-loads and subsequent distress to clay, cement or plastic pipe, imported sand bedding should be placed 1-foot or more above pipe in areas where excavated trench materials contain significant cobbles. Sand-bedding materials should be compacted and tested prior to placement of backfill.

Where utility trenches are proposed parallel to building footings (interior and/or exterior trenches), the bottom of the trench should not be located within a 1:1 (h:v) plane projected downward from the outside bottom edge of the adjacent footing.

11.0 PRELIMINARY FOUNDATION DESIGN RECOMMENDATIONS

11.1 General

Provided that site grading is performed in accordance with the recommendations of this report, conventional shallow foundations are considered feasible for support of the proposed multi-use buildings. Tentative foundation recommendations are provided herein. However, these recommendations may require modification depending on as-graded conditions existing within the building sites upon completion of grading.

11.2 Allowable-Bearing Values

An allowable-bearing value of 2,000 pounds per square foot (psf) may be used for 12-inch wide or greater continuous footings or 24-inch square pad footings, founded completely within competent compacted fill at a depth of 12-inches or more below the lowest adjacent final grade. This value may be increased by 20 percent for each additional foot of width and depth, to a value no greater than 3,000 psf. For a 12-inch wide or greater continuous footings or 24-inch square pad footings, founded completely within competent undisturbed bedrock at a depth of 12-inches or more below the lowest adjacent final grade an allowable-bearing value of 3,000 per square foot (psf) may be used. This value may be increased by 20 percent for each additional foot of width and depth, to a value no greater than 4,000 psf The recommended allowable-bearing values includes both dead and live loads and may not be increased by one-third for short-duration wind and seismic forces. The bearing capacities should be re-evaluated when loads and footing sizes have been finalized.

11.3 Settlement

Based on the general settlement characteristics of compacted fill, the overexcavation recommendations in this report and anticipated fill loading, it is estimated the site would be subjected to a total static settlement about 0.75-inch, and a differential settlement of about 0.50-inch over a distance of about 30 feet. It is anticipated that the majority of the settlement will occur during construction or shortly thereafter as building loads are applied.

The above settlement estimates are based on the assumption that the proposed rough grading will be performed in accordance with the grading recommendations presented in this report and that the project geotechnical consultant will observe and/or test the soil conditions in the footing excavations.

11.4 Lateral Resistance

Lateral forces on footings should be resisted by passive earth resistance and friction at the bottom of the footing. Foundations should be designed for a passive earth pressure of 320 psf per foot of depth to a maximum 3,000 psf and a coefficient of friction of 0.30. The passive earth pressure incorporates a minimum factor of safety of 1.5. When combining passive and friction forces, passive resistance should be reduced by 1/3. The above values may not be increased by 1/3 when designing for short-duration wind or seismic forces.

The above values are based on footings placed directly against compacted fill soil. In the case where footing sides are formed, backfill placed against the footings should be compacted to 90 percent or more of maximum dry density as determined by ASTM D1557.

11.5 Footing Setbacks from Descending Slopes

Where structures are proposed near the tops of descending graded or natural slopes, the footing setbacks from the slope face should conform to the 2019 CBC. The required setback is H/3 (one-third the slope height) measured along a horizontal line projected from the lower outside face of the footing to the slope face. The footing setbacks should be 5 feet or more where the slope height is 15 feet or less and vary up to 40 feet where the slope height exceeds 15 feet.

11.6 Building Clearances from Ascending Slopes

Building setbacks from ascending graded or natural slopes should conform with the 2019 CBC, Chapter 18, which requires a building clearance of H/2 (one-half the slope height) varying from 5 to 15 feet. The building clearance is measured along a horizontal line projected from the toe of the slope to the face of the building. A retaining wall may be constructed at the base of the slope to achieve the required building clearance.

11.7 Footing Observations

Footing trenches should be observed by the project geotechnical consultant to document that those have been excavated into competent bearing soil. The foundation trenches should be observed prior to the placement of forms, reinforcement or concrete. The trenches should be trimmed neat, level and square. Loose, sloughed or moisture-softened soil should be removed prior to concrete placement.

Excavated materials from footing trenches should not be placed in slab-on-ground areas unless the soil are compacted to 90 percent or more of maximum dry density as determined by ASTM D1557.

11.8 Expansive Soil Considerations

Results of preliminary laboratory tests by LGC indicate onsite soil materials exhibit expansion potentials of **VERY LOW** in accordance with 2019 CBC, Chapter 18. Expansive soil conditions of the near surface finish grade soil should be evaluated and tested for individual building pads on a pad-by-pad basis during and at the completion of rough grading to verify and/or modify the anticipated conditions. The design and construction details presented herein are intended to provide recommendations for the levels of expansion potential which may be evident at the completion of rough grading. Furthermore, it should be noted that additional slab thickness, footing sizes and/or reinforcement more stringent than the recommendations that follow should be provided as recommended by the project structural engineer.

11.9 *Footing/Floor Slabs: Very Low Expansion Potential*

The following are our recommendations where foundation soil exhibits a **VERY LOW** expansion potential as classified in accordance with 2019 CBC, and it is recommended that footings and floors be constructed and reinforced in accordance with the following criteria.

- *Footings*

– Exterior continuous footings should be founded into compacted engineered fill below the lowest adjacent final grade at minimum depths of 18 inches deep for one-story to two-story construction and 24 inches deep for three-story to four-story construction. Interior continuous footings may be founded at a depth of 12 inches or greater into compacted engineered fill below the lowest adjacent final grade. Continuous footings should have a minimum width of 15 inches or more for one-story and two-story structures and 18-inches for three-story to four-story structures.

– Continuous footings should be reinforced with two (2) No. 4 bars, one near top and one near bottom.

– Interior isolated pad footings should be 24 inches or more square and founded at a depth of 12 inches or more below the lowest adjacent grade. Footings should be reinforced in accordance with the structural engineer's recommendation.

– Exterior pad footings should be 24 inches or more square and founded at a depth of 18 inches or more below the lowest adjacent grade. Footings should be reinforced in accordance with the structural engineer's recommendations.

- *Floor Slabs*

– Concrete floor slabs should be 4 inches or more thick and reinforced with No. 3 bars spaced 24 inches or less on-centers, both ways. Slab reinforcement should be supported on concrete chairs or bricks so that the desired placement is near mid-depth.

– Concrete floors should be underlain with a moisture-vapor retarder consisting of 15-mil thick vapor barrier. Laps within the membrane should be sealed and overlapped 12 inches. Two inches or more of clean sand should be placed above and below the membrane to promote uniform curing of the concrete. These recommendations must be confirmed (and/or modified) by the foundation engineer with our concurrence, based upon the performance expectations of the foundation. It is the responsibility of the contractor to ensure that the moisture/vapor barrier systems are placed in accordance with the project plans and specifications, and that the moisture/vapor retarder materials are free of tears and punctures prior to concrete placement. Additional moisture reduction and/or prevention measures may be needed, depending on the performance requirements of future interior floor coverings.

– Garage area floor slabs should be a minimum of 5 inches thick and should be reinforced in a similar manner as concrete interior living area floor slabs. Garage area floor slabs should be placed separately from adjacent wall footings with a positive separation maintained with 3/8-inch minimum felt expansion joint materials and quartered with weakened-plane joints. A 12-inch wide grade beam founded at the same depth as adjacent footings should be provided across garage entrances. The grade beam should be reinforced with a minimum of two No. 4 bars, one near top and one at bottom.

– Prior to placing concrete, the subgrade soils below all floor slabs should be pre-watered to achieve a moisture content that is equal to 100% of the optimum water content of the subgrade soils. The water content should penetrate to a minimum depth of 18 inches. This will promote uniform curing of the concrete and minimize the development of shrinkage cracks.

12.0 RETAINING WALLS

12.1 Lateral Earth Pressures and Retaining Wall Design Parameters

Conventional footings for retaining walls founded in properly compacted fill should be embedded at least 18 inches below lowest adjacent grade. At this depth, an allowable bearing capacity of 2,500 psf may be assumed for retaining walls founded in competent compacted fill.

The following are lateral earth pressures are recommended for retaining walls up to 10 feet high that may be proposed. The recommended lateral pressures for approved on-site or import soil **(with an expansion index of 20 or less and an angle of internal friction (phi) of at least 28 degrees)** for level or sloping backfill are presented in Table 4. Onsite soil should be screened of rocks and other material over 3 inches in diameter.

TABLE 4
Lateral Earth Pressures

CONDITIONS	*EQUIVALENT FLUID WEIGHT (pcf)*					
	Level Backfill (up to 6 feet)	*Level Backfill Dynamic (>6 feet to 10 feet)*	*2:1 Backfill Ascending (up to 6 feet)*	*2:1 Backfill Ascending-Dynamic (>6 feet to 10 feet)*	*Level Backfill Dynamic (10 feet to 30 feet)*	*2:1 Backfill Ascending-Dynamic (10 feet to 30 feet)*
Active	40	72	50	88	75	90
At-Rest	60	92	80	118	95	120
Passive	320	320	185	183	320	185

Notes:
1. Applicable to retaining walls only.
2. Active force applied a 1/3 wall height.
3. Seismic force applied to at 1/2 to 6/10 wall height.
4. Lateral pressure acts normally to vertical stem.

For sliding resistance, the friction coefficient of 0.30 may be used at the concrete and soil interface. Wall footings should be designed in accordance with structural considerations. The passive resistance value may be increased by one-third when considering loads of short duration such as wind or seismic loads.

Embedded structural walls should be designed for lateral earth pressures exerted on them. Restrained structural walls should be designed for at rest conditions. The magnitude of those pressures depends on the amount of deformation that the wall can yield under load. If the wall can yield enough to mobilize the full shear strength of the soil, it can be designed for "active" pressure. If the wall cannot yield under the applied load, the shear strength of the retained soil cannot be mobilized and the earth pressure will be higher. Such walls should be designed for "at-rest" conditions. If a structure moves toward the soil, the resulting resistance developed by the soil is the "passive" resistance.

The equivalent fluid pressure values assume free-draining conditions and a soil expansion index of 20 or less. If conditions other than those assumed above are anticipated, revised equivalent fluid pressure values should be provided on an individual-case basis by the geotechnical engineer.

Surcharge loading effects from the adjacent structures should be evaluated by the geotechnical and structural engineers.

With proposed retaining walls for this development in excess of 10 feet, special design considerations are necessary, such as an anchored wall design. The retaining wall should be battered towards the slope at a minimum of 10 degrees to provide additional resistance against sliding and overturning moments. Tie back anchors should be embedded into undisturbed bedrock or fill material. Also, footings should be founded at a depth of 24 inches or more below lowest final grade.

12.2 Footing Embedments

The base of retaining wall footings constructed on level ground may be founded at a depth of 18 inches or more below the lowest adjacent final grade. Where retaining walls are proposed on or within 15 feet from the top of an adjacent descending fill slopes, the footings should be deepened such that a horizontal clearance of H/3 or more (one-third the slope height) is maintained between the outside bottom edges of the footings and the face of the slope but not to exceed 15 feet nor be less than 5 feet. The above recommended footing setbacks are preliminary and may be revised based on site specific soil conditions. Footing or pier excavations should be observed by the project geotechnical representative to document that the footing trenches have been excavated into competent bearing soil and to the embedments recommended above. These observations should be performed prior to placing forms or reinforcing steel.

Special design considerations are necessary to address proposed retaining walls within large cute slopes that may require buttressing. Additional slope stability investigation and analysis is required in these areas.

12.3 Drainage

Surcharge loading effects from the adjacent structures should be evaluated by the geotechnical and structural engineers. All retaining wall structures should be provided with appropriate wall drainage and appropriately waterproofed. The outlet pipe should be sloped to drain to a suitable outlet. It should be noted that recommended wall drains do not provide protection against seepage through the face of the wall and/or efflorescence. If such seepage or efflorescence is undesirable, retaining walls should be waterproofed to reduce this potential.

Weep holes or open vertical masonry joints should be provided in retaining walls 3 feet or less in height to reduce the likelihood of entrapment of water in the backfill. Weep holes, if used, should be 3 inches or more in diameter and provided at intervals of 6 feet or less along the wall. Open vertical masonry joints, if used, should be provided at 32-inch or less intervals. A continuous gravel fill, 12 inches by 12 inches, should be placed behind the weep holes or open masonry joints. The gravel should be wrapped in filter fabric to reduce infiltration of fines and subsequent clogging of the gravel. Filter fabric may consist of Mirafi 140N or equivalent.

In lieu of weep holes or open joints, for retaining walls less than 3 feet, a perforated pipe and gravel subdrain may be used. Perforated pipe should consist of 4-inch or more diameter PVC Schedule 40 or ABS SDR-35, with the perforations laid down. The pipe should be embedded in 1.5 cubic feet per foot of 0.75 or 1.5-inch open graded gravel wrapped in filter fabric. Filter fabric may consist of Mirafi 140N equivalent.

Retaining walls greater than 3 feet high should be provided with a continuous backdrain for the full height of the wall. This drain could consist of geosynthetic drainage composite, such as Miradrain 6000 or equivalent, or a permeable drain material, placed against the entire backside of the wall. If a permeable drain material is used, the backdrain should be 1 or more feet thick. Caltrans Class II permeable material or open graded gravel or crushed stone may be used as permeable drain material. If gravel or crushed stone is used, it should have less than 5 percent material passing the No. 200 sieve. The drain should be separated from the backfill with a geofabric. The upper 1-foot of the backdrain should be covered with compacted fill. A drainage pipe consisting of 4-inch diameter perforated pipe (described above) surrounded by 1 cubic foot per foot of gravel or crushed rock wrapped in a filter fabric should be provided along the back of the wall. The pipe should be placed with perforations down, sloped at 2 percent or more and discharge to an appropriate outlet through a solid pipe. The pipe should outlet away from structures and slopes. The outside portions of retaining walls supporting backfill should be coated with an approved waterproofing compound to inhibit infiltration of moisture through the walls.

12.4 Temporary Excavations

Retaining walls should be constructed and backfilled as soon as possible after backcut excavations are constructed. Prolonged exposure of backcut slopes may result in some localized slope instability. To facilitate retaining wall construction, the lower 5 feet of temporary slopes may be cut vertical and the upper portions exceeding a height of 5 feet should be cut back at a gradient of 1:1 (h:v) or flatter for the duration of construction. However, temporary slopes should be observed by the project geotechnical consultant for evidence of potential instability. Depending on the results of these observations, flatter slopes may be necessary. The potential effects of various parameters such as weather, heavy equipment travel, storage near the tops of the temporary excavations and construction scheduling should also be considered in the stability of temporary slopes. Water should not be permitted to drain away from the slope. Surcharges due to equipment, spoil piles, etc., should not be allowed within 10 feet of the top of the slope.

All excavations should be made in accordance with Cal/OSHA. Excavation safety is the sole responsibility of the contractor.

12.5 Retaining Wall Backfill

The retaining wall backfill soil (with an angle of internal friction of at least 33 degrees) should be placed in 6 to 8 inch loose lifts, watered or air-dried as necessary to achieve near optimum moisture conditions, and compacted to at least 90 percent relative density (based on ASTM Test Methods D2922 and D3017).

13.0 MASONRY GARDEN WALLS

13.1 Construction on Level Ground

Where masonry screen walls or garden walls are proposed on level ground and 5 feet or more from the tops of descending slopes, the footings for these walls may be founded at a depth of 18 inches or more below the lowest adjacent final grade. These footings should also be reinforced with four No. 4 bars, two top and two bottom and in accordance with the structural engineer’s recommendations.

13.2 Construction Joints

In order to mitigate the potential for unsightly cracking related to the effects of differential settlement, positive separations (construction joints) should be provided in the walls at horizontal intervals of approximately 25 feet and at each corner. The separations should be provided in the blocks only and not extend through the footings. The footings should be placed monolithically with continuous rebar to serve as effective “grade beams” along the full lengths of the walls.

14.0 CONCRETE FLATWORK

14.1 Nonstructural Concrete Flatwork

Concrete flatwork (such as walkways, bicycle trails, etc.) has a high potential for cracking because of changes in soil volume related to soil-moisture fluctuations. To reduce the potential for excessive cracking and lifting, concrete should be designed in accordance with the minimum guidelines outlined in Table 5. These guidelines will reduce the potential for irregular cracking and promote cracking along construction joints but will not eliminate all cracking or lifting. Thickening the concrete and/or adding additional reinforcement will further reduce cosmetic distress.

TABLE 5
Nonstructural Concrete Flatwork for Very Low Expansive Soils

	Private Sidewalks	*Private Drives*	*Patios/ Entryways*	*City Sidewalk Curb and Gutters*
Minimum Thickness (in.)	4 (nominal)	4(full)	4 (full)	City/Agency Standard
Presaturation	Presoak to 12 inches	Presoak to 12 inches	Presoak to 12 inches	City/Agency Standard
Reinforcement	—	No. 3 at 24 inches on centers	No. 3 at 24 inches on centers	City/Agency Standard
Thickened Edge	—	8″ x 8″	8″ X 8″	City/Agency Standard
Crack Control	Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness	Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness	Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness	City/Agency Standard
Maximum Joint Spacing	5 feet	10 feet or quarter cut whichever is closer	6 feet	City/Agency Standard

14.2 Joint Spacing

To reduce the potential for unsightly cracking, concrete sidewalks and patio type slabs should be provided with construction or expansion joints every 6 feet or less. Concrete driveway slabs should be provided with construction or expansion joints every 10 feet or less.

14.3 Subgrade Preparation

As a further measure to reduce cracking of concrete flatwork, the upper 12 inches of subgrade soil below concrete-flatwork areas should first be compacted to a relative density of 90 percent of more and then thoroughly wetted to achieve a moisture content that is equal to or slightly greater than optimum moisture content. This moisture should extend to a depth of 12 inches or more below subgrade and maintained in the soil during placement of concrete. Pre-watering of the soil will promote uniform curing of the concrete and reduce the potential for the development of shrinkage cracks. A representative of the project geotechnical consultant should observe and document the density and moisture content of the soil and depth of moisture penetration prior to placing concrete.

15.0 PLANTERS

Area drains should be extended into planters that are located within 5 feet of building walls, foundations, retaining walls and masonry garden walls to reduce excessive infiltration of water into the adjacent foundation soil. The surface of the ground in these areas should also be sloped at a gradient of 2 percent or more away from the walls and foundations. Drip-irrigation systems are also recommended to reduce overwatering and subsequent saturation of the adjacent foundation soil.

16.0 SOIL CORROSIVITY

16.1 Corrosivity to Concrete and Metal

The National Association of Corrosion Engineers (NACE) defines corrosion as "a deterioration of a substance or its properties because of a reaction with its environment". From a geotechnical viewpoint, the "environment" is the prevailing foundation soil and the "substances" are the reinforced concrete foundations or various buried metallic elements such as rebar, piles, pipes, etc., which are in direct contact with or within close vicinity of the foundation soil.

In general, soil environments that are detrimental to concrete have high concentrations of soluble sulfates. ACI 318-19 provides specific guidelines for the concrete mix design based on different amount of soluble sulfate content. The minimum amount of chloride ions in the soil environment that are corrosive to steel, either in the form of reinforcement protected by concrete cover, or plain steel substructures such as steel pipes or piles, is 500 ppm per California Test 532 and ACI 318-19.

The corrosion potential of the onsite materials was evaluated for its effect on steel and concrete. The corrosion potential was evaluated using the results of laboratory tests on representative samples obtained during our field exploration. Laboratory testing was performed to evaluate pH, minimum electrical resistivity and chloride and soluble sulfate content. Based on testing performed during this investigation within the project site, the onsite soil are classified as having a **negligible** sulfate exposure condition in accordance with ACI 318-19, and **negligible** chloride exposure condition in accordance with ACI 318-19. Based on laboratory testing of on-site soil it is also our opinion that onsite soil should be considered **mildly** corrosive to buried metals due to the low resistivity. Metal piping should be corrosion-protected or consideration should be given to using plastic piping instead of metal or plastic sleeving around the metal pipe.

Despite the minimum recommendation above, LGC is not a corrosion-engineering firm. Therefore, we recommend that you consult with a competent corrosion engineer and conduct additional testing (if required) to evaluate the actual corrosion potential of the site and to provide recommendations to reduce the corrosion potential with respect to the proposed improvements. The recommendations of the corrosion engineer may supersede the above requirements.

These recommendations are based on the current and previous samples of the subsurface soil or bedrock. The initiation of grading at the site could blend various soil types and import soil may be used locally. These changes made to the foundation soil could alter sulfate-content levels. Accordingly, it is recommended that additional testing be performed at the completion of grading.

17.0 PRELIMINARY PAVEMENT DESIGN

17.1 Preliminary Pavement Structural Section Designs

Structural pavement section design recommendations presented herein are based on soil samples recovered during our subsurface exploration. However, it should be understood that the soil material exposed during grading may differ from the materials sampled and tested during this investigation. Therefore, preliminary pavement recommendations are subject to verification and possible revision based on observations and possible sampling and testing of subgrade soils that exist after grading.

For purposes of design, we have prepared the following pavement structural sections based on R-values acquired during our recent laboratory testing (Appendix C). The assigned Traffic Indices (T.I.) 5.0 and 5.5 utilized in pavement section calculations was taken from the City of Corona Roadway Design Requirements. Since the subgrade R-Value quality of the soils may change, laterally, based on the available laboratory testing, Table 6 proposes the following pavement designs for the areas indicated below:

TABLE 6
Preliminary Pavement Design

AREA	ASSUMED TRAFFIC INDEX	DESIGN R-VALUE	ASPHALTIC CONCRETE (AC) Inches)	AGGREGATE BASE (AB) (AB)(Inches)
Parking Areas	5.0	14	4.0	6.0
Entryways	5.5	14	4.0	8.0

Aggregate base materials may consist of crushed miscellaneous base (CMB) or Class 2 aggregate base materials.

Subgrade soil immediately below the aggregate base (base) should be compacted to a minimum of 95 percent relative compaction based on ASTM Test Method D1557 to a minimum depth of 12 inches. Final subgrade compaction should be performed prior to placing base or asphaltic concrete and after all utility trench backfills have been compacted and tested.

Base materials should consist of crushed aggregate base conforming to Section 200-2 of Greenbook and should be compacted to at least 95 percent of the laboratory maximum dry density determined in accordance with ASTM D1557.

Our preliminary pavement recommendations should be considered as minimum and can be revised once actual T.I.'s are known or superseded by the City of Corona.

18.0 PLAN REVIEWS AND CONSTRUCTION SERVICES

This is a preliminary geotechnical investigation report prepared for the exclusive use of **GF Investments, LLC,** to assist the project engineer and architect in the design of the proposed development. It is recommended that LGC be engaged to review the rough grading plans, foundation plans and other pertinent final design drawings and specifications prior to construction. This is to document that the recommendations contained in this report have been properly interpreted and are incorporated into the project specifications. LGC's review of the final grading plans may indicate that additional subsurface exploration, laboratory testing and analysis should be performed to address areas of concern. If LGC is not accorded the opportunity to review these documents, we can take no responsibility for misinterpretation of our recommendations.

We recommend that LGC be retained to provide geotechnical engineering services during both the rough grading and construction phases of the work. This is to document compliance with the design, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

If the project plans change significantly (e.g., building loads or type of structures), LGC should be retained to review our original design recommendations and their applicability to the revised construction. If conditions are encountered during construction that appear to be different than those indicated in this report, this office should be notified immediately. Design and construction revisions may be required.

19.0 LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable engineers and geologists practicing in this or similar localities. The professional opinions contained herein have been derived in accordance with current standards of practice for preliminary reports. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report. The samples taken and submitted for laboratory testing, the observations made and the in-situ field testing performed are believed representative of the entire project; however, soil and geologic conditions can vary in characteristics between excavations, both laterally and vertically and may be different than our preliminary findings.

If this occurs, the changed conditions must be evaluated by the project geotechnical engineer and engineering geologist and design(s) adjusted as required or alternate design(s) recommended.

This report is issued with the understanding that it is the responsibility of the owner, or of his/her representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and/or project engineer and incorporated into the plans, and the necessary steps are taken to see that the contractor and/or subcontractor properly implements the recommendations in the field. The contractor and/or subcontractor should notify the owner if they consider any of the recommendations presented herein to be unsafe.

The conclusions and opinions contained in this report are based on the results of the described geotechnical evaluations and represent our professional judgment. The findings, conclusions and recommendations contained in this report are to be considered preliminary only and subject to confirmation by the undersigned during the construction process. Without this confirmation, this report is to be considered incomplete and LGC or the undersigned professionals assume no responsibility for its use.

The conclusions and opinions contained in this report are valid up to a period of 2 years from the date of this report. Changes in the conditions of a property can and do occur with the passage of time, whether they be because of natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate codes or 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, if any of the above-mentioned situations occur, an update of this report should be completed.

This report has not been prepared for use by parties or projects other than those named or designed above. It may not contain sufficient information for other parties or other purposes.

The opportunity to be of service is appreciated. Should you have any questions regarding the content of this report, or should you require additional information, please do not hesitate to contact this office at your earliest convenience.

APPENDIX A

REFERENCES

APPENDIX A

References

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LGC Geo-Environmental, Inc., 2019, *"Preliminary Infiltration Testing Investigation for the Proposed 17-Acre Multi-Use Development, Located at West Chase Drive and Foothill Parkway in the City of Corona, Riverside County, California; APNs: 275-050-014-6 and 275-080-041-3"* dated December 31.

LGC Geo-Environmental, Inc., 2020, *"Updated Geologic Fault Hazard Evaluation for the Proposed 17-Acre Multi-Use "Skyline Village" Development, Located at West Chase Drive and Foothill Parkway in the City of Corona, Riverside County, California; APNs: 275-050-014-6 and 275-080-041-3"* dated July 16.

APPENDIX B-1

FIELD EXPLORATION TRENCH LOGS

APPENDIX B-1

Field Exploration

B-1 General

Geologic mapping of the site was carried out by LGC's personnel. The locations of the exploratory excavations were chosen to obtain subsurface information needed to achieve the objective for this investigation.

A visual survey was conducted to verify that the proposed excavations would not encounter any subsurface utility lines. No underground lines were encountered during the field exploratory program.

B-2 Excavation, Trenching and Sampling

Our initial subsurface exploration was performed on December 9, 2019 and December 10, 2019, which included trenching, logging and sampling eight (8) trenches, to depths ranging from 5 feet to 14 feet. Logs of the trenches are presented in Appendix B, and their approximate locations are depicted on the Geotechnical Map (Plate 1).

Prior to the subsurface work, an underground utilities clearance was obtained from Underground Service Alert of Southern California. At the conclusion of the subsurface investigation, all trenches were backfilled with native materials. Minor settlement of the backfill soil may occur over time.

During our subsurface investigation, representative bulk and relatively undisturbed samples were retained for laboratory testing. Laboratory testing was performed on selected representative samples of onsite soil samples and included maximum dry density and optimum moisture content, expansion index, sulfate content, chloride content, pH, resistivity, direct shear, and R-Values. A discussion of the tests performed and a summary of the results are presented in Appendix C. Moisture and density test results are presented on the trench logs which are presented on the following pages.

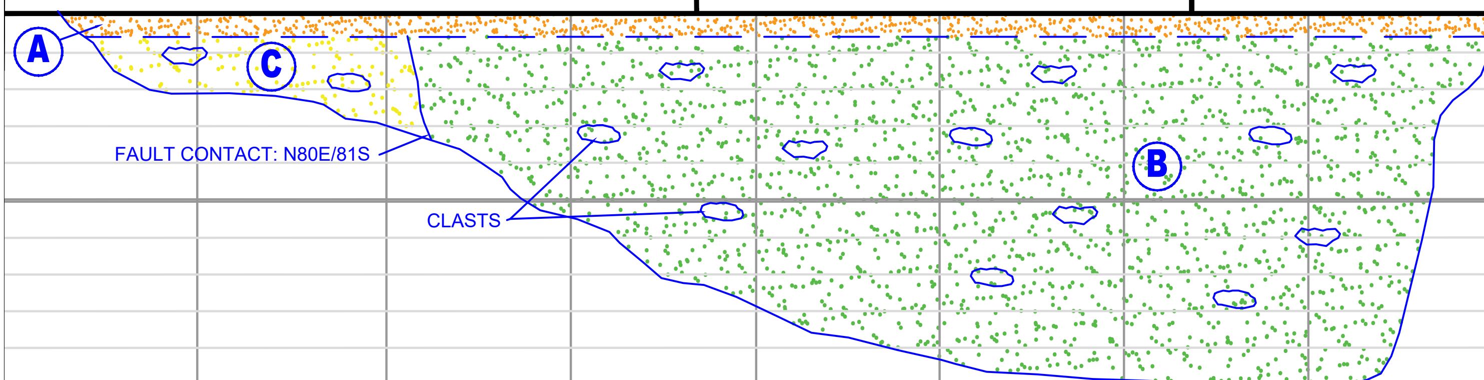
B-3 Miscellaneous

The trench logs describe the earth materials encountered, sampling method used, and field and laboratory tests performed. The logs also show the trench number, date of completion, and the name of the logger. A geologist logged the trenches in accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) ASTM D2488-93. The boundaries between soil types shown on the logs are approximate and the transition between different soil layers may be gradual. The logs of the trenches are presented on the following pages.

Project Name: GF INVESTMENTS	**Logged by: JL**	**LOG OF TRENCH TR-1**
Project Number: G19-1802-10	**Elevation: 1,216'**	**Engineering Properties**
Equipment: BACKHOE	**Location/Grid: SEE GEOTECHNICAL MAP**	

Depth	**Date: 12/9/19**	**Description:**	**Geologic Unit**	**USCS**	**Sample No.**	**Moisture (%)**	**Dry Density (pcf)**
0.0'-0.5'	A	ARTIFICIAL FILL, COMPACTED: Clayey SAND; light brown to brown, damp to moist, fine to medium grained with some coarse grains, roots, roothairs, localized debris	Afc	SC	Bulk @ 0.0'-4.0' Nuke @ 0.0'	8.8	124.8
0.5'-10'	B	SILVERADO FORMATION: Clayey SANDSTONE; red brown to light brown, damp, very hard, fine to coarse grained with gravel and some cobbles, oxidations staining, subangular to subrounded weathered granitic clasts	Tsi		Nuke @ 4.0' Nuke @ 10.0'	5.2 8.6	132.1 124.7
0.5'-3.0'	C	LADD FORMATION: Silty SANDSTONE; white, yellow, orange, light brown, damp, very hard, fine to coarse grained with gravel and some cobbles, oxidation staining, subangular to subrounded weathered granitic, angular to subangular weathered shale clasts	Kl				

GRAPHICAL REPRESENTATION: EAST WALL | **SCALE: 1" = 5'** | **SURFACE SLOPE: LEVEL** | **TREND: N3W**

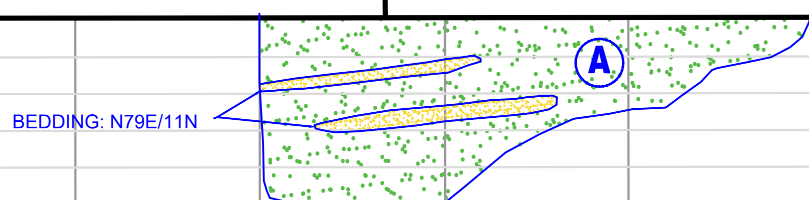


TOTAL DEPTH=10.0 FEET
GROUNDWATER NOT ENCOUNTERED

Project Name: GF INVESTMENTS	Logged by: JL	LOG OF TRENCH TR-2
Project Number: G19-1802-10	Elevation: 1,216'	Engineering Properties
Equipment: BACKHOE	Location/Grid: SEE GEOTECHNICAL MAP	

Depth	Date: 12/9/19	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0.0'-5.0'	A	SILVERADO FORMATION: Clayey/Silty SANDSTONE; red to light brown, damp to moist, very hard, fine to coarse grained with gravel and some cobbles, oxidation staining, interbedded sandstone layers, bedding: N79E/11N	Tsi	SC	Bulk @ 0.0'-5.0'		
					Nuke @ 1.0'	11.2	124.7
					Nuke @ 5.0'	12.7	106.3

GRAPHICAL REPRESENTATION: EAST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: N45E

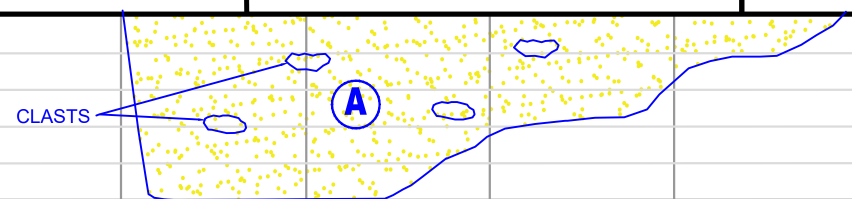


TOTAL DEPTH= 5.0 FEET
GROUNDWATER NOT ENCOUNTERED

Project Name: GF INVESTMENTS	Logged by: JL	LOG OF TRENCH TR-3
Project Number: G19-1802-10	Elevation: 1,210'	Engineering Properties
Equipment: BACKHOE	Location/Grid: SEE GEOTECHNICAL MAP	

Depth	Date: 12/9/19 Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0.0'-5.0'	A LADD FORMATION: Silty SANDSTONE; orange, red, white, light brown, gray, damp to moist, moderately hard to hard, fine to coarse grained with gravel and cobbles, oxidation staining, subangular to subrounded weathered granitic clasts	Kl		Bulk @ 1.0'-5.0' Nuke @ 4.5'	7.8	128.7

GRAPHICAL REPRESENTATION: EAST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: N10W

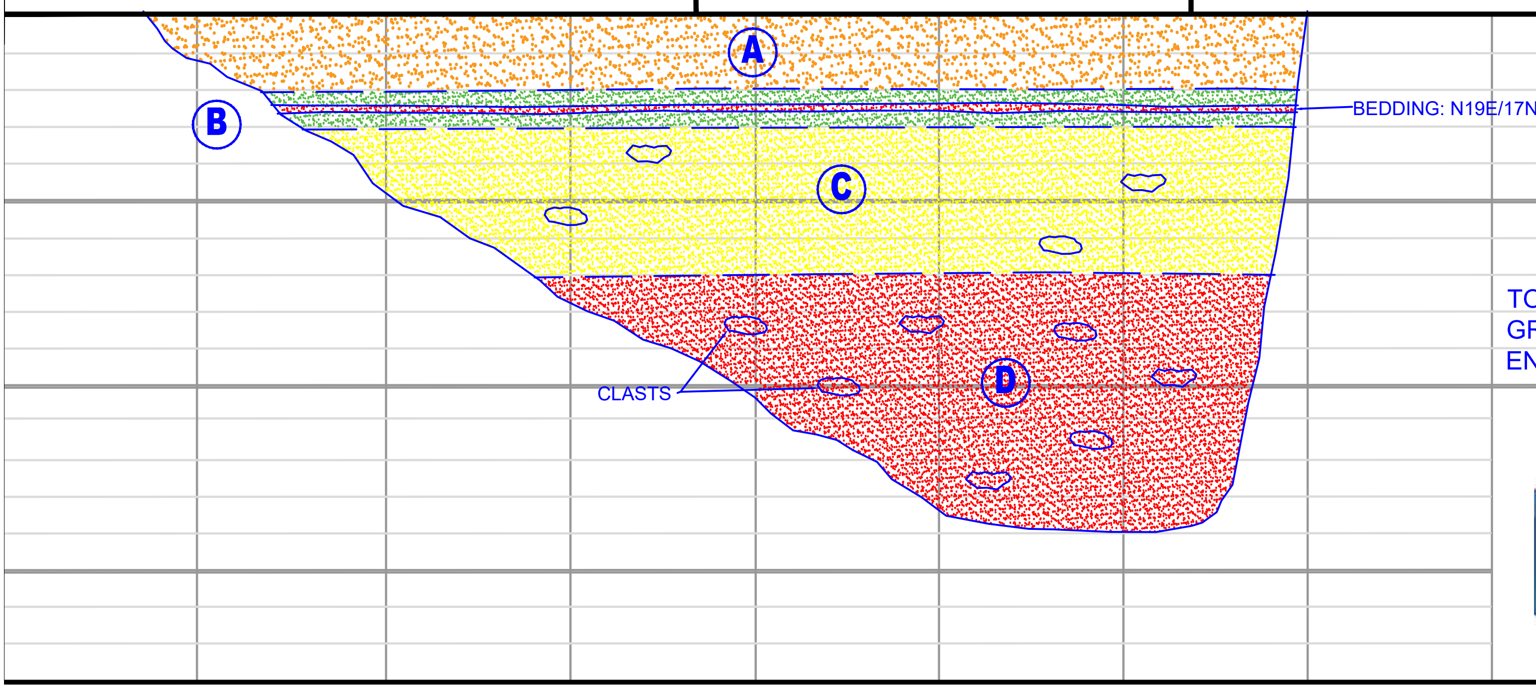


TOTAL DEPTH= 5.0 FEET
GROUNDWATER NOT ENCOUNTERED

Project Name: GF INVESTMENTS	Logged by: JL	LOG OF TRENCH TR-4
Project Number: G19-1802-10	Elevation: 1,110'	Engineering Properties
Equipment: BACKHOE	Location/Grid: SEE GEOTECHNICAL MAP	

Depth	Date: 12/10/19	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0.0'-2.0'	A	ARTIFICIAL FILL, COMPACTED: Clayey SAND/ Silty SAND; light brown to brown, damp to moist, medium dense, fine to medium grained with some coarse grains, gravel, and cobbles, roots, roothairs, upper 5" desiccated	Afc	SC/SM	Bulk @ 0.0'-5.0' Nuke @ 0.0'	11.4	122.8
2.0'-3.0'	B	YOUNG ALLUVIAL FAN DEPOSITS: Poorly-graded SAND; light brown to yellow brown, damp to moist, medium dense, fine to medium grained with gravel, oxidation staining @3.5'; silty sand seam, grayish brown, bedding: N19E/17N	Qyf	SP			
3.0'-7.0'	C	Silty SAND/GRAVEL; brown, moist, loose, fine to coarse grained with cobbles, oxidation staining, weathered granitic clasts, subangular to subrounded clasts		SW/SM			
7.0'-14.0'	D	Well-graded SAND; brown to gray, damp, loose to medium dense, fine to coarse grained with gravel and cobbles, oxidation staining, weathered granitic clasts, subangular to subrounded clasts		SW			

GRAPHICAL REPRESENTATION: EAST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: N3E

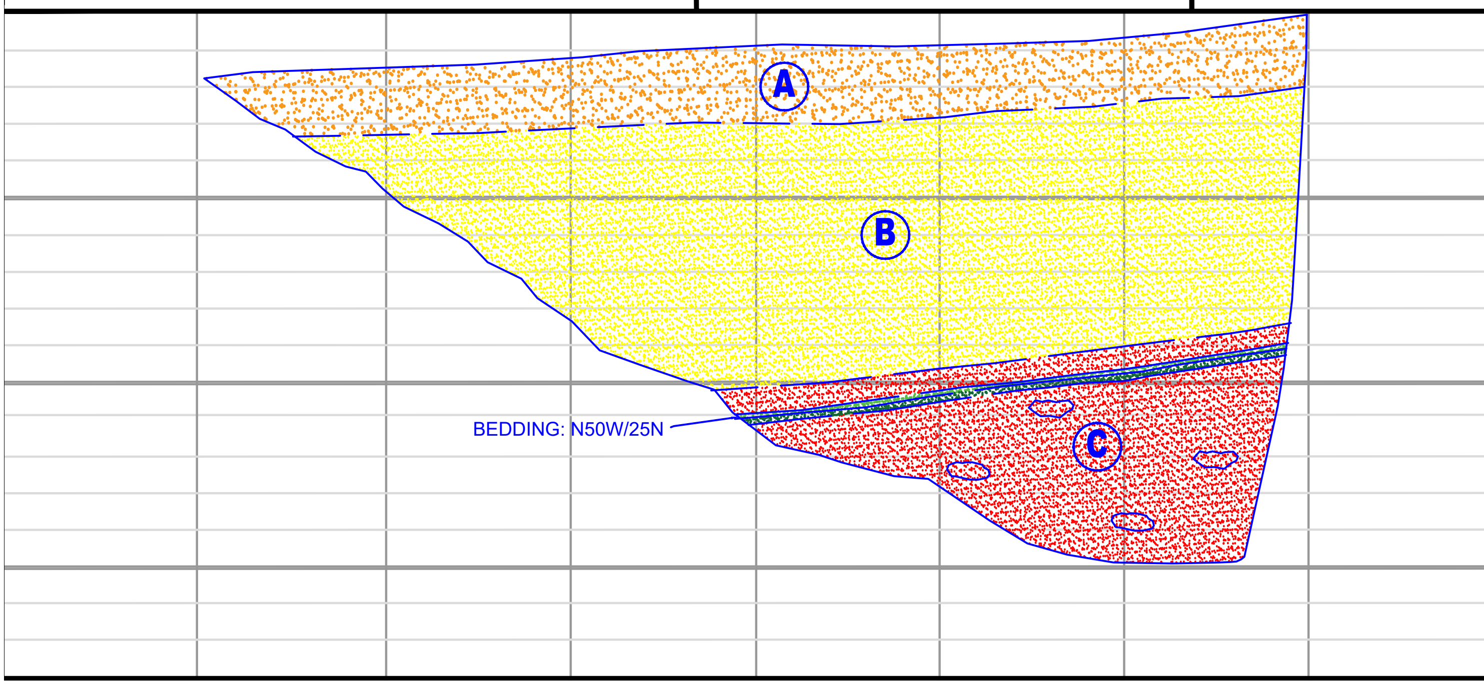


TOTAL DEPTH=14.0 FEET
GROUNDWATER NOT ENCOUNTERED

Project Name: GF INVESTMENTS	**Logged by: JL**	**LOG OF TRENCH TR-5**
Project Number: G19-1802-10	**Elevation: 1,136'**	**Engineering Properties**
Equipment: BACKHOE	**Location/Grid: SEE GEOTECHNICAL MAP**	

Depth	Date: 12/10/19 Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0.0'-2.0'	A ARTIFICIAL FILL, UNDOCUMENTED: Clayey SAND; orange to brown, moist, medium dense, fine to medium grained with some gravel, roots, roothairs, and asphalt fragments	Afu	SC	Bulk @ 1.0'-6.0'		
2.0'-8.5'	B YOUNG ALLUVIAL FAN DEPOSITS: Well-graded SAND; orange to light brown, dry to damp, medium dense, fine to coarse grained with gravel	Qyf	SW	Nuke @ 5.0'	1.6	118.3
8.5'-14.0'	C SAND/GRAVEL; light brown to brown, damp, loose to medium dense, fine to medium grained with some coarse grains and cobbles, weathered granitic clasts, subangular to rounded clasts @10.0'; bedding: N50W/25N		SP	Nuke @ 11.0'	5.6	100.4

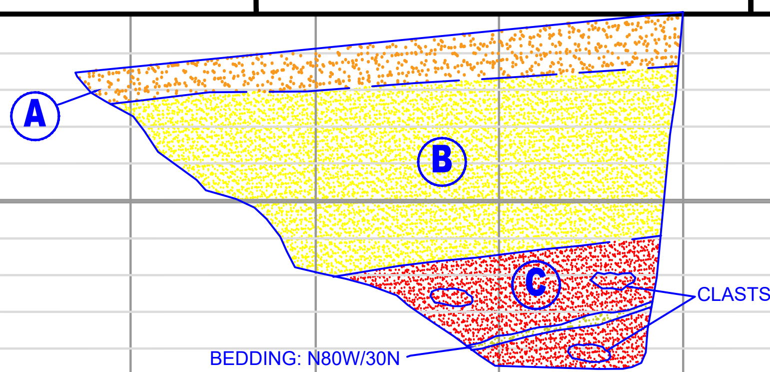
GRAPHICAL REPRESENTATION: EAST WALL	**SCALE: 1" = 5'**	**SURFACE SLOPE: LEVEL**	**TREND: N40E**



TOTAL DEPTH=14.0 FEET
GROUNDWATER NOT ENCOUNTERED

Project Name: GF INVESTMENTS		Logged by: JL		LOG OF TRENCH TR-6			
Project Number: G19-1802-10		Elevation: 1,158'		Engineering Properties			
Equipment: BACKHOE		Location/Grid: SEE GEOTECHNICAL MAP					
Depth	**Date: 12/10/19**	**Description:**	**Geologic Unit**	**USCS**	**Sample No.**	**Moisture (%)**	**Dry Density (pcf)**
0.0'-1.5'	A	ARTIFICIAL FILL, UNDOCUMENTED: Clayey SAND; red to brown, damp to moist, medium dense, fine to medium grained with some coarse grains and gravel, roots and roothairs	Afc	SC	Nuke @ 1.0'	13.9	112.8
1.5'-6.0'	B	Silty SAND; light brown, damp, medium dense, fine to medium grained with coarse grains and gravel, oxidation staining, porous		SM	Bulk @ 2.0'-6.0'		
6.0'-9.5'	C	LADD FORMATION: Well-graded SANDSTONE; gray, red, to brown, dry to damp, moderately hard to hard, fine to coarse grained with gravel and cobbles, weathered granitic and shale clasts, subangular to rounded clasts @8.0'; Poorly-graded sand seam, bedding: N80W/30N	Kl		Bulk @ 6.0'-9.5' Nuke @ 9.5'	7.2	105.4

GRAPHICAL REPRESENTATION: EAST WALL | **SCALE: 1" = 5'** | **SURFACE SLOPE: LEVEL** | **TREND: N34E**

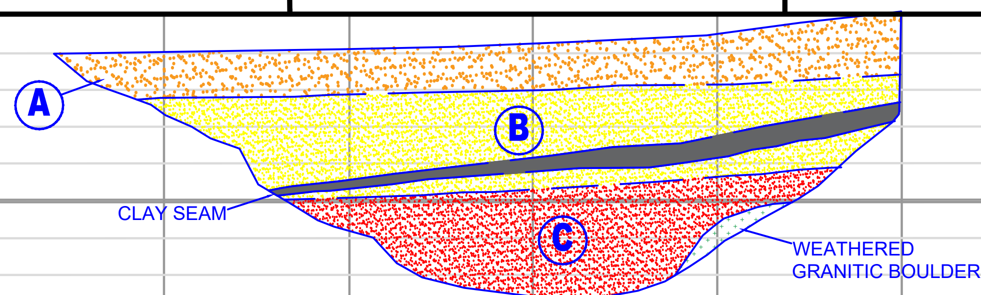


TOTAL DEPTH= 9.5 FEET
GROUNDWATER NOT ENCOUNTERED

Project Name: GF INVESTMENTS	Logged by: JL	LOG OF TRENCH TR-7
Project Number: G19-1802-10	Elevation: 1,143'	Engineering Properties
Equipment: BACKHOE	Location/Grid: SEE GEOTECHNICAL MAP	

Depth	Date: 12/10/19	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0.0'-2.0'	A	ARTIFICIAL FILL, COMPACTED: Clayey SAND; brown, moist, medium dense, fine to medium grained with some coarse grains, gravel, and cobbles, roots and roothairs, upper 5" desiccated	Afc	SC	Nuke @ 0.0' Bulk @ 1.0'-6.0'	10.5	121.5
2.0'-4.0'	B	LADD FORMATION: Clayey/Silty SANDSTONE; orange to brown, damp, moderately hard, fine to medium grained with gravel, roothairs, some oxidation staining @ 3.5'; 4"-6" thick layer of sandy clay/clay seam, bedding N73W/17N	Kl				
4.0'-7.5'	C	Silty SANDSTONE; gray, orange, to brown, dry to damp, moderately hard, fine to coarse grains with gravel and cobbles, weathered granitic clasts, subangular to subrounded clasts @ 5.0' to 7.0'; weathered granitic boulder					

GRAPHICAL REPRESENTATION: EAST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: N5W

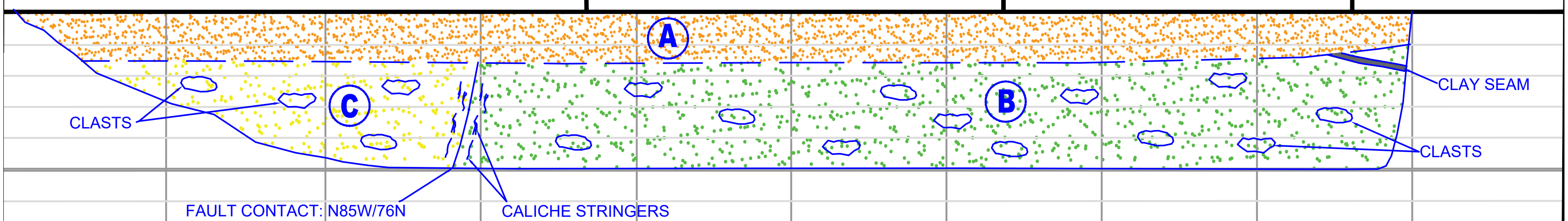


TOTAL DEPTH= 7.5 FEET
GROUNDWATER NOT ENCOUNTERED

Project Name: GF INVESTMENTS	Logged by: JL	LOG OF TRENCH TR-8
Project Number: G19-1802-10	Elevation: 1,218'	Engineering Properties
Equipment: BACKHOE	Location/Grid: SEE GEOTECHNICAL MAP	

Depth	Date: 12/10/19	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0.0'-1.5'	A	ARTIFICIAL FILL, COMPACTED: Clayey SAND; red to brown, damp to moist, medium dense, fine to medium grained with some coarse grains and gravel, roots, roothairs, localized debris	Afc	SC			
1.5'-5.0'	B	SILVERADO FORMATION: Clayey SANDSTONE; red, gray, brown, dry to damp, hard, fine to coarse grained with gravel, weathered granitic clasts, subangular to rounded clasts, oxidation staining, caliche stringers along contact with Ladd Formation @1.5'; 3" thick clay seam, bedding N71W/33S	Tsi				
1.5'-5.0'	C	LADD FORMATION: Silty SANDSTONE red, yellow, gray, white, light brown, dry to damp, hard, fine to coarse grained with gravel and cobbles, weathered granitic clasts, subangular to rounded clasts, caliches stringers along contact with Silverado Formation	Kl				

GRAPHICAL REPRESENTATION: EAST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: N2W



TOTAL DEPTH= 5.0 FEET
GROUNDWATER NOT ENCOUNTERED

APPENDIX B-2

LGC INLAND (2004) BORING LOG AND TEST PITS

Geotechnical Boring Log B-1

Date: 6/21/04	Project Name: Addison — Page 1 of 2
Project Number: I04481-10	Logged By: MRF
Drilling Company: 2R	Type of Rig: CME 155
Drive Weight (lbs): 140	Drop (in): 30 — Hole Dia (in): 8
Top of Hole Elevation (ft):	Hole Location: See Geotechnical Map

Depth (ft)	Blow Count / 6"	Sample No.	Dry Density (pcf)	Moisture (%)	Geologic / USCS Symbol	DESCRIPTION	Type of Test
0					Qyf	**Young Alluvial Fan Deposits:** Silty SAND with pebbles and gravel; medium brown, loose, slightly moist.	
	7 7 9	R-1					
5	5 7 10	R-2					
10	22 25 15	R-3			SW-SM	SAND with gravel; orange, medium dense, dry.	
15	16 18 18	R-4			SM	Silty SAND with gravel; orange brown, medium dense, dry, slightly moist.	200 Sieve
20	41 39 50	R-5				Dense to very dense.	200 Sieve
25	13 19 20	R-6				Medium dense.	200 Sieve
30							

LGC INLAND

Geotechnical Boring Log B-1

Date: 6/21/04	**Project Name: Addison** **Page 2 of 2**
Project Number: I04481-10	**Logged By: MRF**
Drilling Company: 2R	**Type of Rig: CME 155**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Dia (in): 8**
Top of Hole Elevation (ft):	**Hole Location: See Geotechnical Map**

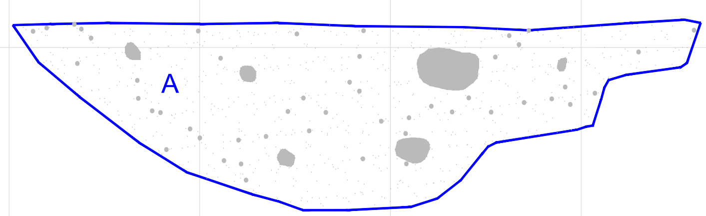
Depth (ft)	Blow Count / 6"	Sample No.	Dry Density (pcf)	Moisture (%)	Geologic / USCS Symbol	DESCRIPTION	Type of Test
30	20 50/3"					No recovery.	
35	50/ 3"	R-7				yellow brown, very dense, slightly moist, no gravel.	
					Kl	**Ladd Formation:** Clayey SAND; yellow-green, moist, massive, and black siltstone, highly fractured.	
40	50/ 2"	R-8				Partial recovery.	
45	50/ 3"	R-9					
50	50/ 2"					No recovery.	
						Total Depth - 50 Feet	
						No Groundwater.	
55							
60							

LGC INLAND

Project Name: COREY ADDISON	Logged by: AW	LOG OF TEST PIT 1			
Project Number: I04481	Elevation:	Engineering Properties			
Equipment: CAT 416 C	Location/Grid: SEE GEOTECHNICAL MAP				

Depth	Date: 5-19-04	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0-5'	A	Bedrock (Ladd Formation): Conglomerate; white to gray, dry, dense, fine to coarse sandstone, fine to coarse gravel (subangular to subrounded), cobbles, boulders, massive.	Kl	SM	Bag 1 @ 0-5' DC 1 @ 1.5'	5.2	117.3

GRAPHICAL REPRESENTATION: west wall	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: SN



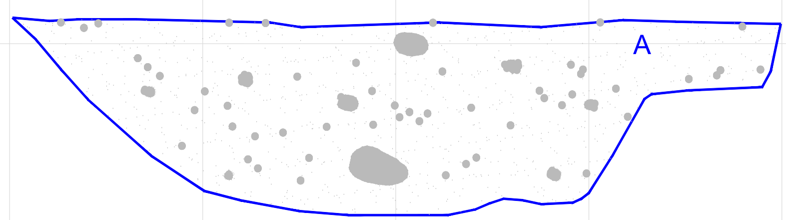
TOTAL DEPTH= 5.0 FEET
NO GROUNDWATER ENCOUNTERED

LGC INLAND

Project Name: COREY ADDISON	**Logged by:** AW	**LOG OF TEST PIT 2**
Project Number: I04481	**Elevation:**	**Engineering Properties**
Equipment: CAT 416 C	**Location/Grid:** SEE GEOTECHNICAL MAP	

Depth	Date: 5-19-04	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0-5'	A	Bedrock (Ladd Formation): Conglomerate; white to gray, dry, dense, fine to coarse sandstone, fine to coarse gravel (subangular to subrounded), cobbles, boulders, massive.	Kl	SC-SM	Bag 1 @ 0-1' DC 1 @ 1'	6.2	94.5

GRAPHICAL REPRESENTATION: NORTH WALL	**SCALE: 1" = 5'**	**SURFACE SLOPE: LEVEL**	**TREND: WE**

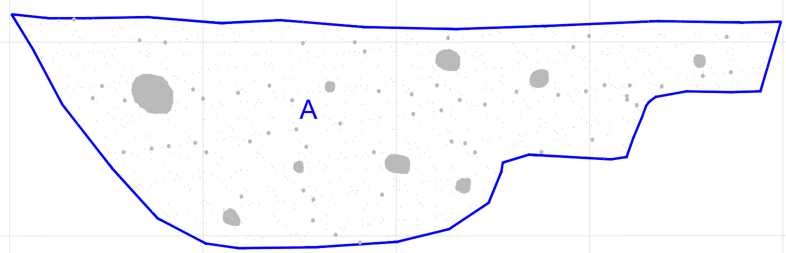


TOTAL DEPTH= 5.0 FEET
NO GROUNDWATER ENCOUNTERED

LGC INLAND

Project Name: COREY ADDISON		Logged by: AW			LOG OF TEST PIT 3			
Project Number: I04481		Elevation:			Engineering Properties			
Equipment: CAT 416 C		Location/Grid: SEE GEOTECHNICAL MAP						
Depth	Date: 5-19-04	Description:		Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0-6'	A	Bedrock (Ladd Formation): Conglomerate; white to gray, dry, dense, fine to coarse sandstone, fine to coarse gravel (subangular to subrounded), cobbles, boulders, massive.		Kl	SM			

GRAPHICAL REPRESENTATION: NORTH WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: WE



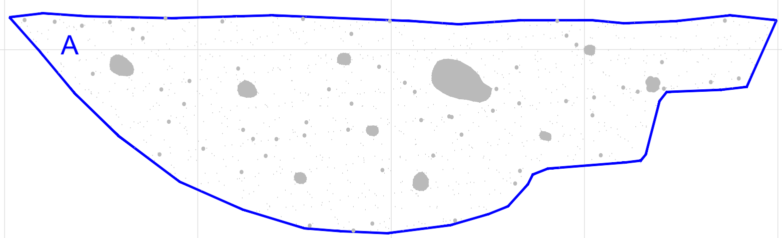
TOTAL DEPTH= 6.0 FEET
NO GROUNDWATER ENCOUNTERED

LGC INLAND

Project Name: COREY ADDISON	**Logged by:** AW	**LOG OF TEST PIT 4**
Project Number: I04481	**Elevation:**	**Engineering Properties**
Equipment: CAT 416 C	**Location/Grid:** SEE GEOTECHNICAL MAP	

Depth	Date: 5-19-04	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0-5.5'	A	Bedrock (Ladd Formation): Conglomerate; white to gray, dry, dense, fine to coarse sandstone, fine to coarse gravel (subangular to subrounded), cobbles, boulders, massive.	Kl	SC/SM SM			

GRAPHICAL REPRESENTATION: NORTH WALL	**SCALE: 1" = 5'**	**SURFACE SLOPE: LEVEL**	**TREND: WE**



TOTAL DEPTH= 5.5 FEET
NO GROUNDWATER ENCOUNTERED

LGC INLAND

APPENDIX C

LABORATORY TESTING PROCEDURES AND TEST RESULTS

APPENDIX C

Laboratory Testing Procedures and Test Results

The laboratory testing program was directed towards providing quantitative data relating to the relevant engineering properties of the soil. Samples considered representative of site conditions were tested in general accordance with American Society for Testing and Materials (ASTM) procedure and/or California Test Methods (CTM), where applicable. The following summary is a brief outline of the test type and a table summarizing the test results.

Soil Classification: Soil were classified according the Unified Soil Classification System (USCS) in accordance with ASTM Test Methods D2487 and D2488. The soil classifications (or group symbol) are shown on the laboratory test data, and trench logs.

Maximum Dry Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM test method D1557. The test results are presented in the table below:

SAMPLE LOCATION	**SAMPLE DESCRIPTION (USCS)**	**MAXIMUM DRY DENSITY (% by weight)**	**OPTIMUM MOISTURE CONTENT (%)**
TR-2 @ 0'-5'	Clayey/Silty SANDSTONE	128.8	10.0
TR-4 @ 0'-5'	Silty SAND (SM)	130.0	9.0

Expansion Index: The expansion potential of a selected sample was evaluated by the Expansion Index Test, U.B.C. Standard No. 18-2 and/or ASTM test method D4829. Specimens are molded under a given compactive energy at or near the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION* **(USCS)**	*EXPANSION INDEX*	*EXPANSION POTENTIAL**
TR-4 @ 0'-5'	Silty SAND (SM)	0	Very Low

*Per ASTM D4829

Soluble Sulfates: The soluble sulfate content of selected samples was determined by standard geotechnical methods (CTM 417). The soluble sulfate content is used to determine the appropriate cement type and maximum water-cement ratios. The test results are presented in the table below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION* **(USCS)**	*SULFATE CONTENT (ppm)*	*SULFATE EXPOSURE**
TR-4 @ 0'-5'	Silty SAND (SM)	Non-Detected	Negligible

*Per ACI 318-19

Chloride Content: Chloride content was tested with CTM 422. The results are presented below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION* **(USCS)**	*CHLORIDE CONTENT (ppm)*
TR-4 @ 0'-5'	Silty SAND (SM)	21

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed with CTM 643. The results are presented in the table below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION* **(USCS)**	*pH*	*MINIMUM RESISTIVITY (ohm-cm)*
TR-4 @ 0′-5′	Silty SAND (SM)	8.1	9,600

Direct Shear: Direct shear tests were performed on selected remolded samples, which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1 hour prior to application of shearing force. The samples were tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less than 0.001 to 0.5 inch per minute (depending upon the soil type). The graphical test results are presented in the table below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION*	*ANGLE OF INTERNAL FRICTION (degrees)*	*COHESION (psf)*
TR-2 @ 0′-5′	Clayey/Silty SANDSTONE	27	710
TR-4 @ 0′-5′	Silty SAND (SM)	35	300

R-Value: The resistance R-value was determined by the ASTM test method D2844 for base, sub-base, and basement soil. The samples were prepared and exudation pressure and R-value were determined. These results were used for pavement design:

SAMPLE LOCATION	*SAMPLE DESCRIPTION* **(USCS)**	*R-VALUE*
TR-1 @ 0′-4′	Clayey SANDSTONE	14
TR-6 @ 2′-7′	Silty SAND (SM)	16

APPENDIX D

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

APPENDIX D

General Earthwork and Grading Specifications

1.0 General

1.1 ***Intent:*** These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 ***The Geotechnical Consultant of Record:*** Prior to commencement of work, the owner shall employ a qualified Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to confirm that the attained level of compaction is being accomplished as specified. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 ***The Earthwork Contractor:*** The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the project plans and specifications. The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "equipment" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading.

The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate personnel will be available for observation and testing. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified. It is the contractor's sole responsibility to provide proper fill compaction.

2.0 *Preparation of Areas to be Filled*

2.1 ***Clearing and Grubbing:*** Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 10 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed. The contractor is responsible for all hazardous waste relating to his work. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Client should acquire the services of a qualified environmental assessor.

2.2 ***Processing:*** Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soil are broken down and free of oversize material and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 ***Overexcavation:*** In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 ***Benching:*** Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 ***Evaluation/Acceptance of Fill Areas:*** All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 *Fill Material*

3.1 ***General:*** Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soil of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soil to achieve satisfactory fill material.

3.2 ***Oversize:*** Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 ***Import:*** If importing of fill material is required for grading, proposed import material shall meet the requirements of this Section. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 *Fill Placement and Compaction*

4.1 ***Fill Layers:*** Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 ***Fill Moisture Conditioning:*** Fill soil shall be watered, dried back, blended, and/or mixed, as necessary to attain relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557-91).

4.3 ***Compaction of Fill:*** After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557-91). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 ***Compaction of Fill Slopes:*** In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557-91.

4.5 ***Compaction Testing:*** Field tests for moisture content and relative compaction of the fill soil shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

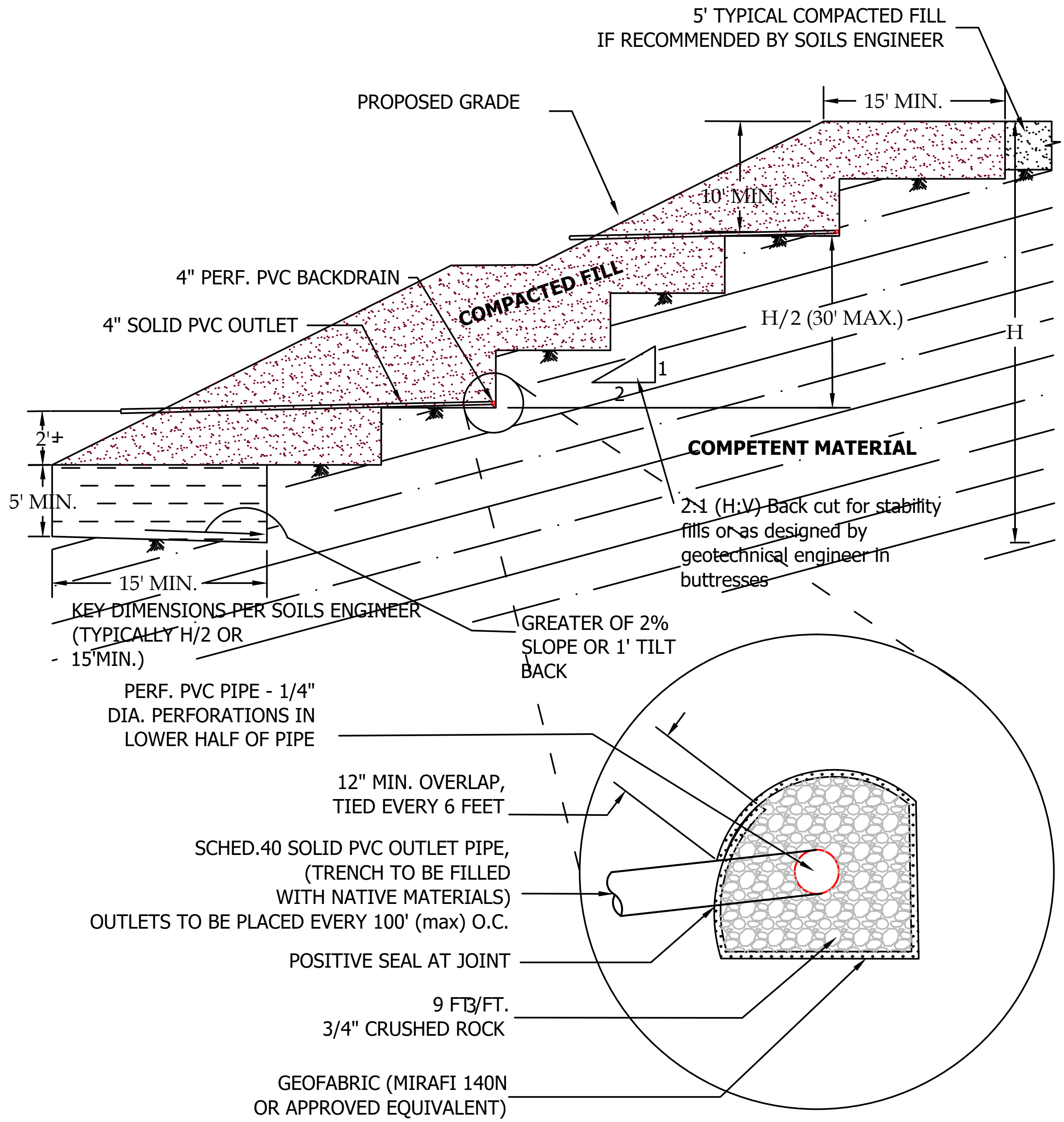
4.6 ***Frequency of Compaction Testing:*** Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soil embankment. In addition, as a guideline, at least one (1) test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations:

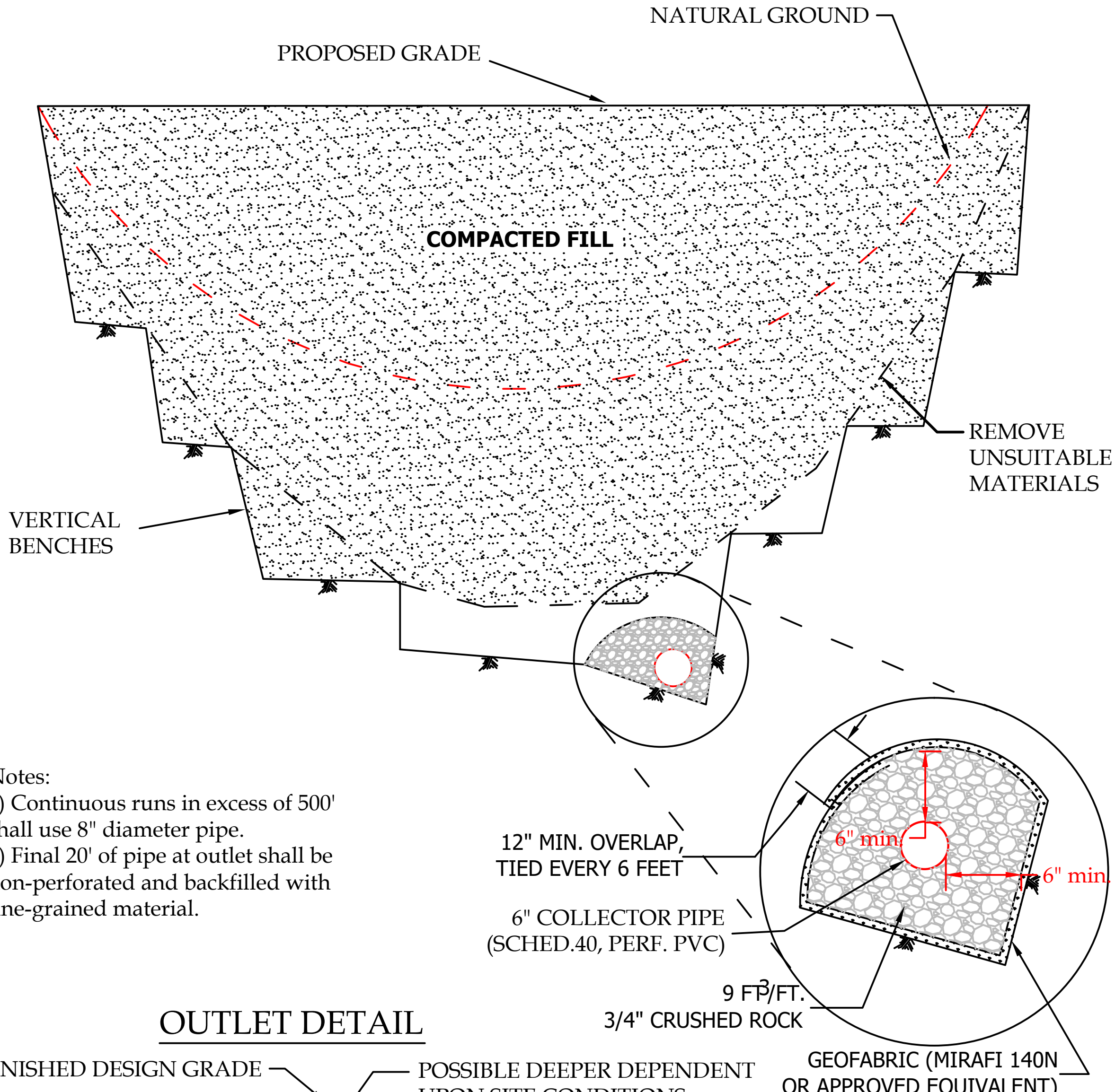
The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two (2) grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s) and grading plan. The Geotechnical Consultant may recommend additional subdrain and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

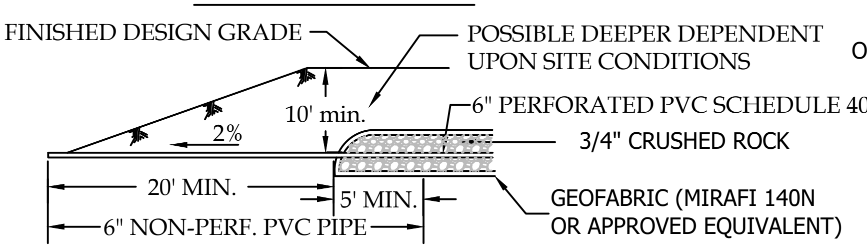


TYPICAL BUTTRESS/ STABILIZATION FILL DETAIL



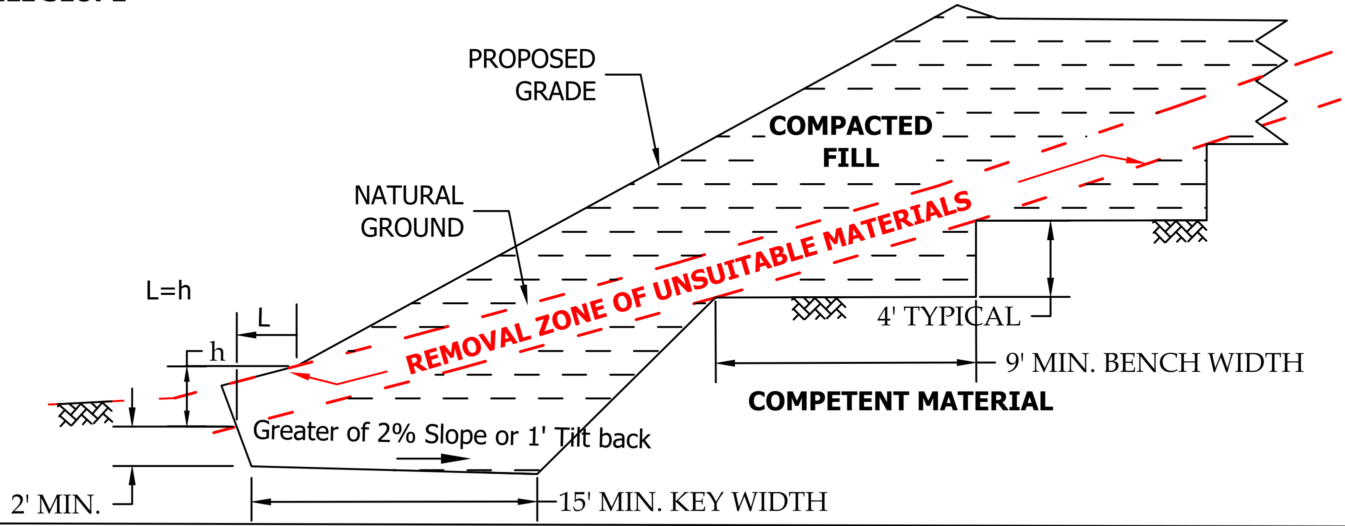
Notes:
1) Continuous runs in excess of 500' shall use 8" diameter pipe.
2) Final 20' of pipe at outlet shall be non-perforated and backfilled with fine-grained material.

OUTLET DETAIL

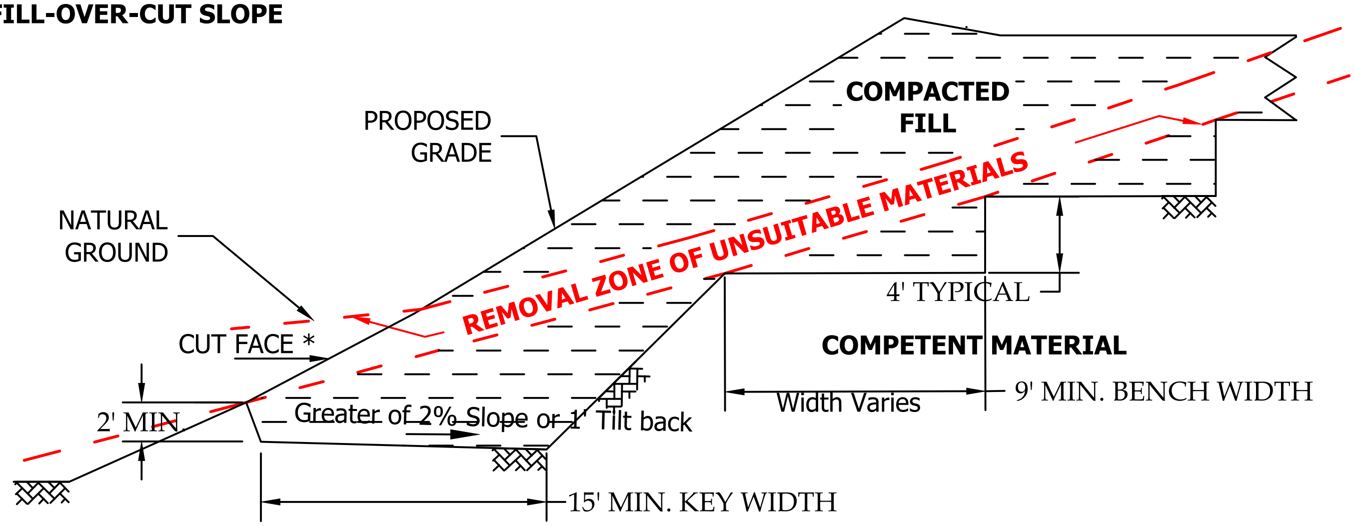


CANYON & STREET SUBDRAINS

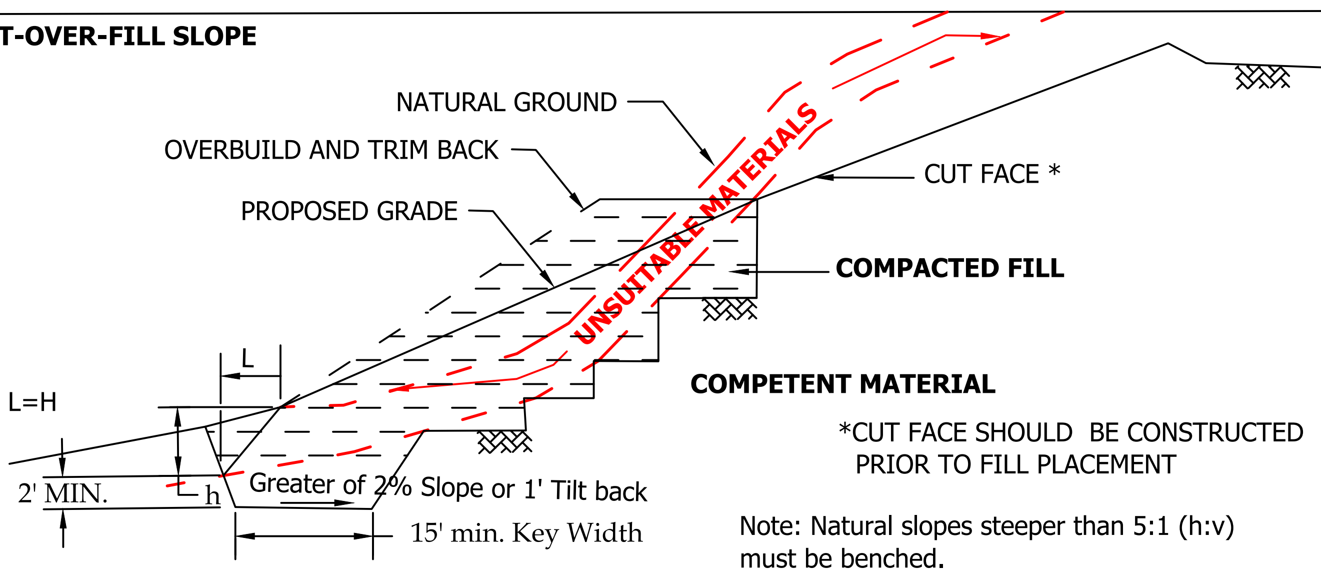
FILL SLOPE



FILL-OVER-CUT SLOPE



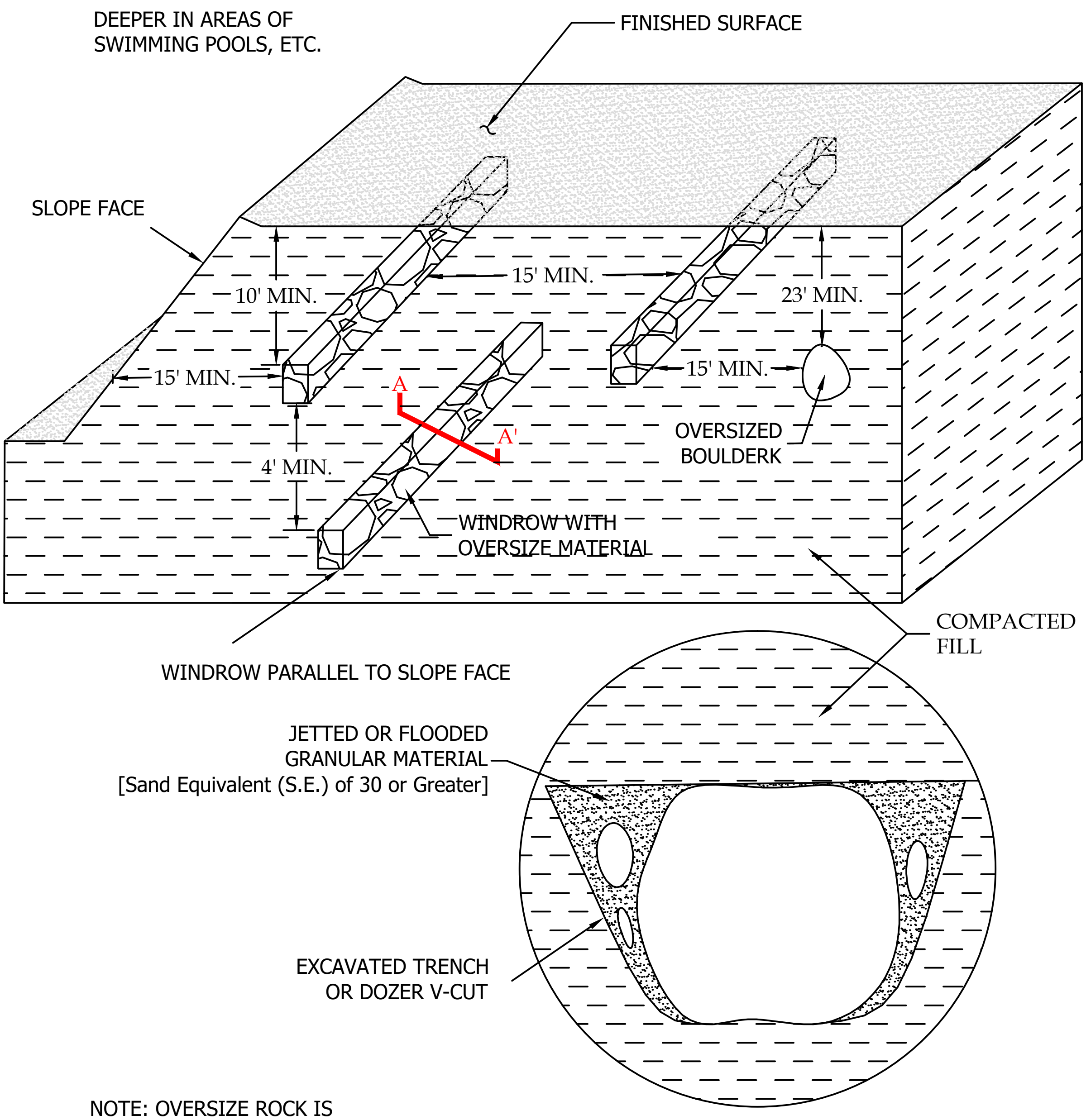
CUT-OVER-FILL SLOPE



*CUT FACE SHOULD BE CONSTRUCTED PRIOR TO FILL PLACEMENT

Note: Natural slopes steeper than 5:1 (h:v) must be benched.

KEYING AND BENCHING



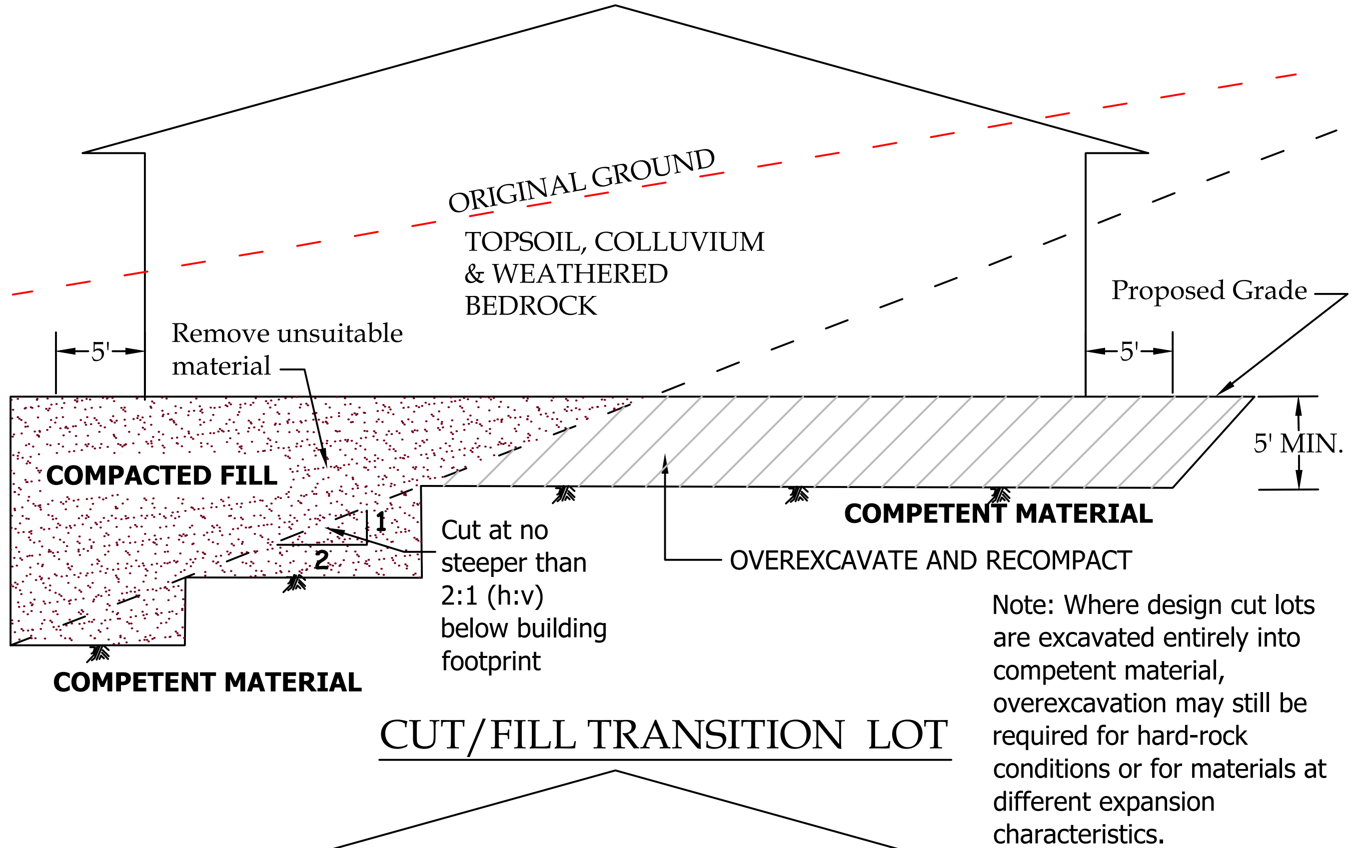
NOTE: OVERSIZE ROCK IS
LARGER THAN 12" IN DIMENSION.

SECTION A-A'

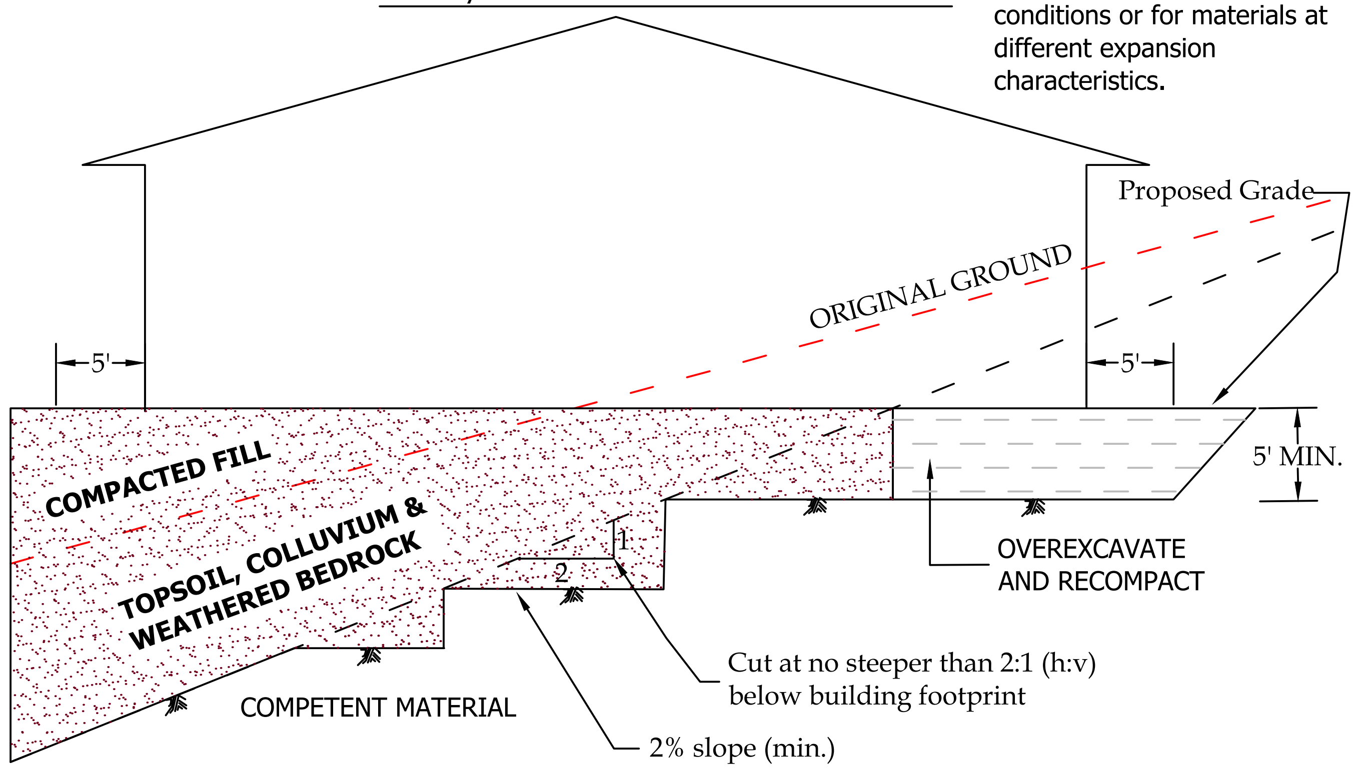
OVERSIZE ROCK DISPOSAL

CUT LOT

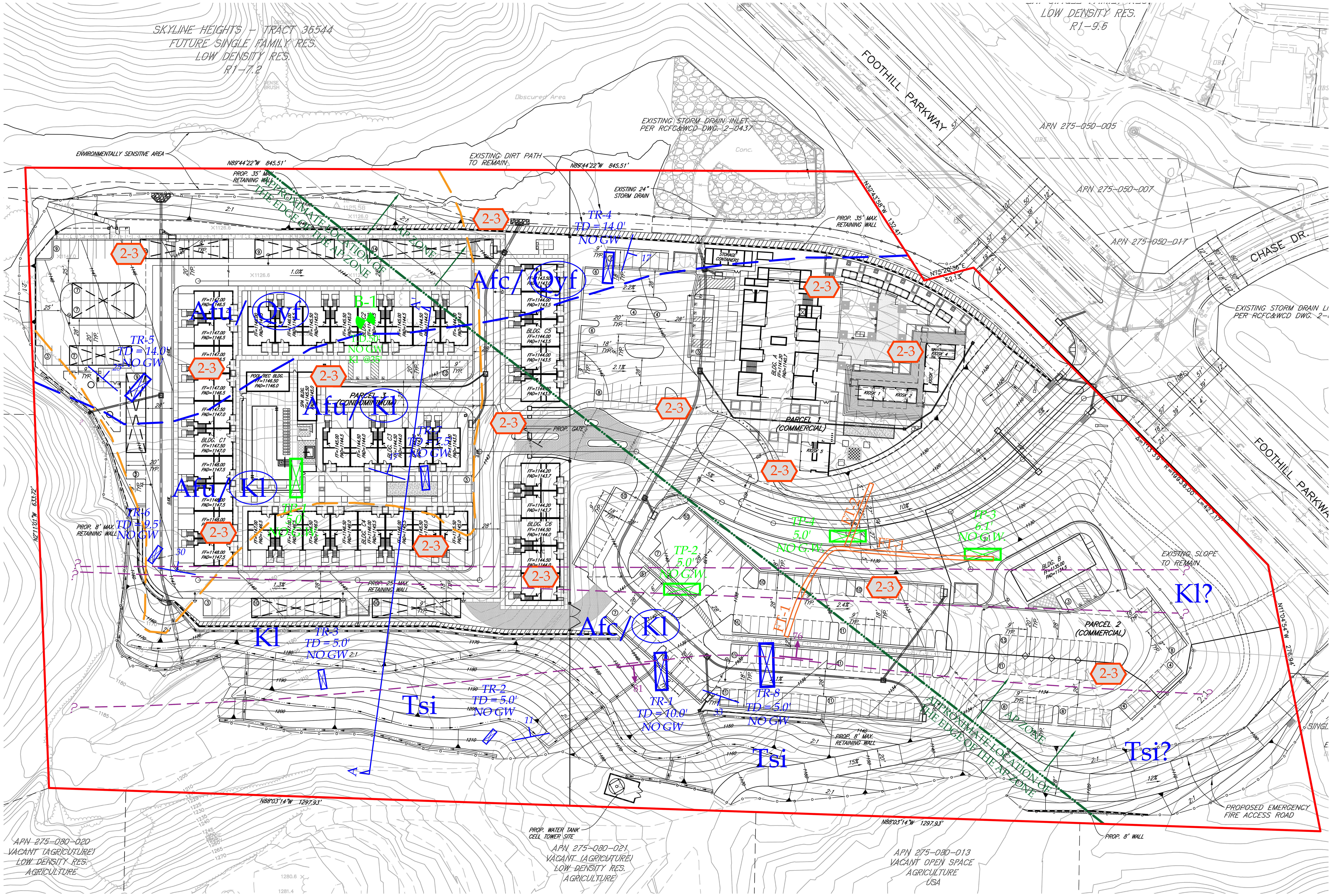
(Exposing Unsuitable Soils/Bedrock @ Design Grade)



CUT/FILL TRANSITION LOT



TRANSITION LOT OVEREXCAVATION DETAIL



LEGEND
(Locations are Approximate)

Geologic Earth Units

- Afu - Artificial Fill, Undocumented
- Afc - Artificial Fill, Compacted
- Qyf - Young Alluvial Fan Deposits (Circled Where Buried)
- Tsi - Silverado Formation (Circled Where Buried)
- Kl - Ladd Formation (Circled Where Buried)

Symbols

- Limits of This Report
- TR-8 TD=5.0' NO GW - Exploratory Trench Location
- Approximate Geologic Contact
- Approximate Afu/Afc Contact
- Approximate Location of Tin Mine Fault
- 17 - Bedding Attitude
- 81 - Fault Contact Attitude
- A A' - Cross-Section A-A'
- Limits of State of California Alquist-Priolo (AP) Zone
- 2-3 - Approximate Depths of Overexcavation Below Proposed Grade (ft.) in Proposed Cut and Fill areas
- B-1 T.D.50' NO GW Kl @35' - Exploratory Boring Location (LGC Inland, 2004)
- TP-4 5.0' NO G.W. - Test Pit Location (LGC Inland, 2004)
- FT-2 - Fault Trench Location (LGC Inland, 2004)

0 50' 100'

LOGICAL GEOTECHNICAL CONSULTANTS
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING
27570 COMMERCE CENTER DR., #128, TEMECULA, CA 92590
PHONE: 951.297.2450 FAX: 951.719.2998
WWW.LGCGEOENV.COM

Mark Bergmann, Engineering Geologist
Larry Cooley, Civil Engineer

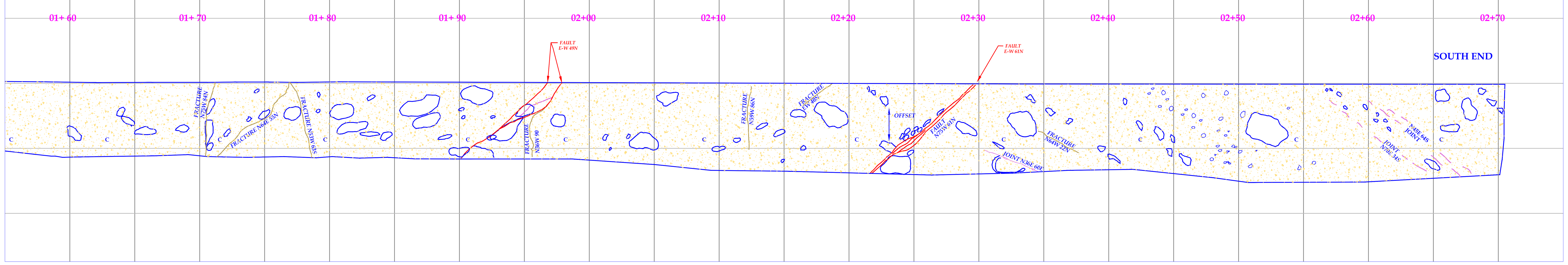
GEOTECHNICAL MAP

APNs 275-050-014-6 and 275-080-041-3, Located at West Chase Drive and Foothill Parkway
City of Corona, County of Riverside, State of California

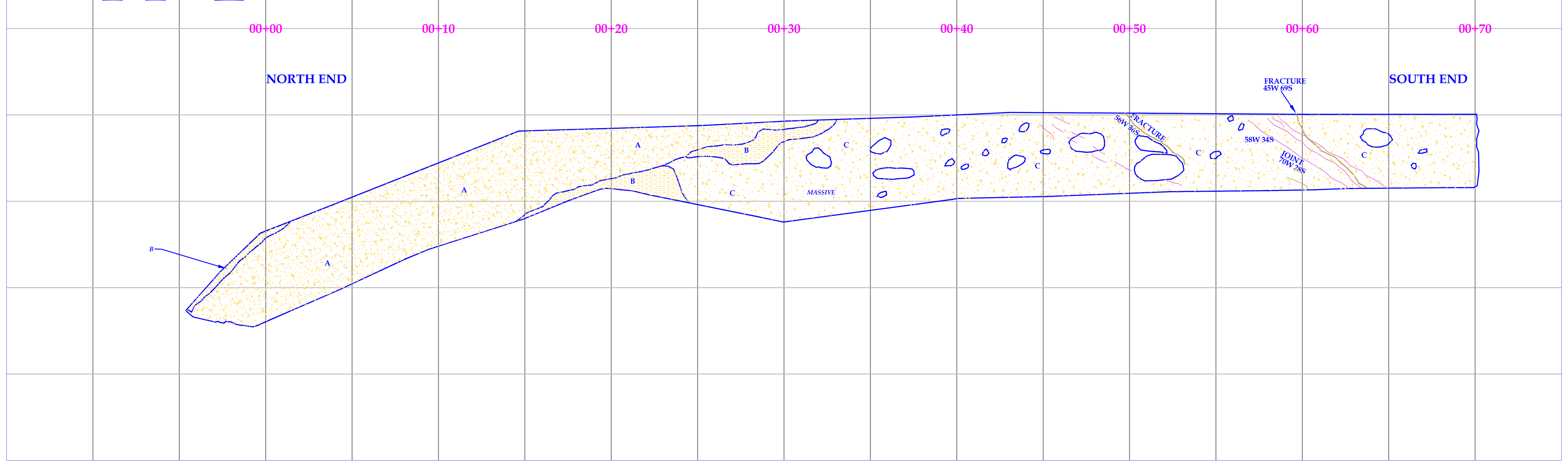
Name:	GF Investments
Project No.	G19-1802-10
Client:	GF Investments, LLC
Scale:	1" = 50'
Date:	July 2020
Reference:	KWC Engineers, Conceptual Grading Plan, Skyline Village Project, Scale 1"=40' dated 6/19/20
Plate No.	1 OF 2

FT- 1

FT- 1 Continued



FT- 2



LEGEND

(Locations are Approximate)

Earth Units

A - Undocumented Fill (Map Symbol Afu): SAND with cobbles and gravel; dry, loose.

B - Topsoil: Silty SAND; medium brown, dry, loose, rootlets.

C - Ladd Formation Bedrock (Map Symbol Kl): conglomerate, yellow gray, slightly moist, dense, massive.

LGC INLAND

LGC INLAND

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Temecula, California 92591
(909) 719-1076 Fax (909) 719-1077

Mark Bergmann	Stephen Poole
Principal Geologist	Principal Engineer

FAULT TRENCH LOGS

TRENCH 1 & 2

LOGGED BY MRF ON JULY 15, 2004

Name:	COREY ADDISON
Project No.	I04481-10
Client:	MR. COREY ADDISON
Scale:	1" = 5'
Date:	AUGUST 2004
Sheet No.	
Plate No.	PLATE NO. 2 OF 2