

**GEOLOGY AND SOILS EVALUATION
GRANTVILLE FOCUSED
PLAN AMENDMENT, EIR
SAN DIEGO, CALIFORNIA**

PREPARED FOR:

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Ms. Kathie Washington
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Subject: Geology and Soils Evaluation
Grantville Focused Plan Amendment, Subarea A
San Diego, California

Dear Ms. Washington:

In accordance with your request and authorization, we have performed a geology and soils evaluation for the Grantville Focused Plan Amendment, Subarea A project in San Diego, California. The attached report presents our methodology, findings, opinions, and recommendations regarding the geology and soils conditions at the site.

We appreciate the opportunity to be of service on this project.

Respectfully submitted,
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EXECUTIVE SUMMARY

Subarea A of the Grantville Focused Plan Amendment project encompasses portions of the Allied Gardens, Grantville, and College area communities of the City of San Diego, California. Subarea A is one of three subareas of the Grantville Master Planning area. Subarea A is comprised generally of commercial, industrial and retail land uses north of Interstate Highway 8 (I-8) and along both sides of Fairmont Avenue and Mission Gorge Road up to Zion Avenue. Portions of the irregularly-shaped project area, such as those adjacent to the San Diego River, are undeveloped, and are partially vegetated with grasses, shrubs, and trees. The general boundaries of the subarea include the San Diego River and Admiral Baker Golf Course to north, Alvarado Creek and I-8 to the south, the San Diego River and Fairmont Avenue to the west, and Adobe Falls and Waring Roads to the east. Geologic and geotechnical conditions and constraints include:

- Geologically, Subarea A is underlain by fill (both documented and undocumented), young alluvium, young colluvium, old alluvium, and formational soils of the Mission Valley Formation, Stadium Conglomerate, and Friars Formation. Fill, young alluvium, and young colluvium are not considered suitable in their current state for support of improvements. The condition of these fill, young alluvium, and young colluvium soils is not known and they may be subject to settlement under foundation loads. To mitigate the potential for future settlement, these soils may need to be removed and replaced as compacted fill, if future structures are planned in these areas. The formational materials contain layers of cemented gravel and cobbles which may be difficult to excavate and may impact trenching operations.
- The closest known active fault is the Rose Canyon Fault, which is located approximately 4 miles west of the site. In addition, the site is in a region of active faults and therefore strong ground motion in the event of an earthquake is a design consideration.
- Liquefaction hazards are mapped by the City of San Diego. Parcels in close proximity to the San Diego River and the I-8 highway may have a moderate to high potential for liquefaction. Liquefaction hazards are mapped by the City of San Diego. According to the City of San Diego, the majority of the lower elevation portions of the project area are defined as having a high potential for liquefaction (Category 31). Mitigation may include removal of loose soils and replacement with compacted fill or supporting structures on deep foundations which extend through the loose materials.
- Landslide hazards are mapped both by the State of California and the City of San Diego. According to the State of California (Tan, 1995), the majority of the project area is classified as being marginally susceptible to landsliding (Designation 2). However, some portions of the project area are classified as being generally susceptible or most susceptible to landsliding (Designations 3-1 or 4-1). The eastern portion of the project area (along Waring Road) is classified as being most susceptible to landsliding. According to the City of San Diego, the majority of the project area is mapped as having a low risk for landsliding (Category 52). However, the eastern portion of the project area along Waring Road is mapped as being underlain by a slide-prone formation, specifically the Friars Formation with neutral or favorable geologic structure (Category 23). In addition, some portions of the project area are mapped as having a low to moderate risk for landsliding (Category 53).
- Significant flooding of the portions of the site in close proximity to the San Diego River and Alvarado Creek is likely.

- Based on previous work by our office in the project area, we anticipate the soils at the project site to have a low potential for expansion.
- Based on previous work by our office in the project area, the soils at the project site are not anticipated to be corrosive. However, the potential for corrosive soils to occur at the project site exists on parcels in close proximity to the San Diego River.

Please note the following recommendations regarding the geologic and geotechnical considerations described above:

- In order to develop the site for improvements, undocumented fill soils would need to be removed and/or replaced as engineered compacted fill. The extent of removals cannot be determined without further investigation.
- Structures such as building foundations would need to be designed appropriately to mitigate strong ground shaking or liquefaction in the event of an earthquake on a nearby fault.
- In areas where materials prone to landsliding are exposed, buttress fills may be needed in cut slopes.
- If expansive soils exist on the site, they can be mitigated during grading by placing them in deeper fill areas, removing them from the site, or treating them to reduce their potential for expansion.
- If corrosive soils exist on the site, a corrosion engineer may be required to assist in the design of improvements in contact with the soil.

The conditions described above would increase the cost and duration of grading the site, but would not preclude development of the project. Our conclusions and recommendations are based on our limited geotechnical evaluation. A geotechnical evaluation including subsurface exploration and associated laboratory testing are recommended.

1. INTRODUCTION

In accordance with your request on behalf of BRG Consulting (client), Ninyo & Moore has completed an evaluation of geologic and soil conditions for Subarea A of the Grantville Focused Plan Amendment. Subarea A of the Grantville Focused Plan Amendment project encompasses portions of the Allied Gardens, Grantville, and College area communities of San Diego, California. Subarea A is one of three subareas of the Grantville Master Planning area.

Ninyo & Moore previously reported on geologic and geotechnical conditions for Subareas A, B, and C of the Grantville Master Planning Area (Ninyo & Moore, 2004). Subarea A is comprised generally of commercial, industrial and retail land uses north of Interstate Highway 8 (I-8) and along both sides of Fairmont Avenue and Mission Gorge Road up to Zion Avenue. Portions of the irregularly-shaped project area, such as those adjacent to the San Diego River, are undeveloped, and are partially vegetated with grasses, shrubs, and trees. The general boundaries of the subarea include the San Diego River and Admiral Baker Golf Course to north, I-8 to the south, the San Diego River and Fairmont Avenue to the west, and Adobe Falls and Waring Roads to the east. Figures 1 and 2 are maps and aerial photographs depicting the general location of the project area.

Our evaluation is based on geologic reconnaissance, published and unpublished reports, aerial photographs, in-house data, our previous experience in the vicinity, and the assessment of the potential geologic hazards affecting the project area. The purpose of this survey was to estimate the potential for existing environmental impacts to the project area from geologic or soils conditions on or in proximity to the project area, and to discuss measures that can be implemented to reduce or mitigate the potential impacts with respect to the design and construction of the proposed project.

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this geologic and soils evaluation included the activities listed below:

- Review of readily available regional, local, and project area-specific geologic and geotechnical reports.
- Review of readily available background information including topographic, soils, mineral resources, geologic, and seismic and geologic hazard maps, and stereoscopic aerial photographs.
- Performance of a geologic reconnaissance of the project area vicinity.
- Compilation and analysis of the data obtained from our background reviews and site reconnaissance.
- Preparation of this report documenting our findings and providing opinions and recommendations regarding possible geologic and soil impacts at the project area. The findings were evaluated with respect to questions A through H listed in Section 6, "Geology and Soils" within Appendix G, "Envi-

ronmental Checklist Form” of the “Guidelines for Implementation of the California Environmental Quality Act (CEQA).”

3. REGULATORY FRAMEWORK

Geologic resources and geotechnical hazards within the proposed project area are governed by the City of San Diego. The City’s Building Division plans contain conservation and safety elements for the protection of geologic features and avoidance of geologic hazards. The procedures for construction related earthwork and excavation are established by these local grading ordinances developed by the City of San Diego Engineering Department. The site is also governed by the regulations of the California Code of Regulations (CCR), 2013 California Building Code (CBC).

The CBC is promulgated under CCR, Title 24, Parts 1 through 12, also known as the California Building Standards Code, and is administered by the California Building Standards Commission (CBSC). The CBSC is responsible for administering California’s building codes.

4. PROJECT AREA DESCRIPTION

Subarea A is currently generally developed for commercial (including office), industrial, and retail uses. In addition to these commercial, industrial and retail uses, some portions of the subarea are developed for hospital, and multi- and single-family residential. Portions of the project area along the San Diego River located west of Fairmount Avenue are designated as open space areas.

The majority of the project area is located in the San Diego River Valley. The southern portion of the project area is located within the Alvarado Creek drainage. The elevation along the San Diego River is approximately 80 feet above mean sea level (MSL). Elevations of the eastern limits of the project area near Waring Road are up to approximately 200 feet MSL. Elevations of the southern limits of the project area near the College area are up to approximately 300 feet MSL.

5. PROJECT DESCRIPTION

We understand that the City of San Diego established the Grantville Redevelopment Project in May 2005. The project was established in order to address the following issues: construction of industrial properties prior to the development of current zoning regulations, an inefficient mixture of commercial and industrial businesses, inadequate parking and storage for commercial facilities, traffic, and flooding of business along Mission Gorge Place. The City intends to redevelop areas that are considered to have physical and economic blighting conditions and to ensure the continued economic viability of the commercial, industrial, and retail uses within the project area.

6. GEOLOGY

The following sections present our findings relative to regional and project area geology, geologic hazards (e.g., landslides or expansive soils), groundwater, faulting and seismicity, and agricultural soils.

6.1. Regional Geologic Setting

The project area is situated in the coastal foothill section of the Peninsular Ranges Geomorphic Province. The province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California (Norris and Webb, 1990; Harden, 1998). The province varies in width from approximately 30 to 100 miles. In general, the province consists of rugged mountains underlain by Jurassic metavolcanic and metasedimentary rocks, and Cretaceous igneous rocks of the southern California batholith.

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending roughly northwest (Jennings, 2010). Several of these faults are considered active. The Elsinore, San Jacinto and San Andreas faults are active fault systems located northeast of the project area and the Rose Canyon, Coronado Bank, San Diego Trough, and San Clemente faults are active faults located west of the project area. Major tectonic activity associated with these and other faults within the regional tectonic framework consists primarily of right-lateral, strike-slip movement. Specifics of faulting are discussed in following sections of this report.

6.2. Project Area Geology

Geologic mapping indicates that the near-surface geology at the project area includes the geologic units listed below (Kennedy and Peterson, 1975; Kennedy and Tan, 2008) (Figure 3). However,

based on our field reconnaissance, developed portions of the project area is generally underlain by fill associated with the development of individual parcels.

- Fill: Fills in the project area are expected to consist of engineered and undocumented fills, derived from nearby formational and surficial units. Fill soils can vary from clay to sand, depending on the parent material. The compaction of the fills can vary considerably, ranging from loose to dense.
- Qya: Young Alluvial Flood-Plain Deposits (Holocene and late Pleistocene) – Poorly sorted, poorly consolidated, permeable flood-plain deposits of sand, silt, or clay. Scattered layers of gravel and cobbles are also likely to be present within the alluvium. The alluvium is generally in a loose condition and much of it would be subject to liquefaction below the water table. In developed parts of the western portion of Subarea A, alluvium is likely to be present below existing fill soils.
- Qyc: Young Colluvial Deposits (Holocene and late Pleistocene) – Poorly sorted and poorly consolidated sand and silt slope wash deposits. These deposits are expected to also contain gravel and cobbles. They are also expected to be generally in a loose condition.
- Qoa: Old Alluvial Flood Plain-Deposits (late to middle Pleistocene) – Poorly sorted, well consolidated, permeable, commonly slightly dissected gravel, sand, silt, and clay.
- Tmv: Mission Valley Formation (middle Eocene) – Predominantly light olive gray, soft, friable, fine- to medium-grained marine and non-marine sandstone containing cobble conglomerate tongues. These materials may be slightly to moderately cemented.
- Tst: Stadium Conglomerate (middle Eocene) – Massive cobble conglomerate with dark yellowish brown, coarse-grained sandstone matrix. These materials may be moderately cemented.
- Tf: Friars Formation (middle Eocene) – Yellowish gray, medium-grained, massive, poorly indurated, non-marine lagoonal sandstone and claystone with tongues of cobble conglomerate. These materials may be moderately cemented.

6.3. Groundwater

Sources provided by the California Department of Water Resources (DWR) and the California State Water Resources Control Board (SWRCB) were reviewed for information pertaining to groundwater quality and occurrence in the vicinity of the project area. According to the SWRCB Water Quality Control Plan for the San Diego Basin, the project area is located within the Mission San Diego Hydrologic Subarea (907.11) in the San Diego Unit (907.00) (SWRCB, 1995).

We researched information on the SWRCB GeoTracker (2013) website reported for properties with wells located in proximity to the project area and found that several DWR wells are located within the project area. Based on that research groundwater is present at relatively shallow depths (as shallow as 9 feet below the adjacent surface) throughout Subarea A. Specifics of the groundwater data obtained are presented below.

- Monitoring wells located at 10385 Friars Road have measured groundwater at depths ranging from 15 to 35 feet (75 to 55 feet MSL).
- Monitoring wells located at 5910 Mission Gorge Road have measured groundwater at depths ranging from 13 to 15 feet (65 to 67 feet MSL).
- Monitoring wells located at 6011 Mission Gorge Road have measured groundwater at depths ranging from 10 to 15 feet (75 to 80 feet MSL).
- Monitoring wells located at 6075 Mission Gorge Road have measured groundwater at depths ranging from 14 to 21 feet (79 to 86 feet MSL).
- Monitoring wells located at 6110 Mission Gorge Road have measured groundwater at depths ranging from 15 to 21 feet (79 to 85 feet MSL).

- Monitoring wells located at 6401 Mission Gorge Road have measured groundwater at depths ranging from 25 to 26 feet (79 to 80 feet MSL).
- Monitoring wells located at 6605 Mission Gorge Road have measured groundwater at depths ranging from 19 to 25 feet (87 to 93 feet MSL).
- Monitoring wells located at 4421 Glacier Avenue have measured groundwater at depths ranging from 13 to 16 feet (64 to 67 feet MSL).
- Monitoring wells located at 5957 Fairmont Avenue have measured groundwater at depths ranging from 13 to 14 feet (66 to 67 feet MSL).
- Monitoring wells located at 4282 Camino del Rio North have measured groundwater at depths ranging from 9 to 13 feet (67 to 71 feet MSL).
- Monitoring wells located at 4660 Alvarado Canyon Road have measured groundwater at depths ranging from 26 to 47 feet (53 to 74 feet MSL).

Based on the topography of the project area and its proximity to the San Diego River and Alvarado Creek, groundwater beneath the project area is presumed to flow generally in a westerly direction. Groundwater levels can fluctuate due to seasonal variations, groundwater withdrawal or injection, and other factors.

6.4. Faulting and Seismicity

As shown on Figure 4, there are several active faults in the region of the project and therefore, the project area is considered to be seismically active. As shown on Figure 5, according to the City of San Diego Seismic Safety Study (2008), there are no known faults that cross the project area. The closest known major active fault is the Rose Canyon Fault, which is capable of generating an earthquake magnitude of 7.2 (Cao, et al, 2003). The Rose Canyon Fault is located approximately 4 miles west of the project area (Figure 4).

In general, hazards associated with seismic activity include strong ground motion, ground surface rupture, liquefaction, and tsunamis. These hazards are discussed in the following sections.

6.4.1. Strong Ground Motion

Based on the peak horizontal ground acceleration (PGA) having a 2 percent probability of exceedance in 50 years which is defined as the Maximum Considered Earthquake (MCE). The statistical return period for PGA_{MCE} is approximately 2,475 years. In evaluating the seismic hazards associated with the project site, we have used a Site Class D for this preliminary evaluation. Seismic hazards and classifications should be further evaluated through a full geotechnical evaluation including subsurface and laboratory evaluation. If the results of the geotechnical evaluation indicate a different Site Class, the following estimations will be revised. The site modified PGA_{MCE} is an estimated 0.49g using the United States Geological Survey (USGS) (USGS, 2011) ground motion calculator

(web-based). The design PGA was 0.33g using the USGS ground motion calculator. These estimates of ground motion do not include near-source factors that may be applicable to the design of structures on site.

6.4.2. Ground Surface Rupture

Based on our review of the referenced literature, active faults are not known to cross the project vicinity. Therefore, the potential for ground rupture due to faulting at the site is considered low. However, lurching or cracking of the ground surface as a result of nearby seismic events is possible.

6.4.3. Liquefaction and Seismically Induced Settlement

Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Research and historical data indicate that loose granular soils and non-plastic silts that are saturated by a relatively shallow groundwater table are susceptible to liquefaction.

Based on the shallow groundwater table and relatively loose granular nature of the subsurface materials, portions of Subarea A underlain by alluvium (or fills over alluvium) have a high potential for liquefaction in the event of a nearby seismic event. Based on the relatively dense nature of the subsurface materials on portions of Subarea A away from the drainages of the San Diego River and Alvarado Creek, it is our opinion that the potential for liquefaction is not a design consideration in these areas.

Liquefaction hazards are mapped by the City of San Diego, and according to the City of San Diego Seismic Safety Study (Figure 5), portions of the project area are mapped as Categories 31 and 32. Areas mapped as Category 31 are defined as having a high potential for liquefaction and areas mapped as Category 32 are defined as having a low potential for liquefaction.

6.5. Tsunamis

Tsunamis are long wavelength seismic sea waves (long compared to the ocean depth) generated by sudden movements of the ocean bottom during submarine earthquakes, landslides, or volcanic activity. Based on the inland location and elevation of the project area, the potential for a tsunami is not considered a design constraint.

6.6. Landsliding

Landslide hazards are mapped both by the State of California and the City of San Diego. According to the State of California (Tan, 1995), the majority of the project area is classified as being marginally susceptible to landsliding (Designation 2). However, some portions of the project area are classified as being generally susceptible or most susceptible to landsliding (Designations 3-1 or 4-1). The eastern portion of the project area (along Waring Road) is classified as being most susceptible to landsliding.

According to the City of San Diego Seismic Safety Study (Figure 5), portions of the project area are mapped as having a low risk for landsliding (Category 52). However, the eastern portion of the project area along Waring Road is mapped as being underlain by a slide-prone formation, specifically the Friars Formation with neutral or favorable geologic structure (Category 23). In addition, some portions of the project area are mapped as having a low to moderate risk for landsliding (Category 53).

6.7. Flood Hazards

Based on review of Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) (FEMA, 2012), the low lying areas near the San Diego River and Alvarado Creek are within 100- and 500-year floodplains. Based on this review and our site reconnaissance, the potential for significant flooding for parcels located near the San Diego River and Alvarado Creek is high.

6.8. Expansive Soils

Expansive soils generally result from specific clay minerals that have the capacity to shrink or swell in response to changes in moisture content. Shrinking or swelling of foundation soils can lead to damage to foundations and engineered structures, including tilting and cracking. Review of regional geologic maps, geologic reconnaissance, and site-specific subsurface exploration at the project area, indicates that the near surface soils consist predominately of cobbles, gravel, sand, silt, and clay. The soils at the project area may be anticipated to have a low to moderate potential for expansion.

6.9. Corrosive Soils

Caltrans corrosion (2012) criteria define corrosive soils as soils with more than 500 parts per million chlorides, more than 0.2 percent sulfates, or a pH less than 5.5. Soil corrosivity testing was not performed for the proposed project in preparation for this specific project. Based on laboratory testing performed on soil samples during previous Ninyo & Moore projects elsewhere in the area, and Caltrans corrosion (2012) criteria, those soils were not classified as corrosive. However, there is the potential for corrosive soils to occur through the project area, in particular, on parcels in close proximity to the San Diego River.

6.10. Agricultural Soils

Based on the Soil Survey for the San Diego Area (Bowman, 1973), several different soil series have been mapped on the project area. These soil types and their characteristics are summarized in Table 1. The potential for loss of agricultural soils due to further development of the study area is considered negligible since the majority of the project area has been extensively developed and is no longer in its natural state. The potential for loss of agricultural soils due to development are a concern in undeveloped areas such those directly adjacent to the San Diego River.

Table 1 – Soil Series Characteristics

Soil Series and Map Symbol	Use	Erosion Potential
Huerhuero loam (HrC)	range, irrigated truck crops, tomatoes, and flowers	slight to moderate
Huerhuero urban land complex (HuC)	range, irrigated truck crops, tomatoes, and flowers	slight to moderate
Made land (Md)	building sites	N/A
Olivenhain cobbly loam (OhF)	range and watershed	high
Riverwash (Rm)	farming, ranching, sand and gravel	N/A
Terrace Escarpments (TeF)	watershed	N/A
Tujung sand (TuB)	range and golf courses	slight

6.11. Mineral Resource

According to the California Geological Survey Open File Report 96-04, areas mapped as Mineral Resource Zone 2 and 3 (MRZ-2 through MRZ-3) have been mapped in the project area. Areas mapped as being in MRZ-2 are considered to have extractable aggregate deposits. Areas mapped as being in MRZ-3 contain mineral deposits that may qualify as mineral resources. Based on our review of referenced data, Subarea A is in an urban area where the potential for loss of mineral deposits due to further development is considered low.

7. CONCLUSIONS

Based on our review of the referenced background data and our geologic field reconnaissance it is our opinion that geologic and geotechnical considerations at the project area include the following:

- Geologically, Subarea A is underlain by fill (both documented and undocumented), young alluvium, young colluvium, old alluvium, and formational soils of the Mission Valley Formation, Stadium Conglomerate, and Friars Formation. Fill, young alluvium, and young colluvium are not considered suitable in their current state for support of improvements. The condition of these fill, young alluvium, and young colluvium soils is not known and they may be subject to settlement under foundation loads. To mitigate the potential for future settlement, these soils may need to be removed and replaced as compacted fill if future structures are planned in these areas. The formational materials contain layers of cemented gravel and cobbles which may be difficult to excavate and may impact trenching operations.
- The closest known major active fault is the Rose Canyon Fault, which is located approximately 4 miles west of the site. In addition, the site is in an area of active faults and therefore strong ground motion in the event of an earthquake is a consideration.
- Liquefaction hazards are mapped by the City of San Diego. Parcels in close proximity to the San Diego River and Alvarado Creek may have a moderate to high potential for liquefaction (Category 31).

Mitigation may include removal of loose soils and replacement with compacted fill or supporting structures on deep foundations which extend through the loose materials.

- Landslide hazards are mapped both by the State of California and the City of San Diego. According to the State of California (Tan, 1995), the majority of the project area is classified as being marginally susceptible to landsliding (Designation 2). However, some portions of the project area are classified as being generally susceptible or most susceptible to landsliding (Designations 3-1 or 4-1). The eastern portion of the project area (along Waring Road) mapped as being most susceptible to landsliding. The majority of the project area is mapped as having a low risk for landsliding (Category 52). However, the eastern portion of the project area along Waring Road is mapped as being underlain by a slide-prone formation, specifically the Friars Formation with neutral to favorable geologic structure (Category 23). In addition, some portions of the project area are mapped as having a low to moderate risk for landsliding (Category 53).
- The potential for significant flooding of the portions of the site in close proximity to the San Diego River and Alvarado Creek is considered high.
- Based on previous work by our office in the project area, we anticipate the soils at the project site to have a low potential for expansion.
- Based on previous work by our office in the project area, the soils at the project site are not anticipated to be corrosive. However, the potential for corrosive soils to occur at the project site exists on parcels in close proximity to the San Diego River.

The conditions described above would increase the cost and duration of grading the project area, but would not preclude development of the project. Our conclusions and recommendations are based on our limited geotechnical evaluation. A geotechnical evaluation including subsurface exploration and associated laboratory testing are recommended.

8. IMPACT ANALYSIS

Based upon the results of the Limited Geotechnical and Soils Evaluation, our opinions, and recommendations are provided in the following sections.

8.1. Significance Thresholds

In evaluating the significance of potential environmental concerns in a particular study area, the criteria to consider, as they relate to geologic and soil conditions, are presented in the CEQA Guidelines. In accordance with the scope of work, the findings of this study were evaluated with respect to Questions A through E of Section 6 “Geology and Soils” with in Appendix G of the CEQA Guidelines (2009).

8.2. Project Impacts and Significance

Based on the above criteria and the results of the evaluation, the potential impact by geologic and soil conditions at the project site have been identified, and are discussed below.

A. Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i. Rupture of a known earthquake fault, as delineated on the most recent Alquist Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of known fault?

Subarea A is not located within a mapped Alquist Priolo Earthquake Fault Zone and there are no known faults crossing the area.

ii. Strong seismic ground shaking?

Subarea A has a moderate potential for strong ground motions due to earthquakes on nearby active faults.

iii. Seismic related ground failure, including liquefaction?

Parcels in close proximity to the San Diego River and Alvarado Creek may have a moderate to high potential for liquefaction. Areas underlain by formational materials that are out of the low-lying valley areas have a low potential for liquefaction.

iv. Landslides?

No landslides have been mapped in Subarea A, therefore the potential for landslides is considered low over the major portions of Subarea A. However, the eastern portion of the project area along Waring Road is in an area which is classified as being most susceptible to landsliding as it is underlain by the slide-prone Friars Formation.

B. Would the project result in substantial soil erosion or the loss of topsoil?

The potential for substantial soil erosion or loss of topsoil due to the proposed improvements is a consideration in undeveloped areas such as those adjacent to the San Diego River. The potential for substantial soil erosion or loss of topsoil for the majority of the project area is negligible because the project area is not in its natural condition and native soil/topsoil were likely removed during grading operations.

C. Would the project be located on geologic unit or soil that is unstable or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

Young alluvium and young colluvium may be subject to static settlement.

D. Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

The on site soils are expected to have a moderate to low potential for expansion.

9. LIMITATIONS

The field evaluation and geotechnical analyses presented in this report have been conducted in accordance with current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No warranty, implied or expressed, is made regarding the conclusions, recommendations, and professional opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered. Our preliminary conclusions and recommendations are based on an analysis of the observed conditions and the referenced background information.

The purpose of this study was to evaluate geologic and geotechnical conditions within the project site and to provide a geotechnical reconnaissance report to assist in the preparation of environmental impact documents for the project. A comprehensive geotechnical evaluation, including subsurface exploration and laboratory testing, should be performed prior to design and construction of structural improvements.

10. REFERENCES

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