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GEOTECHNICAL INVESTIGATION AND FAULT RUPTURE HAZARD EVALUATION PROPOSED MIXED USE BUILDING 2426 4TH AVENUE SAN DIEGO, CALIFORNIA

PREPARED FOR:

MR. RICHARD SIMIS
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PREPARED BY:

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Providing Professional Engineering Services Since 1959

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January 12, 2018

SCST No. 170441N
Report No. 1R

Mr. Richard Simis
4th Avenue Apartments, LLC
2820 Shelter Island Drive
San Diego, California 92101

Subject: GEOTECHNICAL INVESTIGATION AND
FAULT RUPTURE HAZARD EVALUATION
PROPOSED MIXED USE DEVELOPMENT
2426 4TH AVENUE
SAN DIEGO, CALIFORNIA

Dear Mr. Simis:

SCST, Inc. (SCST) is pleased to present our report describing the fault evaluation and geotechnical investigation performed for the subject project. We conducted our services investigation in general conformance with the scope of work presented in our proposal dated November 17, 2017. Based on the results of our investigation, we consider the planned development feasible from a geotechnical standpoint provided the recommendations of this report are followed. If you have any questions, please call us at (619) 280-4321.

Respectfully submitted,
SCST, INC.

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EXECUTIVE SUMMARY

This report presents the results of the geotechnical investigation and fault rupture hazard evaluation SCST, Inc. (SCST) performed for the subject project. We understand that the currently planned project will consist of the design and construction of a six-story, mixed-use development over one level of subterranean parking. The purpose of our work is to provide conclusions and recommendations regarding the geotechnical aspects of the project.

SCST explored the subsurface conditions by drilling three borings to depths between approximately 20 and 40 feet below the existing ground surface using a truck-mounted, drill rig equipped with a hollow stem auger. An SCST geologist logged the borings and collected samples of the materials encountered for laboratory testing. SCST tested selected samples from the borings to evaluate pertinent soil classification and engineering properties to assist in developing geotechnical conclusions and recommendations.

To evaluate fault rupture hazard potential at the site, SCST excavated six exploratory trenches across the site. The trenches were excavated using a rubber-tire backhoe. The trenches varied in length from approximately 25 to 90 feet, and in depth from approximately 3 to 10 feet below existing ground surface.

The materials encountered in the borings and trenches consist of artificial fill, very old paralic deposits, and San Diego Formation. The fill consists of loose silty to clayey sand with varying amounts of gravel. The very old paralic deposits consist of silty to clayey sand. The San Diego Formation consists of very dense, moderately to strongly cemented silty sandstone. Groundwater was not encountered in the borings.

The main geotechnical considerations affecting the project are the presence of potentially compressible fill and difficult excavations in the very old paralic deposits and San Diego Formation. To reduce the potential for settlement, the existing fill should be excavated in its entirety. We anticipate that the bottom of the subterranean parking structure will extend through the existing fill and into competent very old paralic deposits. The planned structure can be supported on shallow spread footings with bottom levels on very old paralic deposits. Site preparation will need to be performed in areas to receive at-grade slabs, pavements, retaining walls or new fill to reduce the potential for distress to the improvements. Strongly cemented zones should be expected within the very old paralic deposits and San Diego Formation. Gravel and cobbles should also be anticipated. Contract documents should specify that the contractor mobilize equipment capable of excavating and compacting materials with concretions, gravel and cobbles. The recommendations presented herein may need to be updated once final plans are developed.

1. INTRODUCTION

This report presents the results of the geotechnical investigation SCST performed for the subject project. We understand that the currently planned project will consist of the design and construction of a six-story mixed use development over one level of subterranean parking. The purpose of our work is to provide conclusions and recommendations regarding the geotechnical aspects of the project. Figure 1 presents a site vicinity map.

2. SCOPE OF WORK

2.1 GEOTECHNICAL FIELD INVESTIGATION

We explored the subsurface conditions by drilling three borings to depths between approximately 20 and 40 feet below the existing ground surface using a truck-mounted drill rig equipped with a hollow stem auger. Figure 2 shows the approximate locations of the borings. Figure 3 presents the regional geology in the vicinity of the site. An SCST engineer logged the borings and collected samples of the materials encountered for laboratory testing. Logs of the borings are presented in Appendix I. Soils are classified according to the Unified Soil Classification System illustrated on Figure I-1.

2.2 LABORATORY TESTING

Selected samples were tested to evaluate pertinent soil classification and engineering properties and enable development of geotechnical conclusions and recommendations. The laboratory tests consisted of in situ moisture and density, grain size distribution, Atterberg Limits, expansion index, corrosivity, and direct shear. The results of the laboratory tests and brief explanations of the test procedures are presented in Appendix II.

2.3 FAULT RUPTURE HAZARD EVALUATION

SCST evaluated the fault rupture hazard potential at the site by excavating a total of six exploratory trenches (T-1 through T-6) across the site. The trenches were excavated using a rubber-tire backhoe with a 24-inch bucket. The trenches varied in length from approximately 25 to 90 feet, and in depth from approximately 3 to 10 feet below existing ground surface. The trenches were supported with hydraulic shoring prior to personnel entering the excavation. The trenches were visually logged by our engineering. Graphic logs of the trenches are presented on Figures 4 through 7.

Additionally, geologic research of readily available published and unpublished geologic data was performed. Historical aerial photographs and topographic maps were reviewed for geomorphic evidence of faulting.

2.4 ANALYSIS AND REPORT

The results of the field, laboratory tests, and background reviews were evaluated to develop conclusions and recommendations regarding:

- Subsurface conditions beneath the site
- Potential geologic hazards including active and potentially active surface fault rupture
- Criteria for seismic design in accordance with the 2016 California Building Code (CBC)
- Site preparation and grading
- Foundation alternatives and geotechnical engineering criteria for design of the foundations
- Estimated foundation settlements
- Support for concrete slabs-on-grade
- Lateral pressures for the design of retaining walls
- Pavement sections
- Soil corrosivity

3. SITE DESCRIPTION

The site is located west of 4th Avenue, south of Laurel Street and north of Kalmia Street in the Bankers Hill neighborhood of San Diego, California. The site consists of a single, square-shaped parcel identified as Assessor's Parcel Number (APN) 533-106-13-00 with a physical address of 2426 4th Avenue. In general, a mixture of commercial and high-density residential development surrounds the site. The site is currently a vacant lot. A partially completed foundation system, consisting of footing excavations, rebar, and an ungrouted masonry block wall are present at the site. Site elevations range from about 235 feet on the south to about 240 feet on the west. Vegetation consists of weeds and grasses.

4. PROPOSED DEVELOPMENT

We understand that the currently planned project will consist of the design and construction of a six-story, mixed-use development over one level of subterranean parking. Design-level drawings were not available at the time of this report. However, we anticipate that excavations up to about 15 feet deep may be required to reach the subterranean level.

5. REGIONAL GEOLOGIC SETTING

5.1 GEOLOGIC STRATIGRAPHIC UNITS

Most of the Banker's Hill area is underlain directly by middle to early Pleistocene Very Old Paralic Deposits, Unit 9, formerly identified as the Lindavista Formation (Kennedy and Tan 2008). The Very Old Paralic Deposits are comprised primarily of interfingered strandline, beach, estuarine, and colluvial deposits. Per Kennedy and Tan (2008), these soils are underlain by marine sandstone of the early Pleistocene to late Pliocene San Diego Formation.

5.2 GEOLOGIC STRUCTURE

The geologic structure of the metropolitan San Diego area is dominated by the active Rose Canyon Fault Zone. The fault zone consists of a number of discrete subparallel faults that extend from Newport Beach in Orange County, southward beneath the Pacific Ocean to La Jolla where the faults trend onshore and extend to San Diego Bay (Figure 3). The fault zone changes character from a relatively narrow, predominantly strike slip fault zone to a wider, predominantly dip-slip zone. This change occurs between Old Town and the San Diego River. In the downtown area the fault zone consists of the Spanish Bight Fault, Coronado/San Diego Fault, and the Silver Strand /San Diego Graben Fault. Movement on the Rose Canyon Fault Zone has uplifted Mt Soledad, tilted the older sedimentary rocks in La Jolla and has down dropped the area between Point Loma and San Diego to create San Diego Bay.

6. SITE GEOLOGY

The site is located on gently sloping terrace in the Bankers Hill neighborhood of San Diego. The site topography has been altered by grading. A review of historic aerial photographs does not show unaltered, native topography. Rather, the photographs indicate that the site has been developed since the 1920s and has been modified by grading. Old topographic maps do not show evidence of north-south trending breaks in slope, drainages or swales indicative of active faulting (United States Geological Survey, 1953).

6.1 STRATIGRAPHY AND GEOCHRONOLOGY

The materials encountered in our borings and trenches consist of fill, channel deposits, and Very Old Paralic Deposits and the San Diego Formation. Descriptions of the materials are presented below. Figure 8 presents a geologic cross-section.

Fill (Qf): The fill consists of loose to dense silty to clayey sand with varying amounts of gravel and scattered debris (brick, glass, and asphalt fragments). The fill extends to depths varying from about 1 to 8 feet below the existing ground surface with the deepest fill located in the southwest portion of the site. Figures 4 through 7 show the distribution of fill in our trenches as Subunit 1.

Very Old Paralic Deposits Unit 9 ($Qvop_9$): The fill is underlain by very old paralic deposits Unit 9. These deposits consist of very dense silty sand to clayey sand. Refusal on strongly cemented material occurred at the west end of trenches T-1 and T-3. Evidence of an argillic soil horizon (Trench Log Subunit 3) was observed in the upper portion of Unit 9 in trench T-1. This horizon was laterally continuous across T-1 (Figure 4). In the remaining trenches, the upper portion of Unit 9 had been stripped of soil by grading.

Unit 9 exposed in the trenches consists of three different lithologies. Subunit 4 material consists of weathered, tan to yellow brown, friable fine- to coarse-grained silty sand. Subunit 5 material consists of orange brown to reddish brown with grey mottling, fine- to coarse-grained, clayey sandstone. Trench Log Subunit 6 materials consists of reddish brown with grey mottling, fine- to coarse-grained, clayey sandstone. The three different lithologies did not appear to be laterally continuous across the trenches. Rather, their development and location appeared to be a result of fluid migration and weathering.

The age of the Very Old Paralic Deposits, Unit 9 could not be determined at the site due to a lack of carbon debris and pedology. However, they correlate laterally and lithologically with the mapping and descriptions of Kennedy and Tan (2008), and are estimated to be approximately 0.5 to 1.5 million years old. The cementation observed in the trenches also suggest a pre-Holocene age for the sediments.

Channel deposits (trench log Subunit 2) were observed in trenches T-1, T-3, and T-5. The channel deposits are composed of stratified medium dense silty sand which are locally derived from the very old paralic deposits. The age of the channel deposits is unknown. However, our observations showed that the channel deposits incised into the underlying very old paralic deposits indicating that are likely much younger than the very old paralic deposits.

Groundwater: Groundwater was not encountered in the borings or trenches. The permanent groundwater table is expected to be below a depth that will influence planned construction. However, groundwater levels may fluctuate in the future due to rainfall, irrigation, broken pipes, or changes in site drainage. Because groundwater rise or seepage is difficult to predict, such conditions are typically mitigated if and when they occur.

6.2 LOCAL GEOLOGIC STRUCTURE

The known active faults nearby consist of elements of the Newport-Inglewood-Rose Canyon fault zone. (Figure 3). The old paralic deposits, Unit 9 are relatively flat lying. Localized discontinuous (could not be traced vertically or horizontally over several feet) fractures were noted in both trenches T-1 and T-3 (Figures 4 and 5). No offset bedding was observed across the fractures. No offset bedding, folding or structural discontinuities were observed. The Unit 9 sediments observed in our explorations have not been offset or deformed by faulting (Figures 4 through 7).

7. GEOLOGIC HAZARDS

7.1 CITY OF SAN DIEGO SEISMIC SAFETY STUDY

Figure 9 shows the approximate site location on the City of San Diego Seismic Safety Study map. The site is located in Geologic Hazard Category 13, which is defined as the Downtown Special Study Zone. This zone was created in response to recognized active faulting in the downtown area. The City of San Diego added this downtown zone as an amendment to the 1991 Uniform Building Code.

7.2 CBC SEISMIC DESIGN PARAMETERS

A geologic hazard likely to affect the project is groundshaking as a result of movement along an active fault zone in the vicinity of the subject site. The site coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) spectral response acceleration parameters in accordance with the 2016 CBC are presented below:

TABLE 1

2016 California Building Code Seismic Design Criteria	
Site Coordinates	
Latitude	**Longitude**
32.730721°	-117.161495°
Site Coefficients and Spectral Response Acceleration Parameters	**Values**
Site Class	C
Site Coefficients, F_a	1.000
Site Coefficients, F_v	1.334
Mapped Spectral Response Acceleration at Short Period, S_s	1.209g
Mapped Spectral Response Acceleration at 1-Second Period, S_1	0.466g
Design Spectral Acceleration at Short Period, S_{DS}	0.806g
Design Spectral Acceleration at 1-Second Period, S_{D1}	0.414g
Site Peak Ground Acceleration, PGA_M	0.54g

Computed from USGS "US Seismic Design Maps" online program

7.3 FAULTING AND SURFACE RUPTURE

Evidence of active surface faulting was not observed in our exploration. In addition, no active faults are known to underlie or project toward the site. Therefore, in our opinion the probability of fault rupture is low.

7.4 LIQUEFACTION AND DYNAMIC SETTLEMENT

Liquefaction occurs when loose, saturated, generally fine sands and silts are subjected to strong ground shaking. The soils lose shear strength and become liquid; resulting in large total and differential ground surface settlements as well as possible lateral spreading during an earthquake. Due to the lack of shallow groundwater, and given the relatively dense nature of the materials beneath the site, the potential for liquefaction and dynamic settlement to occur is considered negligible.

7.5 LANDSLIDES AND SLOPE STABILITY

Evidence of landslides or slope instabilities was not observed. In addition, the site is not in an area designated by the City of San Diego as being subject to landslides. The potential for landslides or slope instabilities to occur at the site is considered negligible.

7.6 FLOODING, TSUNAMIS AND SEICHES

The site is not located within a mapped area on the State of California Tsunami Inundation Maps (Cal EMA, 2009); therefore, damage due to tsunamis is considered low. Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays, or reservoirs. The site is not located adjacent to any lakes or confined bodies of water; therefore, the potential for a seiche to affect the site is considered negligible. The site is not located within a flood zone or dam inundation area (County of San Diego, 2012).

7.7 SUBSIDENCE

The site is not located in an area of known subsidence associated with fluid withdrawal (groundwater or petroleum); therefore, the potential for subsidence due to the extraction of fluids is considered negligible.

7.8 HYDRO-CONSOLIDATION

Hydro-consolidation can occur in recently deposited sediments (less than 10,000 years old) that were deposited in a semi-arid environment. Examples of such sediments are aolian sands, alluvial fan deposits, and mudflow sediments deposited during flash floods. The pore spaces between the particle grains can re-adjust when inundated by groundwater causing the material to consolidate. The relatively dense materials underlying the site are not considered susceptible to hydro-consolidation.

8. CONCLUSIONS

The main geotechnical considerations affecting the project are the presence of potentially compressible fill and difficult excavations in the very old paralic deposits and San Diego Formation. To reduce the potential for settlement, the existing fill should be excavated in its entirety. We anticipate that the bottom of the planned subterranean parking structures will extend through the existing fill and into competent very old paralic deposits. The planned structures can be supported on shallow spread footings with bottom levels on very old paralic deposits. Site preparation will need to be performed in areas to receive at-grade slabs, pavements, retaining walls or new fill to reduce the potential for distress to the improvements. Strongly cemented zones should be anticipated in cemented zones within the very old paralic deposits and San Diego Formation. Gravel and cobbles should also be anticipated. Contract documents should specify that the contractor mobilize equipment capable of excavating and compacting materials with concretions, gravel, and cobbles. The recommendations presented herein may need to be updated once final plans are developed.

9. RECOMMENDATIONS

9.1 SITE PREPARATION AND GRADING

9.1.1 Site Preparation

Site preparation should begin with the removal of existing improvements, vegetation and debris. Subsurface improvements that are to be abandoned should be removed, and the resulting excavations should be backfilled and compacted in accordance with the recommendations of this report. Pipeline abandonment can consist of capping or rerouting at the project perimeter and removal within the project perimeter. If appropriate, abandoned pipelines can be filled with grout or slurry as recommended by and observed by the geotechnical consultant.

9.1.2 Remedial Grading

The existing fill should be excavated in its entirety beneath structures and settlement sensitive improvements. We anticipate that the bottom of the planned subterranean parking structures will extend through the existing fill and into competent very old paralic deposits. Horizontally, remedial excavations should extend at least 5 feet outside the planned perimeter foundations, at least 2 feet outside the planned hardscape/pavements, or up to temporary shoring or existing improvements, whichever is less. An SCST representative should observe conditions exposed in the bottom of excavation to determine if additional excavation is required.

9.1.3 Compacted Fill

Excavated material, except for soil containing roots, debris and rock greater than 6 inches, can be used as compacted fill. Exterior concrete slabs-on-grade should be underlain by at least 2 feet of material with an expansion index of 20 or less determined in accordance with ASTM D4829. We expect that most of the onsite materials will meet the expansion index criteria. Fill should be placed in 6- to 8-inch thick loose lifts, moisture conditioned to near optimum moisture content, and compacted to at least 90% relative compaction. The maximum density and optimum moisture content for the evaluation of relative compaction should be determined in accordance with ASTM D1557. Utility trench backfill beneath structures, pavements and hardscape should be compacted to at least 90% relative compaction. The top 12 inches of subgrade beneath pavements should be compacted to at least 95% relative compaction.

9.1.4 Imported Soil

Imported soil should consist of predominately granular soil free of organic matter and rocks greater than 6 inches. Imported soil should have an expansion index of 20 or less and should be inspected and, if appropriate, tested by SCST prior to transport to the site.

9.1.5 Expansive Material

The onsite materials tested have a very low to low expansion potential. The foundation recommendations presented in this report reflect a very low expansion potential.

9.1.6 Site Excavation Characteristics

It is anticipated that excavations can be achieved with conventional earthwork equipment in good working order. Difficult excavation should be anticipated in cemented zones within very old paralic deposits. Gravel and cobbles should also be anticipated within very old paralic deposits. Contract documents should specify that the contractor mobilize equipment capable of excavating and compacting strongly cemented materials with gravel and cobbles.

9.1.7 Oversized Material

Excavations may generate oversized material. Oversized material is defined as rocks or cemented clasts greater than 6 inches in largest dimension. Oversized material should be broken down to no greater than 6 inches in largest dimension for use in fill, used as landscape material, or disposed offsite.

9.1.8 Temporary Excavations

Temporary excavations 3 feet deep or less can be made vertically. Deeper temporary excavations in fill should be laid back no steeper than 1:1 (horizontal:vertical). Deeper temporary excavations in very old paralic deposits should be laid back no steeper than ¾:1 (horizontal:vertical) up to 30 feet deep. The faces of temporary slopes should be inspected daily by the contractor’s Competent Person before personnel are allowed to enter the excavation. Any zones of potential instability, sloughing or raveling should be brought to the attention of the Engineer and corrective action implemented before personnel begin working in the excavation. Excavated soils should not be stockpiled behind temporary excavations within a distance equal to the depth of the excavation.

SCST should be notified if other surcharge loads are anticipated so that lateral load criteria can be developed for the specific situation. If temporary slopes are to be maintained during the rainy season, berms are recommended along the tops of slopes to prevent runoff water from entering the excavation and eroding the slope faces. Slopes steeper than those described above will require shoring. Additionally, temporary excavations that extend below a plane inclined at 1½:1 (horizontal:vertical) downward from the outside bottom edge of existing structures or improvements will require shoring.

9.1.9 Temporary Shoring

For design of cantilevered shoring with level backfill, an active earth pressure equal to a fluid weighing 35 pounds per cubic foot (pcf) can be used. For design of tied-back shoring with level backfill, a trapezoidal earth pressure distribution with a maximum pressure of 25H pounds per square foot (psf) at 0.2H down from the top of shoring and 0.2H up from the base of shoring, where H is the height of shoring in feet, can be used. The surcharge loads from traffic and construction equipment adjacent to the shored excavation can be modeled by assuming an additional 2 feet of soil behind the shoring.

For design of soldier piles embedded in very old paralic deposits, an allowable passive pressure of 350 psf per foot of embedment over three times the pile diameter or the spacing of the piles, whichever is less, up to a maximum of 7,500 psf can be used. Soldier piles should be spaced at least three pile diameters, center to center.

For design of tie-backs, a friction angle of 35 degrees, a cohesion of 200 psf and an average frictional resistance of 600 psf can be used for the portion of anchor embedded in very old paralic deposits. Only the frictional resistance developed beyond the active wedge will be effective in resisting lateral loads. It can be assumed that the active wedge adjacent to the shoring wall is defined by a plane drawn at 35 degrees from vertical through the bottom of the excavation. Anchor capacities should be proof-tested during construction. Where satisfactory tests are not achieved, the anchor diameter and/or length should be increased until satisfactory test results are obtained.

Continuous lagging will be required throughout. The soldier piles and tie-back anchors should be designed for the full-anticipated lateral pressure; however, the pressure on the lagging will be less due to arching in the soils. For design of lagging, the earth pressure but can be limited to a maximum value of 400 psf.

We recommend that the performance of the shoring system be monitored. The monitoring should consist of periodic surveying of the lateral and vertical locations of the tops of all soldier piles and the lateral movement along the lengths of selected soldier piles. We recommend that structures and improvements adjacent to the shoring be surveyed by the contractor prior to excavation and monitored weekly during construction.

9.1.10 Temporary Dewatering

Groundwater seepage may occur locally and should be anticipated in excavations. Temporary dewatering can be accomplished by sloping the excavation bottom to a sump and pumping from the sump. A layer of gravel about 6 inches thick placed in the bottom of the excavation will facilitate groundwater flow and can be used as a working platform.

9.1.11 Slopes

All permanent slopes should be constructed no steeper than 2:1 (horizontal:vertical). Faces of fill slopes should be compacted either by rolling with a sheep-foot roller or other suitable equipment, or by overfilling and cutting back to design grade. All slopes are susceptible to surficial slope failure and erosion. Water should not be allowed to flow over the top of slopes. Additionally, slopes should be planted with vegetation that will reduce the potential for erosion.

9.1.12 Surface Drainage

Final surface grades around structures should be designed to collect and direct surface water away from the structure and toward appropriate drainage facilities. The ground around the structure should be graded so that surface water flows rapidly away from the structure without ponding. In general, we recommend that the ground adjacent to the structure slope away at a gradient of at least 2%. Densely vegetated areas where runoff can be impaired should have a minimum gradient of at least 5% within the first 5 feet from the structure. Roof gutters with downspouts that discharge directly into a closed drainage system are recommended on structures. Drainage patterns established at the time of fine grading should be maintained throughout the life of the proposed structures. Site irrigation should be limited to the minimum necessary to sustain landscape growth. Should excessive irrigation, impaired drainage, or unusually high rainfall occur, saturated zones of perched groundwater can develop.

9.1.13 Grading Plan Review

SCST should review the grading plans and earthwork specifications to ascertain whether the intent of the recommendations contained in this report have been implemented, and that no revised recommendations are needed due to changes in the development scheme.

9.2 FOUNDATIONS

9.2.1 Shallow Spread Footings

Shallow spread footings with bottom levels on very old paralic deposits can be used to support the planned subterranean parking structures. Shallow spread footings with bottom levels on compacted fill or very old paralic deposits can be used to support minor at-grade structures or site retaining walls. Footings should extend at least 24 inches below lowest adjacent finished grade. A minimum width of 12 inches is recommended for continuous footings and 24 inches for isolated or retaining wall footings. An allowable bearing capacity of 5,000 psf can be used for footings supported on very old paralic deposits. An allowable bearing capacity of 2,500 psf can be used for footings supported on compacted fill. The allowable bearing capacity can be increased by 500 psf for each foot of depth below the minimum and 250 psf for each foot of width beyond the minimum up to a maximum of 8,000 psf on very old paralic deposits or 5,000 psf on compacted fill. The bearing value can be increased by ⅓ when considering the total of all loads, including wind or seismic forces. Footings located adjacent to or within slopes should be extended to a depth such that a minimum horizontal distance of 7 feet exists between the lower outside footing edge and the face of the slope.

Lateral loads will be resisted by friction between the bottoms of footings and passive pressure on the faces of footings and other structural elements below grade. An allowable coefficient of friction of 0.35 can be used. Passive pressure can be computed using an allowable lateral pressure of 350 psf per foot of depth below the ground surface for level ground conditions. The passive pressure can be increased by ⅓ when considering the total of all loads, including wind or seismic forces. The upper 1 foot of soil should not be relied on for passive support unless the ground is covered with pavements or slabs.

9.2.2 Settlement Characteristics

Total foundation settlements are estimated to be less than 1 inch. Differential settlements between adjacent columns and across continuous footings are estimated to be less than ½ inch over a distance of 40 feet. Settlements should be completed shortly after structural loads are applied.

9.2.3 Foundation Plan Review

SCST should review the foundation plans to ascertain that the intent of the recommendations in this report has been implemented and that revised recommendations are not necessary as a result of changes after this report was completed.

9.2.4 Foundation Excavation Observations

A representative from SCST should observe the foundation excavations prior to forming or placing reinforcing steel.

9.3 SLABS-ON-GRADE

9.3.1 Parking Structure Slabs-on-Grade

The project structural engineer should design the parking structure slabs-on-grade. However, we recommend that the slab have a minimum thickness of 6 inches and be underlain by at least 6 inches of aggregate base material. The aggregate base should conform to Caltrans Standard Specifications. The slab should be reinforced with at least No. 4 reinforcing bars placed at 16 inches on center each way. Reinforcement should be placed approximately at mid-height of the slab. Concrete should have a minimum compressive strength of 3,250 psi.

A vapor barrier should be placed beneath the slab-on-grade where moisture sensitive floor coverings or equipment are planned. If plastic is used, a minimum 10-mil is recommended. The plastic should comply with ASTM E1745. Installation should comply with ASTM E1643. Current construction practice typically includes placement of a 2-inch thick sand cushion between the bottom of the concrete slab and the moisture vapor barrier. This cushion can provide some protection to the vapor barrier during construction, and may assist in reducing the potential for edge curling in the slab during curing. However, the sand layer also provides a source of moisture to the underside of the slab that can increase the time required to reduce vapor emissions to limits acceptable for the type of floor covering placed on top of the slab. The slab can be placed directly on the vapor barrier. The floor covering manufacturer should be contacted to determine the volume of moisture vapor allowable and any treatment needed to reduce moisture vapor emissions to acceptable limits for the particular type of floor covering installed.

9.3.2 Exterior Slabs-on-Grade

Exterior slabs should be at least 4 inches thick and reinforced with at least No. 3 bars at 18 inches on center each way. Slabs should be provided with weakened plane joints. Joints should be placed in accordance with the American Concrete Institute (ACI) guidelines. The project architect should select the final joint patterns. A 1-inch maximum size aggregate mix is recommended for concrete for exterior slabs. The corrosion potential of on-site soils with respect to reinforced concrete will need to be taken into account in concrete mix design. Coarse and fine aggregate in concrete should conform to the “Greenbook” Standard Specifications for Public Works Construction.

9.4 CONVENTIONAL RETAINING WALLS

9.4.1 Foundations

The recommendations provided in the foundation section of this report are also applicable to conventional retaining walls.

9.4.2 Lateral Earth Pressures

The at-rest earth pressure for the design of restrained retaining wall with level backfills can be taken as equivalent to the pressure of a fluid weighing 55 pcf. The active earth pressure for the design of unrestrained retaining walls with level backfills can be taken as equivalent to the pressure of a fluid weighing 35 pcf. These values assume a granular and drained backfill condition. An additional 20 pcf should be added to these values for walls with 2:1 (horizontal:vertical) sloping backfill. An increase in earth pressure equivalent to an additional 2 feet of retained soil can be used to account for surcharge loads from light traffic. The above values do not include a factor of safety. Appropriate factors of safety should be incorporated into the design. If any other surcharge loads are anticipated, SCST should be contacted for the necessary increase in soil pressure.

Retaining walls should be designed to resist hydrostatic pressures or be provided with a backdrain to reduce the accumulation of hydrostatic pressures. Backdrains may consist of a 2-foot wide zone of ¾-inch crushed rock. The backdrain should be separated from the adjacent soils using a non-woven filter fabric, such as Mirafi 140N or equivalent. Weep holes should be provided or a perforated pipe should be installed at the base of the backdrain and sloped to discharge to a suitable storm drain facility. As an alternative, a geocomposite drainage system such as Miradrain 6000 or equivalent placed behind the wall and connected to a suitable storm drain facility can be used. The project architect should provide waterproofing specifications and details. Figure 6 presents typical conventional retaining wall backdrain details.

9.4.3 Seismic Earth Pressure

If required, the seismic earth pressure can be taken as equivalent to the pressure of a fluid weighing 20 pcf. This value is for level backfill and does not include a factor of safety. Appropriate factors of safety should be incorporated into the design. This pressure is in addition to the un-factored, static active earth pressure. The passive pressure and bearing capacity can be increased by ⅓ in determining the seismic stability of the wall.

9.4.4 Backfill

Wall backfill should consist of granular, free-draining material with on expansion index of 20 or less. Expansive or clayey soil should not be used. Additionally, fill within 3 feet from the back of the wall should not contain rocks greater than 3 inches in dimension. We anticipate that a portion of the onsite soils will be suitable for wall backfill. Backfill should be compacted to at least 90% relative compaction. Backfill should not be placed until walls have achieved adequate structural strength. Compaction of wall backfill will be necessary to minimize settlement of the backfill and overlying settlement sensitive improvements. However, some settlement should still be anticipated. Provisions should be made for some settlement of concrete slabs and pavements supported on backfill. Additionally, any utilities supported on backfill should be designed to tolerate differential settlement.

9.5 SOIL NAIL WALLS

It is anticipated that the soil nails will generally encounter very old paralic deposits. The following soil parameters can be used for the design of the soil nails.

- **Soil Unit Weight:** 130 pcf
- **Internal Friction Angle:** 35 degrees
- **Ultimate Bond Stress:** 1,500 psf

Bond stress capacity is influenced by soil and rock condition, method of construction and grouting techniques. The contractor should verify the bond stress capacity in the field prior to production nail installation.

9.6 PIPELINES

9.6.1 Thrust Blocks

For level ground conditions, a passive earth pressure of 350 psf per foot of depth below the lowest adjacent final grade can be used to compute allowable thrust block resistance. A value of 150 psf per foot should be used below groundwater level, if encountered.

9.6.2 Modulus of Soil Reaction

A modulus of soil reaction (E') of 2,000 psi can be used to evaluate the deflection of buried flexible pipelines. This value assumes that granular bedding material is placed adjacent to the pipe and is compacted to at least 90% relative compaction.

9.6.3 Pipe Bedding

Pipe bedding as specified in the "Greenbook" Standard Specifications for Public Works Construction can be used. Bedding material should consist of clean sand having a sand equivalent not less than 30 and should extend to at least 12 inches above the top of pipe. Alternative materials meeting the intent of the bedding specifications are also acceptable. Samples of materials proposed for use as bedding should be provided to the engineer for inspection and testing before the material is imported for use on the project. The onsite materials are not expected to meet "Greenbook" bedding specifications. The pipe bedding material should be placed over the full width of the trench. After placement of the pipe, the bedding should be brought up uniformly on both sides of the pipe to reduce the potential for unbalanced loads. No voids or uncompacted areas should be left beneath the pipe haunches. Ponding or jetting the pipe bedding should not be allowed.

9.7 SOIL CORROSIVITY

Representative samples of the onsite soils were tested to evaluate corrosion potential. The test results are presented in Appendix II. The project design engineer can use the sulfate results in conjunction with ACI 318 to specify the water/cement ratio, compressive strength and cementitious material types for concrete exposed to soil. A corrosion engineer should be contacted to provide specific corrosion control recommendations.

10. GEOTECHNICAL ENGINEERING DURING CONSTRUCTION

The geotechnical engineer should review project plans and specifications prior to bidding and construction to check that the intent of the recommendations in this report has been incorporated. Observations and tests should be performed during construction. If the conditions encountered during construction differ from those anticipated based on the subsurface exploration program, the presence of the geotechnical engineer during construction will enable an evaluation of the exposed conditions and modifications of the recommendations in this report or development of additional recommendations in a timely manner.

11. CLOSURE

SCST should be advised of any changes in the project scope so that the recommendations contained in this report can be evaluated with respect to the revised plans. Changes in recommendations will be verified in writing. The findings in this report are valid as of the date of this report. Changes in the condition of the site can, however, occur with the passage of time, whether they are due to natural processes or work on this or adjacent areas. In addition, changes in the standards of practice and government regulations can occur. Thus, the findings in this report may be invalidated wholly or in part by changes beyond our control. This report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations to site conditions at that time.

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the boring locations, and that our data, interpretations, and recommendations are based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of any kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

12. REFERENCES

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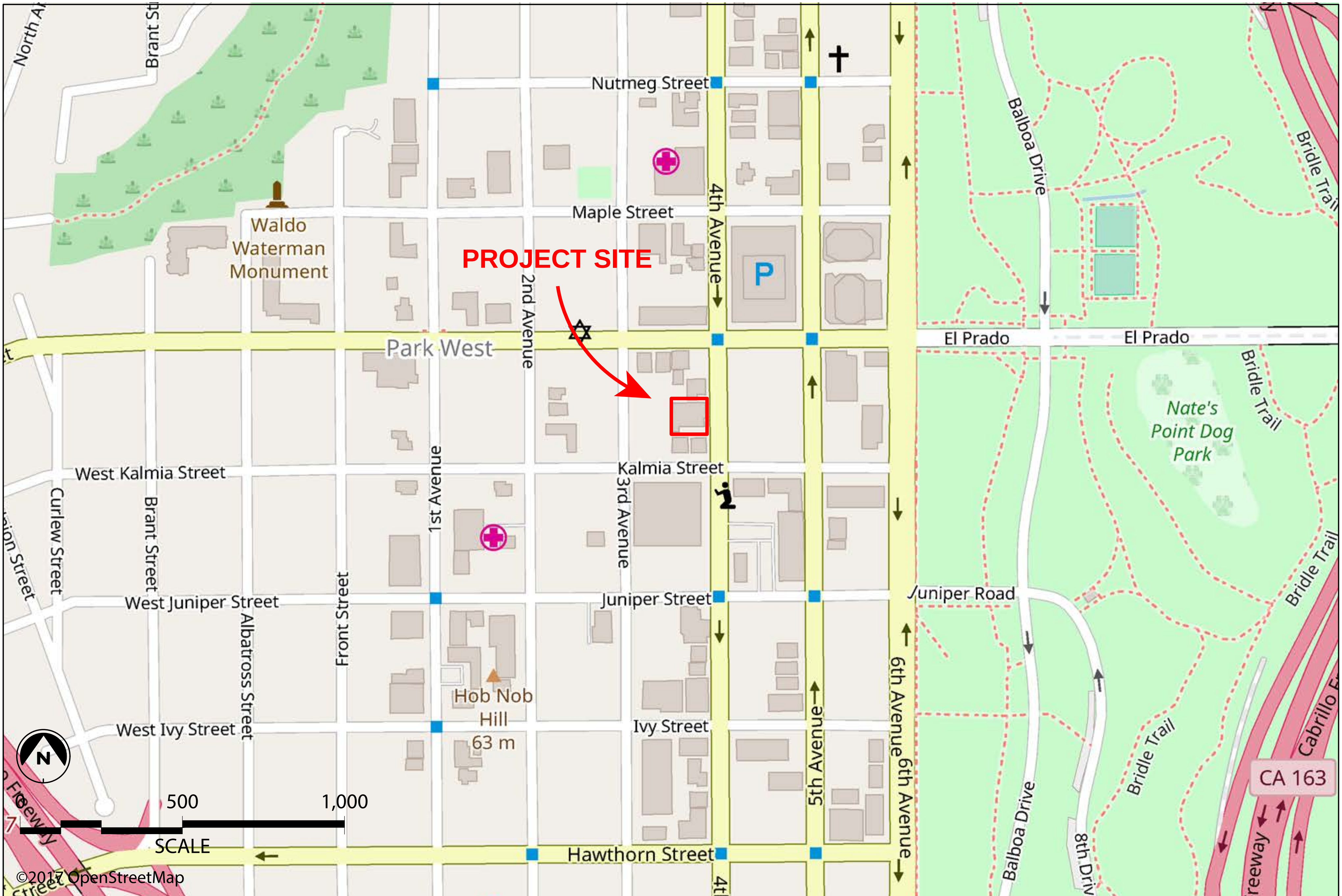
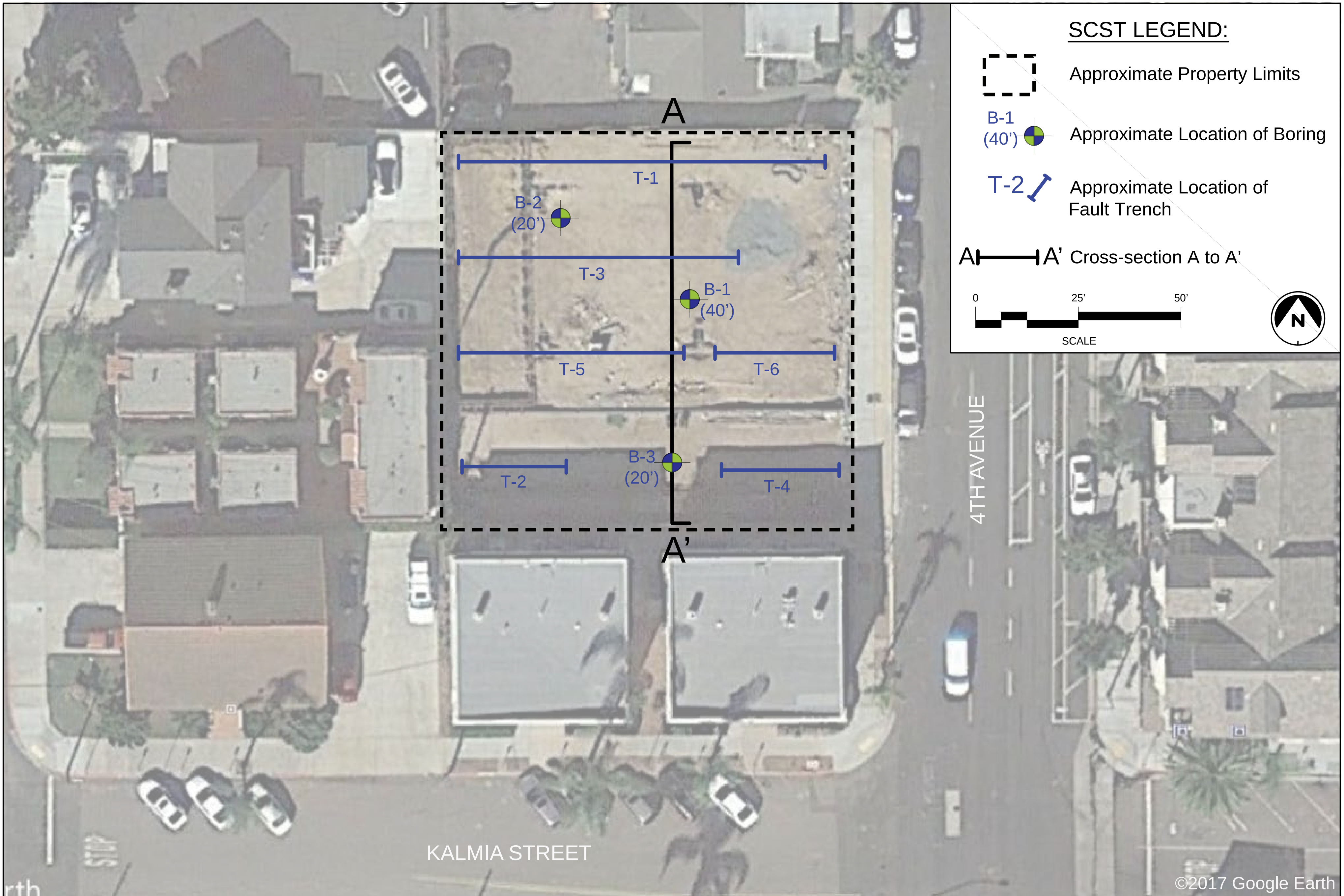


SCST, Inc.	**SITE VICINITY MAP** 4th Avenue Apartments San Diego, California	Date: January, 2018 By: EMW Job No.: 170441N-1	Figure: 1



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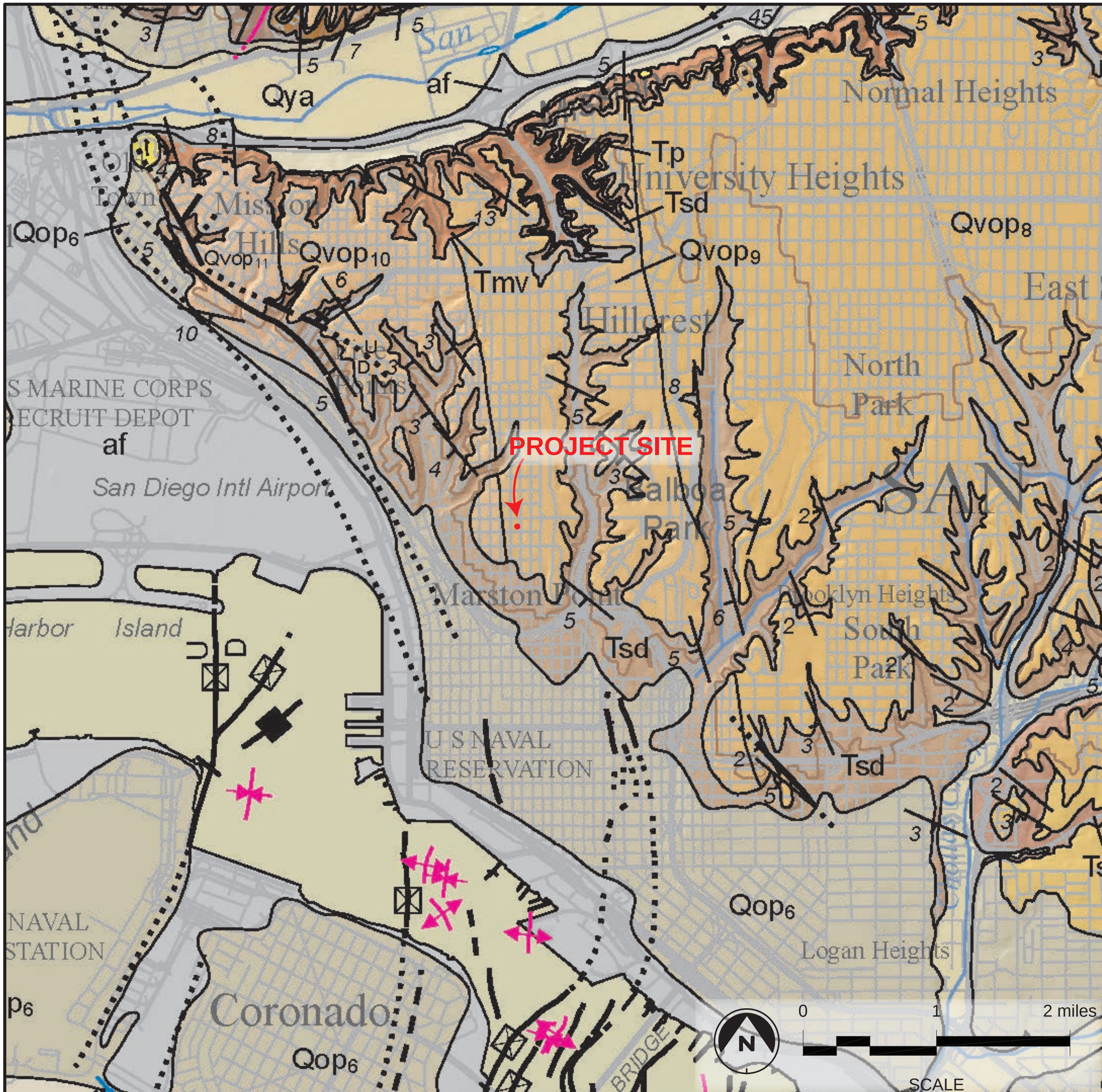
SUBSURFACE EXPLORATION MAP

4th Avenue Apartments
San Diego, California

Date: January, 2018
By: EMW
Job No.: 170441N-1

Figure: 2



EXPLANATION:

af	Artificial Fill
Qya	Young Alluvial Flood-plain Deposits
Qyc	Young Colluvial Flood-plain Deposits
Qop_6	Old Paralic Deposits, Unit 6
$Qvop_8$	Very Old Paralic Deposits, Unit 8
$Qvop_9$	Very Old Paralic Deposits, Unit 9
$Qvop_{10}$	Very Old Paralic Deposits, Unit 10
Tmv	Mission Valley Formation
Tp	Pomerado Conglomerate
Tst	Stadium Conglomerate
Tsd	San Diego Formation
Tsdss	San Diego Formation - Sandstone member
10	Strike and dip of beds
	Anticline Fold - Solid where well defined; short dash where inferred
	Syncline Fold - Solid where well defined; short dash where inferred
U D	Fault - Solid where accurately located; dashed where approximately located; dotted where concealed. U = upthrown block, D = downthrown block. ☒ cuts strat of Holocene age ■ cuts strat of Quaternary age
Qls?	Landslide - Arrows indicate principal direction of movement. Queried where existence is questionable.

Reference: Geologic Map of San Diego 30'X60' Quadrangle Kennedy, M.P. and Tan, S.S. (2008).

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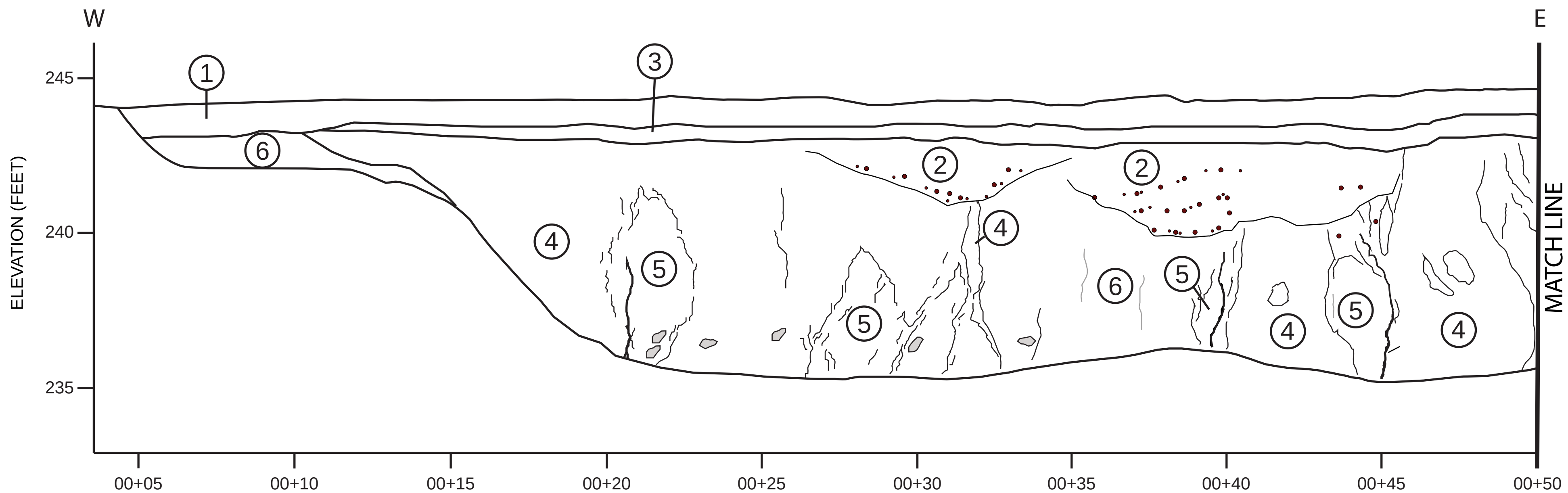
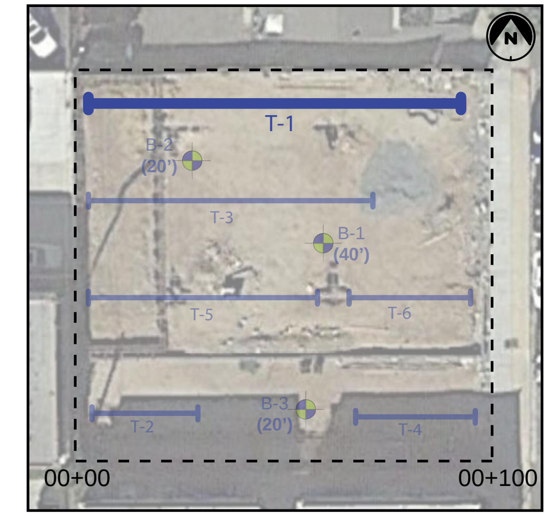
REGIONAL GEOLOGY MAP
4th Avenue Apartments
San Diego, California

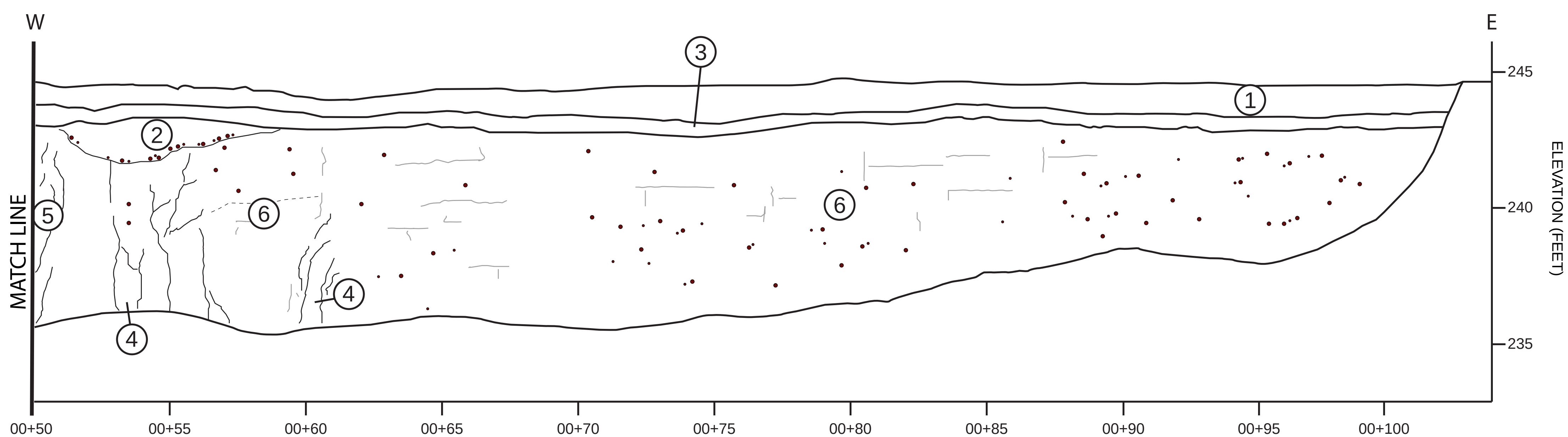
Date: January, 2018
By: EMW
Job No.: 170441N-1

Figure: 3





SCALE
1" = 5'



EXPLANATION FOR EXPLORATORY TRENCH T-1

1 FILL
SILTY SAND, light brown to light reddish brown, fine to medium grained, trace gravel to 5%, moist, loose, some roots, brick and AC fragments up to 12" in diameter.

VERY OLD PARALIC DEPOSITS (Qvop9)

2 SILTY SAND, reddish brown, fine- to coarse-grained, trace gravel, medium dense, gradational deposits of iron concretions, channel deposits.

3 CLAYEY SAND, light brown to gray, fine- to medium-grained, moist, medium dense, with some roots. Former Argillic Soil Horizon.

4 SILTY SAND, tan to yellow brown, fine- to coarse-grained, trace gravel, loose to medium dense.

5 CLAYEY SAND, orange brown to reddish brown with mottled grey, fine- to coarse-grained, moist, medium to very dense, iron concretions encountered up to 1/8" in diameter.

6 CLAYEY SAND, reddish brown with mottled grey, fine- to coarse-grained, trace gravel, moist, medium to very dense, iron concretions encountered up to 1/8" in diameter.

SYMBOLS

Unit Contacts

Fractures

Potential Faults

Iron Concretions

Date: January, 2018
By: EMW
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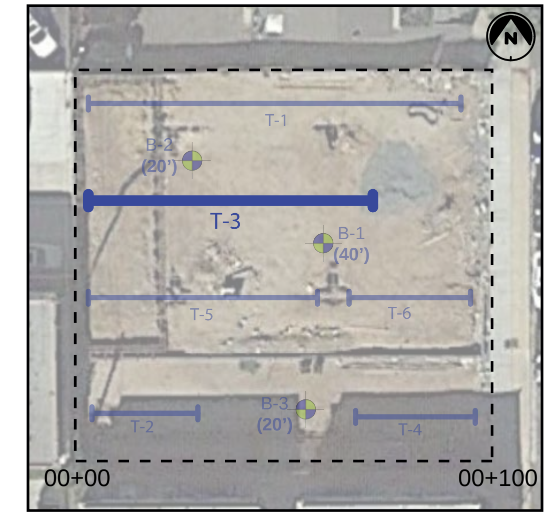
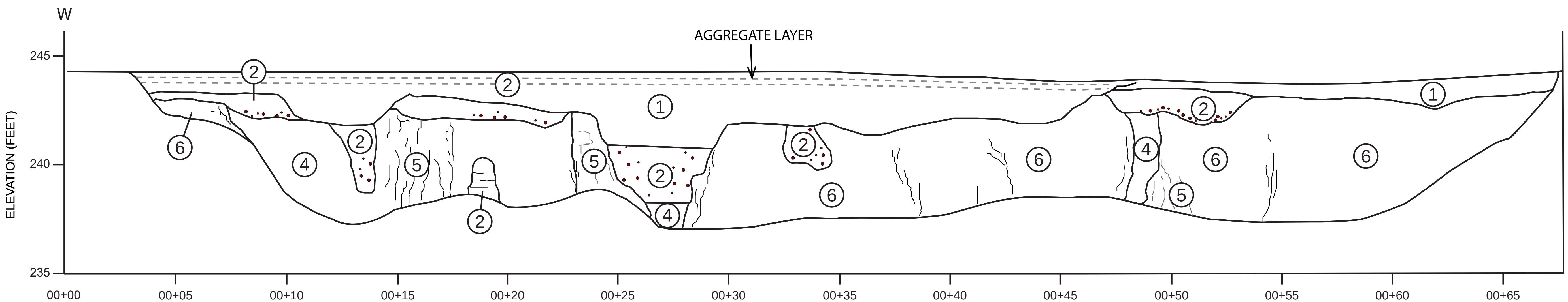
EXPLORATORY TRENCH LOG T-1
4th Avenue Apartments
San Diego, California

SCST, Inc.

Figure:
4

Trench Locations





SCALE

1" = 5'

PLEASE SEE EXPLANATIONS ON FIGURE 5

Date: January, 2018
By: EMW
Job No.: 170441N-1

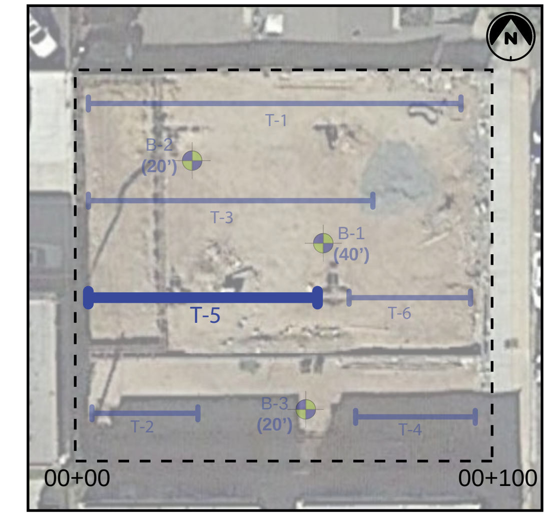
EXPLORATORY TRENCH LOG T-3

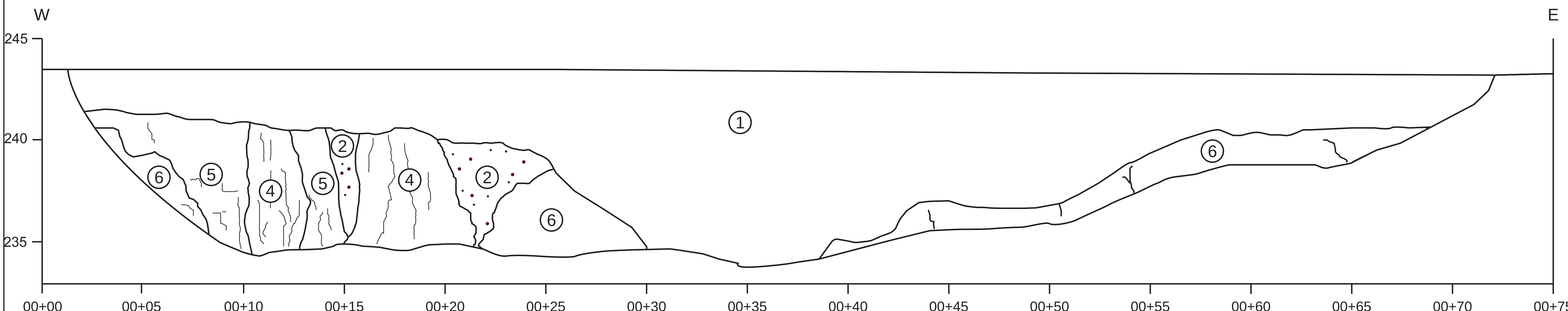
4th Avenue Apartments
San Diego, California

SCST, Inc.

Figure:
5

Trench Locations





SCALE

1" = 5'

PLEASE SEE EXPLANATIONS ON FIGURE 5

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By: EMW
Job No.: 170441N-1

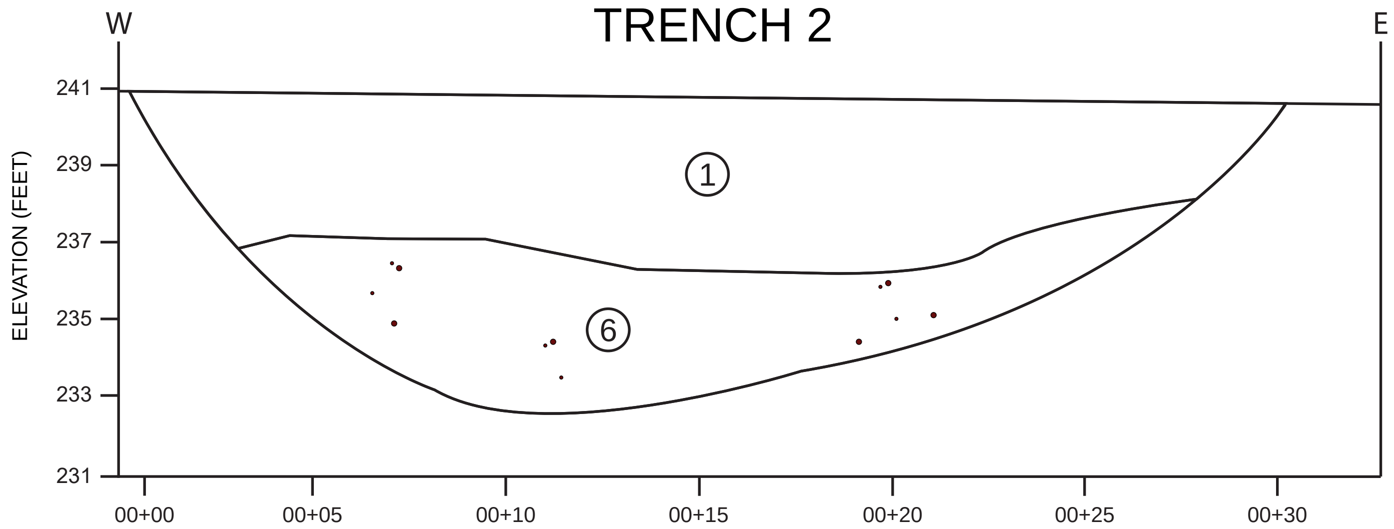
EXPLORATORY TRENCH LOG T-5

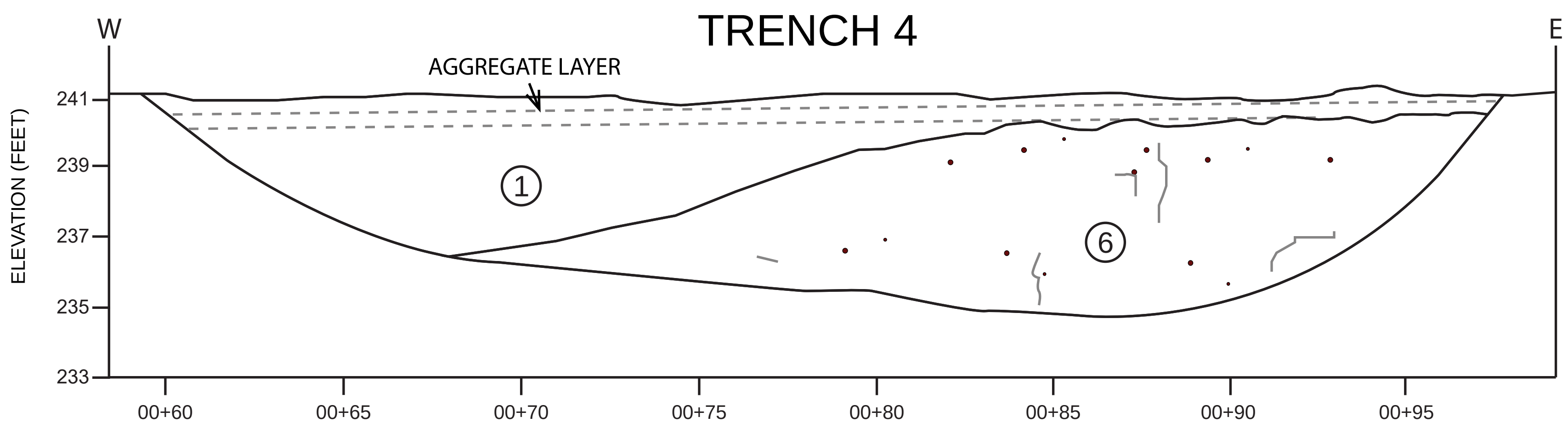
4th Avenue Apartments
San Diego, California

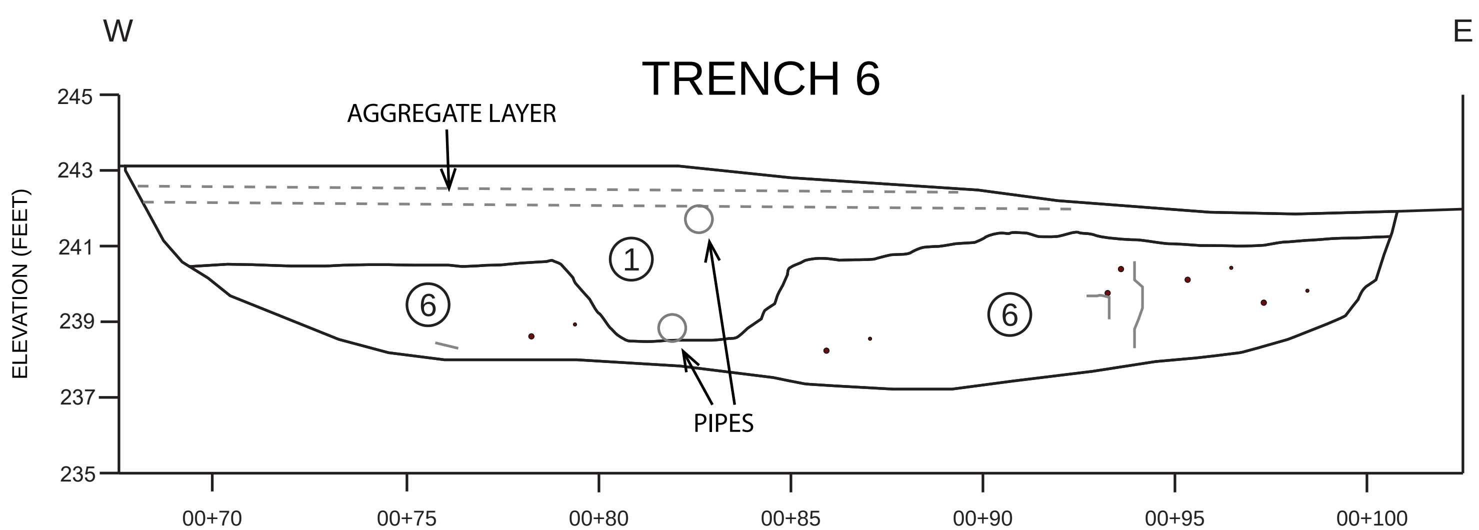
SCST, Inc.

Figure:

6







SCALE

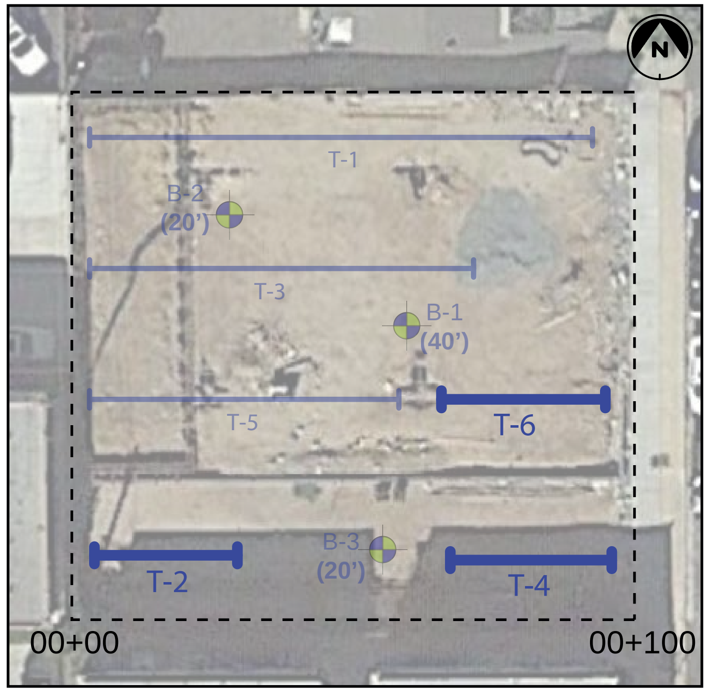
1" = 5'

EXPLANATION FOR EXPLORATORY TRENCHES T-2, T-4 AND T-6

1 FILL
SILTY SAND, light brown to light reddish brown, fine to medium grained, trace gravel to 5%, moist, loose, some roots, brick and AC fragments up to 12" in diameter.

6 VERY OLD PARALIC DEPOSITS ($Qvop_9$)
CLAYEY SANDSTONE, reddish brown with mottled grey, fine to coarse grained, trace gravel, moist, medium to very dense, iron concretions encountered up to 1/8" in diameter.

Trench Locations



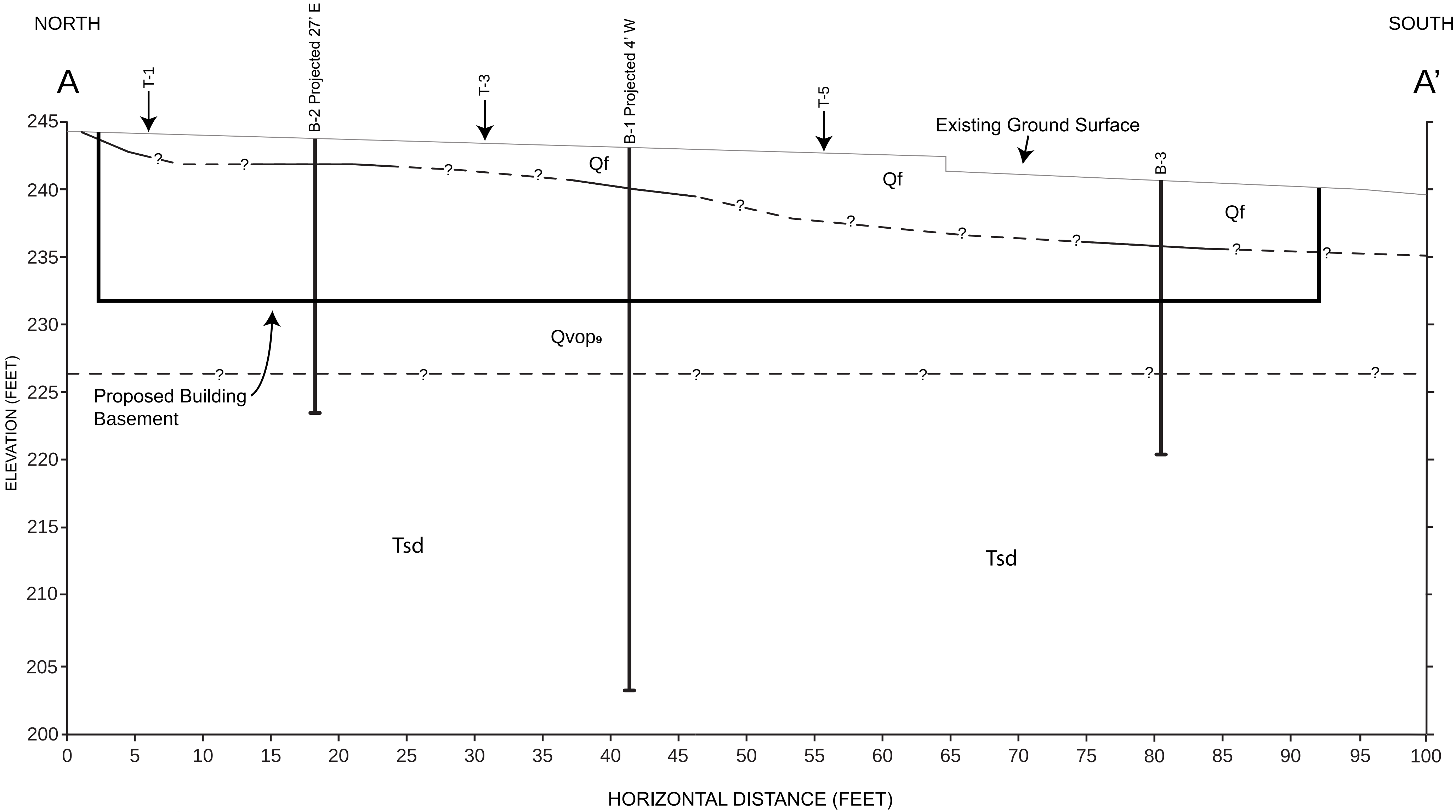
Date: January, 2018
By: EMW
Job No.: 170441N-1

EXPLORATORY TRENCH LOGS T-2, T-4, AND T-6

4th Avenue Apartments
San Diego, California

SCST, Inc.

Figure: 7



SCST Explanation

Qf	Fill	——?– –?–	Approximate Geologic Contact, queried where uncertain
Qvop9	Very Old Paralic Deposits	B-3	Approximate Location of Borings
Tsd	San Diego Formation		

SCALE
1" = 10'

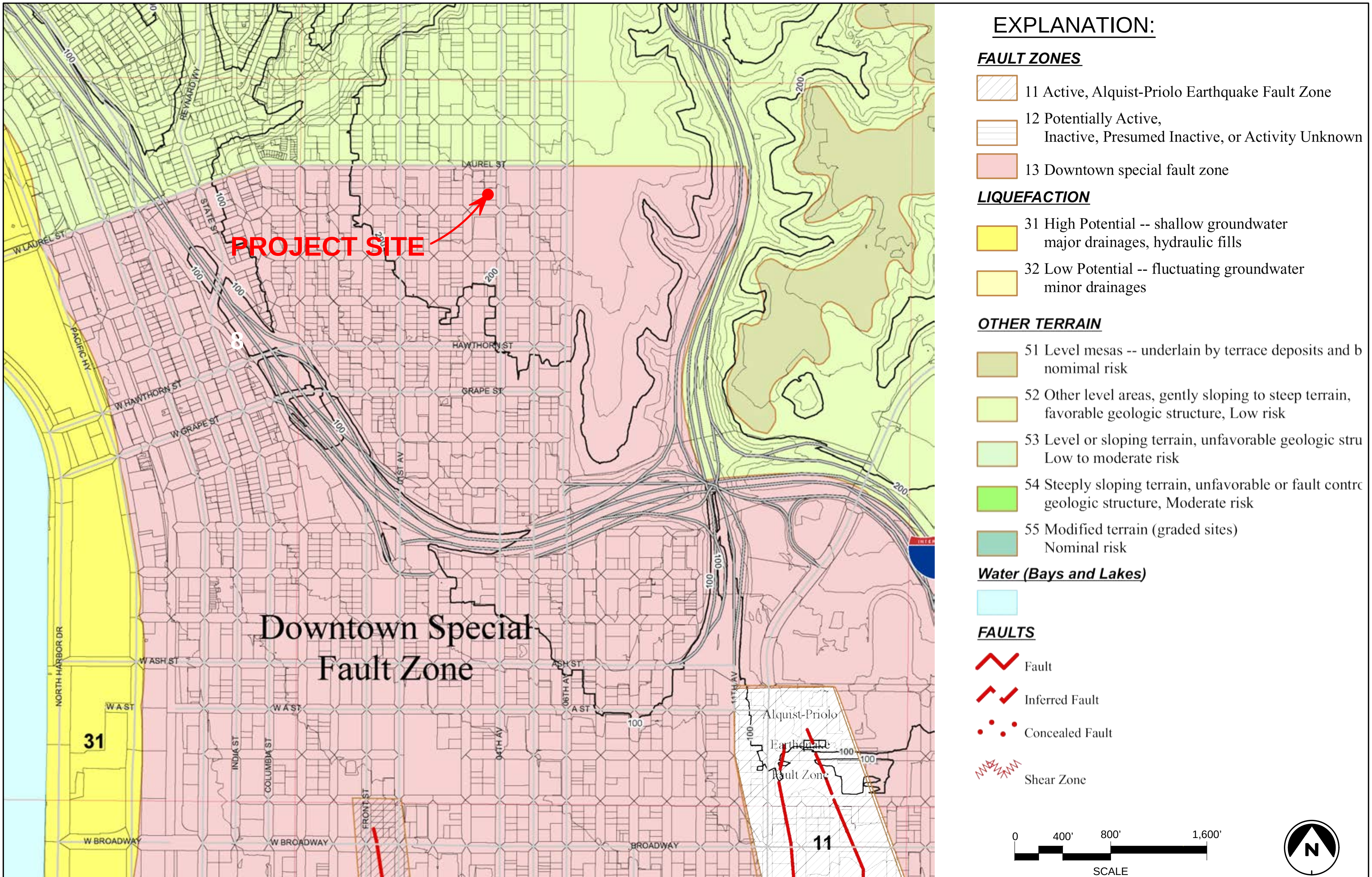
SCST, Inc.

GEOLOGIC CROSS-SECTION

4th Avenue Apartments
San Diego, California

Date: January, 2018
By: EMW
Job No.:170441N-1

Figure:
8



Reference: City of San Diego Seismic Safety Study, Geologic Hazards and Faults (2008)

SCST, Inc.	**CITY OF SAN DIEGO SEISMIC SAFETY STUDY** 4th Avenue Apartments San Diego, California	Date: January, 2018 By: EMW Job No.: 170441N-1	Figure: 9

APPENDIX I
FIELD INVESTIGATION

Our field investigation consisted of a visual reconnaissance of the site and drilling 3 borings on December 14th, 2017 to depths between about 20 and 40 feet below the existing ground surface using a truck-mounted drill rig equipped with a hollow stem auger. Figure 2 presents the approximate locations of the borings. Our field investigation was performed under the observation of an SCST geologist who also logged the borings and obtained samples of the materials encountered.

Relatively undisturbed samples were obtained using a modified California (CAL) sampler, which is a ring-lined split tube sampler with a 3-inch outer diameter and 2½-inch inner diameter. Standard Penetration Tests (SPT) were performed using a 2-inch outer diameter and 1⅜-inch inner diameter split tube sampler. The CAL and SPT samplers were driven with a 140-pound weight dropping 30 inches. The number of blows needed to drive the samplers the final 12 inches of an 18-inch drive is noted on the boring logs as "Driving Resistance (blows/ft of drive)." SPT and CAL sampler refusal was encountered when 50 blows were applied during any one of the three 6-inch intervals, a total of 100 blows was applied, or there was no discernible sampler advancement during the application of 10 successive blows. The SPT penetration resistance was normalized to a safety hammer (cathead and rope) with a 60% energy transfer ratio in accordance with ASTM D6066. The normalized SPT penetration resistance is noted on the boring logs as "N_{60}." Disturbed bulk samples were obtained from the SPT sampler and the drill cuttings.

The soils are classified in accordance with the Unified Soil Classification System as illustrated on Figure I-1. Logs of the borings are presented in the following Figures I-2 through I-5.

SUBSURFACE EXPLORATION LEGEND

UNIFIED SOIL CLASSIFICATION CHART

SOIL DESCRIPTION		GROUP SYMBOL	TYPICAL NAMES
I. COARSE GRAINED, more than 50% of material is larger than No. 200 sieve size.			
GRAVELS More than half of coarse fraction is larger than No. 4 sieve size but smaller than 3".	CLEAN GRAVELS	GW	Well graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels, gravel sand mixtures, little or no fines.
	GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
		GC	Clayey gravels, poorly graded gravel-sand, clay mixtures.
SANDS More than half of coarse fraction is smaller than No. 4 sieve size.	CLEAN SANDS	SW	Well graded sand, gravelly sands, little or no fines.
		SP	Poorly graded sands, gravelly sands, little or no fines.
		SM	Silty sands, poorly graded sand and silty mixtures.
		SC	Clayey sands, poorly graded sand and clay mixtures.
II. FINE GRAINED, more than 50% of material is smaller than No. 200 sieve size.			
	SILTS AND CLAYS (Liquid Limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, sandy silt or clayey-silt-sand mixtures with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL	Organic silts and organic silty clays or low plasticity.
	SILTS AND CLAYS (Liquid Limit greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity.
III. HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils.

SAMPLE SYMBOLS

- Bulk Sample
- Pavement Core Specimen Sample
- CK - Undisturbed Chunk sample
- MS - Maximum Size of Particle
- ST - Shelby Tube
- SPT - Standard Penetration Test sampler

GROUNDWATER SYMBOLS

- Water level at time of excavation or as indicated
- Water seepage at time of excavation or as indicated

LABORATORY TEST SYMBOLS

- AL - Atterberg Limits
- CON - Consolidation
- COR - Corrosivity Tests (Resistivity, pH, Chloride, Sulfate)
- DS - Direct Shear
- EI - Expansion Index
- MAX - Maximum Density
- RV - R-Value
- SA - Sieve Analysis
- FC - Fines Content
- (57%) (Percent Finer Than No. 200 Sieve)
- CP - Core Photograph

SCST, Inc.	4th Avenue Apartments San Diego, CA		
By:	EMW	Date:	January, 2018
Job Number:	170441N-1	Figure:	I-1

LOG OF BORING B-1

Date Drilled: 12/14/2017
Equipment: CME-95 with 8-inch Hollow-stem Auger
Elevation (ft): 240 MSL

Logged by: EMW
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
0–4	SC	**FILL (Qf):** CLAYEY SAND, light reddish brown, fine to medium grained, moist, loose.		X					SA AL
4–8	SC	**VERY OLD PARALIC DEPOSITS ($Qvop_9$):** CLAYEY SAND, reddish brown with mottled gray, fine to medium grained, moist, very dense.							
5–6.5			SPT		50/6"	65/6"			
8–14		SILTY SAND, orange brown, fine to medium grained, moist, very dense.							
10–11.5			CAL		50/2"	65/2"	7.0		DS
14–20		**SAN DIEGO FORMATION (Tsd):** SILTY SANDSTONE, moderate brown, fine to coarse grained, moist, very dense, moderately to strongly cemented.							
15–16.5			SPT		50/4"	65/4"			

BORING CONTINUED ON I-3.

SCST, Inc.

4th Avenue Apartments
San Diego, CA

By:	EMW	Date:	January, 2018
Job Number:	170441N-1	Figure:	I-2

LOG OF BORING B-1 (Continued)

Date Drilled: 12/14/2017
Equipment: CME-95 with 8-inch Hollow-stem Auger
Elevation (ft): 240 MSL

Logged by: EMW
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
21		**SAN DIEGO FORMATION (Tsd):** SILTY SANDSTONE, moderate brown, fine to coarse grained, moist, very dense, moderately to strongly cemented.							
22		Dark reddish brown with mottled gray streaks.							
23									
24									
25									
26		Light reddish brown.	SPT		50/3"	65/3"			
27									
28									
29									
30									
31		Reddish brown, fine to coarse grained, some clay.	SPT		62	81			
32									
33									
34									
35		Orange brown. Trace gravel.	SPT		72	94			
36									
37									
38									
39			SPT		50/2"	65/2"			
40		**BORING TERMINATED AT 40 FEET**							

SCST, Inc.

4th Avenue Apartments
San Diego, CA

By:	EMW	Date:	January, 2018
Job Number:	170441N-1	Figure:	I-3

LOG OF BORING B-2

Date Drilled: 12/14/2017
Equipment: CME-95 with 8-inch Hollow-stem Auger
Elevation (ft): 240 MSL

Logged by: EMW
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
0–3	SC	**FILL (Qf):** CLAYEY SAND, light reddish brown, fine to medium grained, moist, loose.		X					
3	SC	**VERY OLD PARALIC DEPOSITS ($Qvop_9$):** CLAYEY SAND, reddish brown with mottled gray, fine to medium grained, moist, very dense.							
5			SPT		50/4	65/4"			
6		Light reddish brown, trace gravel.	SPT		92	120			
10		Light reddish brown to orange brown.	CAL		50/5"		7.0	100.8	
13		**SAN DIEGO FORMATION (Tsd):** SILTY SANDSTONE, moderate brown, fine to coarse grained, moist, very dense, moderately to strongly cemented.							
15		Dark reddish brown.	SPT		50/4"	65/4"			
18		Reddish brown with mottled gray streaks.	SPT		50/3"	65/3"			
20		**BORING TERMINATED AT 20 FEET**							

SCST, Inc.

4th Avenue Apartments, San Diego, CA			
By:	EMW	Date:	January, 2018
Job Number:	170441N-1	Figure:	I-4

LOG OF BORING B-3

Date Drilled: 12/14/2017
Equipment: CME-95 with 8-inch Hollow-stem Auger
Elevation (ft): 240 MSL

Logged by: EMW
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
0–5	SM	**FILL (Qf):** SILTY SAND, moderate brown, fine to medium grained, some gravel, moist, loose.		X (1–5)					
5–13	SC	**VERY OLD PARALIC DEPOSITS ($Qvop_9$):** CLAYEY SAND, reddish brown with mottled gray, fine to medium-grained, moist, dense.	SPT (5–6.5)		50/5"	65/5"			
		Clay content increases.		X (7–10)					SA AL COR EI
			CAL (10–11.5)		50/4"	65/4"	11.7	99.3	
13–20		**SAN DIEGO FORMATION (Tsd):** SILTY SANDSTONE, moderate brown, fine to coarse grained, moist, very dense, moderately to strongly cemented.							
		Tan to gray.	SPT (15–16.5)		60	78			
			SPT (18–19.5)		60	78			
20		**BORING TERMINATED AT 20 FEET**							

SCST, Inc.

4th Avenue Apartments
San Diego, CA

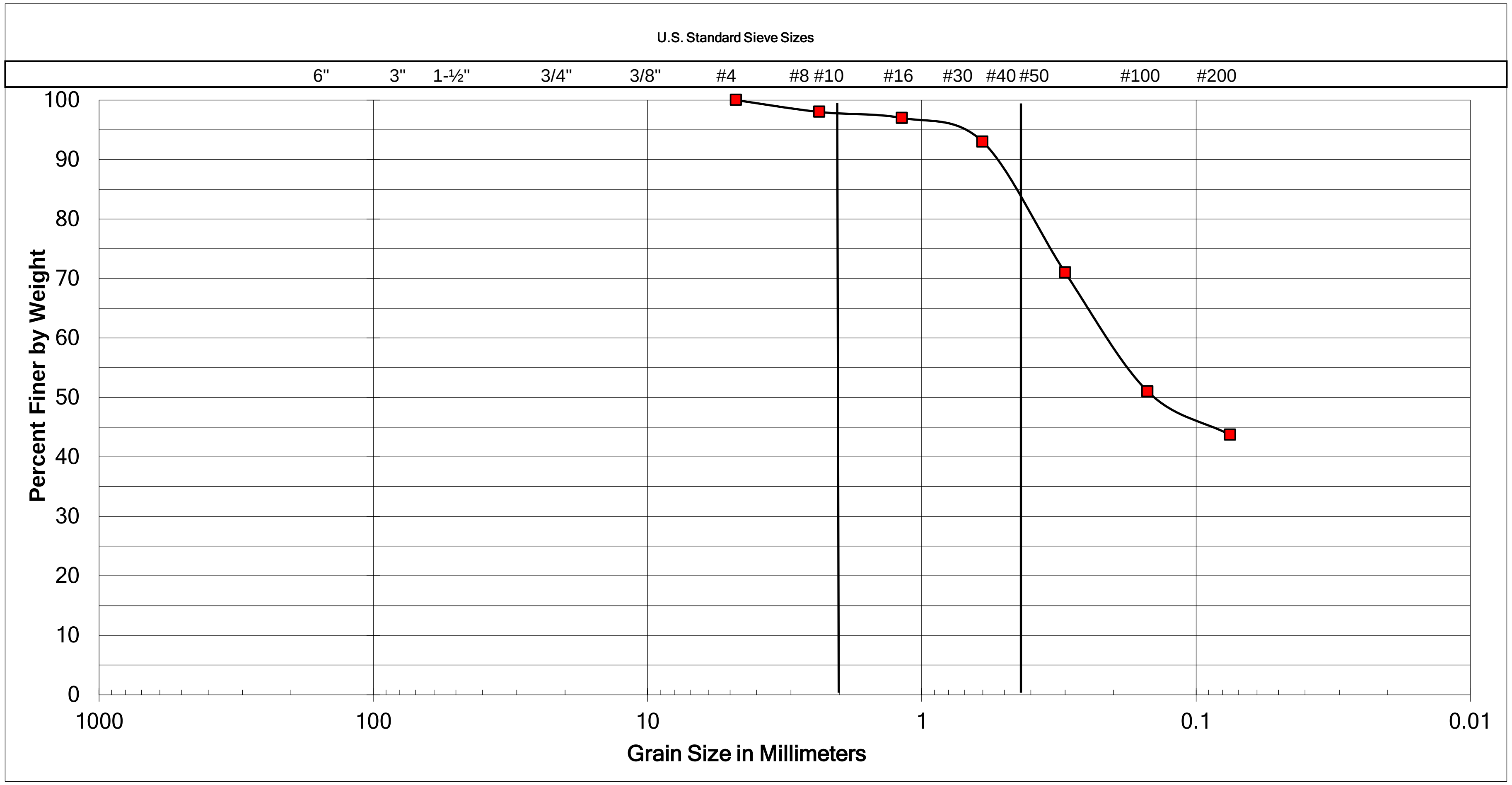
By: EMW
Date: January, 2018
Job Number: 170441N-1
Figure: I-5

APPENDIX II
LABORATORY TESTING

Laboratory tests were performed to provide geotechnical parameters for engineering analyses. The following tests were performed:

- **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System.
- **IN SITU MOISTURE AND DENSITY:** The in-situ moisture content and dry unit weight were determined on samples collected from the borings. The test results are presented on the boring logs in Appendix I.
- **GRAIN SIZE DISTRIBUTION:** The grain size distribution was determined on two soil samples in accordance with ASTM D422. Figures II-1 and II-2 present the test results.
- **EXPANSION INDEX:** The expansion index was determined on one soil sample in accordance with ASTM D4829. Figure II-3 presents the test results.
- **CORROSIVITY**: Corrosivity tests were performed on one soil sample. The pH and minimum resistivity were determined in general accordance with California Test 643. The soluble sulfate content was determined in accordance with California Test 417. The total chloride ion content was determined in accordance with California Test 422. Figure II-3 presents the test results.
- **DIRECT SHEAR:** A direct shear test was performed on one soil sample in accordance with ASTM D3080. The shear stress was applied at a constant rate of strain of 0.003 inch per minute. Figure II-4 presents the test results.

Soil samples not tested are now stored in our laboratory for future reference and analysis, if needed. Unless notified to the contrary, all samples will be disposed of 30 days from the date of this report.



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

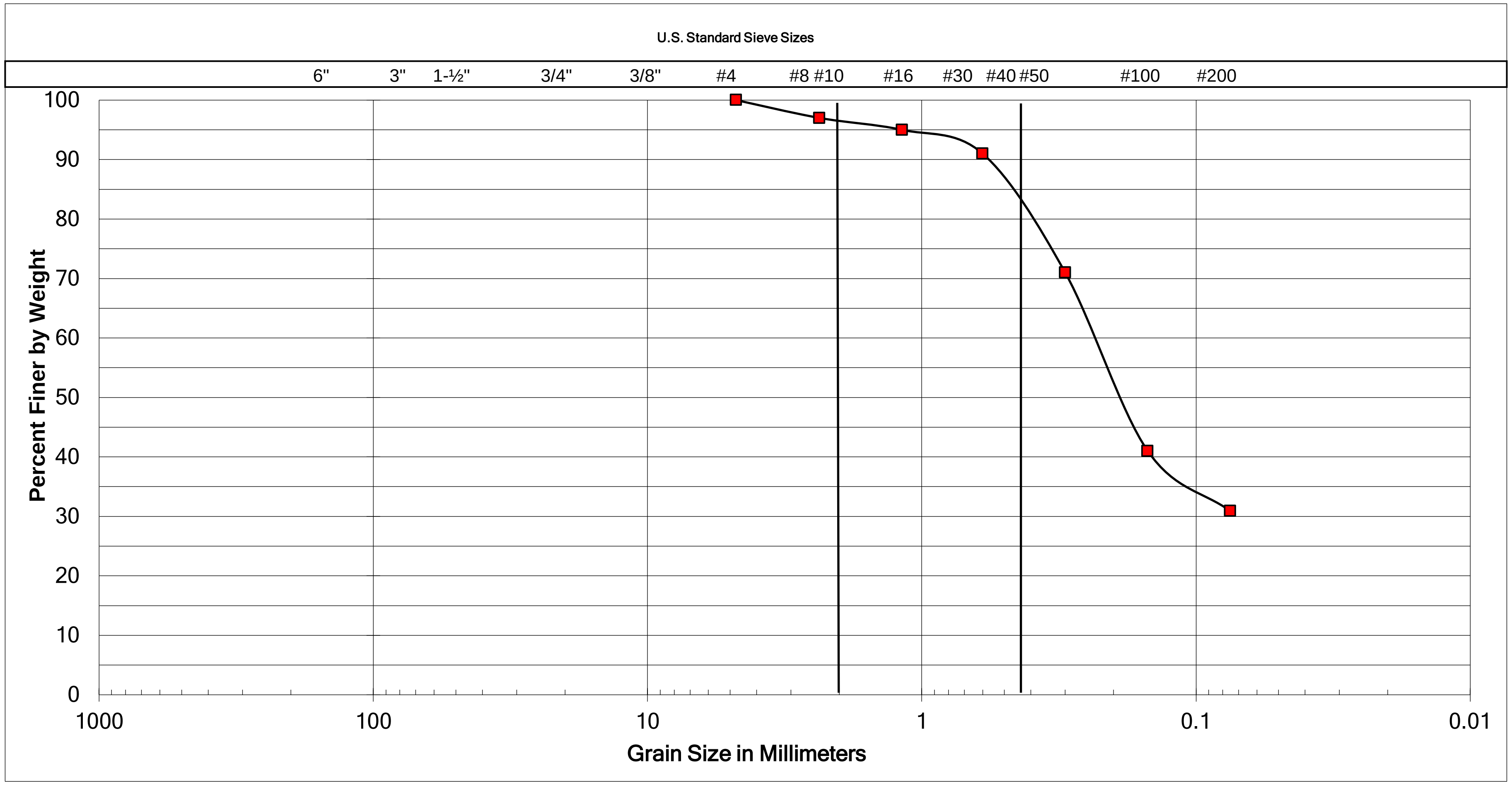
SAMPLE LOCATION
B1 at 0 to 4 feet
SAMPLE NUMBER
25021

UNIFIED SOIL CLASSIFICATION:	SC
DESCRIPTION	CLAYEY SAND

ATTERBERG LIMITS	
LIQUID LIMIT	32
PLASTIC LIMIT	15
PLASTICITY INDEX	17

SCST, Inc.

4th Avenue Apartments San Diego, California			
By:	DRB	Date:	December, 2017
Job Number:	170441N-1	Figure:	II-1



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
B3 at 7 to 10 feet
SAMPLE NUMBER
25024

UNIFIED SOIL CLASSIFICATION:	SM
DESCRIPTION	SILTY SAND

ATTERBERG LIMITS	
LIQUID LIMIT	N/A
PLASTIC LIMIT	NP
PLASTICITY INDEX	NP

SCST, Inc.

4th Avenue Apartments
San Diego, California

By:	DRB	Date:	December, 2017
Job Number:	170441N-1	Figure:	II-2

EXPANSION INDEX

ASTM D 2489

SAMPLE	DESCRIPTION	EXPANSION INDEX
B-3 at 7 to 10 feet	CLAYEY SAND	15

CLASSIFICATION OF EXPANSIVE SOIL [1]

EXPANSION INDEX	POTENTIAL EXPANSION
1 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
Above 130	Very High

1. ASTM - D4829

RESISTIVITY, pH, SOLUBLE CHLORIDE and SOLUBLE SULFATE

pH & Resistivity (Cal 643, ASTM G51)

Soluble Chlorides (Cal 422)

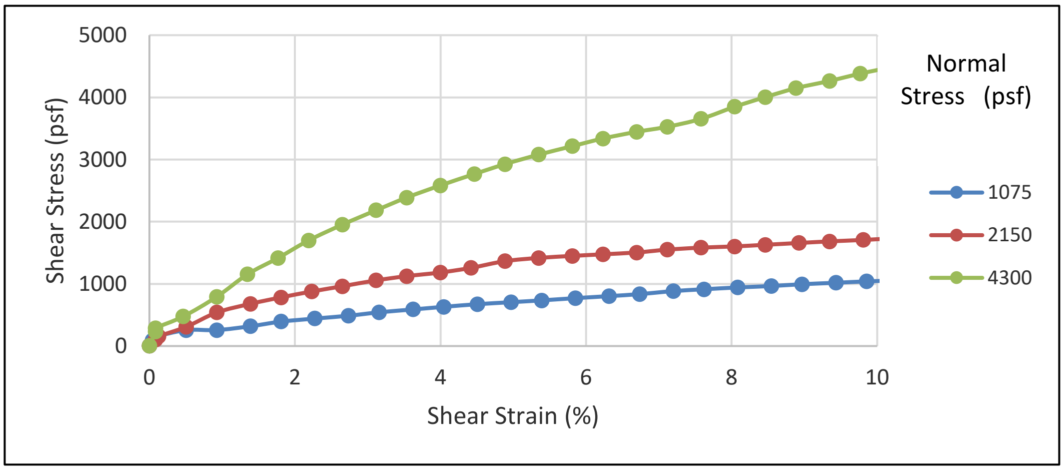
Soluble Sulfate (Cal 417)

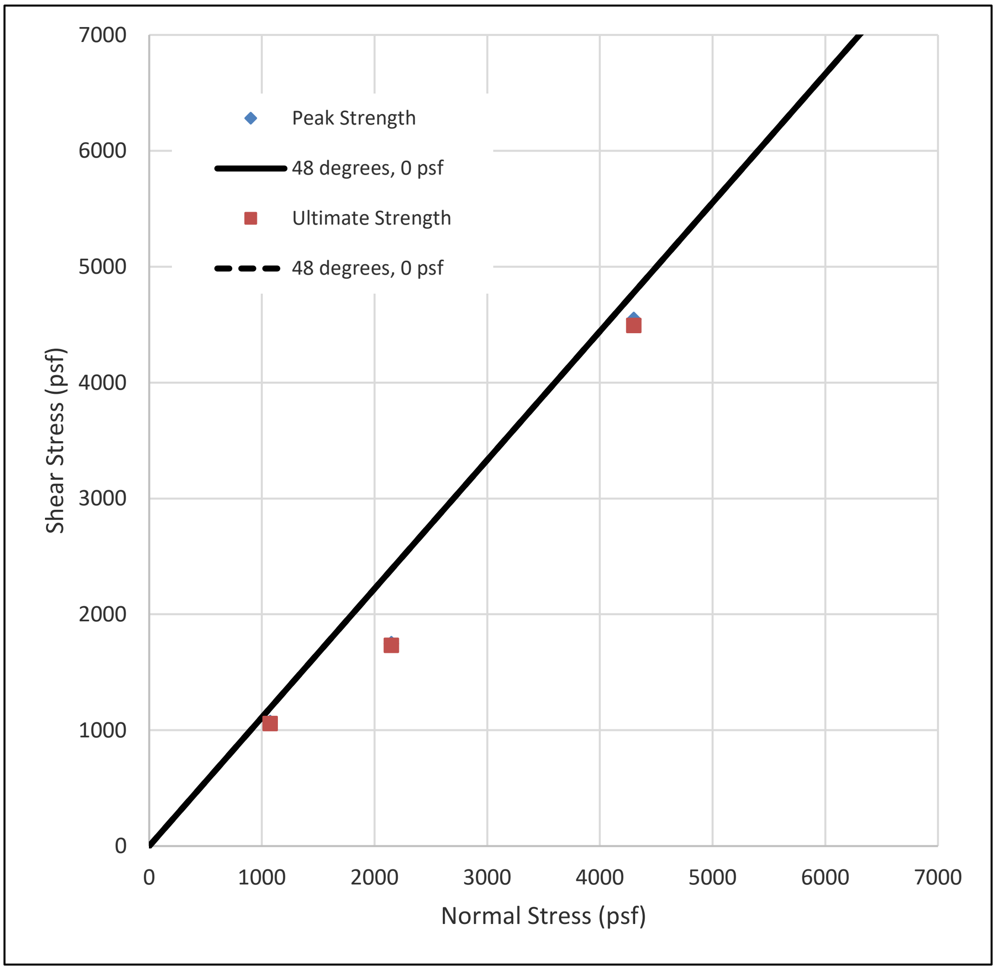
SAMPLE	RESISTIVITY (Ω-cm)	pH	CHLORIDE (%)	SULFATE (%)
B-3 at 7 to 10 feet	1850	6.87	0.003	0.005

SULFATE EXPOSURE CLASSES [2]

CLASS	SEVERITY	WATER-SOLUBLE SULFATE (SO_4) IN SOIL, PERCENT BY MASS
S0	Not applicable	$SO_4 < 0.10$
S1	Moderate	$0.10 \leq SO_4 < 0.20$
S2	Severe	$0.20 \leq SO_4 \leq 2.00$
S3	Very Severe	$SO_4 > 2.00$

2. ACI 318, Table 19.3.1.1





SAMPLE ID: B1 at 10 to 10½ feet

Orange Brown Silty Sand

NOTES: Insitu

Strain Rate: 0.003 in/min

Sample was consolidated and drained

	Peak	Ultimate
Φ	48 °	48 °
c	0 psf	0 psf

	Initial	Final
γ_d	101.0 pcf	101.0 pcf
w_c	8.3 %	21.9 %
Saturation	34 %	89 %

SCST Inc.	4th Avenue Apartments San Diego, California			
	By:	DRB	Date:	December, 2017
	Job Number:	170441N-1	Figure:	II-4

SCST, Inc.
Corporate Headquarters
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SDVOSB . DVBE

May 8, 2018

SCST No. 170441N
Report No. 2

Mr. Richard Simis
Next Space Development
2820 Shelter Island Drive
San Diego, California 92106

Subject: RESPONSES TO CITY REVIEW COMMENTS (CYCLE 3 PRELIMINARY REVIEW)
PROPOSED MIXED USE DEVELOPMENT
2426 4^{TH} AVENUE
SAN DIEGO, CALIFORNIA
PROJECT NUMBER: 565988

References: 1) Cook Rogers McGill, (2018), *Development Plans for 4^{th} Avenue Apartments, 2426 4^{th} Avenue, San Diego, California,* dated January 11; Civil Plans prepared by Civil Landworks, dated November 29, 2017.

2) SCST, Inc., (2018), *Geologic Investigation and Fault Rupture Hazard Evaluation, Proposed Mixed Use Building, 2426 4^{th} Avenue, San Diego, California,* SCST Report No. 170441N-01, dated January 10.

Dear Mr. Simis:

SCST, Inc. (SCST) prepared this update letter to respond to review comments (Cycle 3 Preliminary Review) from the City of San Diego for the subject project. The review comments and our responses are provided below.

<u>Issue No. 2</u>: *The project's geotechnical consultant must submit an addendum geotechnical report or update letter for the purposes of environmental review that specifically addresses the proposed development plans and the following:*

<u>Response</u>: This letter shall serve as an addendum geotechnical report for the project.

<u>Issue No. 3</u>: *Provide a geologic/geotechnical map that uses true scale building site plan or grading plan as a base. Show the distribution of fill and geologic units, location of exploratory excavations, limits of recommended remedial grading, and proposed construction. If applicable, indicate the precise and accurate location of all active or potentially active faults or fault zones.*

<u>Response</u>: The requested geologic/geotechnical map on a topographic base is attached to this letter as Figure 1.

<u>Issue No. 4</u>: *The fault trench log for T-1 presented in the referenced report appears to show potential faults (Figure 4 at 00+20, 00+40, and 00+45). Provide an explicit opinion whether or not an "active" or "potentially active" fault trace passes beneath the proposed development and whether or not structural setbacks are recommended.*

<u>Response</u>: It is our opinion that the features depicted on the fault trench log for T-1 at stations 00+20, 00+40, and 00+45 represents fractures associated either with ground shaking or lateral ground displacement. The fractures have little to no vertical displacement and no evidence of horizontal displacement, as all units match across the features. In our opinion, neither active nor potentially active faults underlie the site. No structural setbacks are recommended. An updated fault trench log for T-1 is attached to this letter as Figure 2.

<u>Issue No. 5</u>: *The fault trench logs for T-3 and T-5 (Figures 5 and 6) presented in the referenced report show vertical bedding juxtaposed to the bedding in adjacent trenches. Clarify whether or not this is an indication of faulting.*

<u>Response</u>: The apparently juxtaposed bedding depicted in the fault trench logs for T-3 and T-5 represent the geologic subunits of the Very Old Paralic Deposits, Unit 9 which are the result of differential weathering patterns, and not a function of faulting. Updated fault trench logs for T-3 and T-5 are attached to this letter as Figures 3 and 4, respectively.

<u>Issue No. 6</u>: *The consultant could consider describing and showing how the data demonstrate the existence (or absence) and location of hazardous faults on or adjacent to the site.*

<u>Response</u>: It is our opinion that, with our observations from the trench exposures and the lack of fault-related geomorphology, no late Quaternary activity has occurred on the site. In summary, our observations show: 1) There is little to no evidence of vertical displacement and no evidence of horizontal displacement across fractures, and 2) Fractures underlie and do not rupture subunits 2 and 3 exposed in the trenches, and are therefore much older than the age of those subunits.

<u>Issue No. 7</u>: *The project geotechnical consultant should provide a conclusion regarding if the proposed development will destabilize or result in settlement of adjacent property or the right of way.*

<u>Response</u>: It is our opinion that, provided the recommendations presented in our geotechnical investigation are followed, the proposed development will not destabilize or results in settlement of adjacent property or the right of way.

Issue No. 8: *The projects geotechnical consultant should provide a statement as to whether or not the site is suitable for the intended use.*

Response: Based on the results of our geotechnical investigation and fault rupture hazard evaluations, it is our opinion that the site is suitable for the intended and proposed use.

If you have questions, please call us at (619) 280-4321.

Respectfully submitted,
SCST, INC.

REGISTERED PROFESSIONAL GEOLOGIST
DOUGLAS A. SKINNER
No. 2472
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Douglas A. Skinner, CEG 2472
Senior Geologist

Elizabeth White, GIT
Staff Geologist

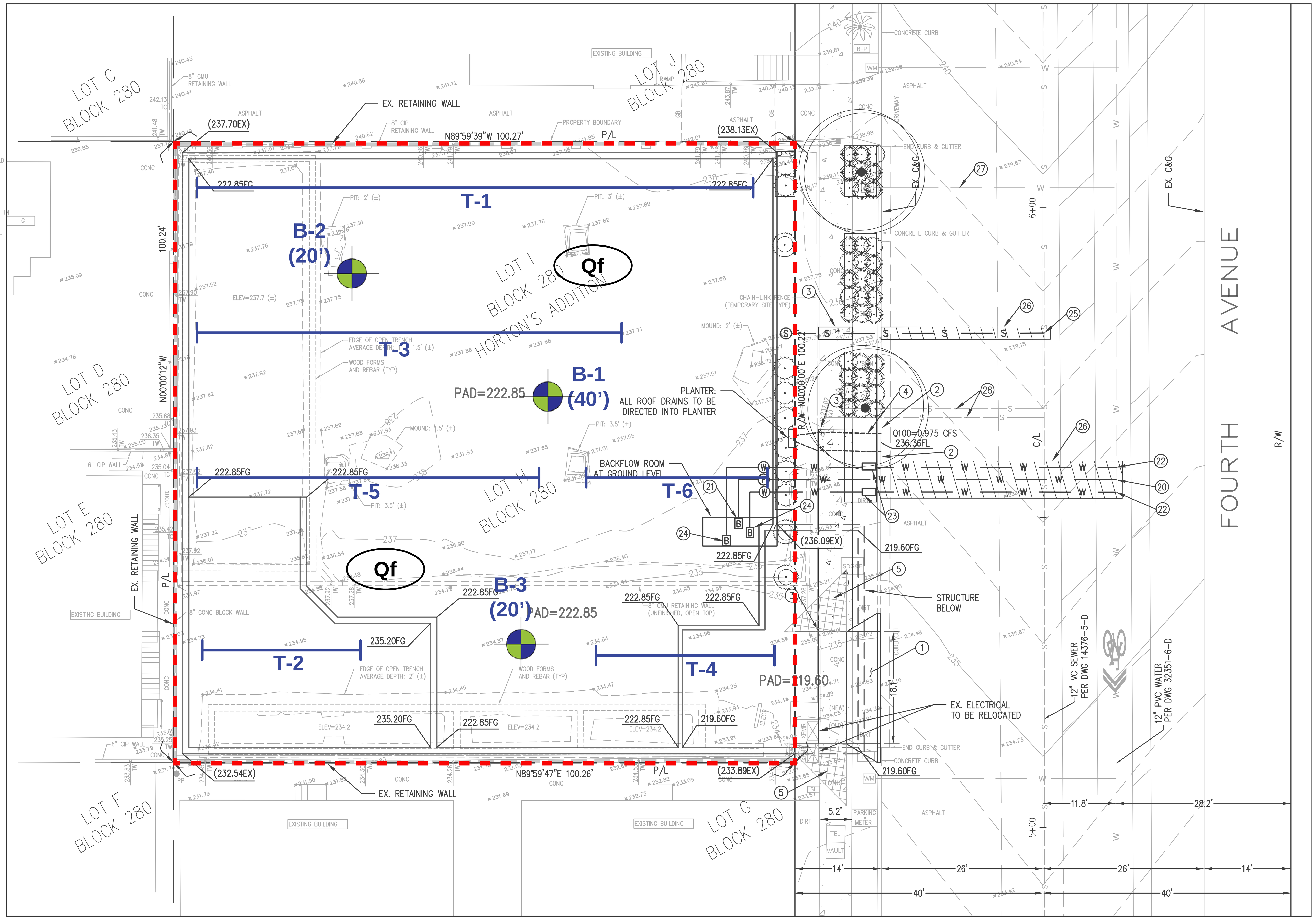
DAS:EMW:hu

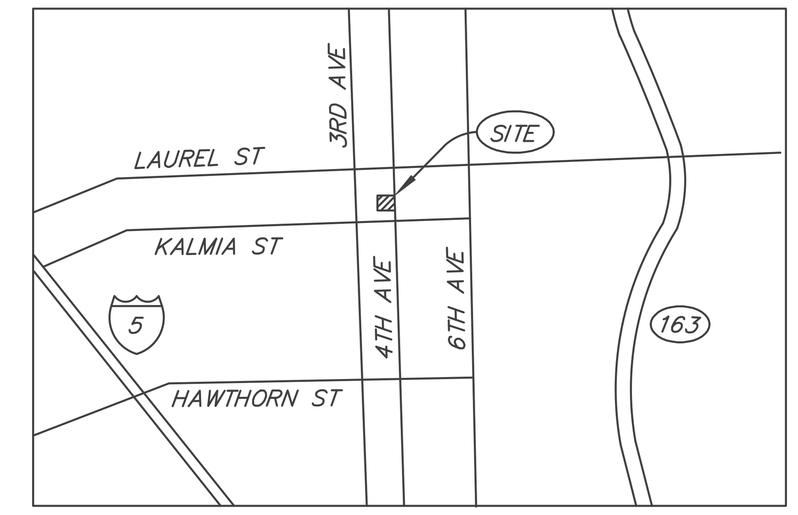
Attachments:

Figure 1 – Subsurface Exploration Map
Figure 2 – Exploratory Trench Log 1
Figure 3 – Exploratory Trench Log 3
Figure 4 – Exploratory Trench Log 5

(1) Addressee via e-mail: richard@pbsconstructionservices.com

PRELIMINARY GRADING PLAN FOR 2426 FOURTH AVENUE
NOT FOR CONSTRUCTION





VICINITY
NOT TO SCALE

SCST LEGEND:

B-1 (40') — Approximate Location of Exploratory Borings

T-2 — Approximate Location of Exploratory Fault Trenches

Limits of Proposed Construction and Remedial Grading

Qf — Fill; underlain by Very Old Paralic Deposits, Unit 9

10 0 10 20
GRAPHIC SCALE
SCALE: 1"= 10'

REFERENCE: Cook Rogers McGill, (2018), Development Plans for 4th Avenue Apartments, 2426 4th Avenue, San Diego, California, dated January 11; Civil Plans prepared by Civil Landworks, dated November 29, 2017.

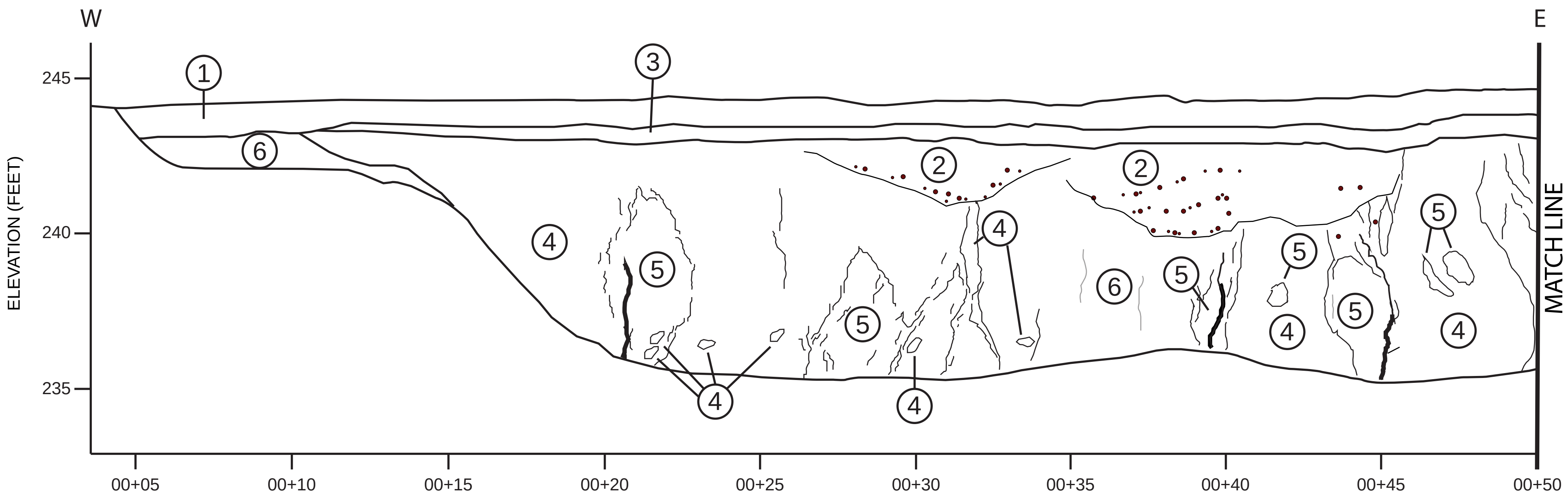
Date: May, 2018
By: EMW
Job No.: 170441N-2

SUBSURFACE EXPLORATION MAP
4th Avenue Apartments
San Diego, California

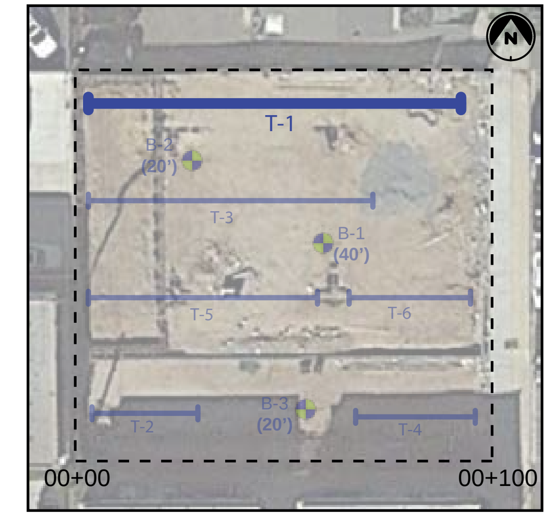
SCST, Inc.

Figure:
1

5/4/18

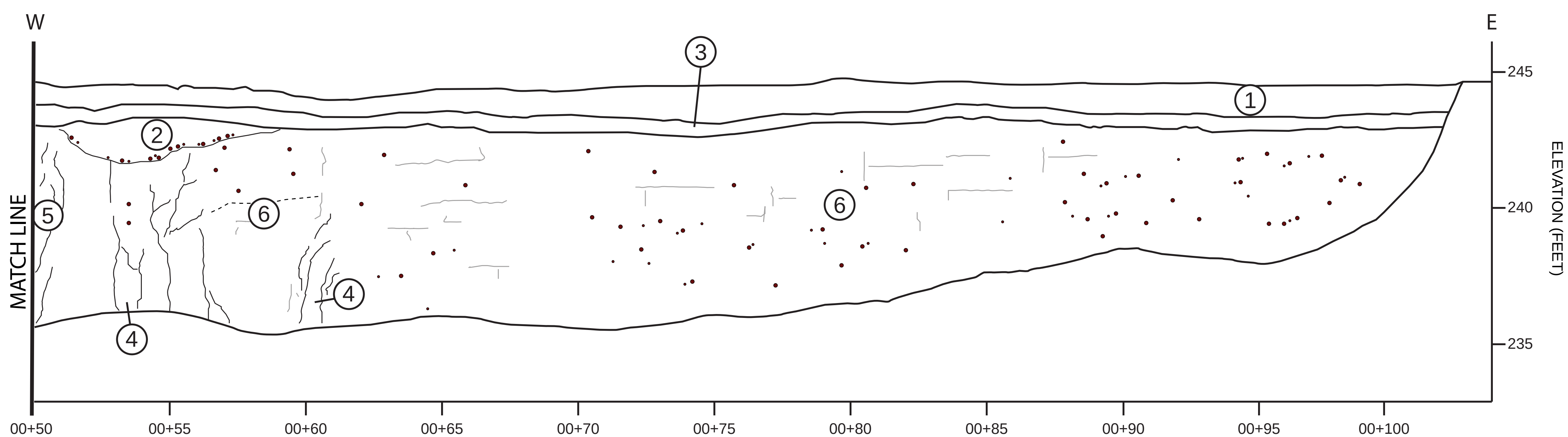


Trench Locations



SCALE

1" = 5'



EXPLANATION FOR EXPLORATORY TRENCH T-1

1 FILL
SILTY SAND, light brown to light reddish brown, fine to medium grained, trace gravel to 5%, moist, loose, some roots, brick and AC fragments up to 12" in diameter.

VERY OLD PARALIC DEPOSITS (Qvop9)

2 SILTY SAND, reddish brown, fine- to coarse-grained, trace gravel, medium dense, gradational deposits of iron concretions, channel deposits.

3 CLAYEY SAND, light brown to gray, fine- to medium-grained, moist, medium dense, with some roots. Former Argillic Soil Horizon.

4 SILTY SAND, tan to yellow brown, fine- to coarse-grained, trace gravel, loose to medium dense.

5 CLAYEY SAND, orange brown to reddish brown with mottled grey, fine- to coarse-grained, moist, medium to very dense, iron concretions encountered up to 1/8" in diameter.

6 CLAYEY SAND, reddish brown with mottled grey, fine- to coarse-grained, trace gravel, moist, medium to very dense, iron concretions encountered up to 1/8" in diameter.

SYMBOLS

- Approximate Geologic Subunit Contact (Dashed where unknown)
- Fractures (<0.5 mm separation)
- Fractures (0.5 to 1 mm separation)
- Fractures (>1 mm separation)
- Iron Concretions

Date: May, 2018
By: EMW
Job No.: 170441N-2

EXPLORATORY TRENCH LOG T-1

4th Avenue Apartments
San Diego, California

SCST, Inc.

Figure:
2

SYMBOLS

Approximate Geologic Subunit Contact
(Dashed where unknown)

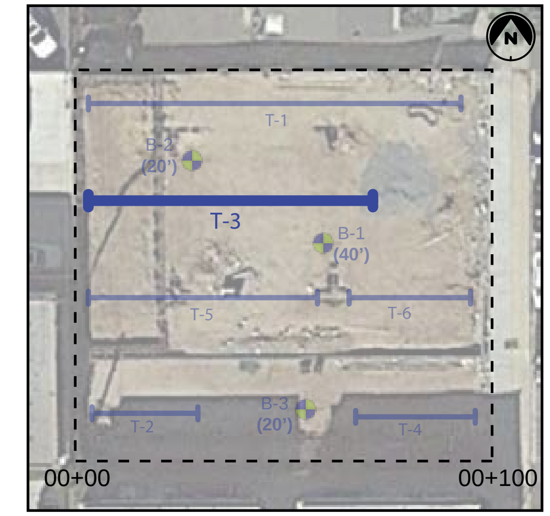
Fractures (<0.5 mm separation)

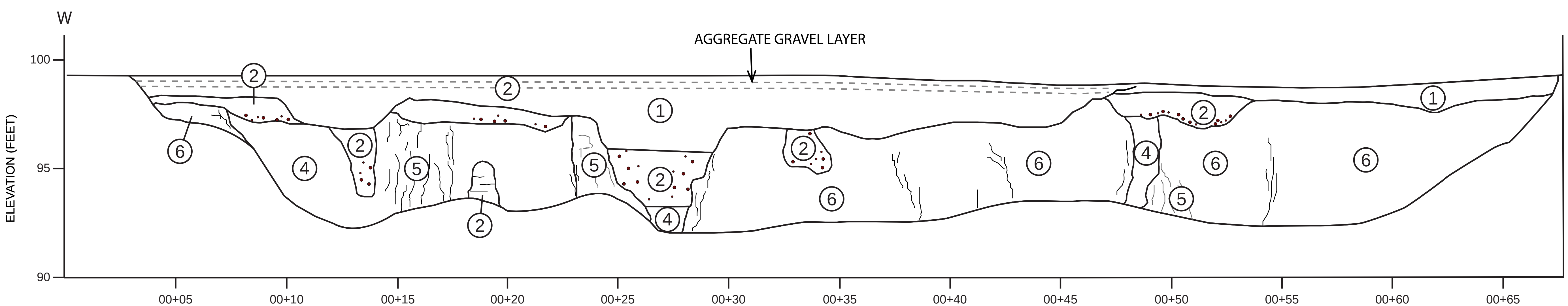
Fractures (0.5 to 1 mm separation)

Fractures (>1 mm separation)

Iron Concretions

Trench Locations





00+00

SCALE

1" = 5'

EXPLANATION FOR EXPLORATORY TRENCH T-1

(1) Fill
SILTY SAND, light brown to light reddish brown, fine to medium grained, trace gravel to 5%, moist, loose, some roots, brick and AC fragments up to 12” in diameter.

(2) Channel Deposits
SILTY SAND, reddish brown, fine to coarse grained, trace gravel, medium dense, gradational deposits of iron concretions derived from Qvop$_9$.

(4) Weathered Qvop$_9$
SILTY SAND, tan to yellow brown, fine to coarse grained, trace gravel, loose to medium dense.

(5) Qvop$_9$ (Hardened Sections)
CLAYEY SANDSTONE, orange brown to reddish brown with mottled grey, fine to coarse grained, moist, medium to very dense, iron concretions encountered up to 1/8” in diameter.

(6) Qvop$_9$
CLAYEY SANDSTONE, reddish brown with mottled grey, fine to coarse grained, trace gravel, moist, medium to very dense, iron concretions encountered up to 1/8” in diameter.

Date: May, 2018
By: EMW
Job No.: 170441N-2

EXPLORATORY TRENCH LOG T-3
4th Avenue Apartments
San Diego, California

SCST, Inc.

Figure:
3

SYMBOLS

Approximate Geologic Subunit Contact (Dashed where unknown)

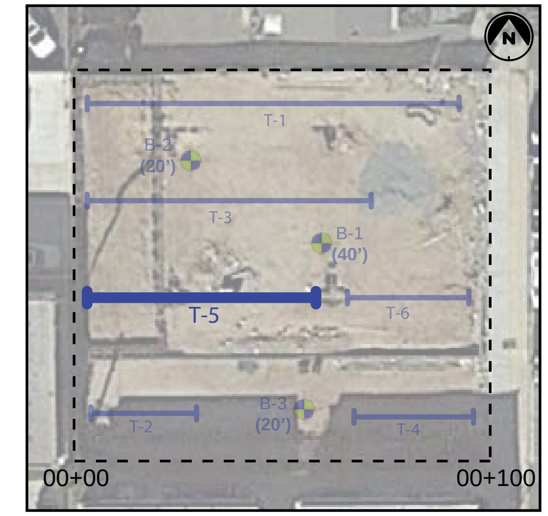
Fractures (<0.5 mm separation)

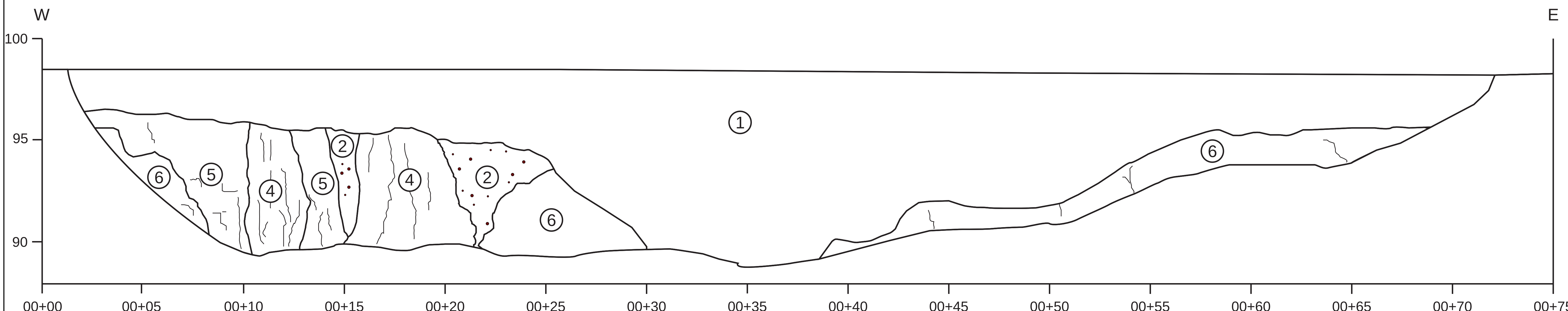
Fractures (0.5 to 1 mm separation)

Fractures (>1 mm separation)

Iron Concretions

Trench Locations





SCALE

1" = 5'

EXPLANATION FOR EXPLORATORY TRENCH T-5

1 Fill
SILTY SAND, light brown to light reddish brown, fine to medium grained, trace gravel to 5%, moist, loose, some roots, brick and AC fragments up to 12” in diameter.

2 Channel Deposits
SILTY SAND, reddish brown, fine to coarse grained, trace gravel, medium dense, gradational deposits of iron concretions derived from $Qvop_9$.

4 Weathered $Qvop_9$
SILTY SAND, tan to yellow brown, fine to coarse grained, trace gravel, loose to medium dense.

5 $Qvop_9$ (Hardened Sections)
CLAYEY SANDSTONE, orange brown to reddish brown with mottled grey, fine to coarse grained, moist, medium to very dense, iron concretions encountered up to 1/8” in diameter.

6 $Qvop_9$
CLAYEY SANDSTONE, reddish brown with mottled grey, fine to coarse grained, trace gravel, moist, medium to very dense, iron concretions encountered up to 1/8” in diameter.

Date: May, 2018
By: EMW
Job No.: 170441N-2

EXPLORATORY TRENCH LOG T-5
4th Avenue Apartments
San Diego, California

SCST, Inc.

Figure:
4

BORING COMPLETION REPORT

October 24, 2018

SCST No. 170441N
Report No. 3

Mr. Richard Simis
Next Space Development
2820 Shelter Island Drive
San Diego, California 92106

Subject: BORING COMPLETION REPORT
PROPOSED MIXED-USE DEVELOPMENT
PROJECT NUMBER: 565988
PERMIT #LMWP-003221
2426 4TH AVENUE
SAN DIEGO, CALIFORNIA

Dear Mr. Simis:

In accordance with County of San Diego requirements, we prepared this boring completion report for the three geotechnical borings that were drilled at the subject site. A subsurface exploration map, boring logs, and the laboratory test results are attached. Baja Exploration (C57 License # 804318) drilled the borings. The borings were sealed in accordance with California Well Standards Bulletins and the County of San Diego Code of Regulatory Ordinances.

If you have any questions, please call me at (619) 280-4321.

Respectfully submitted,
SCST, INC.

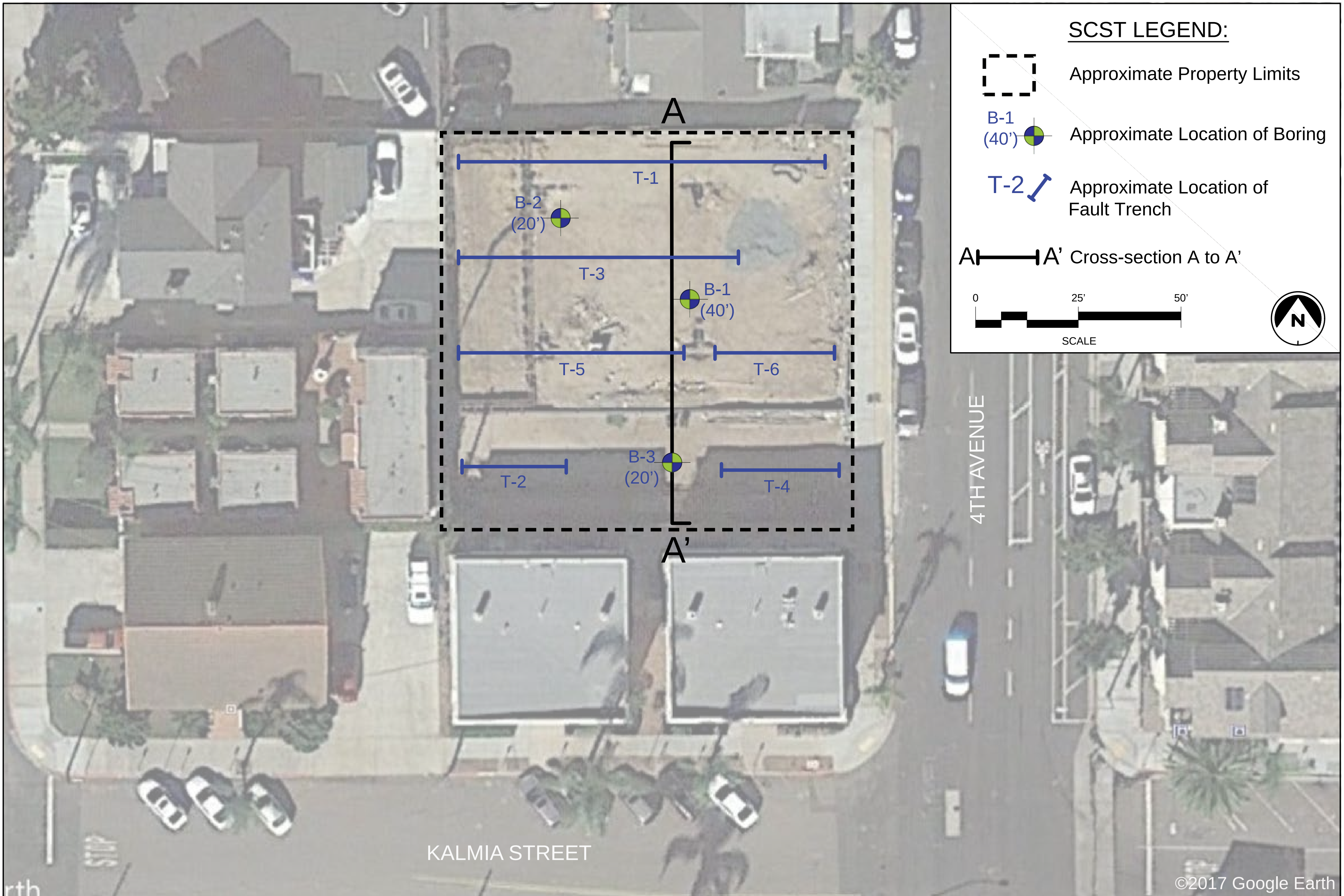
REGISTERED PROFESSIONAL GEOLOGIST
DOUGLAS A. SKINNER
No. 2472
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Douglas A. Skinner, CEG 2472
Senior Geologist

DAS:hu

<u>Attachments</u>:
Subsurface Exploration Map
Boring Logs
Laboratory Test Results

(1) Addressee via e-mail: richard@pbsconstructionservices.com
(1) The County of San Diego via e-mail: MonitoringWells.DEH@sdcounty.ca.gov



SCST, Inc.	**SUBSURFACE EXPLORATION MAP** 4th Avenue Apartments San Diego, California	Date: January, 2018 By: EMW Job No.: 170441N-1	Figure: 2

SUBSURFACE EXPLORATION LEGEND

UNIFIED SOIL CLASSIFICATION CHART

SOIL DESCRIPTION		GROUP SYMBOL	TYPICAL NAMES
I. COARSE GRAINED, more than 50% of material is larger than No. 200 sieve size.			
GRAVELS More than half of coarse fraction is larger than No. 4 sieve size but smaller than 3".	CLEAN GRAVELS	GW	Well graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels, gravel sand mixtures, little or no fines.
	GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
		GC	Clayey gravels, poorly graded gravel-sand, clay mixtures.
SANDS More than half of coarse fraction is smaller than No. 4 sieve size.	CLEAN SANDS	SW	Well graded sand, gravelly sands, little or no fines.
		SP	Poorly graded sands, gravelly sands, little or no fines.
		SM	Silty sands, poorly graded sand and silty mixtures.
		SC	Clayey sands, poorly graded sand and clay mixtures.
II. FINE GRAINED, more than 50% of material is smaller than No. 200 sieve size.			
	SILTS AND CLAYS (Liquid Limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, sandy silt or clayey-silt-sand mixtures with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL	Organic silts and organic silty clays or low plasticity.
	SILTS AND CLAYS (Liquid Limit greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity.
III. HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils.

SAMPLE SYMBOLS

- Bulk Sample
- Pavement Core Specimen Sample
- CK - Undisturbed Chunk sample
- MS - Maximum Size of Particle
- ST - Shelby Tube
- SPT - Standard Penetration Test sampler

GROUNDWATER SYMBOLS

- Water level at time of excavation or as indicated
- Water seepage at time of excavation or as indicated

LABORATORY TEST SYMBOLS

AL - Atterberg Limits
CON - Consolidation
COR - Corrosivity Tests (Resistivity, pH, Chloride, Sulfate)
DS - Direct Shear
EI - Expansion Index
MAX - Maximum Density
RV - R-Value
SA - Sieve Analysis
FC - Fines Content
(57%) (Percent Finer Than No. 200 Sieve)
CP - Core Photograph

SCST, Inc.	4th Avenue Apartments San Diego, CA			
	By:	EMW	Date:	January, 2018
	Job Number:	170441N-1	Figure:	I-1

LOG OF BORING B-1

Date Drilled: 12/14/2017
Equipment: CME-95 with 8-inch Hollow-stem Auger
Elevation (ft): 240 MSL

Logged by: EMW
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
0–4	SC	**FILL (Qf):** CLAYEY SAND, light reddish brown, fine to medium grained, moist, loose.		X					SA AL
4–8	SC	**VERY OLD PARALIC DEPOSITS ($Qvop_9$):** CLAYEY SAND, reddish brown with mottled gray, fine to medium grained, moist, very dense.	SPT		50/6"	65/6"			
8–14		SILTY SAND, orange brown, fine to medium grained, moist, very dense.	CAL		50/2"	65/2"	7.0		DS
14–20		**SAN DIEGO FORMATION (Tsd):** SILTY SANDSTONE, moderate brown, fine to coarse grained, moist, very dense, moderately to strongly cemented.	SPT		50/4"	65/4"			

BORING CONTINUED ON I-3.

SCST, Inc.

4th Avenue Apartments
San Diego, CA

By:	EMW	Date:	January, 2018
Job Number:	170441N-1	Figure:	I-2

LOG OF BORING B-1 (Continued)

Date Drilled: 12/14/2017 | Logged by: EMW
Equipment: CME-95 with 8-inch Hollow-stem Auger | Reviewed by: TBC
Elevation (ft): 240 MSL | Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
21		**SAN DIEGO FORMATION (Tsd):** SILTY SANDSTONE, moderate brown, fine to coarse grained, moist, very dense, moderately to strongly cemented.							
22		Dark reddish brown with mottled gray streaks.							
23									
24									
25									
26		Light reddish brown.	SPT		50/3"	65/3"			
27									
28									
29									
30									
31		Reddish brown, fine to coarse grained, some clay.	SPT		62	81			
32									
33									
34									
35		Orange brown. Trace gravel.							
36			SPT		72	94			
37									
38									
39			SPT		50/2"	65/2"			
40		**BORING TERMINATED AT 40 FEET**							

SCST, Inc.

4th Avenue Apartments San Diego, CA	
By: EMW	Date: January, 2018
Job Number: 170441N-1	Figure: I-3

LOG OF BORING B-2

Date Drilled: 12/14/2017
Equipment: CME-95 with 8-inch Hollow-stem Auger
Elevation (ft): 240 MSL

Logged by: EMW
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
0–3	SC	**FILL (Qf):** CLAYEY SAND, light reddish brown, fine to medium grained, moist, loose.		X					
3	SC	**VERY OLD PARALIC DEPOSITS ($Qvop_9$):** CLAYEY SAND, reddish brown with mottled gray, fine to medium grained, moist, very dense.							
5			SPT		50/4	65/4”			
6		Light reddish brown, trace gravel.	SPT		92	120			
10		Light reddish brown to orange brown.	CAL		50/5"		7.0	100.8	
13		**SAN DIEGO FORMATION (Tsd):** SILTY SANDSTONE, moderate brown, fine to coarse grained, moist, very dense, moderately to strongly cemented.							
15		Dark reddish brown.	SPT		50/4"	65/4"			
18		Reddish brown with mottled gray streaks.	SPT		50/3"	65/3"			
20		**BORING TERMINATED AT 20 FEET**							

SCST, Inc.

4th Avenue Apartments, San Diego, CA	
By: EMW	Date: January, 2018
Job Number: 170441N-1	Figure: I-4

LOG OF BORING B-3

Date Drilled: 12/14/2017
Equipment: CME-95 with 8-inch Hollow-stem Auger
Elevation (ft): 240 MSL

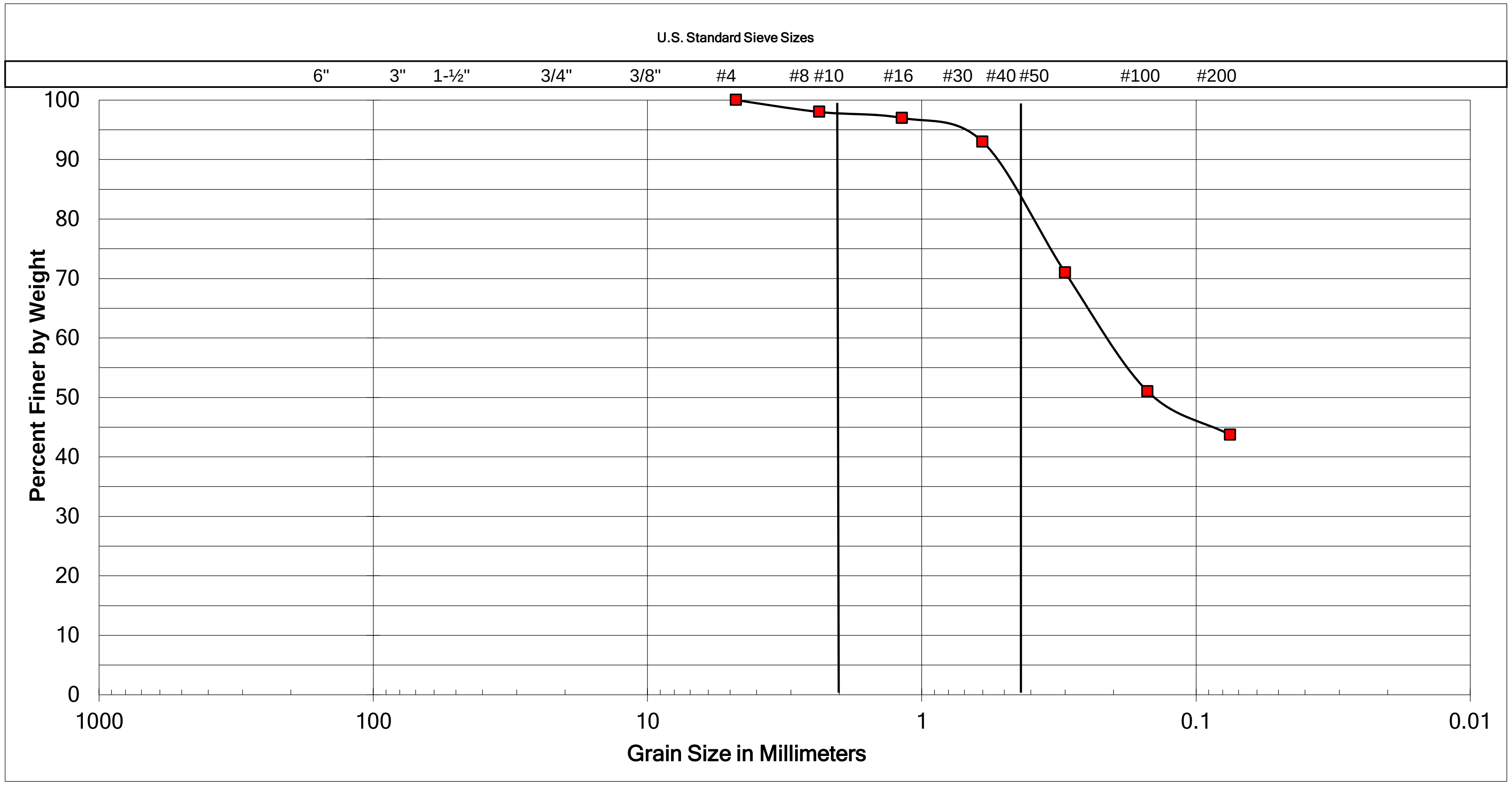
Logged by: EMW
Reviewed by: TBC
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
0	SM	**FILL (Qf):** SILTY SAND, moderate brown, fine to medium grained, some gravel, moist, loose.							
1									
2									
3									
4									
5	SC	**VERY OLD PARALIC DEPOSITS ($Qvop_9$):** CLAYEY SAND, reddish brown with mottled gray, fine to medium-grained, moist, dense.	SPT		50/5"	65/5"			
6									
7									
8		Clay content increases.							SA AL COR EI
9									
10			CAL		50/4"	65/4"	11.7	99.3	
11									
12									
13		**SAN DIEGO FORMATION (Tsd):** SILTY SANDSTONE, moderate brown, fine to coarse grained, moist, very dense, moderately to strongly cemented.							
14									
15			SPT		60	78			
16		Tan to gray.							
17									
18			SPT		60	78			
19									
20		BORING TERMINATED AT 20 FEET							

SCST, Inc.

4th Avenue Apartments
San Diego, CA

By:	EMW	Date:	January, 2018
Job Number:	170441N-1	Figure:	I-5



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

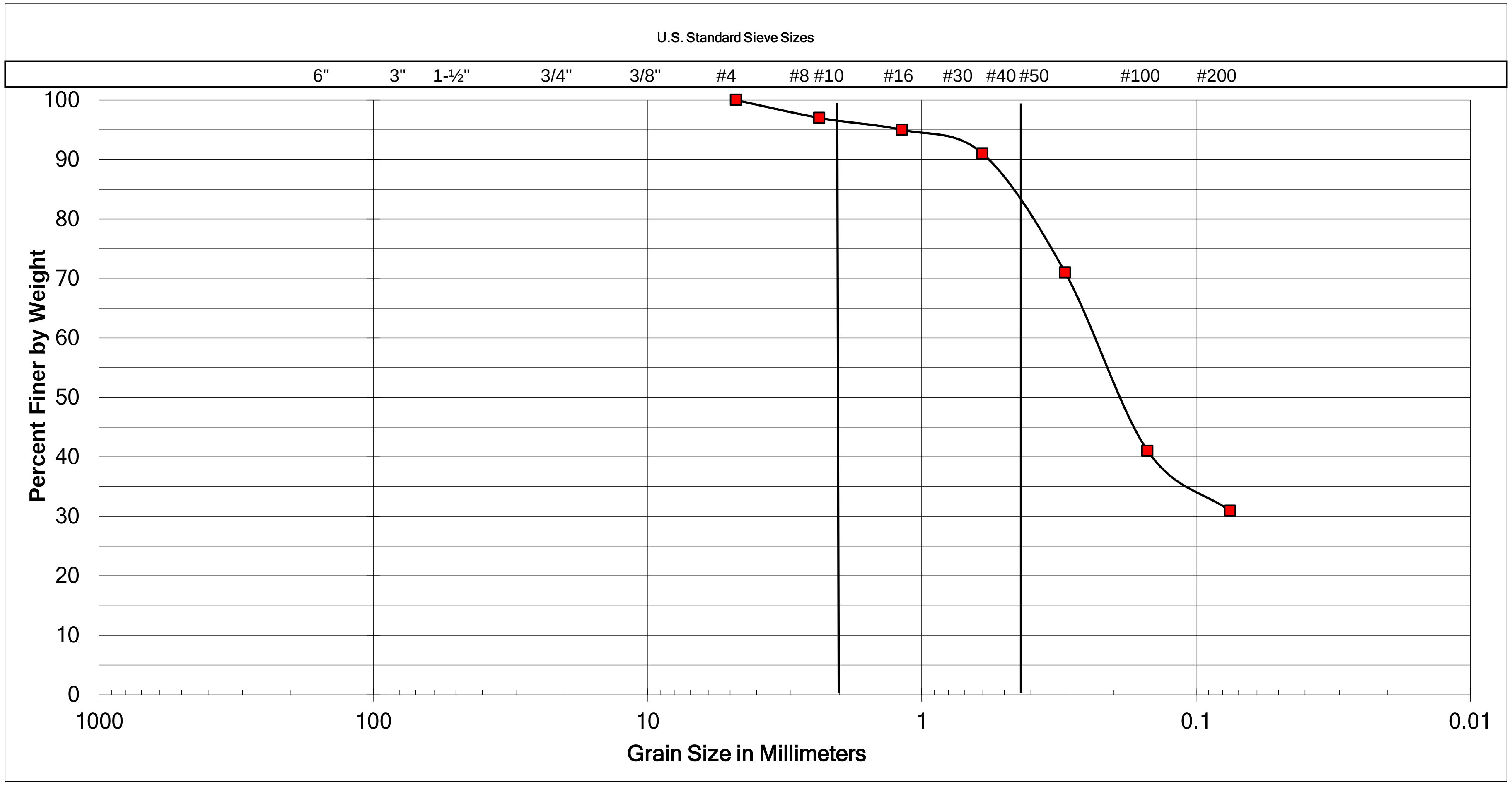
SAMPLE LOCATION
B1 at 0 to 4 feet
SAMPLE NUMBER
25021

UNIFIED SOIL CLASSIFICATION:	SC
DESCRIPTION	CLAYEY SAND

ATTERBERG LIMITS	
LIQUID LIMIT	32
PLASTIC LIMIT	15
PLASTICITY INDEX	17

SCST, Inc.

4th Avenue Apartments San Diego, California			
By:	DRB	Date:	December, 2017
Job Number:	170441N-1	Figure:	II-1



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
B3 at 7 to 10 feet
SAMPLE NUMBER
25024

UNIFIED SOIL CLASSIFICATION:	SM
DESCRIPTION	SILTY SAND

ATTERBERG LIMITS	
LIQUID LIMIT	N/A
PLASTIC LIMIT	NP
PLASTICITY INDEX	NP

SCST, Inc.

4th Avenue Apartments San Diego, California			
By:	DRB	Date:	December, 2017
Job Number:	170441N-1	Figure:	II-2

EXPANSION INDEX

ASTM D 2489

SAMPLE	DESCRIPTION	EXPANSION INDEX
B-3 at 7 to 10 feet	CLAYEY SAND	15

CLASSIFICATION OF EXPANSIVE SOIL [1]

EXPANSION INDEX	POTENTIAL EXPANSION
1 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
Above 130	Very High

1. ASTM - D4829

RESISTIVITY, pH, SOLUBLE CHLORIDE and SOLUBLE SULFATE

pH & Resistivity (Cal 643, ASTM G51)

Soluble Chlorides (Cal 422)

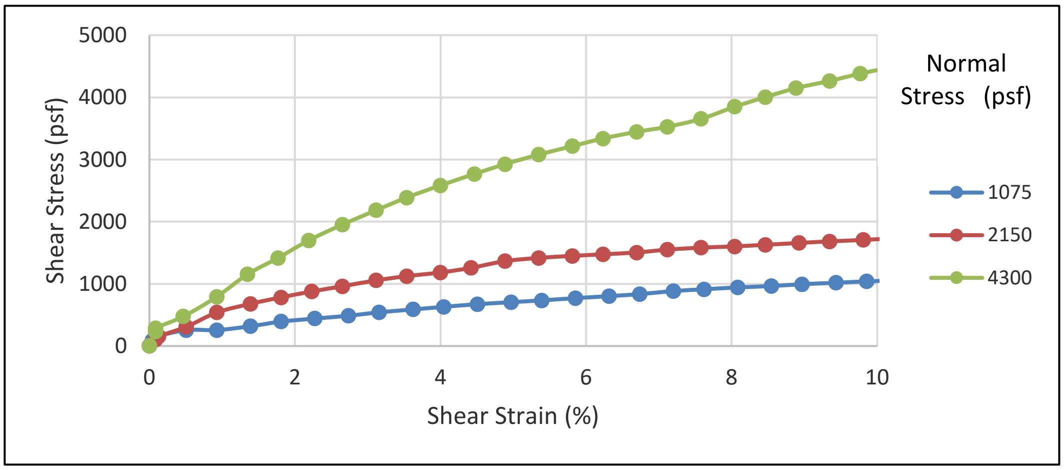
Soluble Sulfate (Cal 417)

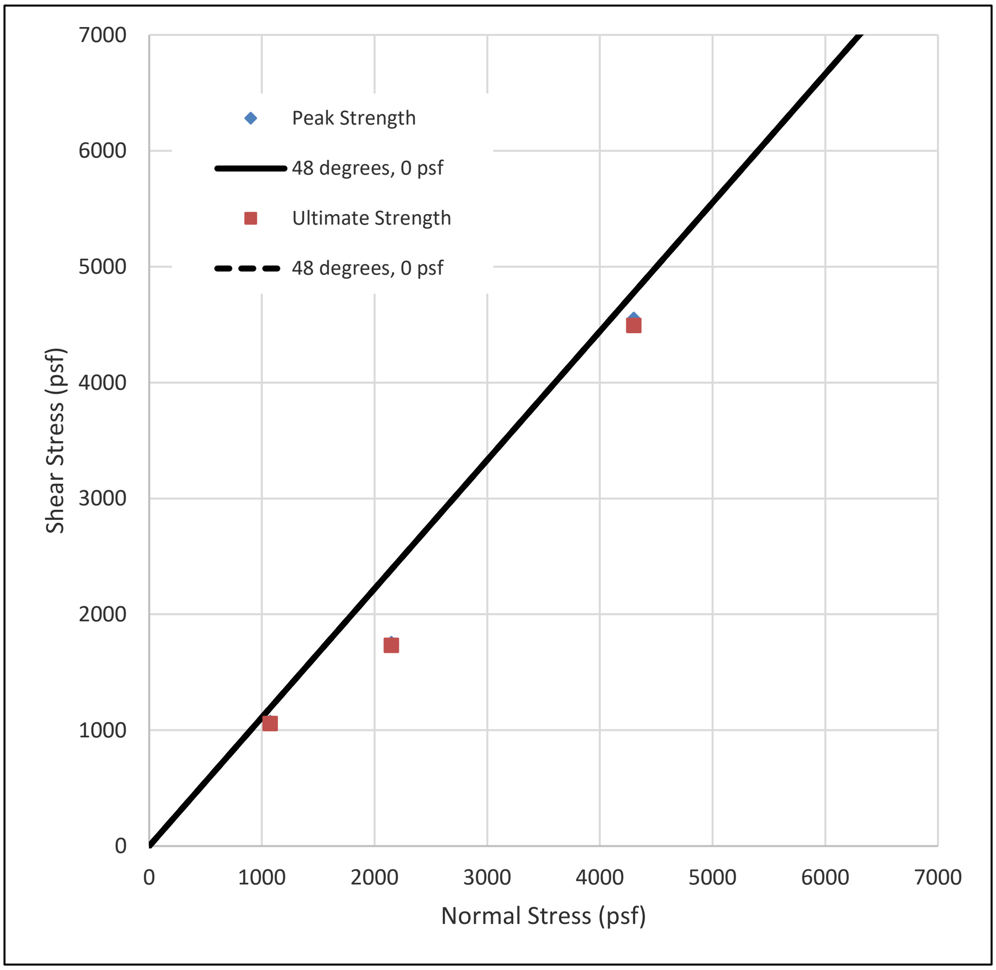
SAMPLE	RESISTIVITY (Ω-cm)	pH	CHLORIDE (%)	SULFATE (%)
B-3 at 7 to 10 feet	1850	6.87	0.003	0.005

SULFATE EXPOSURE CLASSES [2]

CLASS	SEVERITY	WATER-SOLUBLE SULFATE (SO_4) IN SOIL, PERCENT BY MASS
S0	Not applicable	$SO_4 < 0.10$
S1	Moderate	$0.10 \leq SO_4 < 0.20$
S2	Severe	$0.20 \leq SO_4 \leq 2.00$
S3	Very Severe	$SO_4 > 2.00$

2. ACI 318, Table 19.3.1.1





SAMPLE ID: B1 at 10 to 10½ feet

Orange Brown Silty Sand

NOTES: Insitu

Strain Rate: 0.003 in/min

Sample was consolidated and drained

	Peak	Ultimate
Φ	48 °	48 °
c	0 psf	0 psf

	Initial	Final
γ_d	101.0 pcf	101.0 pcf
w_c	8.3 %	21.9 %
Saturation	34 %	89 %

SCST Inc.

4th Avenue Apartments
San Diego, California

By:	DRB	Date:	December, 2017
Job Number:	170441N-1	Figure:	II-4

CLIMATE ACTION PLAN CONSISTENCY CHECKLIST INTRODUCTION

In December 2015, the City adopted a Climate Action Plan (CAP) that outlines the actions that City will undertake to achieve its proportional share of State greenhouse gas (GHG) emission reductions. The purpose of the Climate Action Plan Consistency Checklist (Checklist) is to, in conjunction with the CAP, provide a streamlined review process for proposed new development projects that are subject to discretionary review and trigger environmental review pursuant to the California Environmental Quality Act (CEQA).[1]

Analysis of GHG emissions and potential climate change impacts from new development is required under CEQA. The CAP is a plan for the reduction of GHG emissions in accordance with CEQA Guidelines Section 15183.5. Pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b), a project's incremental contribution to a cumulative GHG emissions effect may be determined not to be cumulatively considerable if it complies with the requirements of the CAP.

This Checklist is part of the CAP and contains measures that are required to be implemented on a project-by-project basis to ensure that the specified emissions targets identified in the CAP are achieved. Implementation of these measures would ensure that new development is consistent with the CAP's assumptions for relevant CAP strategies toward achieving the identified GHG reduction targets. Projects that are consistent with the CAP as determined through the use of this Checklist may rely on the CAP for the cumulative impacts analysis of GHG emissions. Projects that are not consistent with the CAP must prepare a comprehensive project-specific analysis of GHG emissions, including quantification of existing and projected GHG emissions and incorporation of the measures in this Checklist to the extent feasible. Cumulative GHG impacts would be significant for any project that is not consistent with the CAP.

The Checklist may be updated to incorporate new GHG reduction techniques or to comply with later amendments to the CAP or local, State, or federal law.

[1] Certain projects seeking ministerial approval may be required to complete the Checklist. For example, projects in a Community Plan Implementation Overlay Zone may be required to use the Checklist to qualify for ministerial level review. See Supplemental Development Regulations in the project's community plan to determine applicability.

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CAP CONSISTENCY CHECKLIST SUBMITTAL APPLICATION

- The Checklist is required only for projects subject to CEQA review.[2]
- If required, the Checklist must be included in the project submittal package. Application submittal procedures can be found in Chapter 11: Land Development Procedures of the City's Municipal Code.
- The requirements in the Checklist will be included in the project's conditions of approval.
- The applicant must provide an explanation of how the proposed project will implement the requirements described herein to the satisfaction of the Planning Department.

Application Information

Contact Information

Project No./Name: PTS No. 588751 / 4th Avenue Apartments

Property Address: 2426 4th Avenue, San Diego, CA

Applicant Name/Co.: Richard Simis

Contact Phone: 858.518.7372 Contact Email: richard@nextspacedev.com

Was a consultant retained to complete this checklist? ☐ Yes ■ No If Yes, complete the following

Consultant Name: ______ Contact Phone: ______

Company Name: ______ Contact Email: ______

Project Information

1. What is the size of the project (acres)? .23 acres
2. Identify all applicable proposed land uses:
   - ☐ Residential (indicate # of single-family units):
   - ■ Residential (indicate # of multi-family units): 36
   - ■ Commercial (total square footage): 1,085 sf
   - ☐ Industrial (total square footage):
   - ☐ Other (describe):
3. Is the project or a portion of the project located in a Transit Priority Area? ■ Yes ☐ No
4. Provide a brief description of the project proposed:

A 6-story mixed-use building with basement parking and ground level commercial and parking. Project is utilizing the affordable density bonus to increase density from 26 base zone units to 36 units with 15% of the units reserved at the very low income level, and utilizes 5 incentives as allowed.

[2] Certain projects seeking ministerial approval may be required to complete the Checklist. For example, projects in a Community Plan Implementation Overlay Zone may be required to use the Checklist to qualify for ministerial level review. See Supplemental Development Regulations in the project's community plan to determine applicability.

CAP CONSISTENCY CHECKLIST QUESTIONS

Step 1: Land Use Consistency

The first step in determining CAP consistency for discretionary development projects is to assess the project's consistency with the growth projections used in the development of the CAP. This section allows the City to determine a project's consistency with the land use assumptions used in the CAP.

Step 1: Land Use Consistency		
Checklist Item (Check the appropriate box and provide explanation and supporting documentation for your answer)	Yes	No
A. Is the proposed project consistent with the existing General Plan and Community Plan land use and zoning designations?;[3] OR, B. If the proposed project is not consistent with the existing land use plan and zoning designations, and includes a land use plan and/or zoning designation amendment, would the proposed amendment result in an increased density within a Transit Priority Area (TPA)[4] and implement CAP Strategy 3 actions, as determined in Step 3 to the satisfaction of the Development Services Department?; OR, C. If the proposed project is not consistent with the existing land use plan and zoning designations, does the project include a land use plan and/or zoning designation amendment that would result in an equivalent or less GHG-intensive project when compared to the existing designations?	☑	☐
If "***Yes***," proceed to Step 2 of the Checklist. For question B above, complete Step 3. For question C above, provide estimated project emissions under both existing and proposed designation(s) for comparison. Compare the maximum buildout of the existing designation and the maximum buildout of the proposed designation. If "***No***," in accordance with the City's Significance Determination Thresholds, the project's GHG impact is significant. The project must nonetheless incorporate each of the measures identified in Step 2 to mitigate cumulative GHG emissions impacts unless the decision maker finds that a measure is infeasible in accordance with CEQA Guidelines Section 15091. Proceed and complete Step 2 of the Checklist.		

The proposed project is consistent with the General Plan which identifies the site for Multiple-Use. In addition, although the project has a density of 113 DU/AC that is over the designated range of the 'Community Commercial' density (0-109 DU/AC) as outlined in the Uptown Community Plan, the project is consistent with the allowed density per the CC-3-9 zone (1/400 sf) which implements the 'Community Commercial' land use. The project follows the land use designation description as outlined in Table 2-3 of the Uptown Community Plan which states typical development should provide for shopping areas with retail, service, civic, and office uses for the community at-large within three to six miles and housing may be allowed up to a very high residential density as part of a mixed-use development. The project provides retail space and housing at a very high density. Lastly, the project is consistent with the requirements of the 'CC-3-9' zone. Although the project utilizes 5 incentives, 3 of which propose deviations to the CC-3-9 regulations, these are allowed by right pursuant to the California state affordable housing density bonus regulations and therefore the project maintains consistency to the CC-3-9 zone.

[3] This question may also be answered in the affirmative if the project is consistent with SANDAG Series 12 growth projections, which were used to determine the CAP projections, as determined by the Planning Department.

[4] This category applies to all projects that answered in the affirmative to question 3 on the previous page: Is the project or a portion of the project located in a transit priority area.

Step 2: CAP Strategies Consistency

The second step of the CAP consistency review is to review and evaluate a project's consistency with the applicable strategies and actions of the CAP. Step 2 only applies to development projects that involve permits that would require a certificate of occupancy from the Building Official or projects comprised of one and two family dwellings or townhouses as defined in the California Residential Code and their accessory structures.[5] All other development projects that would not require a certificate of occupancy from the Building Official shall implement Best Management Practices for construction activities as set forth in the Greenbook (for public projects).

Step 2: CAP Strategies Consistency			
Checklist Item (Check the appropriate box and provide explanation for your answer)	Yes	No	N/A
Strategy 1: Energy & Water Efficient Buildings			
1. *Cool/Green Roofs*. • Would the project include roofing materials with a minimum 3-year aged solar reflection and thermal emittance or solar reflection index equal to or greater than the values specified in the voluntary measures under California Green Building Standards Code (Attachment A)?; OR • Would the project roof construction have a thermal mass over the roof membrane, including areas of vegetated (green) roofs, weighing at least 25 pounds per square foot as specified in the voluntary measures under California Green Building Standards Code?; OR • Would the project include a combination of the above two options? Check "N/A" only if the project does not include a roof component. The project will provide a "Cool Roof," which will include roofing materials with a minimum 3-year aged solar reflectance (SR) and thermal emittance (TE) or solar reflection index (SRI) equal or greater than the values specified in the voluntary measures under California Green Building Standards Code.	☑	☐	☐

[5] Actions that are not subject to Step 2 would include, for example: 1) discretionary map actions that do not propose specific development, 2) permits allowing wireless communication facilities, 3) special events permits, 4) use permits or other permits that do not result in the expansion or enlargement of a building (e.g., decks, garages, etc.), and 5) non-building infrastructure projects such as roads and pipelines. Because such actions would not result in new occupancy buildings from which GHG emissions reductions could be achieved, the items contained in Step 2 would not be applicable.

2. *Plumbing fixtures and fittings* With respect to plumbing fixtures or fittings provided as part of the project, would those low-flow fixtures/appliances be consistent with each of the following: Residential buildings: • Kitchen faucets: maximum flow rate not to exceed 1.5 gallons per minute at 60 psi; • Standard dishwashers: 4.25 gallons per cycle; • Compact dishwashers: 3.5 gallons per cycle; and • Clothes washers: water factor of 6 gallons per cubic feet of drum capacity? Nonresidential buildings: • Plumbing fixtures and fittings that do not exceed the maximum flow rate specified in Table A5.303.2.3.1 (voluntary measures) of the California Green Building Standards Code (See Attachment A); and • Appliances and fixtures for commercial applications that meet the provisions of Section A5.303.3 (voluntary measures) of the California Green Building Standards Code (See Attachment A)? Check "N/A" only if the project does not include any plumbing fixtures or fittings. Residential Component: The kitchen faucets, standard dishwashers, compact dishwashers, and clothes washers installed in the residential portion of the project would be consistent with the requirements specified above. Non-residential Component: Plumbing fixtures and fittings used in the commercial portion of the project would meet the requirements specified in Table A5.303.2.3.1 (voluntary measures) of CalGreen, and appliances and fixtures would meet the flow requirements specified in Section A5.303.3 of CalGreen.	☑	☐	☐

Strategy 3: Bicycling, Walking, Transit & Land Use			
3. *Electric Vehicle Charging* • <u>Multiple-family projects of 17 dwelling units or less</u>: Would 3% of the total parking spaces required, or a minimum of one space, whichever is greater, be provided with a listed cabinet, box or enclosure connected to a conduit linking the parking spaces with the electrical service, in a manner approved by the building and safety official, to allow for the future installation of electric vehicle supply equipment to provide electric vehicle charging stations at such time as it is needed for use by residents? • <u>Multiple-family projects of more than 17 dwelling units</u>: Of the total required listed cabinets, boxes or enclosures, would 50% have the necessary electric vehicle supply equipment installed to provide active electric vehicle charging stations ready for use by residents? • <u>Non-residential projects</u>: Of the total required listed cabinets, boxes or enclosures, would 50% have the necessary electric vehicle supply equipment installed to provide active electric vehicle charging stations ready for use? Check "N/A" only if the project is a single-family project or would not require the provision of listed cabinets, boxes, or enclosures connected to a conduit linking the parking spaces with electrical service, e.g., projects requiring fewer than 10 parking spaces. Residential Component: As currently proposed, the project would provide a total of 14 garage spaces, 6 tandem spaces using mechanical lifts, and 1 accessible space, for a total of 21 parking spaces. The residential portion of the project would provide 1 space (3%) with the listed cabinets, boxes, or enclosures and that 1 space (50%) would include the electrical vehicle supply equipment. Non-residential Component: The commercial component of the project would include 3 parking spaces. 1 space (3%) would be equipped with a listed cabinet, box, or enclosure, and that 1 space would have the necessary electric vehicle supply equipment.	☑	☐	☐
Strategy 3: Bicycling, Walking, Transit & Land Use (Complete this section if project includes non-residential or mixed uses)			
4. *Bicycle Parking Spaces* Would the project provide more short- and long-term bicycle parking spaces than required in the City's Municipal Code (Chapter 14, Article 2, Division 5)?[6] Check "N/A" only if the project is a residential project. Residential Component: NA Non-residential Component: The project would provide 3 automobile parking spaces. Per the SDMC, the number of short term and long term bicycle parking spaces is a minimum of 2 for short term and 1 for long term as these are the greater of the calculation rules. Per these requirements, minimum number of required spaces would be 2 short term and 1 long term bicycle parking spaces. The project would provide 2 short term and 1 long term bicycle parking spaces.	☐	☑	☐

[6] Non-portable bicycle corrals within 600 feet of project frontage can be counted towards the project's bicycle parking requirements.

5. *Shower facilities*

If the project includes nonresidential development that would accommodate over 10 tenant occupants (employees), would the project include changing/shower facilities in accordance with the voluntary measures under the California Green Building Standards Code as shown in the table below?

Number of Tenant Occupants (Employees)	Shower/Changing Facilities Required	Two-Tier (12" X 15" X 72") Personal Effects Lockers Required
0-10	0	0
11-50	1 shower stall	2
51-100	1 shower stall	3
101-200	1 shower stall	4
Over 200	1 shower stall plus 1 additional shower stall for each 200 additional tenant-occupants	1 two-tier locker plus 1 two-tier locker for each 50 additional tenant-occupants

☐ ☐ ☑

Check "N/A" only if the project is a residential project, or if it does not include nonresidential development that would accommodate over 10 tenant occupants (employees).

Residential Component: N/A

Non-residential Component: It is estimated that the project would include less than 10 employees. Therefore, shower/changing facilitates would not be required.

6. *Designated Parking Spaces*

If the project includes a nonresidential use in a TPA, would the project provide designated parking for a combination of low-emitting, fuel-efficient, and carpool/vanpool vehicles in accordance with the following table?

Number of Required Parking Spaces	Number of Designated Parking Spaces
0-9	0
10-25	2
26-50	4
51-75	6
76-100	9
101-150	11
151-200	18
201 and over	At least 10% of total

This measure does not cover electric vehicles. See Question 4 for electric vehicle parking requirements.

Note: Vehicles bearing Clean Air Vehicle stickers from expired HOV lane programs may be considered eligible for designated parking spaces. The required designated parking spaces are to be provided within the overall minimum parking requirement, not in addition to it.

Check "N/A" only if the project is a residential project, or if it does not include nonresidential use in a TPA.

Residential Component: N/A

Non-residential Component: The commercial would require 3 parking spaces. Therefore, none of these parking spaces would be designated for low-emitting, fuel-efficient, and carpool/vanpool vehicles.

☑ ☐ ☐

7. *Transportation Demand Management Program* If the project would accommodate over 50 tenant-occupants (employees), would it include a transportation demand management program that would be applicable to existing tenants and future tenants that includes: At least one of the following components: • Parking cash out program • Parking management plan that includes charging employees market-rate for single-occupancy vehicle parking and providing reserved, discounted, or free spaces for registered carpools or vanpools • Unbundled parking whereby parking spaces would be leased or sold separately from the rental or purchase fees for the development for the life of the development And at least three of the following components: • Commitment to maintaining an employer network in the SANDAG iCommute program and promoting its RideMatcher service to tenants/employees • On-site carsharing vehicle(s) or bikesharing • Flexible or alternative work hours • Telework program • Transit, carpool, and vanpool subsidies • Pre-tax deduction for transit or vanpool fares and bicycle commute costs • Access to services that reduce the need to drive, such as cafes, commercial stores, banks, post offices, restaurants, gyms, or childcare, either onsite or within 1,320 feet (1/4 mile) of the structure/use? Check "N/A" only if the project is a residential project or if it would not accommodate over 50 tenant-occupants (employees). This is not applicable as the majority of the project is residential and the commercial space would not require over 50 tenant-occupants (employees).	☐	☐	☑

Step 3: Project CAP Conformance Evaluation (if applicable)

The third step of the CAP consistency review only applies if Step 1 is answered in the affirmative under option B. The purpose of this step is to determine whether a project that is located in a TPA but that includes a land use plan and/or zoning designation amendment is nevertheless consistent with the assumptions in the CAP because it would implement CAP Strategy 3 actions. In general, a project that would result in a reduction in density inside a TPA would not be consistent with Strategy 3.The following questions must each be answered in the affirmative and fully explained.

1. **Would the proposed project implement the General Plan's City of Villages strategy in an identified Transit Priority Area (TPA) that will result in an increase in the capacity for transit-supportive residential and/or employment densities?**

   Considerations for this question:
   - Does the proposed land use and zoning designation associated with the project provide capacity for transit-supportive residential densities within the TPA?
   - Is the project site suitable to accommodate mixed-use village development, as defined in the General Plan, within the TPA?
   - Does the land use and zoning associated with the project increase the capacity for transit-supportive employment intensities within the TPA?

2. **Would the proposed project implement the General Plan's Mobility Element in Transit Priority Areas to increase the use of transit?**

   Considerations for this question:
   - Does the proposed project support/incorporate identified transit routes and stops/stations?
   - Does the project include transit priority measures?

3. **Would the proposed project implement pedestrian improvements in Transit Priority Areas to increase walking opportunities?**

   Considerations for this question:
   - Does the proposed project circulation system provide multiple and direct pedestrian connections and accessibility to local activity centers (such as transit stations, schools, shopping centers, and libraries)?
   - Does the proposed project urban design include features for walkability to promote a transit supportive environment?

4. **Would the proposed project implement the City of San Diego's Bicycle Master Plan to increase bicycling opportunities?**

   Considerations for this question:
   - Does the proposed project circulation system include bicycle improvements consistent with the Bicycle Master Plan?
   - Does the overall project circulation system provide a balanced, multimodal, "complete streets" approach to accommodate mobility needs of all users?

5. **Would the proposed project incorporate implementation mechanisms that support Transit Oriented Development?**

   Considerations for this question:
   - Does the proposed project include new or expanded urban public spaces such as plazas, pocket parks, or urban greens in the TPA?
   - Does the land use and zoning associated with the proposed project increase the potential for jobs within the TPA?
   - Do the zoning/implementing regulations associated with the proposed project support the efficient use of parking through mechanisms such as: shared parking, parking districts, unbundled parking, reduced parking, paid or time-limited parking, etc.?

6. **Would the proposed project implement the Urban Forest Management Plan to increase urban tree canopy coverage?**

   Considerations for this question:
   - Does the proposed project provide at least three different species for the primary, secondary and accent trees in order to accommodate varying parkway widths?
   - Does the proposed project include policies or strategies for preserving existing trees?
   - Does the proposed project incorporate tree planting that will contribute to the City's 20% urban canopy tree coverage goal?

CLIMATE ACTION PLAN CONSISTENCY CHECKLIST
ATTACHMENT A

This attachment provides performance standards for applicable Climate Action Pan (CAP) Consistency Checklist measures.

Table 1 **Roof Design Values for Question 1: Cool/Green Roofs supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan**

Land Use Type	Roof Slope	Minimum 3-Year Aged Solar Reflectance	Thermal Emittance	Solar Reflective Index
Low-Rise Residential	≤ 2:12	0.55	0.75	64
	> 2:12	0.20	0.75	16
High-Rise Residential Buildings, Hotels and Motels	≤ 2:12	0.55	0.75	64
	> 2:12	0.20	0.75	16
Non-Residential	≤ 2:12	0.55	0.75	64
	> 2:12	0.20	0.75	16

Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 residential and non-residential voluntary measures shown in Tables A4.106.5.1 and A5.106.11.2.2, respectively. Roof installation and verification shall occur in accordance with the CALGreen Code.

CALGreen does not include recommended values for low-rise residential buildings with roof slopes of ≤ 2:12 for San Diego's climate zones (7 and 10). Therefore, the values for climate zone 15 that covers Imperial County are adapted here.

Solar Reflectance Index (SRI) equal to or greater than the values specified in this table may be used as an alternative to compliance with the aged solar reflectance values and thermal emittance.

Table 2	**Fixture Flow Rates for Non-Residential Buildings related to Question 2: Plumbing Fixtures and Fittings supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan**
Fixture Type	**Maximum Flow Rate**
Showerheads	1.8 gpm @ 80 psi
Lavatory Faucets	0.35 gpm @60 psi
Kitchen Faucets	1.6 gpm @ 60 psi
Wash Fountains	1.6 [rim space(in.)/20 gpm @ 60 psi]
Metering Faucets	0.18 gallons/cycle
Metering Faucets for Wash Fountains	0.18 [rim space(in.)/20 gpm @ 60 psi]
Gravity Tank-type Water Closets	1.12 gallons/flush
Flushometer Tank Water Closets	1.12 gallons/flush
Flushometer Valve Water Closets	1.12 gallons/flush
Electromechanical Hydraulic Water Closets	1.12 gallons/flush
Urinals	0.5 gallons/flush

Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 non-residential voluntary measures shown in Tables A5.303.2.3.1 and A5.106.11.2.2, respectively. See the California Plumbing Code for definitions of each fixture type.

Where complying faucets are unavailable, aerators rated at 0.35 gpm or other means may be used to achieve reduction.

Acronyms:
gpm = gallons per minute
psi = pounds per square inch (unit of pressure)
in. = inch

<table>
<tr><th>Table 3</th><th colspan="2">Standards for Appliances and Fixtures for Commercial Application related to Question 2: Plumbing Fixtures and Fittings supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan</th></tr>
<tr><th>Appliance/Fixture Type</th><th colspan="2">Standard</th></tr>
<tr><td>Clothes Washers</td><td colspan="2">Maximum Water Factor (WF) that will reduce the use of water by 10 percent below the California Energy Commissions' WF standards for commercial clothes washers located in Title 20 of the California Code of Regulations.</td></tr>
<tr><td>Conveyor-type Dishwashers</td><td>0.70 maximum gallons per rack (2.6 L) (High-Temperature)</td><td>0.62 maximum gallons per rack (4.4 L) (Chemical)</td></tr>
<tr><td>Door-type Dishwashers</td><td>0.95 maximum gallons per rack (3.6 L) (High-Temperature)</td><td>1.16 maximum gallons per rack (2.6 L) (Chemical)</td></tr>
<tr><td>Undercounter-type Dishwashers</td><td>0.90 maximum gallons per rack (3.4 L) (High-Temperature)</td><td>0.98 maximum gallons per rack (3.7 L) (Chemical)</td></tr>
<tr><td>Combination Ovens</td><td colspan="2">Consume no more than 10 gallons per hour (38 L/h) in the full operational mode.</td></tr>
<tr><td>Commercial Pre-rinse Spray Valves (manufactured on or after January 1, 2006)</td><td colspan="2">Function at equal to or less than 1.6 gallons per minute (0.10 L/s) at 60 psi (414 kPa) and
• Be capable of cleaning 60 plates in an average time of not more than 30 seconds per plate.
• Be equipped with an integral automatic shutoff.
• Operate at static pressure of at least 30 psi (207 kPa) when designed for a flow rate of 1.3 gallons per minute (0.08 L/s) or less.</td></tr>
<tr><td colspan="3">Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 non-residential voluntary measures shown in Section A5.303.3. See the California Plumbing Code for definitions of each appliance/fixture type.

Acronyms:
L = liter
L/h = liters per hour
L/s = liters per second
psi = pounds per square inch (unit of pressure)
kPa = kilopascal (unit of pressure)</td></tr>
</table>

AWBREY COOK ROGERS MCGILL
ARCHITECTS + INTERIORS

Project Name: **4th and Laurel**

Dec. 14, 2018

Project address: **2426 4th Ave.**

Plan check No. : **588751**

Re: **Project CAP Conformance Evaluation (Step 3)**

1. The proposed land use and zoning designation associated with the project would result in an increase in the capacity for transit-supportive residential and/or employment densities. The zoning designation permits for the development of a project with multiple residential dwelling units. The surrounding area consists of similar multi-family, mixed-use projects with newer developments increasing the residential density. The project is a multi-family mixed-use project.

   In addition, the land use and zoning associated with the project does also increase the capacity for transit-supportive employment intensities as there is a commercial/retail space located on the ground floor, that can employ individuals.

2. The proposed project supports the General Plan's Mobility Element in Transit Priority Areas by supporting the use of public transit. The site is located along active bus routes and is within one city block of bus stops in both the north and south direction. The design of the project, places the Lobby prominently along the street frontage encouraging pedestrian mobility to bus stops.

3. The proposed project implements pedestrian improvements in Transit Priority Areas to increase walking opportunities by creating a central arrival/departure area for pedestrians at the ground level. The City generally does not permit residential uses along the front part of a site lot, however, the project requested a deviation in order provide a Lobby for the residents of the proposed project. This facilitates the pedestrian connection to local activity centers, public park(s) (Balboa Park), and local commercial destinations (shops and restaurants).

4. The proposed project does implement the City's Bicycle Master Plan to increase bicycling opportunities by encouraging the use of bicycles by providing for the on-site storage of tenants' bicycles within the lower parking level.

   The project's overall circulation system does in fact provide a balanced, multimodal, "complete streets" approach to accommodate mobility needs of all users. Users have the option of using personal vehicles, bicycles, or walking to reach destinations with all methods being accessible per the ADA.

5. The proposed project incorporates implementation mechanisms that support Transit Oriented Development by incorporating efficient use of parking permitted by the applicable zoning regulations. In this case, the proposed project will use mechanical lifts so as to allow for the shared use of single parking stalls by an additional vehicle.

   The land use and zoning associated with the proposed project does increase the potential for jobs within the TPA. The proposed project does contain a commercial/retail component on-site, and also provides for affordable housing for the residents to work within the local area.

6. The proposed project implements the Urban Forest Management Plan to increase urban tree canopy coverage. The proposed project includes one (1) new tree as there is currently none found at the site. The City's Municipal Code governing features associated with driveway widths and location, the location of an underground electrical vault with a vault lid for access, and minimum tree spacing requirements from utilities, did not permit for more than one tree to fit along the limited property frontage.

Hydrology Study

4th Avenue Apartments
2426 4th Avenue
San Diego, California 92101
APN: 533-106-13

Prepared For:

4rth Avenue Apartments. LLC
2820 Shelter Island Drive
San Diego, CA 92106

Prepared By:

Civil Landworks Corporation
110 Copperwood Way Suite P,
Oceanside CA, USA 92058
760-908-8745

CLW No. 1244-D July 10, 2018

D-Sheet No. Project No.

TABLE OF CONTENTS

Section

ATTACHMENTS

INTRODUCTION

Determine storm water runoff and site drainage for a 50 year storm event for a new proposed multi-unit apartment development in the City of San Diego, California. The project site is located at 2426 4th Avenue in San Diego. The APN is 533-106-13 and is approximately 10,049 SF. The site is currently demoed from an existing multi-unit apartment complex. Please see Attachment 1 for a picture prior to demolition.

The proposed site developments consist of clearing and grubbing for the construction of a 36 unit apartment complex with underground parking and a retail space. Incidental underground utilities, hardscape, site landscaping, and vehicular pavement are also proposed with this development. See Attachment 1 for site location and vicinity maps.

DESIGN CRITERIA AND ASSUMPTIONS

1. C factors were based on the City of San Diego Drainage Design Manual (2017) Table 2 page 82:
   - The existing condition utilized a C factor of 0.55 and the proposed condition utilized a C factor of 0.99. The C factor is based on impervious percentage of a drainage area. Per Table A-1 of the January 2017 Drainage Design Manual, the lowest C value is 0.55. The drainage area contains 0% of impervious area, which has a C factor of 0.55 categorized as single family development for existing, and a mixed use for proposed. The C factor was calculated by using the revised equation and anytime the equation was greater than 1, a C value of 0.99 was used. See Attachment 2 for the City of San Diego Hydrology Manual (2017) criteria.
2. Hydrologic calculations were performed using the CIVILCAD/CIVILDESIGN Engineering software version 7.6 per the Rational Hydrology Method as outlined within the City of San Diego Drainage Design Manual (2017). The hydrology calculations for proposed and existing conditions may be found within the hydrology calculations section of this report.

DISCUSSION

EXISTING CONDITIONS

The site was developed in the past, but currently has been demoed and comprises of two hydrologic basin. The northern basin sheet flows southerly into a pit located on the existing site. The southern basin flows southerly toward a retaining wall on the adjacent property.

Prior to the demolition, the site was developed as a multi-unit apartment complex. This indicates that the existing downstream system was designed with this structure already in mind.

Below is a summary of pre-development criteria for the subject property:

TABLE 1: 50 YEAR PRE-DEVELOPMENT CRITERIA

Node	C	Tc (Min.)	Area (acre)	Rainfall Intensity (In/Hr)	Q50 (cfs)
102	0.55	5.00	0.127	4.265	0.298
202	0.55	5.00	0.104	4.265	0.244
TOTAL			0.231		0.542

PROPOSED CONDITIONS

The proposed conditions will also consist of one basin with offsite drainage basins drain toward the project site. See Attachment 6 for proposed drainage patterns.

The proposed building will direct all roof drains to discharge into a planter. It will then be directed into 4th avenue through a curb outlet.

The project will not require approval from the Regional Water Quality Control Board under Federal Clean Water Act (CWA) section 401 or 404 because the project is not discharging into any body of water.

See Attachment 4 for the proposed hydrology calculations. The proposed hydrologic conditions are summarized below:

TABLE 2: 50 YEAR POST-DEVELOPMENT CRITERIA WITHOUT DETENTION					
Node	**C**	**Tc (Min.)**	**Area (acre)**	**Rainfall Intensity (In/Hr)**	**Q50 (cfs)**
102	0.99	5.04	0.231	4.265	0.975
TOTAL			0.231		0.975

The project will increase the peak flow by 0.433 CFS. Since the existing site was developed as a multi-unit apartment complex, the existing downstream system will not be impacted by the proposed project. Although the site has currently been demoed, the downstream system was designed with the existing apartment complex accounted for. The proposed project will also construct a multi-unit apartment complex.

CONCLUSION

A hydrologic analysis has been conducted for the subject for a 50 year storm event. The site peak runoff will be increased by 0.433 CFS, but will be discharged onto 4th Avenue through a curb outlet

DECLARATION OF RESPONSIBLE CHARGE

I, hereby declare that I am the Engineer of Work for this project, that I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the City of San Diego is confined to a review only and does not relieve me, as Engineer of Work of my responsibility for project design.

ENGINEER OF WORK:

Civil Landworks Corporation
110 Copperwood Way Suite P,
Oceanside CA, USA 92058

______________________________ 7-10-18

David V. Caron — Date

R.C.E. 70066

Exp. 9-30-18

REFERENCES

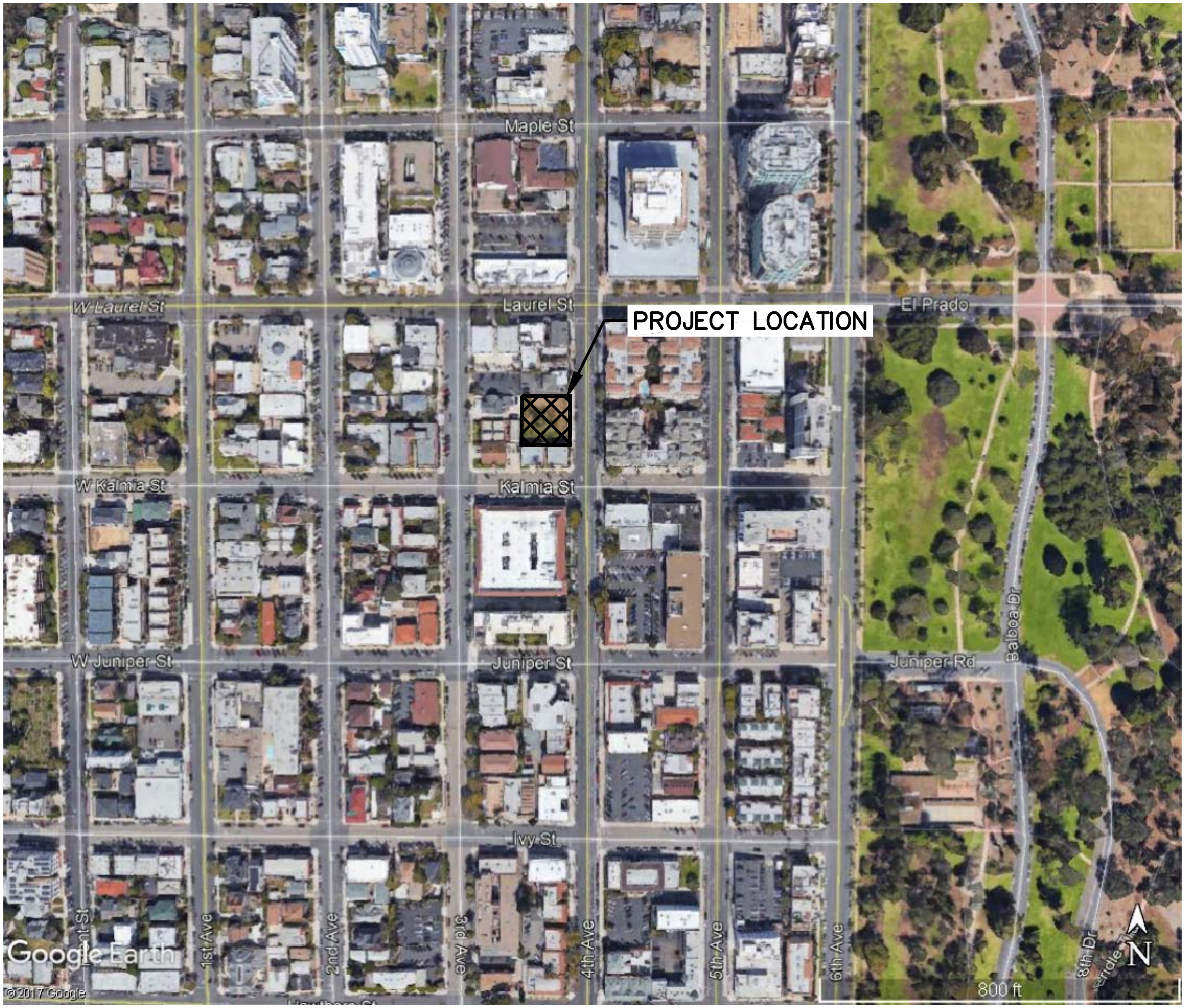
1. City of San Diego Drainage Design Manual (January 2017).
2. CIVILCADD/CIVILDESIGN Engineering Software, © 1991-2006 Version 7.6. City of San Diego Method.

ATTACHMENT 1

LOCATION MAP

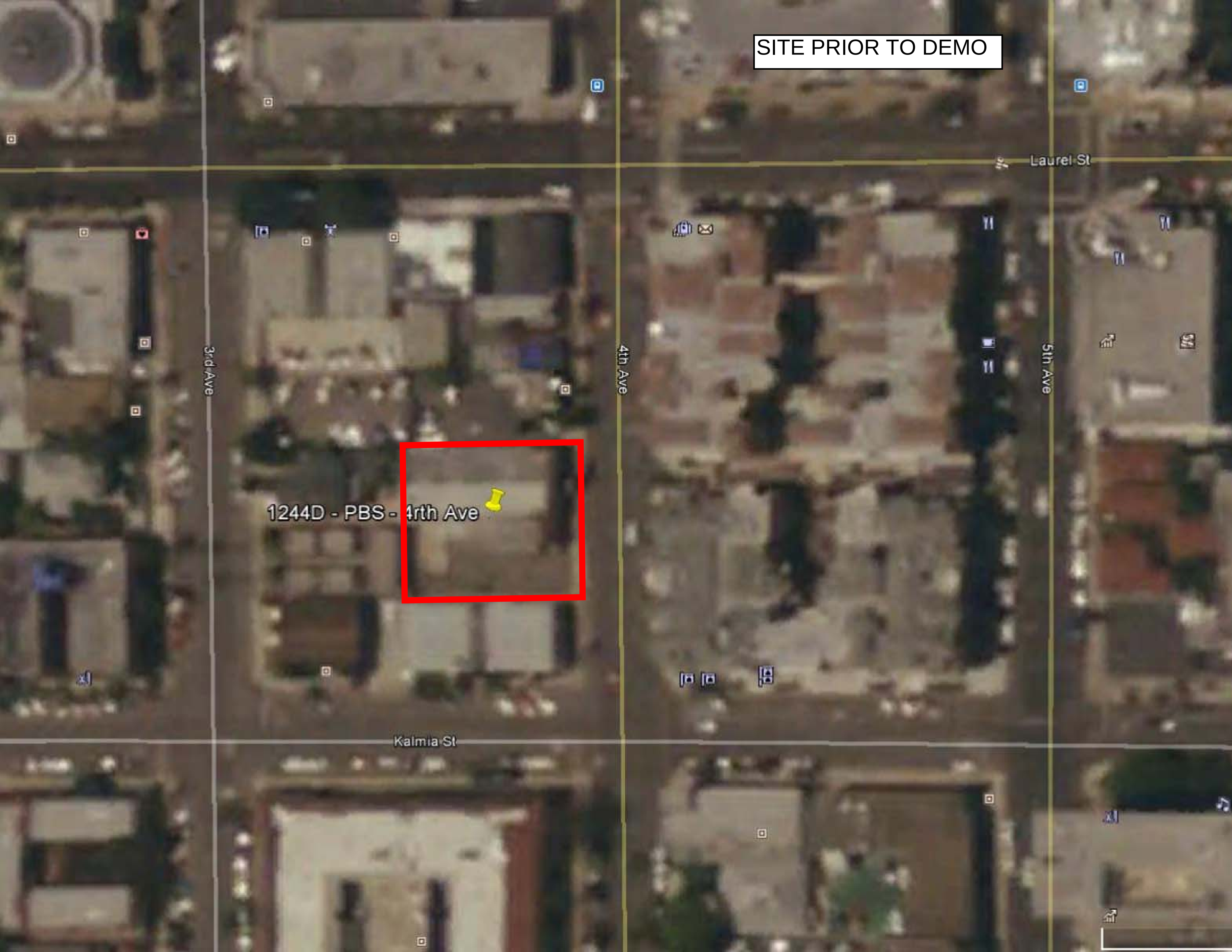
SITE LOCATION MAP

DATE: 11/22/17	4TH AVE	
SCALE: NTS		DRAWN BY: A. GRISWOLD



SITE VICINITY MAP

DATE: 11/22/17	4TH AVE	
SCALE: NTS		DRAWN BY: A. GRISWOLD


SITE PRIOR TO DEMO
Laurel St
3rd Ave
4th Ave
5th Ave
1244D - PBS - 4rth Ave
Kalmia St

ATTACHMENT 2

CITY OF SAN DIEGO MANUAL EXCERPTS

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C) Soil Type (1)
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial (2)	
80% Impervious	0.85
Industrial (2)	
90% Impervious	0.95

Note:
(1) Type D soil to be used for all areas.
(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

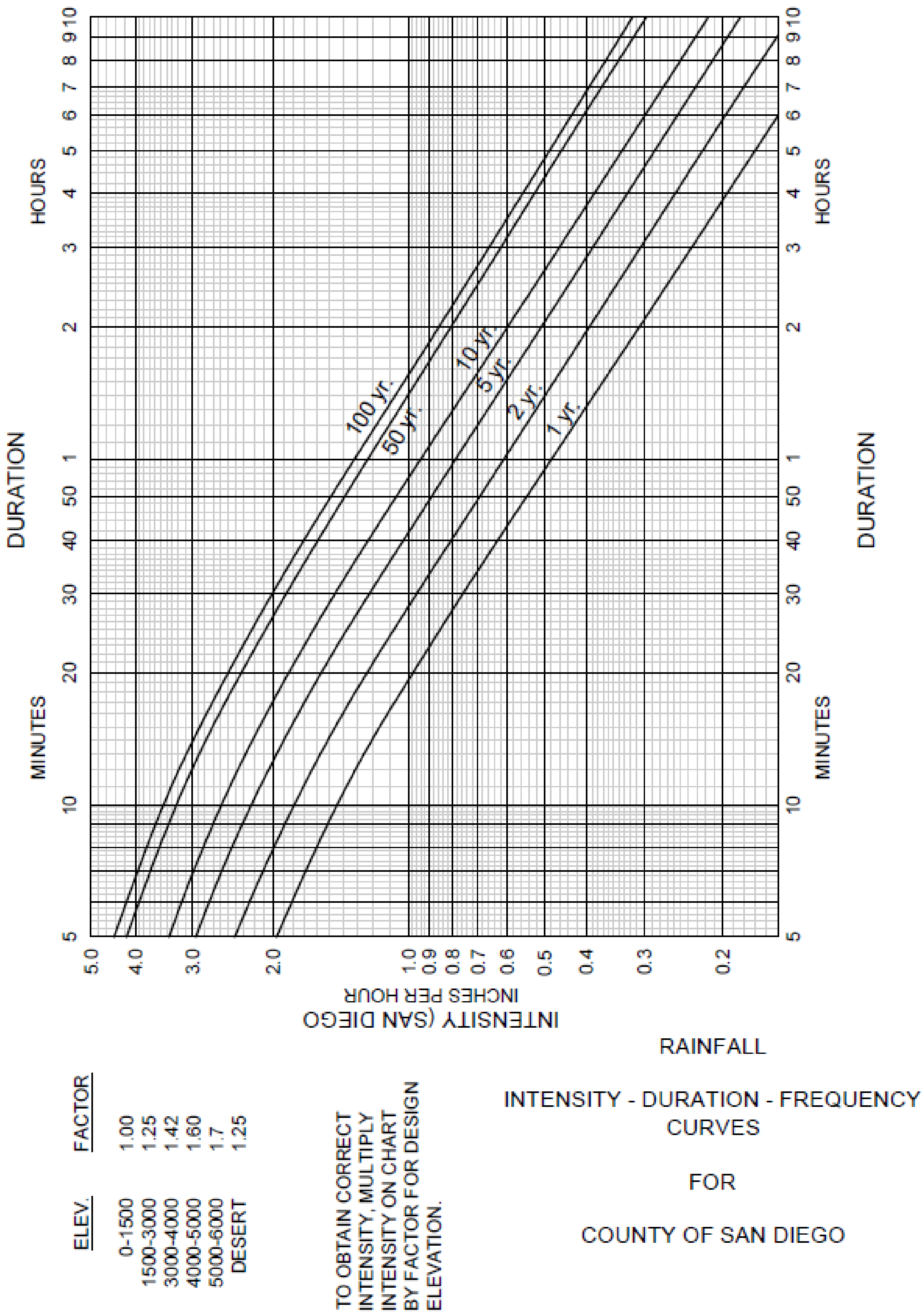


Figure A-1. Intensity-Duration-Frequency Design Chart

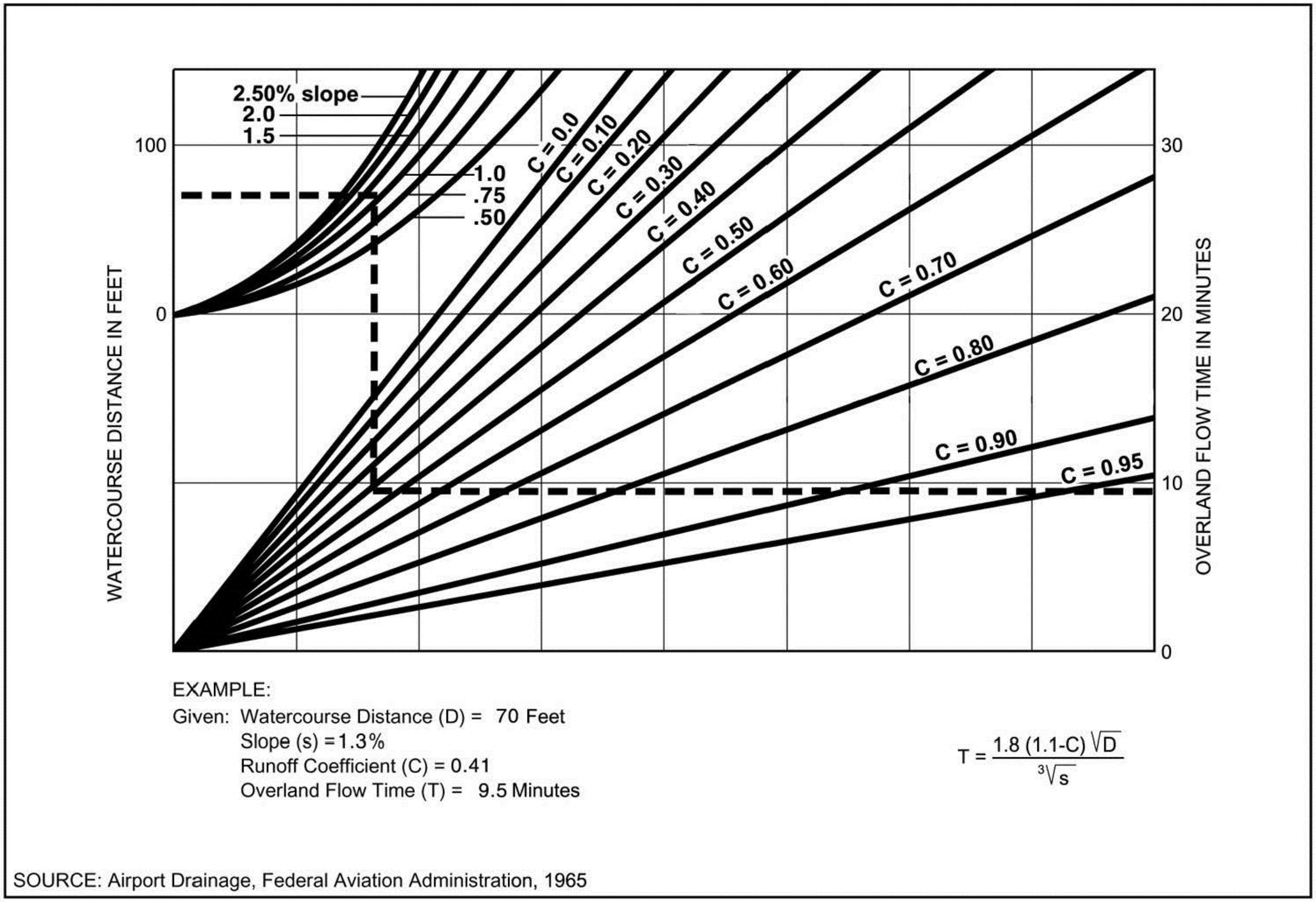


Figure A-4. Rational Formula – Overland Time of Flow Nomograph

<u>**Note**</u>: Use formula for watercourse distances in excess of 100 feet.

A.2. Modified Rational Method (MRM; for Junction Analysis)

The purpose of this section is to describe the steps necessary to develop a hydrology report for a small watershed using the MRM. It is necessary to use the MRM if the watershed contains junctions of independent drainage systems. The process is based on the design manuals of the City/County of San Diego. The general process description for using this method is described below.

The engineer should only use the MRM for drainage areas up to approximately 1 square mile in size. If the watershed will significantly exceed 1 square mile then the NRCS method described in Appendix B should be used.

A.2.1. Modified Rational Method General Process Description

The general process for the MRM differs from the RM only when a junction of independent drainage systems is reached. The peak Q, T_c, and I for each of the independent drainage systems at the point of the junction are calculated by the RM. The independent drainage systems are then combined using the MRM procedure described below. The peak Q, T_c, and I for each of the independent drainage systems at the point of the junction must be calculated prior to using the MRM procedure to combine the independent drainage systems, as these values will be used for the MRM calculations. After the independent drainage systems have been combined, RM calculations are continued to the next point of interest.

A.2.2. Procedure for Combining Independent Drainage Systems at a Junction

1. Calculate the peak Q, T_c, and I for each of the independent drainage systems at the point of the junction. These values will be used for the MRM calculations.
2. At the junction of two or more independent drainage systems, the respective peak flows are combined to obtain the maximum flow out of the junction at T_c. Based on the approximation that total runoff increases directly in proportion to time, a general equation may be written to determine the maximum Q and its corresponding T_c using the peak Q, T_c, and I for each of the independent drainage systems at the point immediately before the junction. The general equation requires that contributing Qs be numbered in order of increasing T_c.
3. Let Q_1, T_1, and I_1 correspond to the tributary area with the shortest T_c. Likewise, let Q_2, T_2, and I_2 correspond to the tributary area with the next longer T_c, Q_3, T_3, and I_3 correspond to the tributary area with the next longer T_c, and so on. When only two independent drainage systems are combined, leave Q_3, T_3, and I_3 out of the equation. Combine the independent drainage systems using the junction equation (see Equation A-2).

Equation A-2. Junction Equation

$$T_1 < T_2 < T_3$$

$$Q_{T1} = Q_1 + \frac{T_1}{T_2} Q_2 + \frac{T_1}{T_3} Q_3$$

$$Q_{T2} = Q_2 + \frac{I_2}{I_1} Q_1 + \frac{T_2}{T_3} Q_3$$

$$Q_{T3} = Q_3 + \frac{I_3}{I_1} Q_1 + \frac{I_3}{I_2} Q_2$$

4. Calculate Q_{T1}, Q_{T2}, and Q_{T3}. Select the largest Q and use the T_c associated with that Q for further calculations (see the three Notes for options). If the largest calculated Q's are equal (e.g., $Q_{T1} = Q_{T2} > Q_{T3}$), use the shorter of the T_cs associated with that Q.
5. This equation may be expanded for a junction of more than three independent drainage systems using the same concept. The concept is that when Q from a selected subarea (e.g., Q_2) is combined with Q from another subarea with a shorter T_c (e.g., Q_1), the Q from the subarea with the shorter T_c is reduced by the ratio of the I's (I_2/I_1); and when Q from a selected subarea (e.g., Q_2) is combined with Q from another subarea with a longer T_c (e.g., Q_3), the Q from the subarea with the longer T_c is reduced by the ratio of the T_cs (T_2/T_3).

The following notes should be considered:

<u>Note #1</u>: At a junction of two independent drainage systems that have the same T_c, the tributary flows may be added to obtain the Q_p.

$$Q_p = Q_1 + Q_2\text{; when } T_1 = T_2\text{; and } T_c = T_1 = T_2$$

This can be verified by using the junction equation above. Let Q_3, T_3, and $I_3 = 0$. When T_1 and T_2 are the same, I_1 and I_2 are also the same, and T_1/T_2 and $I_2/I_1 = 1$. T_1/T_2 and I_2/I_1 are cancelled from the equations. At this point, $Q_{T1} = Q_{T2} = Q_1 + Q_2$.

<u>Note #2</u>: In the upstream part of a watershed, a conservative computation is acceptable. When the times of concentration are relatively close in magnitude (within 10%), use the shorter T_c for the intensity and the equation $Q = \Sigma(CA)I$.

ATTACHMENT 3

EXISTING HYDROLOGY CALCULATIONS

AREA CALCULATIONS

EXISTING HYDROLOGIC BASINS

Basin Number	Total Area SF	Total Area Acres	Impervious Area SF	Landscape Area SF	Pervious Pavers SF	Percent Impervious	C Value Weighted
EX-1	5,526	0.127	0	5,526	0	0.00%	0.55
EX-2	4,523	0.104	0	4,523	0	0.00%	0.55
TOTAL	10,049	0.231	0	10,049	0		

Based on Soil Type D

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 04/24/18
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6313

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                     ]
Initial subarea flow distance  =   50.000(Ft.)
Highest elevation =  237.900(Ft.)
Lowest elevation =  234.000(Ft.)
Elevation difference =    3.900(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.53 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(  50.000^.5)/(   7.800^(1/3)]=   3.53
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.298(CFS)
Total initial stream area =        0.127(Ac.)
End of computations, total study area =           0.127 (Ac.)
```

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 04/24/18

********* Hydrology Study Control Information **********

Program License Serial Number 6313

Rational hydrology study storm event year is 50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity) = 1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method

++
Process from Point/Station 201.000 to Point/Station 202.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type]
Initial subarea flow distance = 41.000(Ft.)
Highest elevation = 237.500(Ft.)
Lowest elevation = 232.100(Ft.)
Elevation difference = 5.400(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 2.68 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(41.000^.5)/(13.171^(1/3)]= 2.68
Setting time of concentration to 5 minutes
Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff = 0.244(CFS)
Total initial stream area = 0.104(Ac.)
End of computations, total study area = 0.104 (Ac.)

ATTACHMENT 4

PROPOSED HYDROLOGY CALCULATIONS

AREA CALCULATIONS

PROPOSED HYDROLOGIC BASINS

Basin Number	Total Area SF	Total Area Acres	Impervious Area SF	Landscape Area SF	Pervious Pavers SF	Percent Impervious	C Value Weighted
PR-1	10,049	0.231	9,481	568	0	94%	0.99
TOTAL	10,049	0.231	9,481	568	0	94%	

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 04/25/18
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 6313

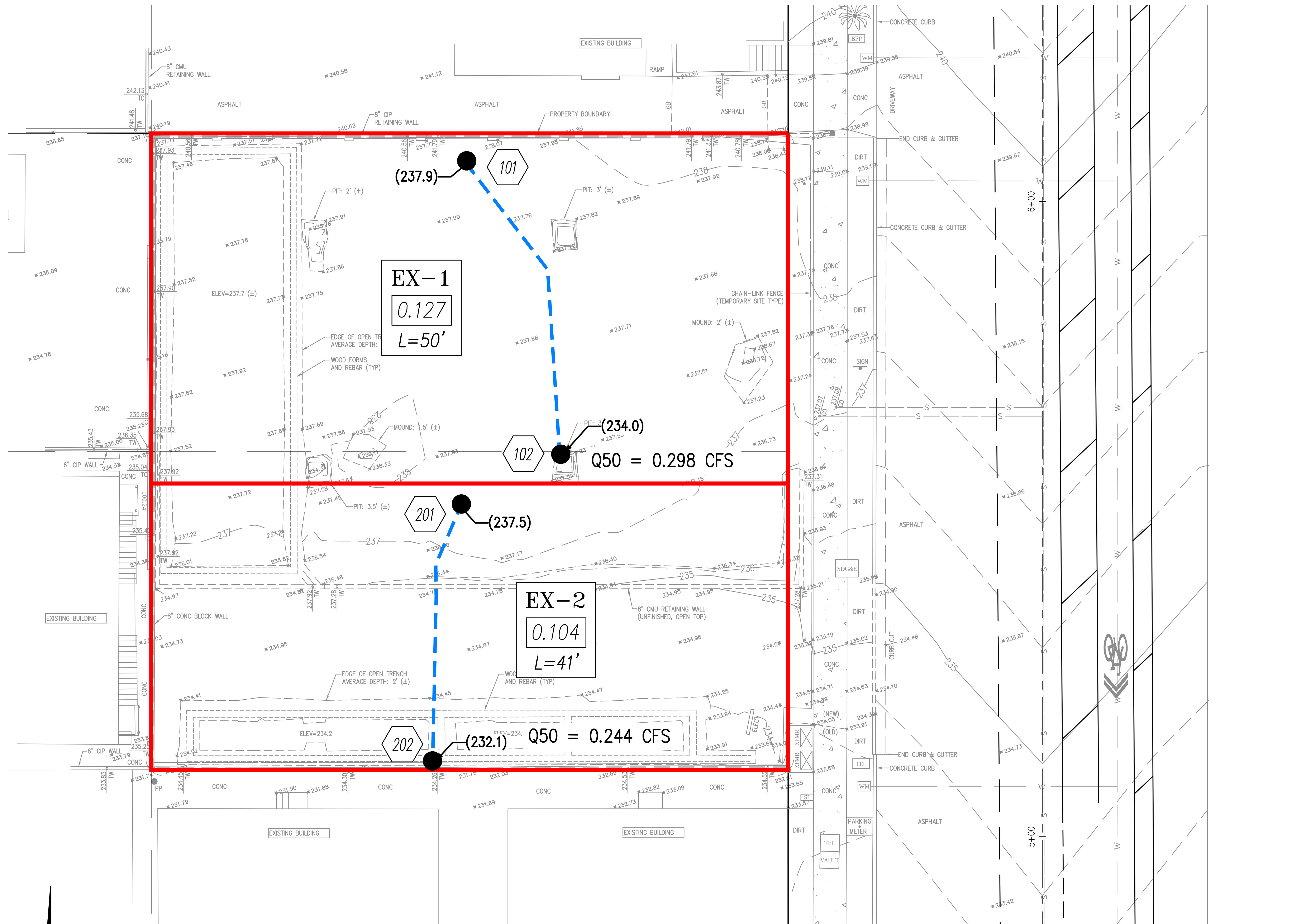
------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.990 given for subarea
Initial subarea flow distance  =  106.000(Ft.)
Highest elevation =  300.860(Ft.)
Lowest elevation =  299.860(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.08 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9900)*( 106.000^.5)/(   0.943^(1/3)]=   2.08
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.990
Subarea runoff =      0.975(CFS)
Total initial stream area =        0.231(Ac.)
End of computations, total study area =          0.231 (Ac.)
```

ATTACHMENT 5

HYDROLOGY MAP - EXISTING CONDITIONS



LEGEND

	SUBDIVISION BOUNDARY
200	EXISTING CONTOUR (MAJOR)
	EXISTING CONTOUR (MINOR)
	HYDROLOGIC BASIN BOUNDARY
	HYDROLOGIC FLOW PATH
EX−1	BASIN NUMBER
0.20	AREA (ACRES)
101	NODE NUMBER
(200.00)	ELEVATION (FEET)

10 0 10 20

GRAPHIC SCALE
SCALE: 1" = 10'

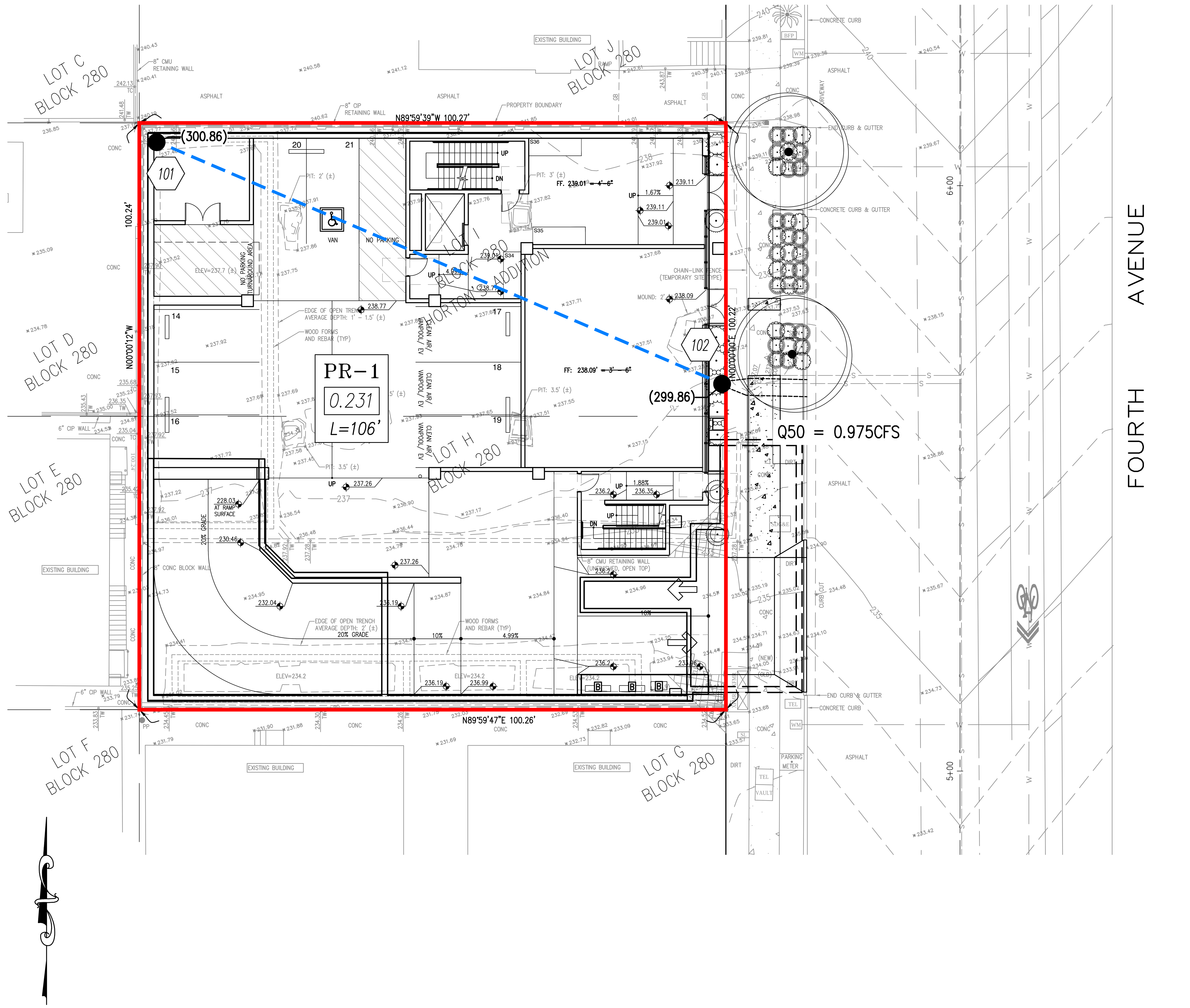
Civil Landworks
110 COPPERWOOD WAY, SUITE P, OCEANSIDE, CA 92058
PH: 760-908-8745 • info@civillandworks.com

4/24/18

ATTACHMENT 5
EXISTING HYDROLOGIC CONDITIONS

ATTACHMENT 6

HYDROLOGY MAP - PROPOSED CONDITIONS



LEGEND

	SUBDIVISION BOUNDARY
200	EXISTING CONTOUR (MAJOR)
	EXISTING CONTOUR (MINOR)
200	PROPOSED CONTOUR (MAJOR)
	PROPOSED CONTOUR (MINOR)
	HYDROLOGIC BASIN BOUNDARY
	HYDROLOGIC FLOW PATH
	STORM DRAIN PIPE FLOW PATH
PR-1	BASIN NUMBER
0.20	AREA (ACRES)
102	NODE NUMBER
(200.00)	ELEVATION (FEET)

GRAPHIC SCALE
SCALE: 1" = 10'

ATTACHMENT 6
PROPOSED HYDROLOGIC CONDITIONS

Civil Landworks
110 COPPERWOOD WAY, SUITE P, OCEANSIDE, CA 92058
PH: 760-908-8745 • info@civillandworks.com

8/21/18

EXTERIOR ACOUSTICAL SITE ASSESSMENT
CCR TITLE 24 INTERIOR NOISE SURVEY
FOURTH AVENUE APARTMENTS
SAN DIEGO, CA

Submitted to:

Mr. Rudy Medina
Next Space Development
2820 Shelter Island Drive
San Diego, CA 92106

Investigative Science and Engineering, Inc.
Scientific, Environmental, and Forensic Consultants

P.O. Box 488
Ramona, CA 92065
(760) 787-0016
www.ise.us

Investigative Science and Engineering, Inc.

ISE Project #17-008

December 19, 2018 (Revised)

REPORT CONTENTS

LIST OF TABLES

LIST OF FIGURES / MAPS / ADDENDA

INTRODUCTION AND DEFINITIONS

Existing Site Characterization

The proposed Fourth Avenue Apartments project site consists of 0.23 acres of undeveloped land located in the City of San Diego, as shown in Figures 1 and 2 on the following pages. Regional access is obtained from Fourth Avenue, via either Laurel or Kalmia Streets, to the north and south respectively.[1] The project site currently resides as a rough graded lot, as shown in Figure 3 on Page 4.

Surrounding land uses consist of single- and multi-family residential infill, commercial and professional reuses, and shopkeeper/condominium structures. Elevations across the project site range from approximately 241 to 248 feet above mean sea level (MSL).

Project Description

The proposed project would construct a mixed-use development consisting of 36 multi-family residential apartment units and a single 1,085 square-foot first floor commercial space, as shown in Figure 4 on Page 5 of this report. Parking would be provided through an underground podium structure roughly 15-feet below street grade.

Acoustical Definitions and Theory

Sound waves are linear mechanical waves. They can be propagated in solids, liquids, and gases. The material transmitting such a wave oscillates in the direction of propagation of the wave itself. Sound waves originate from some sort of vibrating surface, alternatively compressing the surrounding air on a forward movement, and expanding it on a backward movement. There is a large range of frequencies within which linear waves can be generated, sound waves being confined to the frequency range that can stimulate the auditory organs to the sensation of hearing. For humans, this range is from about 20 Hertz (Hz or cycles per second) to about 20,000 Hz. The air transmits these frequency disturbances outward from the source of the wave.

Noise can be represented as a superposition of periodic waves with a large number of components, and is generally defined as unwanted or annoying sound that is typically associated with human activity, and which interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise, the perceived importance of the noise and its appropriateness in the setting, the time of day, and the sensitivity of the individual hearing the sound.

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[1] Addressed as 2426 Fourth Avenue, San Diego CA 92101, APN 533-106-13-00.

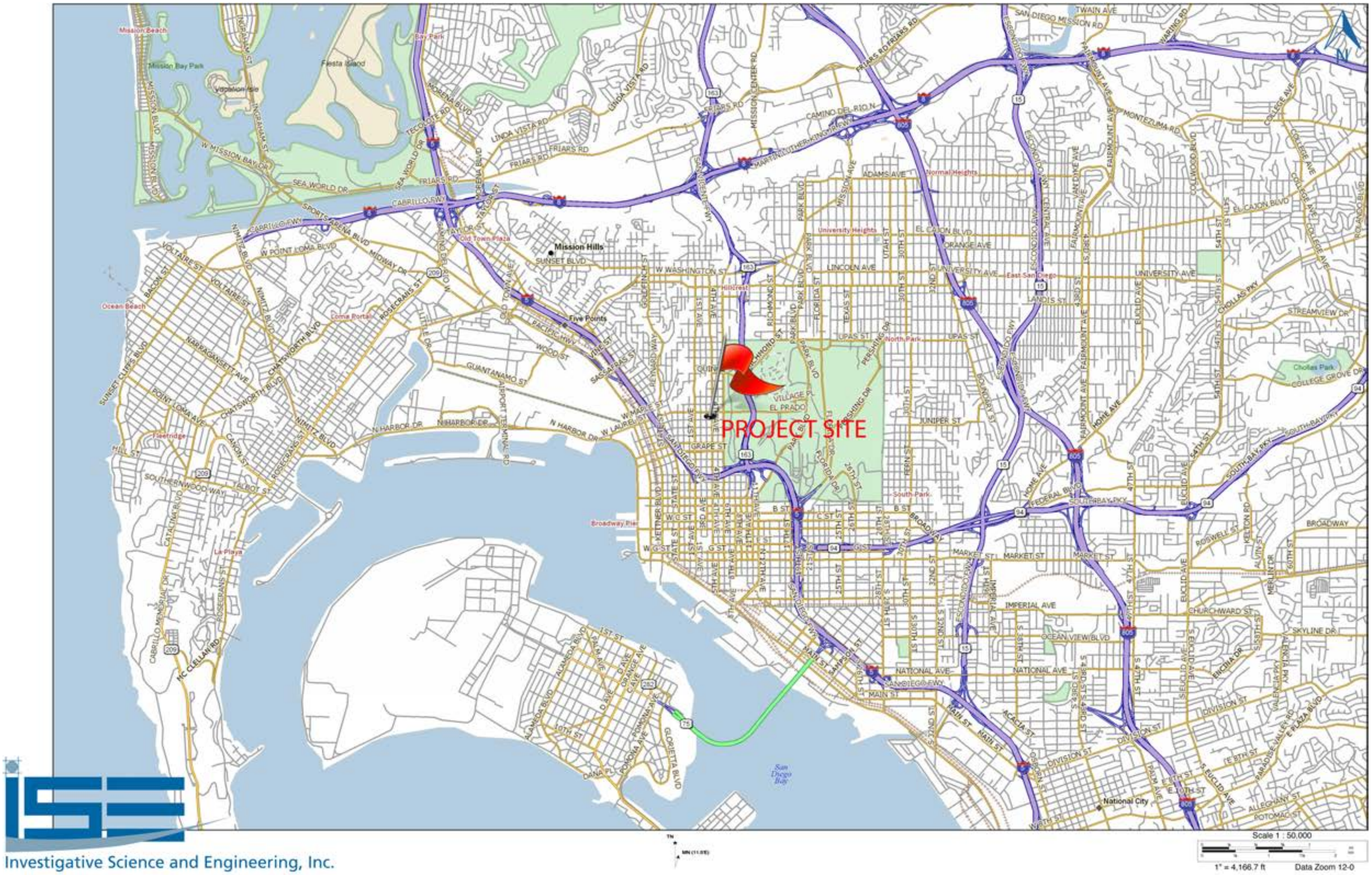

FIGURE 1: Project Vicinity Map (ISE 12/17)

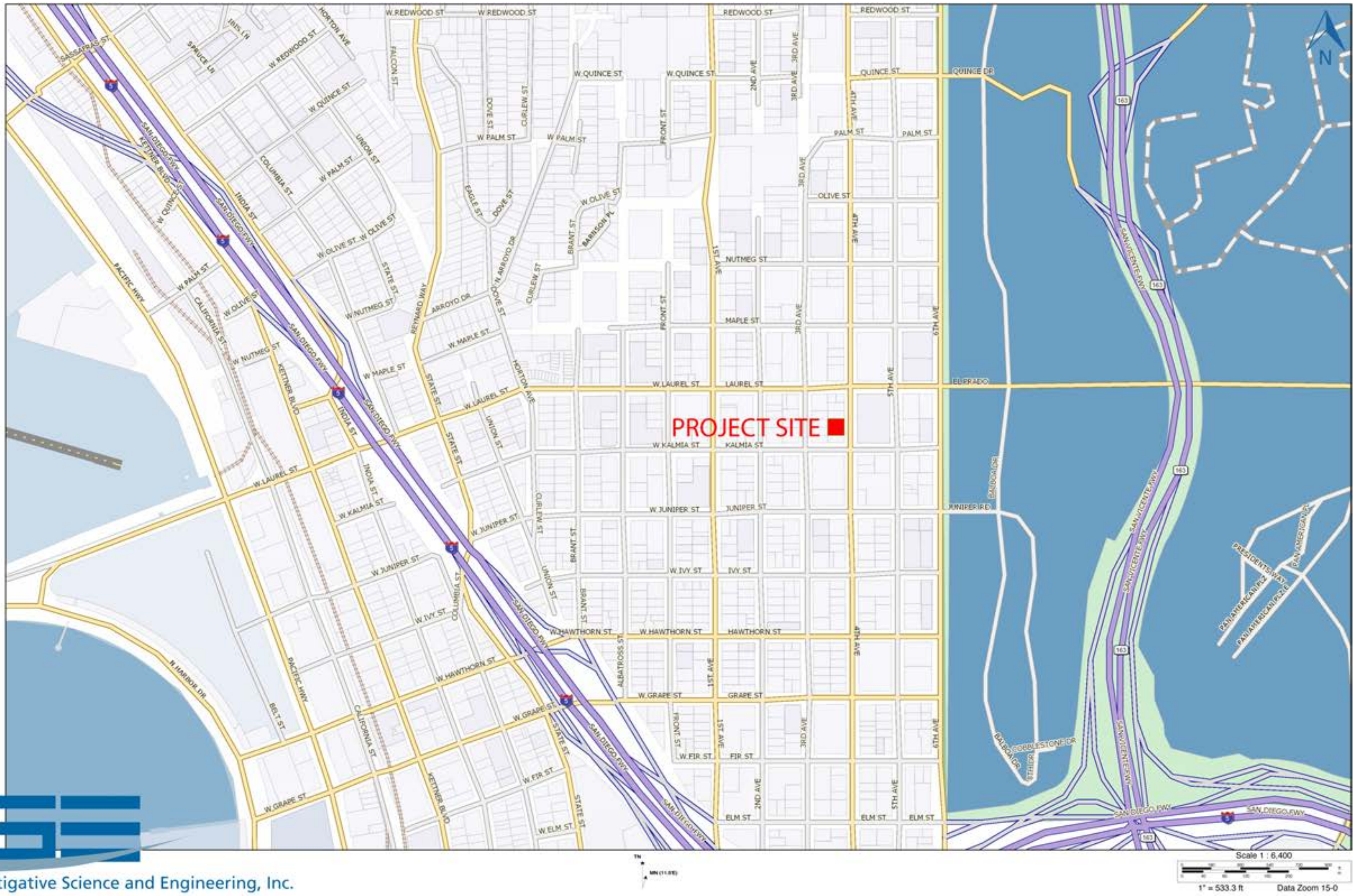

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FIGURE 2: Project Parcel Map (ISE 12/17)

View Looking East Towards Fourth Avenue

View Looking Northwest Towards Rear of Property

FIGURE 3: Project Area Panoramic Photographs (ISE 12/17)

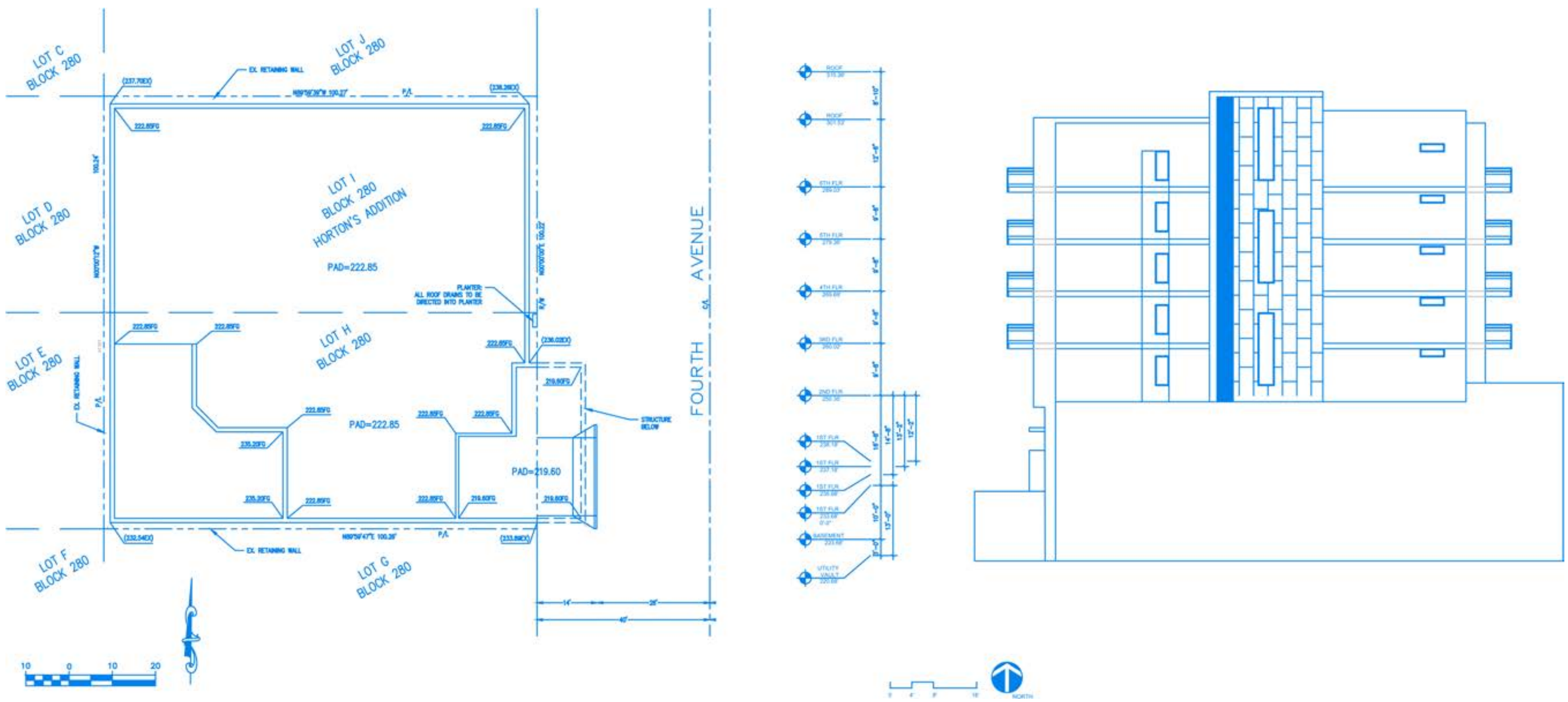


FIGURE 4: Project Site Development Plan (Civil Landworks / ACRM, 12/17)

The loudest sounds that the human ear can hear comfortably are approximately one trillion (or $1x10^{12}$) times the acoustic energy that the ear can barely detect. Because of this vast range, any attempt to represent the acoustic intensity of a particular sound on a linear scale becomes unwieldy. As a result, a logarithmic ratio, originally conceived for radio work, known as the decibel (dB), is commonly employed.[2]

A sound level of zero “0” dB is scaled such that it is defined as the threshold of human hearing, and would be barely audible to a human of normal hearing under extremely quiet listening conditions. Sound levels above 120 dB roughly correspond to the threshold of pain. The minimum change in sound level that the human ear can detect is approximately 3.0 dBA.[3] A change in sound level of 10 dB is usually perceived by the average person as a doubling (or halving) of the sound’s loudness.[4] A change in sound level of 10 dB actually represents an approximate 90 percent change in the sound intensity, but only about a 50 percent change in the perceived loudness. This is due to the nonlinear response of the human ear to sound.

As mentioned above, most of the sounds we hear in the environment do not consist of a single frequency, but rather a broad band of frequencies differing in sound level. The intensities of each frequency add to generate the sound we hear. The method commonly used to quantify environmental sounds, consists of determining all of the frequencies of a sound according to a weighting system that reflects the nonlinear response characteristics of the human ear. This is called "A" weighting, and the decibel level measured is called the A-weighted sound level (or dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

Although the A-weighted sound level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of sounds from distant sources that create a relatively steady background noise in which no particular source is identifiable. For this type of noise, a single descriptor called the L_{eq} (or equivalent sound level) is used. L_{eq} is the energy-mean A-weighted sound level during a measured time interval, and would be defined mathematically by the following continuous integral,

$$L_{eq} = 10Log_{10}\left[\frac{1}{T}\int_{0}^{T} SPL(t)^2\,dt\right]$$

[2] A unit used to express the relative magnitude of a sound wave. This level is defined as being equal to 20 times the common logarithm of the ratio of the pressure produced by a sound wave of interest, to a ‘reference’ pressure wave equal to 20 micro Pascal’s (μPa) measured at a distance of 1 meter. 20 μPa is the smallest amount of pressure capable of producing the sensation of hearing in a human.

[3] Every 3 dB equates to a 50% drop (or increase) in wave strength; therefore a 6 dB drop/increase = a loss/increase of 75% of total signal strength and so on.

[4] This is a subjective reference based upon the nonlinear nature of the human ear.

In the previous expression, L_{eq} is the energy equivalent sound level, t is the independent variable of time, T is the total time interval of the event, and SPL is the sound pressure level *re. 20 µPa*. Thus, L_{eq} is the 'equivalent' constant sound level that would have to be produced by a given source to equal the average of the fluctuating level measured. For most acoustical studies, the study interval is generally taken as one-hour and the abbreviation used is $L_{eq\text{-}h}$ or *Leq-h;* however, other time intervals are utilized depending on the jurisdictional preference.

The aggregate of all community noise events are typically averaged into a single value known as the *Community Noise Equivalent Level* (CNEL). This descriptor is calculated by averaging all events over a specified time interval, and applying a 5-dBA penalty to any sounds occurring between 7:00 p.m. and 10:00 p.m., and a 10-dBA penalty to sounds that occur during nighttime hours (i.e., 10 p.m. to 7 a.m.). This penalty is applied to compensate for the increased sensitivity to noise during the quieter nighttime hours.

Mathematically, CNEL can be derived based upon the hourly L_{eq} values, via the following expression where, '$L_{eq}(x)_i$' is the equivalent sound level during period '*x*' at time interval 'i', and 'n' is the number of time intervals:

$$CNEL = 10Log_{10}\frac{1}{n}\sum_{i=1}^{n}\left(10^{\frac{Leq(day)_i}{10}} + 10^{\frac{Leq(evening+5)_i}{10}} + 10^{\frac{Leq(night+10)_i}{10}}\right)$$

Additionally, a sound insulation parameter known as the Sound Transmission Class (or STC) of a wall, window, or ceiling assembly is defined as the acoustic transmission of a structural assembly at a frequency of 500 Hertz with respect to a *reference transmission curve*.

The use of a single-number transmission rating (such as the STC) correlates in a general way with subjective impressions of sound transmission for speech, radio, television, and similar sources of noise in buildings through a single path (i.e., a directed path). The "reference curve" to which the actual transmission is compared, is based upon the above noise sources within the one-third octave frequency bands of 125 to 4,000 Hertz.[5]

[5] In some cases, it is important to measure the distribution of sound pressure as a function of frequency. Under these circumstances, the incoming sound wave is passed through a series of band pass filters having predefined frequencies where they are resonant. The relative response of each filter (in dB, dBA, etc.) directly corresponds to the amount of sound energy present at that particular frequency. In standard acoustics two unique filter sets are used to accomplish this task, namely the 1/1 octave band and 1/3 octave band set. An octave is defined as the interval between any two frequencies having a ratio of 2 to 1.

By definition, a whole octave filter (1/1) is a band-pass filter having a bandwidth equal to 70.7-percent of its center frequency (i.e., the frequency of interest) distributed across 11 bands between 11 Hz and 22,700 Hz (the effective audio frequency range). A 1/3 Octave Band filter has a bandwidth equal to 23.1% of its center frequency, distributed across 32 bands between 14.1 Hz and 22,390 Hz. Thus, the octave band frequencies would be 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hz. The corresponding 1/3 octave band frequencies would be 16, 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, 10000, 12500, 16000 and 20000 Hz.

The STC rating can be used to compare the potential sound insulation of structural assemblies tested in a laboratory setting or between different rooms in an as-built structure. The rating for a partition built and tested in a building may be lower than that obtained for a partition tested in a laboratory because of flanking transmission and construction errors. Table 1 below summarizes the relative effectiveness of the STC descriptor as a measure of sound attenuation in a structure.

TABLE 1: Common STC Ratings and Insulation Effectiveness

STC Rating	Privacy Afforded
25	Normal speech understood at close distances
30	Normal speech audible, but unintelligible
35	Loud speech understood
40	Loud speech audible, but unintelligible
45	Loud speech barely audible
50	Shouting barely audible
55	Shouting not audible

APPLICABLE NOISE STANDARDS

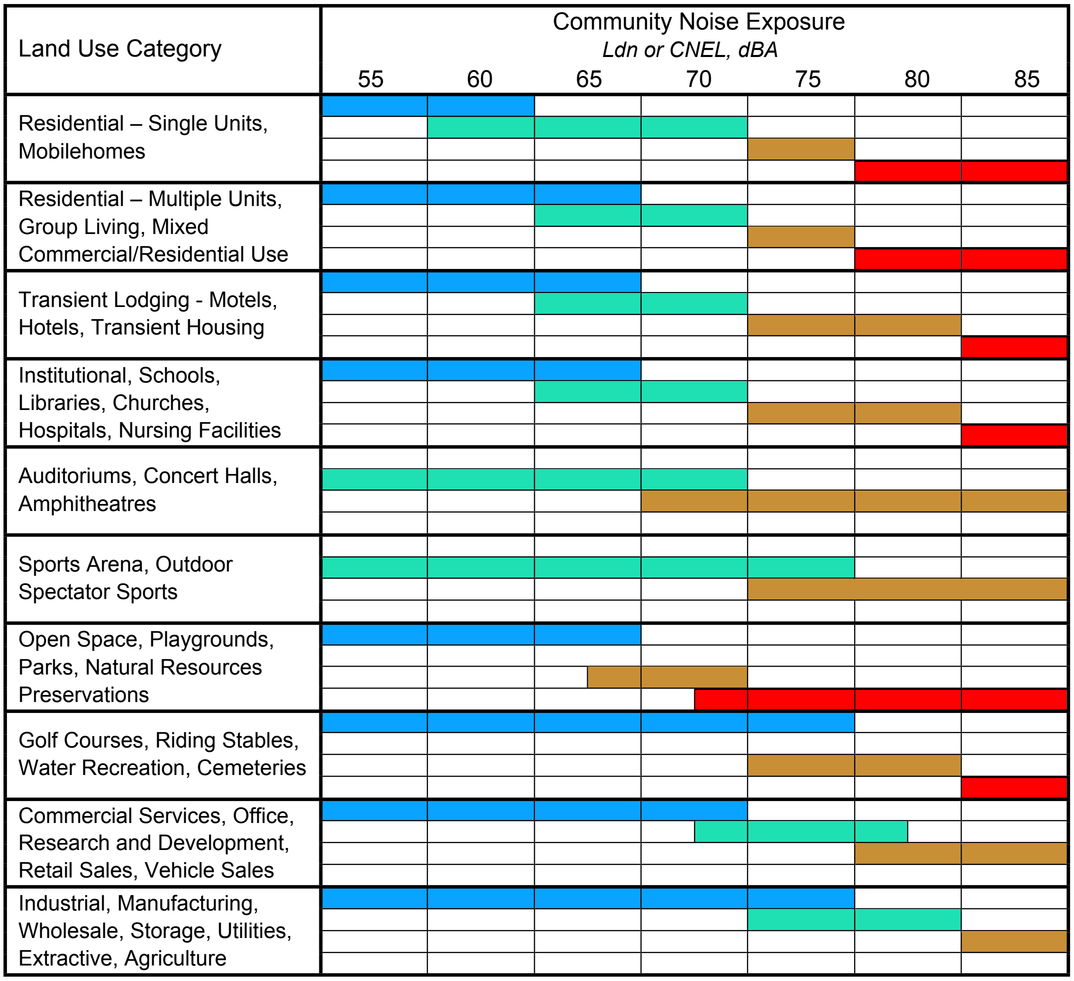
City of San Diego General Plan Regulations

The City of San Diego General Plan Noise Element identifies land use compatibility within the City based upon the annual CNEL from transportation sources as shown in Table 2 on the following page. Based upon these guidelines, residential and other sensitive areas (such as parks and schools) are considered compatible with maximum exterior noise levels of up to 65 dBA CNEL. Noise sensitive areas would typically consist of rear and side yards for single- family dwellings and outdoor congregation/recreation areas for multi-family uses, schools, and parks.

City of San Diego Construction Noise Ordinance

Construction noise within the City of San Diego is governed by the municipal code noise ordinance Section 59.5.0404. Construction noise is limited to an average of 75 dBA during the 12-hour period from 7:00 a.m. to 7:00 p.m. Monday through Saturday, as measured at, or beyond, the property lines of any residentially zoned property. Exceptions are only allowed by permit. Thus, for the purposes of analysis within this report, the maximum allowable noise construction threshold would be 75 dBA Leq_{12h} between the hours of 7:00 a.m. to 7:00 p.m.

TABLE 2: City of San Diego General Plan Land Use Compatibility Matrix



Normally Acceptable
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and necessary noise insulation features included in the design. Conventional construction, with closed windows and fresh air supply systems or air conditioning will normally suffice.

Normally Unacceptable
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and necessary noise insulation features included in the design.

Clearly Unacceptable
New construction or development should generally not be undertaken.

City of San Diego Municipal Code Operational Noise Standards

Property line noise thresholds are established in the City of San Diego Noise Ordinance, Section 59.5.0401. The relevant limits are shown below in Table 3. The applicable requirement is a function of the time-of-day and land use zone. Sound levels are measured at the boundary of the property containing the noise source. The property line standard for cases where the zoning differs between land uses is to utilize the arithmetic mean of the two standards.

TABLE 3: City of San Diego One-Hour Property Line Standards

Receiving Land Use Category	7:00 a.m. - 7:00 p.m.	7:00 p.m. - 10:00 p.m.	10:00 p.m. - 7:00 a.m.
Single Family Residential	50 dBA	45 dBA	40 dBA
Multi-Family Residential	55 dBA	50 dBA	45 dBA
All Other Residential	60 dBA	55 dBA	50 dBA
Commercial	65 dBA	60 dBA	60 dBA
Industrial or Agricultural	75 dBA	75 dBA	75 dBA

The project site is zoned CC-3-9 with surrounding uses having the same zoning, or a similar use zone of CC-3-6. Thus, the applicable property line noise standard would be 65 dBA Leq-h between the hours of 7 a.m. and 7 p.m., and 60 dBA Leq-h for all other times.

State of California CCR Title 24 Noise Isolation Standards

The California Code of Regulations (CCR), State Building Code, Part 2, Title 24, Appendix Chapter 35; "*Noise Insulation Standards for Multifamily Housing*" requires that multi-family dwellings, hotels, and motels located where the CNEL exceeds 60 dBA, require an acoustical analysis showing that the proposed design will limit interior noise to less than 45 dBA CNEL for all residential spaces.[6]

Worst-case noise levels, either existing or future, must be used. The City of San Diego has adopted the CCR Title 24 standards and applies them equally to all residential dwellings. The standard is not applicable to the commercial component of the proposed project.

[6] This standard is also codified in the 2013 version of the California Code of Regulations, Title 24, Part 2, Volume 1, Chapter 12 – Interior Environment, Section 1207 et. seq.

APPROACH AND METHODOLOGY

Field Acoustical Reconnaissance

Onsite acoustical monitoring was performed on December 13, 2017 between approximately 11:30 a.m. and 12:30 p.m. for the purpose of determining the ambient baseline community noise levels during normal free-flow weekday traffic conditions. The instrumentation location, denoted as Monitoring Location ML 1, is shown in Figure 5 on the following page.

For the field monitoring effort, a Quest SoundPro SP-DL-2 ANSI Type 2 integrating sound level meter was used as the data collection device. The meter was affixed to a tripod five-feet above ground level, in order to simulate the noise exposure of an average-height human being. Photos of the test setup are shown in Figure 6 on Page 13. All equipment was calibrated in accordance with ANSI S1-4 1983 Type 2 and IEC 651 Type 2 standards.[7]

City of San Diego General Plan Exterior Noise Compliance

The *ISE RoadNoise Model version 2.5* based on FHWA-PD-96-010 and FHWA/CA/TL-87/03 standards was used to calculate future onsite vehicular traffic noise levels due to adjacent surface street activity. Source traffic data was obtained using SANDAG horizon year 2035 predictions.[8] The model assumed a 3.0-dBA loss per doubling of distance (DD) propagation rule, and a 95/3/2 mix of automobiles/midsize vehicles/trucks, thereby yielding a worst-case noise contour set. Additionally, due to the close proximity of the site to the 60 dBA CNEL contour for San Diego International Airport (SAN), also known as Lindbergh Field, the project site was examined for aircraft noise impacts from the airfield.

Construction Noise Impact Assessment Approach

Major construction noise emission generators expected within the project site would consist predominately of diesel-powered earthwork equipment required for grading activities, underground work, and surface paving. Construction noise present at the project site was based upon EPA recommended values, and past levels measured by ISE.[9] Cumulative (i.e., worst case aggregate) noise levels were calculated for a range of expected emissions from proposed equipment at the closest sensitive receptor, under spherically-soft ground propagation conditions, and compared against City Noise Ordinance Section 59.5.0404.

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[7] All testing and calibration is performed by ISE's Acoustics and Vibration Laboratory using a rubidium atomic frequency and time standard traceable to National Institute of Standards & Technology (NIST). The calibration signal has a long-term stability of 10^{-10}. Specifications for traceability can be obtained at *www.nist.gov*.

[8] Source: SANDAG Transportation Forecast Information Center (TFIC).

[9] Source: EPA PB 206717, Environmental Protection Agency, 12/31/71, "Noise from Construction Equipment and Operations"

FIGURE 5: Ambient Noise Monitoring Location ML 1 (ISE 12/17)

FIGURE 6: Photos for Ambient Monitoring Station ML 1 (ISE 12/17)

Operational Noise Impact Assessment Approach

Predicted sound emanations from the proposed Fourth Avenue Apartments project site would consist solely of 38 rooftop mounted HVAC units located within the parapet area, as shown in Figure 7 on the following page. These sources were modeled in a three-dimensional fashion using the ISE Industrial Source Model (IS3) v4.1. The IS3 model calculates the predicted acoustic field pattern using a vector-based summation of all source-receptor pairs. The resulting output consists of an isogram containing the predicted acoustic field.

For the analysis, proposed structural features were plotted in GIS using a SPCS coordinate system (CA Zone VI), and incorporated into the model. These features included all onsite structures as well as their applicable parapet elevations. Receptor elevations were modeled at 20 feet above any finished pad elevation, which corresponds roughly to second floor bedroom window heights of adjacent parcels. Acoustical sources were modeled at their full measured and/or published levels, and identified lowest dominant emissive frequency (taken in this case at 250 Hz). A propagation rule consistent with a spherical point source was applied 1.4-feet above the final roof height. The resulting aggregate noise emission contours were compared against City Noise Ordinance Section 59.5.0401 to ascertain property line compliance.

CCR Title 24 Interior Exterior Noise Compliance

The analysis methodology used to examine sound transmission and resultant interior noise levels is identified in the American Society of Testing and Materials (ASTM) guidelines Volume 04.06 entitled, "*Thermal Insulation; Environmental Acoustics*" Test Designation: E 413-87. Acoustical modeling of the project was performed in accordance with the above guidelines, and included corrections for the following parameters:

- Exterior noise level adjustment in front of each building element.
- Exterior noise spectrum placement in front of each building element.
- Correction for building facade reflection (ASTM Standard E 966-84).
- Incident angle source correction (ASTM Standard E 966-84).
- Room absorption correction.
- Building element correction and adjustment (ASTM Standard E 413-87).
- Geometric (sizing) and workmanship (construction error) corrections.

The exterior noise level at the proposed structures is calculated in terms of decibels A-weighted (dBA), and converted to six octave band sound pressure levels at 125, 250, 500, 1000, 2000 and 4000 Hertz. The interior noise level is a function of the sound transmission loss qualities of the construction material, and the surface area of each element (wall, window, door, etc.). The interior noise level also depends upon the room's sound absorption characteristics (in Sabins).

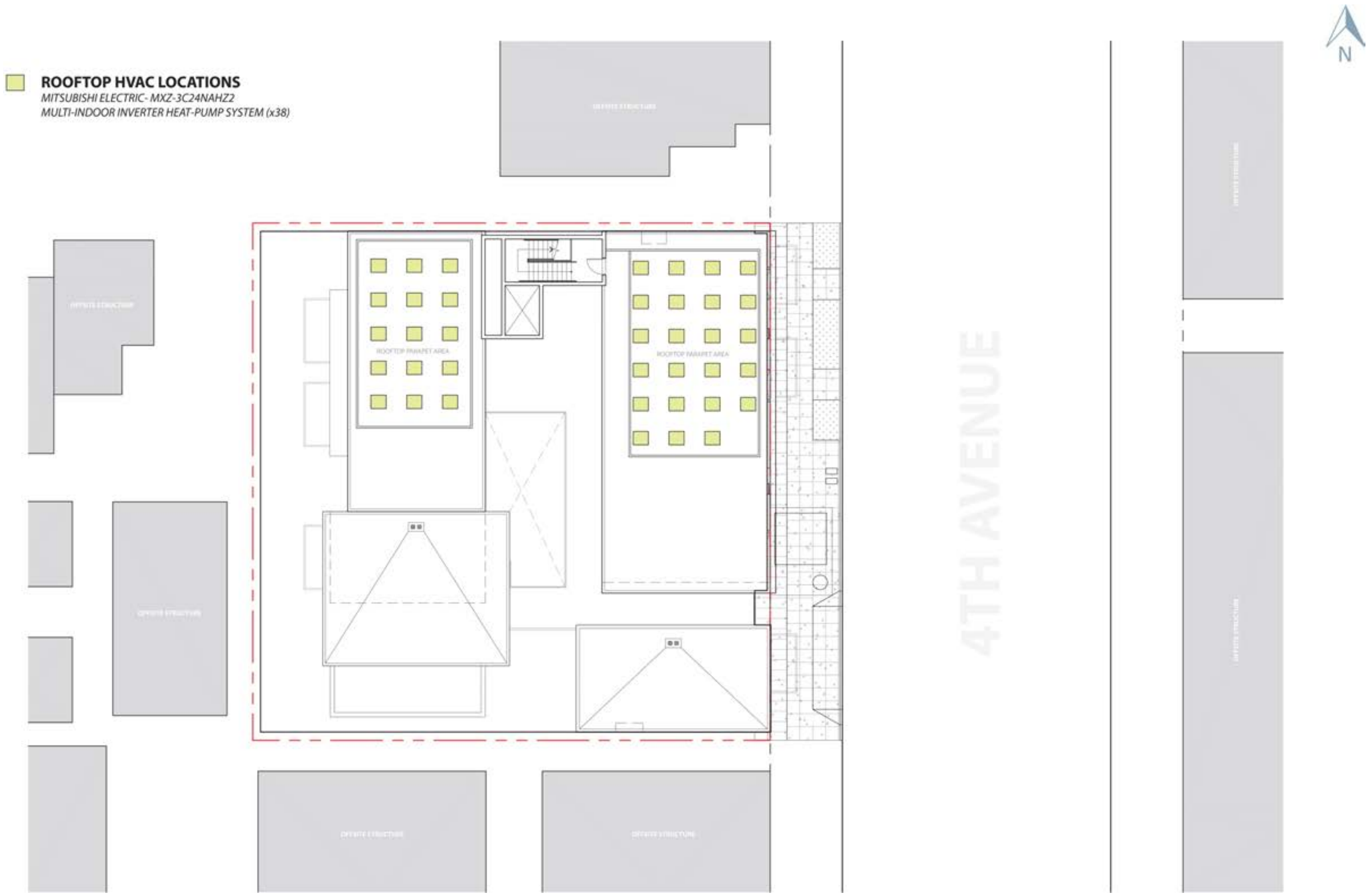

FIGURE 7: Proposed Rooftop HVAC Locations (ACRM 10/18)

Mathematically, the acoustical performance of a structural assembly can be expressed in the form of the following equation,

$$L_{\text{int}_i} = L_{\text{ext}_i} - TL_i - 10Log_{10}(S) - 10Log_{10}(A_i) + F_{\text{corr}} - A_{\text{corr}} + Q_{\text{corr}}$$

Where, L_{int_i} is the interior A-weighted sound level at the ith octave band, L_{ext_i} is the exterior A-weighted sound level at the ith octave band, TL_i is the sound transmission loss at the ith octave band, S is the size of the room façade in square feet, A_i is the total room absorption in Sabins at the ith octave band, and, F_{corr}, A_{corr}, Q_{corr} are the correction factors for the building façade reflection, incident angle, and construction quality.

ISE assumed that the exterior noise levels were calculated for free-field conditions with no interaction between existing offsite structures. A three-decibel (3-dBA) building facade reflection correction was applied to the as-built structure to simulate local reflection effects within the proposed development. The necessary calculations were performed using the *ISE Architectural Acoustical Model (AAM) v3.0* interior noise computation program.

FINDINGS AND RECOMMENDATIONS

Field Acoustical Reconnaissance Findings

The results of the field reconnaissance sound level monitoring are shown in Table 4 below with the field data record provided as an attachment to this report. The values for the equivalent sound level ($L_{eq\text{-}h}$), the maximum and minimum measured sound levels (L_{max} and L_{min}), and the statistical indicators L_{10} and L_{90}, are given for the monitoring location examined.

TABLE 4: Measured Ambient Sound Levels – Fourth Avenue Apartments

		One-Hour Noise Level Descriptors in dBA				
Location	**Start Time**	**L_{eq}**	**L_{max}**	**L_{min}**	**L_{10}**	**L_{90}**
ML 1	11:32 p.m.	56.9	72.5	45.5	59.6	47.1

Monitoring Locations:

Location ML 1: Centrally located within the project site.
GPS: CA-VI 6281340.5E, 1846883.4N

Measurements performed by ISE on 12/13/17. EPE = Estimated GPS Position Error = 13 ft.

Temperature = 81.0 °F. Relative Humidity = 27 %. Barometric Pressure = 30.01 in-Hg.

Measurements collected reflect the ambient daytime community sound levels in the vicinity of the proposed project site. As can be seen, the hourly average sound level (or L_{eq-h}) recorded over the monitoring period was 56.9 dBA at ML 1.

Future Exterior Traffic Noise Levels to Proposed Development

The predominant noise sources affecting the proposed project site are currently, and would continue to be, the aggregation of surface street traffic noise along Fourth Avenue, and to a lesser extent aircraft noise from San Diego International Airport (SAN).

Future year 2035 traffic volumes along Fourth Avenue could be as high as 7,190 ADT traveling at the posted speed of 30 MPH, as can be seen in Figure 8 on the following page.[10] This would yield worst-case surface street traffic noise levels as high as 65.0 dBA CNEL at 50 feet from the roadway centerline, and along the proposed fronting structural façade, as can be seen in Table 5 below.

TABLE 5: Predicted Future Traffic Noise Exposure Levels at Project Site

Roadway	Segment	ADT	Speed MPH	Leq 50ft	75 CNEL Distance	65 CNEL Distance	60 CNEL Distance
Fourth Avenue	Laurel to Kalmia	7,190	30	65.0	5	50	158

Source: ISE RoadNoise Traffic Noise Prediction Model, v 2.5.

Further, examination of published aircraft noise exposure contours for Lindbergh Field, seen in Figure 9 on Page 19; show that the annual noise contours for this airport place the project site within the theoretical 60 to 65 dBA CNEL contour band. ISE estimates the predicted noise exposure level being roughly 62 dBA CNEL.

Thus, the aggregate noise exposure affecting the project site would be the summation of these two sources; namely, surface street traffic noise at a worst-case level of 65 dBA CNEL, and aircraft noise from Lindbergh Field with a level of 62 dBA CNEL, for a resultant level of 66.8 dBA CNEL. For the purposes of analyses within this report, ISE has rounded this value to 67 dBA CNEL. Since there are no proposed exterior use spaces consistent with the City's General Plan Noise Element, this aggregate noise level will be used for the purposes of determining compliance with CCR Title 24 interior noise abatement standards.

[10] Source: SANDAG Transportation Forecast Information Center (TFIC).

FIGURE 8: Future Horizon Year 2035 Surface Street Traffic Predictions (SANDAG 12/17)

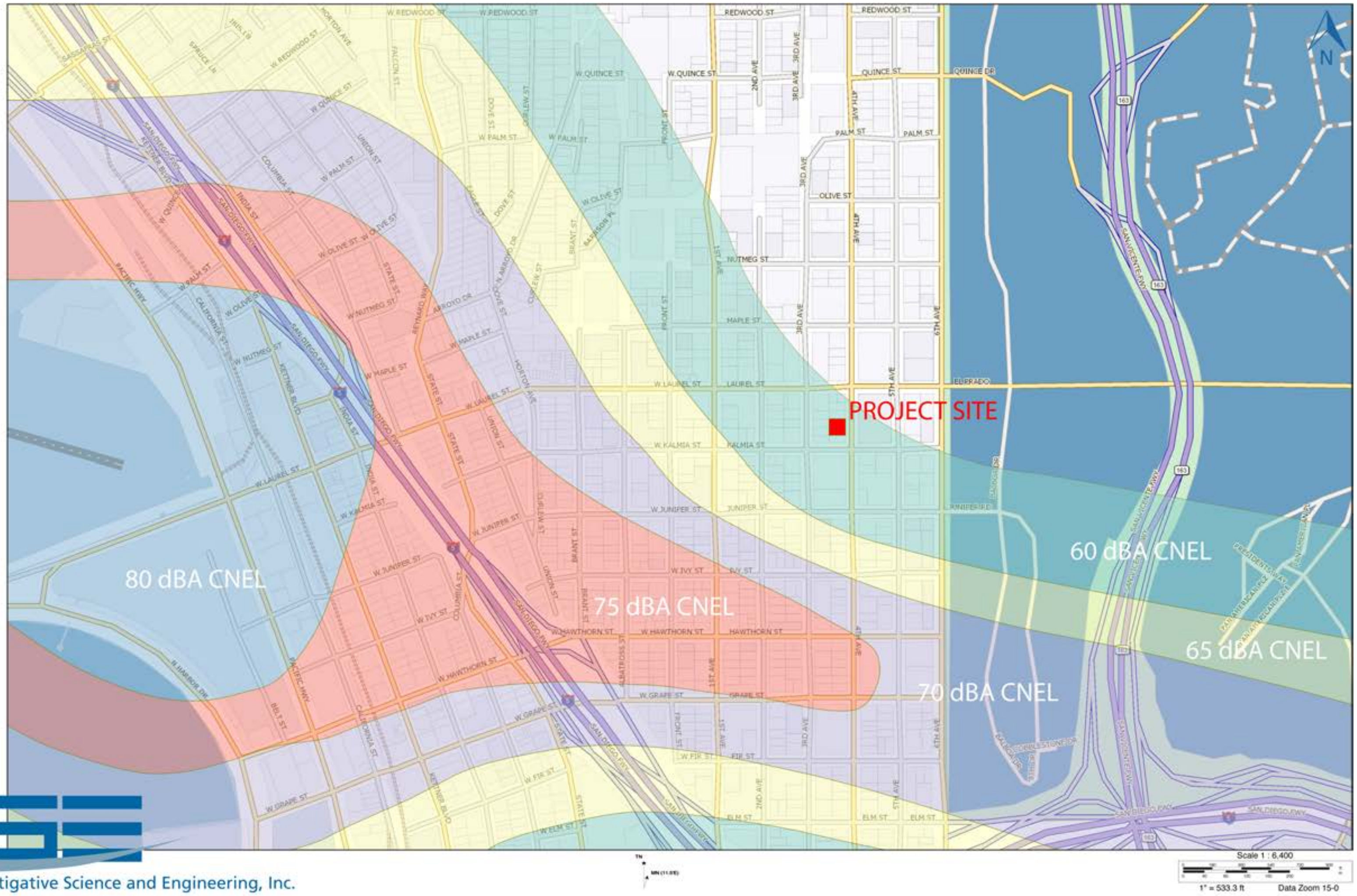

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FIGURE 9: Lindbergh Field Noise Exposure Contours Relative to Project Site (SANDAG 12/17)

Construction Noise Impact Findings

The estimated worst-case construction vehicle noise emissions are provided in Table 6 on the following page. Construction within the proposed project area would typically occur on weekdays between the hours of 7:00 a.m. and 3:00 p.m. The nearest sensitive residential receptor area is approximately 15-feet from any proposed construction activity.

As can be seen, predicted worst-case construction noise levels could be as high as 74.3 dBA Leq-h at 50-feet, with worst-case receptor levels of 87.3 dBA Leq-h. This level would be in excess of City Noise Ordinance Section 59.5.0404. Since final construction means-and-methods are not in place, and the site is highly constrained in terms of temporary construction noise wall placement, it is recommended that onsite acoustical monitoring of construction activities occur, and remedial engineering practices be implemented on a case-by-case basis. Such measures could include, but not be limited to, temporary construction noise barriers (for example plywood barriers with a minimum surface density of 3.5 pounds per square foot), reoperation of construction means-and-methods, strict enforcement of City noise ordinance time restrictions, and selected isolation of noise generating equipment.

Thus, prior to issuance of any construction permits, the applicant shall ensure that the above referenced monitoring and abatement plan is implemented to ensure that construction noise levels do not exceed 75 dBA Leq_{12h} per City Noise Ordinance Section 59.5.0404. This approach is consistent with past City practices for mitigation in highly confined areas.

Operational Noise Impact Findings

The Fourth Avenue Apartments project site would operate 38 Mitsubishi Electric Model MXZ-3C24NAHZ2 multi-indoor inverter heat-pump systems with each of the condenser/compressor sections being roof-mounted as previously shown in Figure 7. Each of these units produces a maximum (heating mode) source level of 58 dBA at 10 feet per AHRI Test Standard 270.

Each unit was modeled using the ISE Industrial Source Model (IS3) v4.1 with the results shown in Figure 10 on Page 22 of this report. The IS3 input model decks, and color output contour plot in SPCS CA VI coordinates, are provided as attachments to this report. As can be seen in the figure, the requisite worst-case 60 dBA Leq-h noise contour, which is the impact threshold delineator per City of San Diego Municipal Code Section 59.5.0401 is contained entirely within the rooftop parapet area. Closest property line noise levels were found to approach 40 dBA. Thus, no operational noise impacts are expected due to proposed HVAC operation.

TABLE 6: Aggregate Construction Noise Levels at Project Site

Equipment Type Model	Quantity Used (#)	Source Level at 50 Feet at Full Load (dBA)	Average Load Factor (%)	Duty Cycle per Hour	Cumulative Effect at 50 Feet (dBA Leq-h)
CAT 330C Hydraulic Excavator	1	80	50	4	72.2
Bauer RTG 23S Drill	1	75	50	4	67.2
CAT 988 Track Loader	1	75	50	3	66.0
CAT 420D Rubber Tire Backhoe	1	70	50	2	59.2
				Worst-Case Aggregate Sum @ 50 Ft. (Σ):	**74.3**
				Leq-h at Receptor Area 15-Feet Distant:	**87.3**

Source: EPA PB 206717, Environmental Protection Agency, 12/31/71, “Noise from Construction Equipment and Operations”
Ordinance Averaging Time = 12 hours.

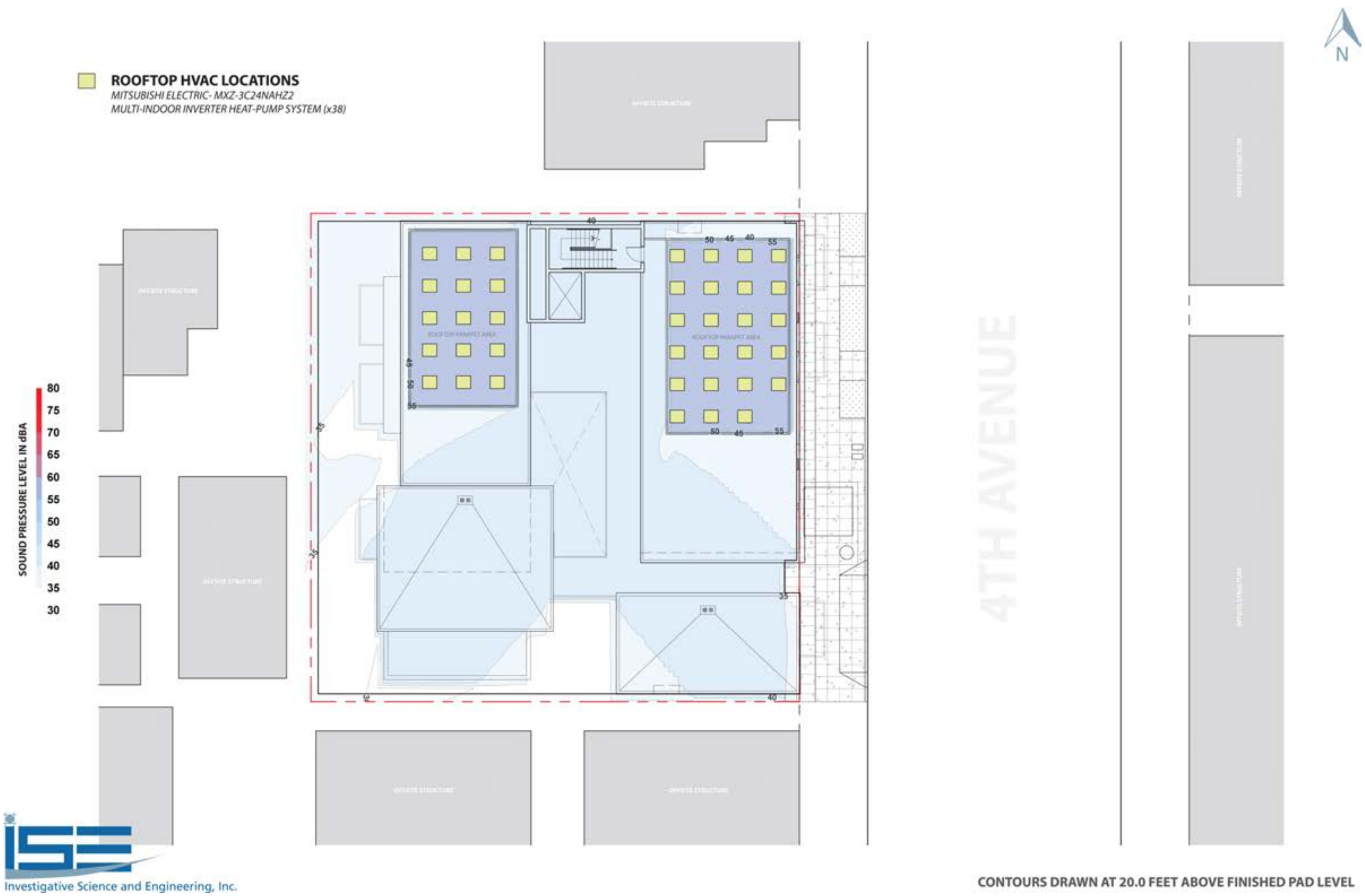

FIGURE 10: Predicted Rooftop Noise Exposure Contours (ISE 10/18)

CCR Title 24 Interior Noise Compliance of Proposed Development

The following general construction assumptions were applied to each of the units to determine their sound insulation characteristics:

- The roof/ceiling construction should have a minimum STC rating of 48.
- All living spaces were assumed to have carpet and pad (i.e., Floor Multiplication Parameter or FMP = 0.75), for the purposes of STC calculation.
- Bathrooms, kitchens, entry/mud rooms, laundry rooms, hallways, stairways, and closet areas are considered non-sensitive uses, and were not examined; thus, these have no construction limitations.

The surface areas and materials for the proposed project were obtained from architectural drawings prepared by ACRM Architects & Interiors, dated 4/24/17. When the interior noise level was found to be greater than 45 dBA CNEL, the value was recalculated for a closed window condition. Further recalculation was done to determine the minimum window-glazing requirement.

The *ISE Architectural Acoustical Model (AAM)* results are provided as an attachment to this report. The minimum required acoustical treatments (STC ratings) for the proposed development are summarized in Table 7 on the following page.[11] These acoustical treatments would only be required for the residential portion of the project. There are no restrictions on the commercial component, although the values shown in Table 7 can be used for guidance in these spaces.

Based upon the model results, the estimated interior noise levels would be as high as 63.1 dBA CNEL (in the Living Rooms of the 2-Bedroom units), when the windows/doors are open, and would require a closed window condition to comply with the CCR Title 24 requirements. Mechanical ventilation would be required per CCR Title 24, and should meet specific City of San Diego building department requirements for such units.

[11] Construction practices may degrade the calculated acoustical performance of walls and window assembles. The interior noise levels have been predicted in accordance with generally accepted acoustical methods and assume good construction techniques.

TABLE 7: Minimum Acoustical Assembly Requirements – Fourth Avenue Apartments

Unit Plan	Building Element Assembly	Minimum Required STC Rating
All Rooms	Roof / Ceiling Assembly	48
All Rooms	Wall Assembly	46
All Rooms	All Solid Door Assemblies	27
All Rooms	All French Glass Door Assemblies	26
Loft Plan: Living Room, Bedroom	Glass Window Assemblies	26
Studio A Plan: Living Room	Glass Window Assemblies	26
2-Bedroom Plan (East): Bedroom 2	Glass Window Assemblies	26
All Other Rooms (in all floor plans)	Glass Window Assemblies	24

Source: ISE Architectural Acoustical Model (AAM) v3.0

Pursuant with City and/or CCR Title 24 requirements, the specified STC ratings should be incorporated into the architectural door and window schedule as indicated. These measures will reduce interior noise within residential spaces to a final maximum closed-window level of approximately 44.8 dBA CNEL (Living Rooms of Studios A and C). As-built architectural assemblies, with a higher STC rating, would also be acceptable from a compliance standpoint.

CERTIFICATION OF ACCURACY AND QUALIFICATIONS

This report was prepared by Investigative Science and Engineering, Inc. (ISE). The members of its professional staff contributing to the report are listed below:

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ISE affirms to the best of its knowledge and belief that the statements and information contained herein are in all respects true and correct as of the date of this report. Content and information contained within this report is intended only for the subject project and is protected under 17 U.S.C. §§ 101 through 810.

Should the reader have any questions regarding the findings and conclusions presented in this report, please do not hesitate to contact ISE at (760) 787-0016.

Approved as to Form and Content:

Rick Tavares, Ph.D.

Project Principal
Investigative Science and Engineering, Inc. (ISE)

APPENDICES AND SUPPLEMENTAL INFORMATION

Field Reconnaissance Measurement Results

ML 1

12/13/2017

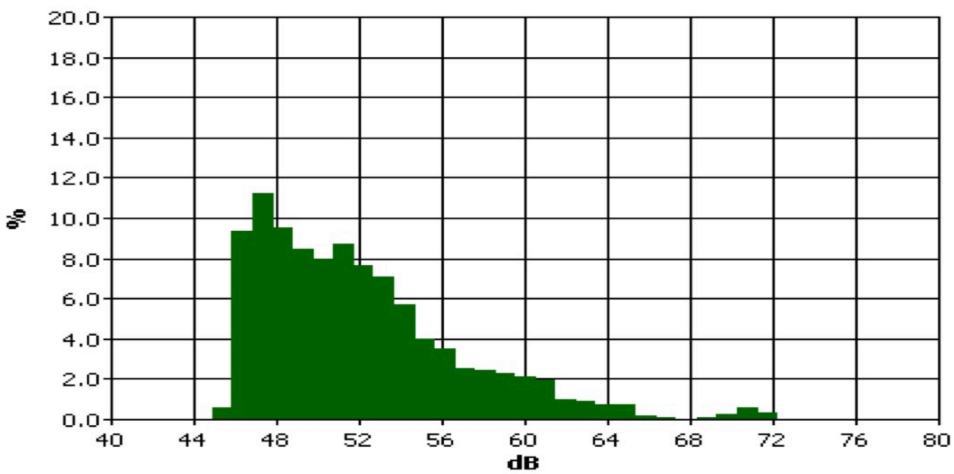
Information Panel

Name	ML 1
Start Time	Wednesday, December 13, 2017 11:32:48
Stop Time	Wednesday, December 13, 2017 12:32:11
Device Model Type	SoundPro DL
Comments	

General Data Panel

Description	Meter	Value	Description	Meter	Value
Leq	1	56.9 dB	Exchange Rate	1	3 dB
Weighting	1	A	Response	1	SLOW
Bandwidth	1	OFF	Exchange Rate	2	3 dB
Weighting	2	C	Response	2	FAST

Statistics Chart



Statistics Table

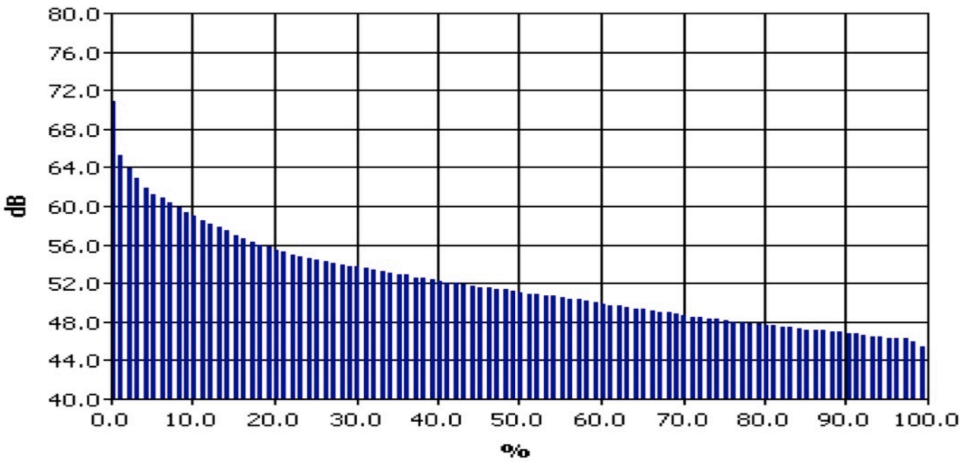
dB	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	%
40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.6
46.0	0.3	0.4	0.6	1.0	1.1	1.2	1.1	1.3	1.3	1.0	9.4
47.0	0.9	1.1	1.2	1.2	1.0	1.0	1.2	1.2	1.1	1.2	11.2
48.0	1.0	1.0	0.7	1.0	1.1	1.1	1.0	1.0	0.8	0.8	9.5
49.0	0.7	0.8	0.9	0.9	0.8	0.9	0.9	0.9	0.9	0.8	8.5
50.0	0.6	0.7	0.6	0.7	0.8	0.8	0.8	0.9	0.9	1.1	8.0
51.0	0.9	1.1	0.7	1.0	0.9	0.9	0.8	0.8	0.8	0.8	8.7
52.0	0.9	0.8	0.7	0.8	0.7	0.8	0.8	0.7	0.7	0.8	7.6
53.0	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.8	0.8	0.8	7.1
54.0	0.8	0.7	0.4	0.6	0.7	0.6	0.5	0.5	0.5	0.5	5.7
55.0	0.5	0.4	0.5	0.4	0.4	0.3	0.4	0.5	0.3	0.3	4.0
56.0	0.4	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	3.5
57.0	0.3	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.3	0.4	2.5
58.0	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.2	2.4
59.0	0.3	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.3	2.2
60.0	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.1	0.2	2.1
61.0	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.1	0.2	0.1	2.0
62.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.0
63.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.9
64.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.8
65.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.7
66.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

1

Statistics Table (cont'd)

dB	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	%
67.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
68.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
69.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3
71.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.6
72.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
73.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Exceedance Chart



Exceedance Table

	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%
0%		70.8	65.2	63.9	62.8	61.8	61.2	60.8	60.3	59.9
10%	59.4	59.0	58.5	58.1	57.8	57.4	56.9	56.6	56.3	56.0
20%	55.8	55.5	55.2	55.0	54.8	54.6	54.4	54.2	54.0	53.9
30%	53.8	53.7	53.5	53.4	53.2	53.1	52.9	52.8	52.6	52.5
40%	52.4	52.2	52.1	52.0	51.9	51.7	51.6	51.5	51.4	51.3
50%	51.2	51.0	50.9	50.8	50.7	50.6	50.5	50.4	50.3	50.1
60%	50.0	49.8	49.7	49.6	49.5	49.4	49.3	49.1	49.0	48.9
70%	48.8	48.6	48.5	48.4	48.3	48.3	48.2	48.0	47.9	47.8
80%	47.8	47.7	47.6	47.5	47.4	47.3	47.2	47.1	47.1	47.0
90%	46.9	46.8	46.7	46.6	46.5	46.4	46.3	46.3	46.2	46.0
100%	45.4									

2

Proposed Rooftop HVAC Manufacturer Specification Data

Outdoor Unit: MXZ-3C24NAHZ2

ACCESSORIES

- 3/8" x 1/2" Port Adapter (MAC-A454JP-E)
- 1/2" x 3/8" Port Adapter (MAC-A455JP-E)
- 1/2" x 5/8" Port Adapter (MAC-A456JP-E)
- M-NET Adapter (PAC-IF01MNT-E)
- Airflow Guide (PAC-SH96SG-E)

(For data on specific indoor units, see the MXZ-C Technical and Service Manual.)

Specifications			Model Name
Unit Type			MXZ-3C24NAHZ2
Cooling* (Non-ducted / Ducted)	Rated Capacity	Btu/h	22,000 / 23,600
	Capacity Range	Btu/h	6,000 - 23,600
	Rated Total Input	W	1,630 / 2,360
Heating at 47°F* (Non-ducted / Ducted)	Rated Capacity	Btu/h	25,000 / 24,600
	Capacity Range	Btu/h	7,200 - 30,600
	Rated Total Input	W	1,725 / 1,871
Heating at 17°F* (Non-ducted/Ducted)	Rated Capacity	Btu/h	14,000 / 14,000
	Maximum Capacity	Btu/h	25,000 / 24, 600
	Rated Total Input	W	1,622 / 1,635
Heating at 5°F*	Maximum Capacity	Btu/h	25,000
Energy Star® (ENERGY STAR products are third-party certified by an EPA-recognized Certification Body.)			Yes
Electrical Requirements	Power Supply	Voltage, Phase, Hertz	208 / 230V, 1-Phase, 60 Hz
	Recommended Fuse/Breaker Size	A	40
	MCA	A	30.5
Voltage	Indoor - Outdoor S1-S2	V	AC 208 / 230
	Indoor - Outdoor S2-S3	V	DC ±24
Compressor			DC INVERTER-driven Twin Rotary
Fan Motor (ECM)		F.L.A.	2.43
Sound Pressure Level (Non-ducted/Ducted)	Cooling	dB(A)	54
	Heating		58
External Dimensions (H x W x D)		In / mm	41-9/32 x 37-13/32 x 13 1048 x 950 x 330
Net Weight		Lbs / kg	189 / 86
External Finish			Munsell No. 3Y 7.8/11
Refrigerant Pipe Size O.D. — Eight Ports	Liquid (High Pressure)	In / mm	1/4 / 6.35
	Gas (Low Pressure)		A:1/2 / 12.7 ; B,C: 3/8 / 9.52
Max. Refrigerant Line Length		Ft / m	230 / 70
Max. Piping Length for Each Indoor Unit		Ft / m	82 / 25
Max. Refrigerant Pipe Height Difference	If IDU is Above ODU	Ft / m	49 / 15
	If IDU is Below ODU		49 / 15
Connection Method			Flared/Flared
Refrigerant			R410A

*** Rating Conditions per AHRI Standard:**

Cooling | Indoor: 80° F (27° C) DB / 67° F (19° C) WB
Cooling | Outdoor: 95° F (35° C) DB / W.B. 23.9° C (75° F)
Heating at 47°F | Indoor: 70° F (21° C) DB / 60° F (16° C) WB
Heating at 47°F | Outdoor: 47° F (8° C) DB / 43° F (6° C) WB
Heating at 17° F | Indoor: 70° F (21° C) DB
Heating at 17° F | Outdoor: 17° F (-8° C) DB / 15° F (-9° C) WB

IS3 Model Input/Output Results for Proposed Rooftop HVAC Units

```
IS3 PROGRAM INPUT DECK - (C) 2018 INVESTIGATIVE SCIENCE & ENGINEERING INC.
GLOBAL VARIABLE DECLARATION
   PROBLEM STATEMENT: FOURTH AVENUE APARTMENTS HVAC MODELING
   STARTING POINT (XY IN FEET): 6281302.8,1846819.4
   ENDING POINT (XY IN FEET): 6281404.9,1846919.5
   ANALYSIS FREQUENCY (HZ): 250
   REFERENCE DISTANCE FOR SOUND (D IN FEET): 10
   SOUND PROPAGATION COEFF XLOG10: 20
   EXCESS ATTENUATION (DB): 0
   COMPUTATIONAL STEP DISTANCE (IN FEET): 1
   RECEPTOR ELEVATION (IN FEET): 20
ACOUSTIC SOURCE DECLARATION (XYZ - SOUND LEVEL - LABEL)
   NUMBER OF SOURCE POINTS: 38
   6281328.5,1846911,65.4,58,HVAC UNIT 1
   6281335.5,1846911,65.4,58,HVAC UNIT 2
   6281342.5,1846911,65.4,58,HVAC UNIT 3
   6281328.5,1846904.375,65.4,58,HVAC UNIT 4
   6281335.5,1846904.375,65.4,58,HVAC UNIT 5
   6281342.5,1846904.375,65.4,58,HVAC UNIT 6
   6281328.5,1846897.75,65.4,58,HVAC UNIT 7
   6281335.5,1846897.75,65.4,58,HVAC UNIT 8
   6281342.5,1846897.75,65.4,58,HVAC UNIT 9
   6281328,1846891.125,65.4,58,HVAC UNIT 10
   6281335,1846891.125,65.4,58,HVAC UNIT 11
   6281342,1846891.25,65.4,58,HVAC UNIT 12
   6281328,1846884.625,65.4,58,HVAC UNIT 13
   6281335,1846884.625,65.4,58,HVAC UNIT 14
   6281342,1846884.625,65.4,58,HVAC UNIT 15
   6281379.5,1846910.75,65.4,58,HVAC UNIT 16
   6281386.5,1846910.75,65.4,58,HVAC UNIT 17
   6281393.5,1846910.75,65.4,58,HVAC UNIT 18
   6281400.5,1846910.75,65.4,58,HVAC UNIT 19
   6281379.5,1846904.125,65.4,58,HVAC UNIT 20
   6281386.5,1846904.125,65.4,58,HVAC UNIT 21
   6281393.5,1846904.125,65.4,58,HVAC UNIT 22
   6281400.5,1846904.125,65.4,58,HVAC UNIT 23
   6281379.5,1846897.5,65.4,58,HVAC UNIT 24
   6281386.5,1846897.5,65.4,58,HVAC UNIT 25
   6281393.5,1846897.5,65.4,58,HVAC UNIT 26
   6281400.5,1846897.5,65.4,58,HVAC UNIT 27
   6281379.5,1846890.875,65.4,58,HVAC UNIT 28
   6281386.5,1846890.875,65.4,58,HVAC UNIT 29
   6281393,1846890.875,65.4,58,HVAC UNIT 30
   6281400,1846890.875,65.4,58,HVAC UNIT 31
   6281379,1846884.25,65.4,58,HVAC UNIT 32
   6281386,1846884.25,65.4,58,HVAC UNIT 33
   6281393,1846884.25,65.4,58,HVAC UNIT 34
   6281400,1846884.25,65.4,58,HVAC UNIT 35
   6281379,1846877.625,65.4,58,HVAC UNIT 36
   6281386,1846877.625,65.4,58,HVAC UNIT 37
   6281393,1846877.625,65.4,58,HVAC UNIT 38
BARRIER SEGMENT DECLARATION (START XY - END XY - HEIGHT - STC - LABEL)
   NUMBER OF BARRIER PAIRS: 41
   6281324.5,1846915.75,6281346.5,1846915.875,67,0,ROOFTOP PARAPET 1
   6281346.5,1846915.875,6281346,1846880,67,0,ROOFTOP PARAPET 1
   6281346,1846880,6281324,1846880,67,0,ROOFTOP PARAPET 1
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   6281402.5,1846914.25,6281402,1846874.375,67,0,ROOFTOP PARAPET 2
   6281402,1846874.375,6281377,1846874.375,67,0,ROOFTOP PARAPET 2
   6281377,1846874.375,6281377.5,1846914.125,67,0,ROOFTOP PARAPET 2
   6281322.5,1846917.625,6281404.5,1846917.625,64,0,BUILDING ENVELOPE
   6281404.5,1846917.625,6281403,1846848.125,64,0,BUILDING ENVELOPE
   6281403,1846848.125,6281401,1846848.125,64,0,BUILDING ENVELOPE
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   6281401,1846848.125,6281401,1846841.5,64,0,BUILDING ENVELOPE
   6281401,1846841.5,6281403.5,1846841.375,64,0,BUILDING ENVELOPE
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   6281314,1846892.25,6281314,1846904.625,64,0,BUILDING ENVELOPE
   6281314,1846904.625,6281319,1846904.625,64,0,BUILDING ENVELOPE
   6281319,1846904.625,6281319,1846906.25,64,0,BUILDING ENVELOPE
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DISCRETE RECEPTOR POINT DECLARATION (XYZ - LABEL)
   NUMBER OF DISCRETE RECEPTORS: 0
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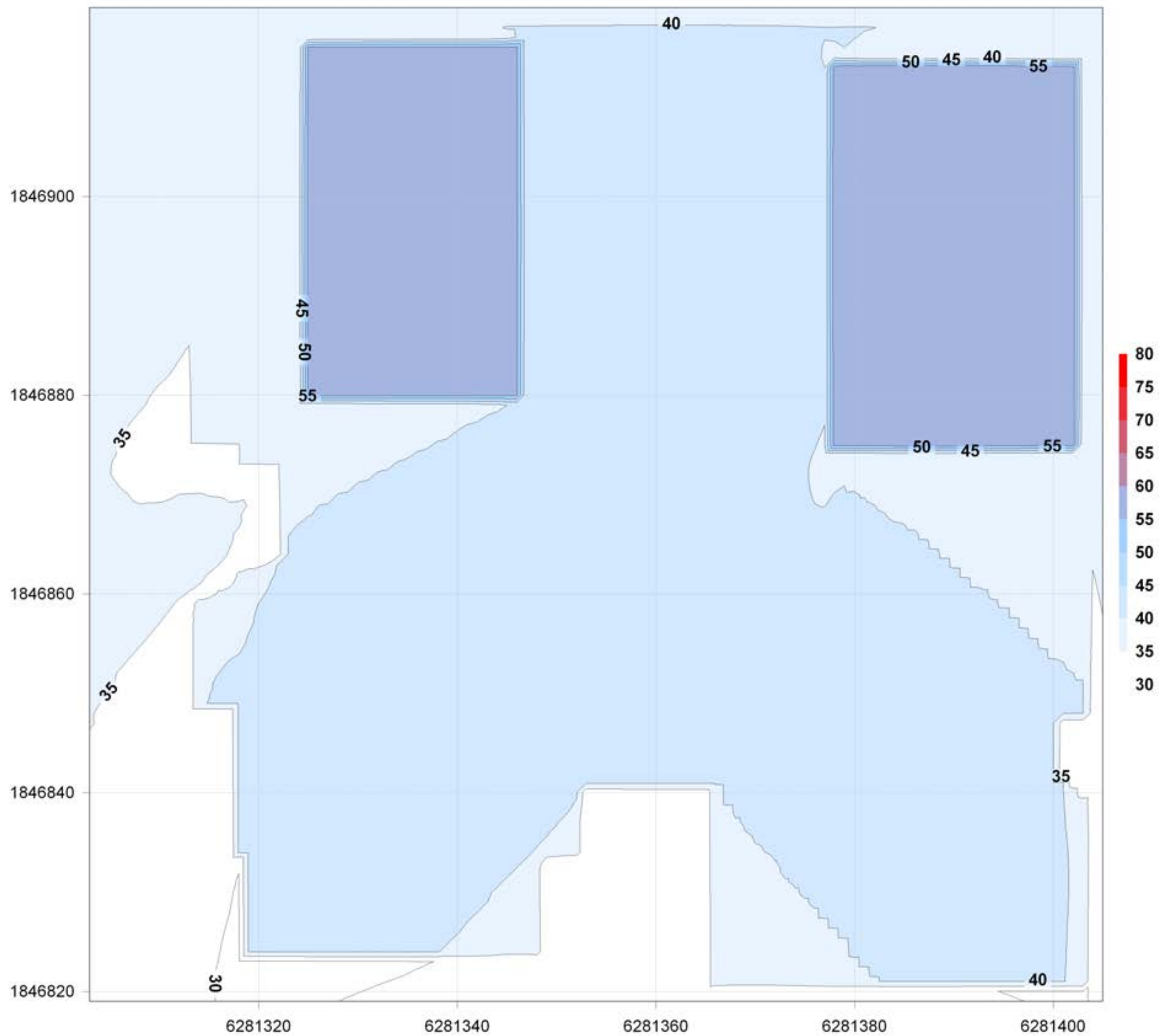
1846900
1846880
1846860
1846840
1846820
6281320
6281340
6281360
6281380
6281400
80
75
70
65
60
55
50
45
40
35
30

AAM Architectural Interior Noise Transmission Results

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	1BR Living Rm
Floor Area (ft²):	502
Ceiling Height (ft):	9
Room Volume (ft³):	4518
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	376.5

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
3	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
4	French Door - 3/32 Glass (NBS W-94-71)	21	24	27	27	24	28
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	31.5	20.6	20.6
2	Stucco Wall (NBS W-50-71)	46	0	66.2	23.8	23.8
3	Window - 3/32 Glass (NBS W-23-72)	24	0	64.0	41.4	41.4
4	French Door - 3/32 Glass (NBS W-94-71)	26	100	21.0	33.0	58.5
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	42.1	58.5
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	2BR-BR2 (W)
Floor Area (ft^2):	168
Ceiling Height (ft):	9
Room Volume (ft^3):	1512
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	126

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
3	-	0	0	0	0	0	0
4	-	0	0	0	0	0	0
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft^2)	Acoustical Contribution (Closed)	Acoustical Contribution (Open)
1	Stucco Wall (NBS W-50-71)	46	0	63.0	28.3	28.3
2	Window - 3/32 Glass (NBS W-23-72)	24	28	36.0	43.7	49.6
3	-	-	0	0.0	0.0	0.0
4	-	-	0	0.0	0.0	0.0
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	43.8	49.6
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	1BR-MBR
Floor Area (ft²):	149
Ceiling Height (ft):	9
Room Volume (ft³):	1341
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	111.75

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
3	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
4	-	0	0	0	0	0	0
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	123.8	31.8	31.8
2	Stucco Wall (NBS W-50-71)	46	0	61.7	28.7	28.7
3	Window - 3/32 Glass (NBS W-23-72)	24	28	36.0	44.2	50.1
4	-	-	0	0.0	0.0	0.0
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	44.5	50.2
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	2BR-BR2 (E)
Floor Area (ft²):	145
Ceiling Height (ft):	9
Room Volume (ft³):	1305
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	108.75

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 1/8 Glass (Monsanto)	20	21	25	27	27	27
3	-	0	0	0	0	0	0
4	-	0	0	0	0	0	0
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	49.3	27.9	27.9
2	Window - 1/8 Glass (Monsanto)	26	0	42.5	42.1	42.1
3	-	-	0	0.0	0.0	0.0
4	-	-	0	0.0	0.0	0.0
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	42.2	42.2
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	2BR-LivRm (E)
Floor Area (ft²):	454
Ceiling Height (ft):	9
Room Volume (ft³):	4086
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	340.5

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
3	French Door - 3/32 Glass (NBS W-94-71)	21	24	27	27	24	28
4	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
5	Solid Core Door (NBS W-90-71)	23	27	29	26	26	29
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	44.6	22.5	22.5
2	Window - 3/32 Glass (NBS W-23-72)	24	0	64.0	41.8	41.8
3	French Door - 3/32 Glass (NBS W-94-71)	26	100	21.0	33.4	58.9
4	Stucco Wall (NBS W-50-71)	46	0	108.6	26.4	26.4
5	Solid Core Door (NBS W-90-71)	27	100	21.0	32.3	58.9
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	43.0	61.9
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	2BR-LivRm (W)
Floor Area (ft²):	493
Ceiling Height (ft):	9
Room Volume (ft³):	4437
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	369.75

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
3	French Door - 3/32 Glass (NBS W-94-71)	21	24	27	27	24	28
4	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
5	Solid Core Door (NBS W-90-71)	23	27	29	26	26	29
6	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
7	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
8	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	68.0	24.0	24.0
2	Window - 3/32 Glass (NBS W-23-72)	24	0	64.0	41.5	41.5
3	French Door - 3/32 Glass (NBS W-94-71)	26	100	21.0	33.0	58.5
4	Stucco Wall (NBS W-50-71)	46	0	132.0	26.9	26.9
5	Solid Core Door (NBS W-90-71)	27	100	21.0	32.0	58.5
6	Stucco Wall (NBS W-50-71)	46	0	210.7	28.9	28.9
7	Window - 3/32 Glass (NBS W-23-72)	24	0	24.5	37.3	37.3
8	Window - 3/32 Glass (NBS W-23-72)	24	100	16.8	35.7	57.6
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	44.5	63.1
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	2BR-MBR (E)
Floor Area (ft²):	212
Ceiling Height (ft):	9
Room Volume (ft³):	1908
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	159

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
3	-	0	0	0	0	0	0
4	-	0	0	0	0	0	0
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	49.3	26.2	26.2
2	Window - 3/32 Glass (NBS W-23-72)	24	0	42.5	43.4	43.4
3	-	-	0	0.0	0.0	0.0
4	-	-	0	0.0	0.0	0.0
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	43.5	43.5
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	2BR-MBR (W)
Floor Area (ft²):	236
Ceiling Height (ft):	9
Room Volume (ft³):	2124
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	177

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
3	-	0	0	0	0	0	0
4	-	0	0	0	0	0	0
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	63.0	26.8	26.8
2	Window - 3/32 Glass (NBS W-23-72)	24	28	36.0	42.2	48.1
3	-	-	0	0.0	0.0	0.0
4	-	-	0	0.0	0.0	0.0
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	42.3	48.2
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	Loft BR
Floor Area (ft^2):	243
Ceiling Height (ft):	9
Room Volume (ft^3):	2187
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	182.25

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	-	0	0	0	0	0	0
3	-	0	0	0	0	0	0
4	-	0	0	0	0	0	0
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft^2)	Acoustical Contribution (Closed)	Acoustical Contribution (Open)
1	Stucco Wall (NBS W-50-71)	46	0	157.1	30.7	30.7
2	-	-	0	0.0	0.0	0.0
3	-	-	0	0.0	0.0	0.0
4	-	-	0	0.0	0.0	0.0
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	30.7	30.7
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	Loft Living Rm
Floor Area (ft^2):	346
Ceiling Height (ft):	18.7
Room Volume (ft^3):	6470.2
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	259.5

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 1/8 Glass (Monsanto)	20	21	25	27	27	27
3	French Door - 3/32 Glass (NBS W-94-71)	21	24	27	27	24	28
4	-	0	0	0	0	0	0
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft^2)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	156.5	29.1	29.1
2	Window - 1/8 Glass (Monsanto)	26	0	149.0	43.7	43.7
3	French Door - 3/32 Glass (NBS W-94-71)	26	100	21.0	34.6	60.1
4	-	-	0	0.0	0.0	0.0
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	44.4	60.2
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	St-A(2,3) Living Area
Floor Area (ft²):	452
Ceiling Height (ft):	9
Room Volume (ft³):	4068
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	339

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 1/8 Glass (Monsanto)	20	21	25	27	27	27
3	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
4	Window - 1/8 Glass (Monsanto)	20	21	25	27	27	27
5	Window - 1/8 Glass (Monsanto)	20	21	25	27	27	27
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	195.8	28.9	28.9
2	Window - 1/8 Glass (Monsanto)	26	0	23.8	34.6	34.6
3	Stucco Wall (NBS W-50-71)	46	0	78.8	25.0	25.0
4	Window - 1/8 Glass (Monsanto)	26	0	21.3	34.1	34.1
5	Window - 1/8 Glass (Monsanto)	26	0	85.0	40.1	40.1
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	42.3	42.3
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	St-A(4,5,6) Living Area
Floor Area (ft²):	452
Ceiling Height (ft):	9
Room Volume (ft³):	4068
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	339

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
3	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
4	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
5	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
6	French Door - 3/32 Glass (NBS W-94-71)	21	24	27	27	24	28
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

					Acoustical Contribution	
Assembly #	Construction	STC Rating	% Operable	Area (ft²)	(Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	195.8	28.9	28.9
2	Window - 3/32 Glass (NBS W-23-72)	24	0	23.8	37.6	37.6
3	Stucco Wall (NBS W-50-71)	46	0	78.8	25.0	25.0
4	Window - 3/32 Glass (NBS W-23-72)	24	0	21.3	37.1	37.1
5	Window - 3/32 Glass (NBS W-23-72)	24	0	64.0	41.9	41.9
6	French Door - 3/32 Glass (NBS W-94-71)	26	100	21.0	33.4	58.9
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	44.7	59.1
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	St-B(2) Living Area
Floor Area (ft²):	346
Ceiling Height (ft):	9
Room Volume (ft³):	3114
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	259.5

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
3	-	0	0	0	0	0	0
4	-	0	0	0	0	0	0
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	72.1	25.8	25.8
2	Window - 3/32 Glass (NBS W-23-72)	24	0	85.0	44.3	44.3
3	-	-	0	0.0	0.0	0.0
4	-	-	0	0.0	0.0	0.0
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	44.3	44.3
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	St-B(3,4,5,6E) Living Area
Floor Area (ft²):	346
Ceiling Height (ft):	9
Room Volume (ft³):	3114
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	259.5

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
3	French Door - 3/32 Glass (NBS W-94-71)	21	24	27	27	24	28
4	-	0	0	0	0	0	0
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	72.1	25.8	25.8
2	Window - 3/32 Glass (NBS W-23-72)	24	0	64.0	43.0	43.0
3	French Door - 3/32 Glass (NBS W-94-71)	26	100	21.0	34.6	60.1
4	-	-	0	0.0	0.0	0.0
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	43.7	60.2
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	St-B(6W) Living Area
Floor Area (ft²):	346
Ceiling Height (ft):	9
Room Volume (ft³):	3114
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	259.5

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
3	French Door - 3/32 Glass (NBS W-94-71)	21	24	27	27	24	28
4	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	Acoustical Contribution (Open)
1	Stucco Wall (NBS W-50-71)	46	0	72.1	25.8	25.8
2	Window - 3/32 Glass (NBS W-23-72)	24	0	64.0	43.0	43.0
3	French Door - 3/32 Glass (NBS W-94-71)	26	100	21.0	34.6	60.1
4	Stucco Wall (NBS W-50-71)	46	0	291.6	31.8	31.8
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	44.0	60.2
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	St-C(2) Living Area
Floor Area (ft²):	322
Ceiling Height (ft):	9
Room Volume (ft³):	2898
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	241.5

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
3	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
4	-	0	0	0	0	0	0
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	Acoustical Contribution (Open)
1	Stucco Wall (NBS W-50-71)	46	0	179.1	30.0	30.0
2	Stucco Wall (NBS W-50-71)	46	0	72.1	26.1	26.1
3	Window - 3/32 Glass (NBS W-23-72)	24	0	85.0	44.6	44.6
4	-	-	0	0.0	0.0	0.0
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	44.8	44.8
Complies with Standard:	Yes	

ISE ARCHITECTURAL ACOUSTICAL MODEL (AAM) v3.0

Room Geometrics Definition	
Room Designation:	St-C(3,4,5,6) Living Area
Floor Area (ft²):	322
Ceiling Height (ft):	9
Room Volume (ft³):	2898
Room Absorption Ratio FMP:	0.75
Total Room Absorption (Sabins)	241.5

Noise Exposure Definition	
Noise Source:	Traffic (NBS Spectrum, 1978)
Noise Sound Level at Building Façade (dBA CNEL)	67
Incident Angle Correction:	-3
Building Façade Correction:	3
Quality Correction:	1

Modeled Octave Band Spectral Parameters for STC Classification

Assembly #	Construction	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
1	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
2	Stucco Wall (NBS W-50-71)	27	42	44	46	49	54
3	Window - 3/32 Glass (NBS W-23-72)	19	18	21	23	27	30
4	French Door - 3/32 Glass (NBS W-94-71)	21	24	27	27	24	28
5	-	0	0	0	0	0	0
6	-	0	0	0	0	0	0
7	-	0	0	0	0	0	0
8	-	0	0	0	0	0	0
9	-	0	0	0	0	0	0
10	-	0	0	0	0	0	0
11	-	0	0	0	0	0	0
12	-	0	0	0	0	0	0
13	-	0	0	0	0	0	0
14	-	0	0	0	0	0	0
15	-	0	0	0	0	0	0
16	-	0	0	0	0	0	0
17	-	0	0	0	0	0	0
18	-	0	0	0	0	0	0
19	-	0	0	0	0	0	0
20	-	0	0	0	0	0	0

Calculated Architectural Sound Leakage Through Assemblies

Assembly #	Construction	STC Rating	% Operable	Area (ft²)	Acoustical Contribution (Closed)	(Open)
1	Stucco Wall (NBS W-50-71)	46	0	179.1	30.0	30.0
2	Stucco Wall (NBS W-50-71)	46	0	72.1	26.1	26.1
3	Window - 3/32 Glass (NBS W-23-72)	24	0	64.0	43.3	43.3
4	French Door - 3/32 Glass (NBS W-94-71)	26	100	21.0	34.9	60.4
5	-	-	0	0.0	0.0	0.0
6	-	-	0	0.0	0.0	0.0
7	-	-	0	0.0	0.0	0.0
8	-	-	0	0.0	0.0	0.0
9	-	-	0	0.0	0.0	0.0
10	-	-	0	0.0	0.0	0.0
11	-	-	0	0.0	0.0	0.0
12	-	-	0	0.0	0.0	0.0
13	-	-	0	0.0	0.0	0.0
14	-	-	0	0.0	0.0	0.0
15	-	-	0	0.0	0.0	0.0
16	-	-	0	0.0	0.0	0.0
17	-	-	0	0.0	0.0	0.0
18	-	-	0	0.0	0.0	0.0
19	-	-	0	0.0	0.0	0.0
20	-	-	0	0.0	0.0	0.0

	Closed	Open
Compliance Threshold (dBA CNEL):	45.0	-
Predicted Level (dBA CNEL):	44.2	60.5
Complies with Standard:	Yes	

INDEX OF IMPORTANT TERMS

CONSTRUCTION VIBRATION ASSESSMENT
FOURTH AVENUE APARTMENTS
SAN DIEGO, CA

Submitted to:

Mr. Rudy Medina
Next Space Development
2820 Shelter Island Drive
San Diego, CA 92106

Investigative Science and Engineering, Inc.
Scientific, Environmental, and Forensic Consultants

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Ramona, CA 92065
(760) 787-0016
www.ise.us

ISE Project #17-008

Investigative Science and Engineering, Inc.

October 23, 2018

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LIST OF TABLES

LIST OF FIGURES / MAPS / ADDENDA

INTRODUCTION AND DEFINITIONS

Existing Site Characterization

The proposed Fourth Avenue Apartments project site consists of 0.23 acres of undeveloped land located in the City of San Diego, as shown in Figures 1 and 2 on the following pages. Regional access is obtained from Fourth Avenue, via either Laurel or Kalmia Streets, to the north and south respectively.[1] The project site currently resides as a rough graded lot, as shown in Figure 3 on Page 4.

Surrounding land uses consist of single- and multi-family residential infill, commercial and professional reuses, and shopkeeper/condominium structures. Elevations across the project site range from approximately 241 to 248 feet above mean sea level (MSL).

Project Description

The proposed project would construct a mixed-use development consisting of 36 multi-family residential apartment units and a single 1,085 square-foot first floor commercial space, as shown in Figure 4 on Page 5 of this report. Parking would be provided through an underground podium structure roughly 15-feet below street grade. This underground excavation, and the resultant vibration levels produced, is the subject of this report.

Ground Vibration Definitions and Theory

Vibration is generally defined as any oscillatory motion induced in a structure or mechanical device as a direct result of some type of input excitation. The object of interest typically has sufficient inertia 'm' so that by Newton's first law of motion, its rest state is one of zero vibration with velocity 'v' equal to zero. Input excitation, in the form of an applied external force 'F' is the mechanism required to start some type of vibratory response. Mathematically, this governing equation can be expressed in the following form for an object's rest state as,

$$\frac{d}{dt}(mv) = \sum_{Ext} F = 0$$

Once an object begins to respond to an applied force excitation, its natural tendency is to vibrate as a linear combination of its natural frequencies. A 'natural frequency' is defined as the frequency at which an object will tend to vibrate if set into motion and allowed to move freely. Any continuous system of particles will have an infinite number of natural frequencies, with each one adding to the overall response in a series of ever-decreasing contributions.

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[1] Addressed as 2426 Fourth Avenue, San Diego CA 92101, APN 533-106-13-00.

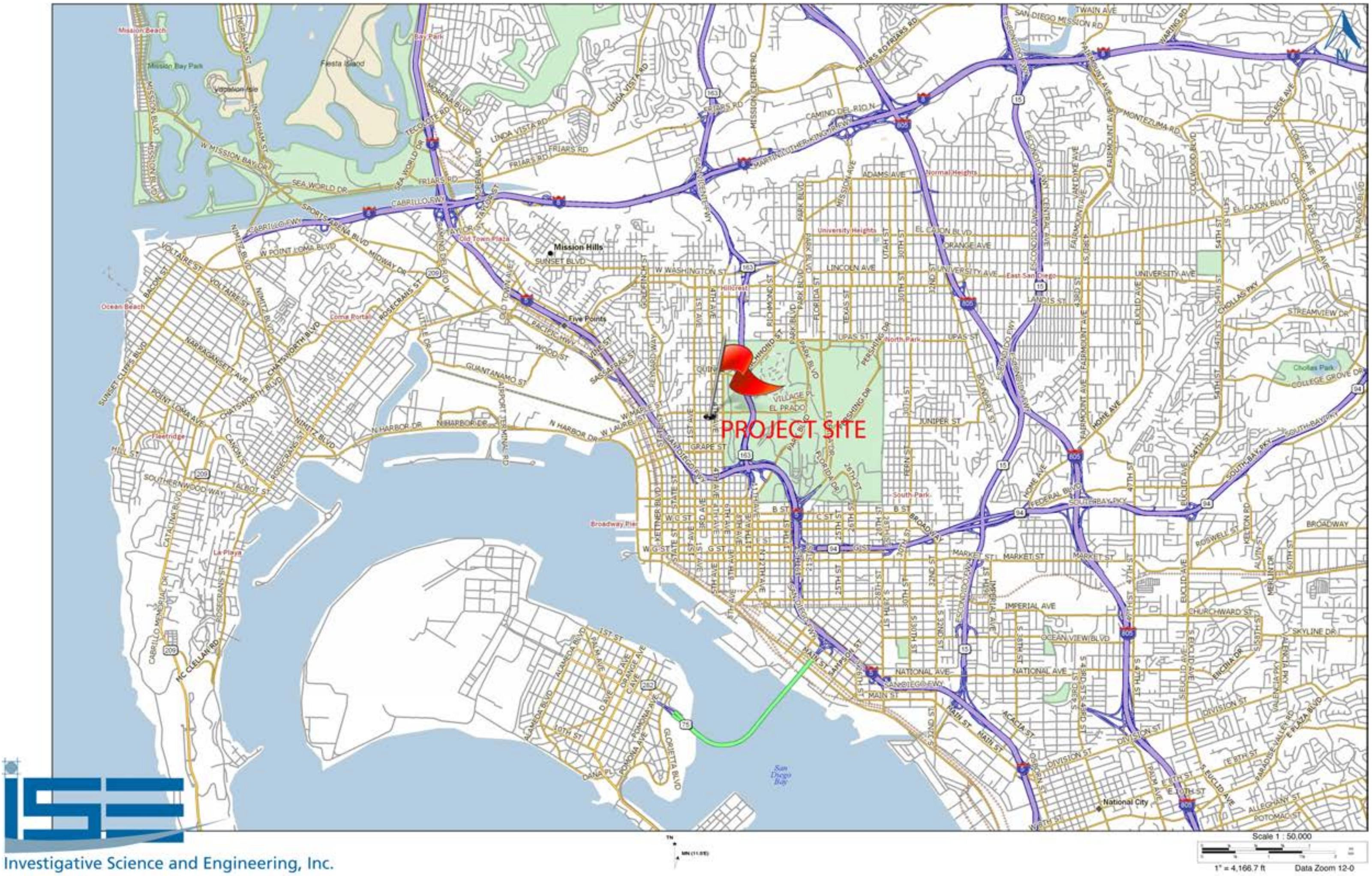

FIGURE 1: Project Study Area Vicinity Map (ISE 12/17)

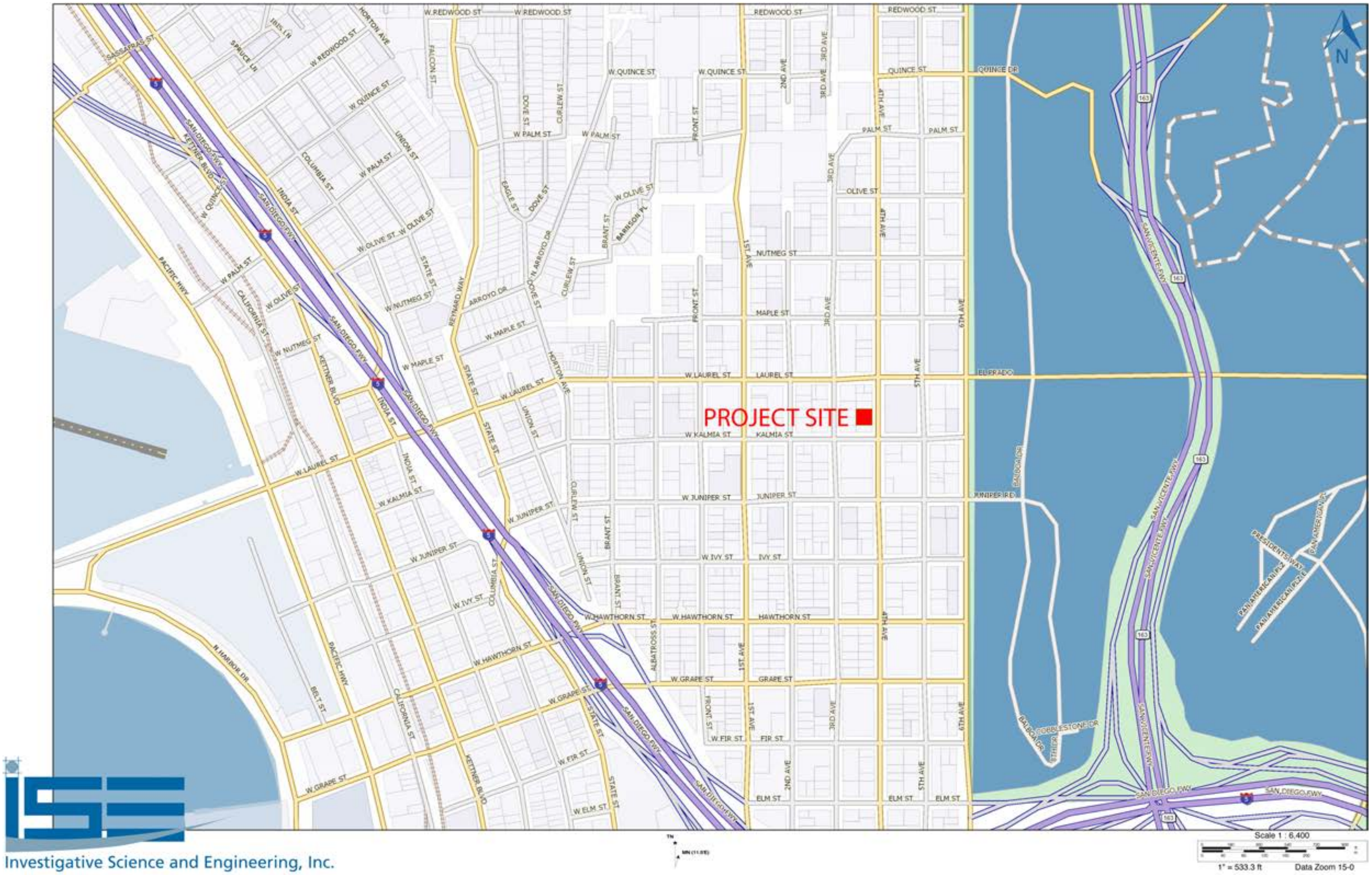

FIGURE 2: Project Study Area Parcel Map (ISE 12/17)

View Looking East Towards Fourth Avenue

View Looking Northwest Towards Rear of Property

FIGURE 3: Project Study Area Panoramic Photographs (ISE 12/17)

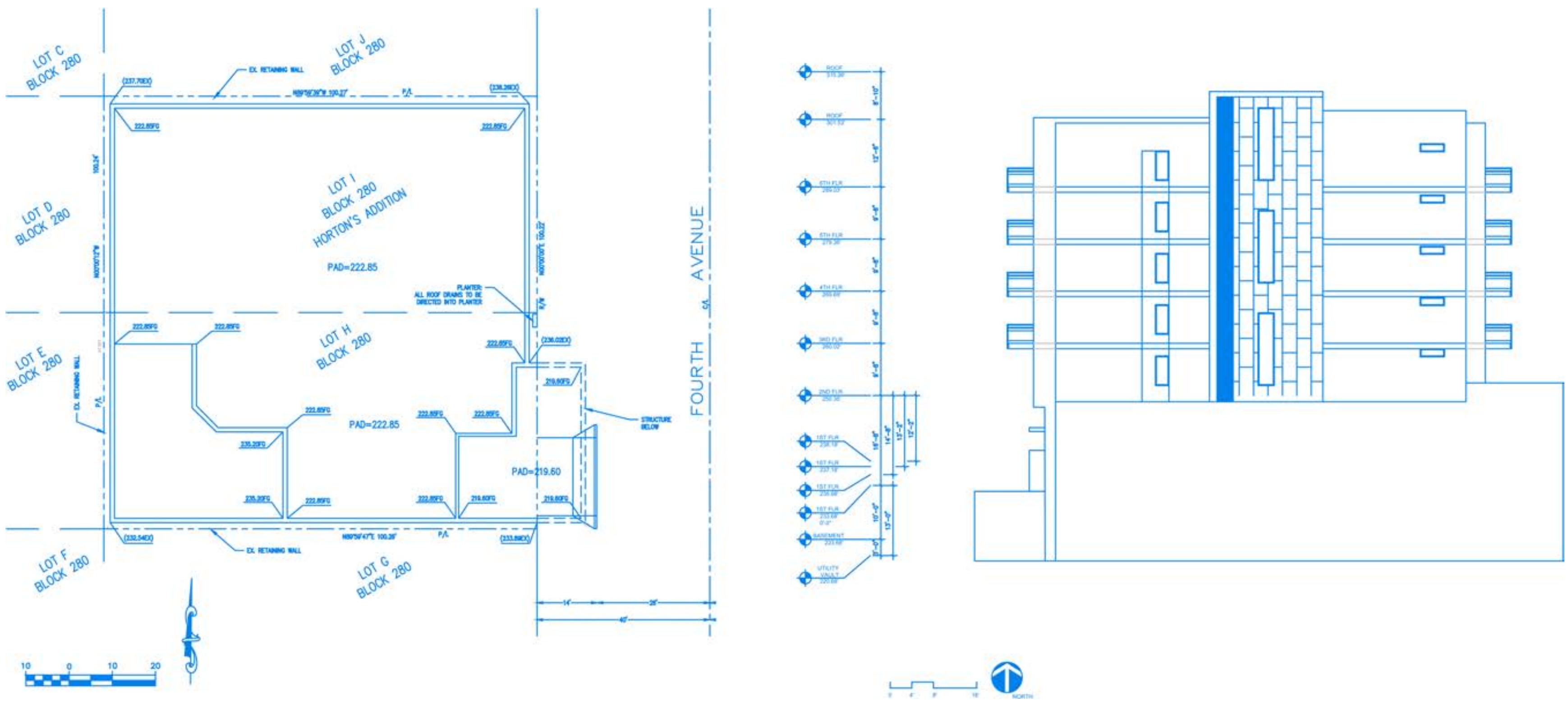

FIGURE 4: Project Site Development Plan (Civil Landworks / ACRM, 12/17)

As the frequency of the excitation approaches one of the object's natural frequencies, the magnitude of the object's vibratory response increases. When the two frequencies are exactly the same, a condition known as *resonance* arises. At resonance, the amplitude of the response approaches infinity. The only natural mechanism available to temper the catastrophic effects of resonance is a quantity known as 'damping'.[2]

In structures, or soils and rock, damping is generally present within the material itself and hence is called 'material damping'. The cause of this damping is due to the interactions between the molecular lattice structures comprising the material.

Vibration energy travels along the surface of a soil using a mechanism known as 'Rayleigh waves'. A Rayleigh wave is a seismic wave producing retrograde elliptical ground motion, and having no transverse, or perpendicular, components. This type of motion can seen visually in Figure 5 to the right. Rayleigh waves have the slowest decay rate of any seismic wave.

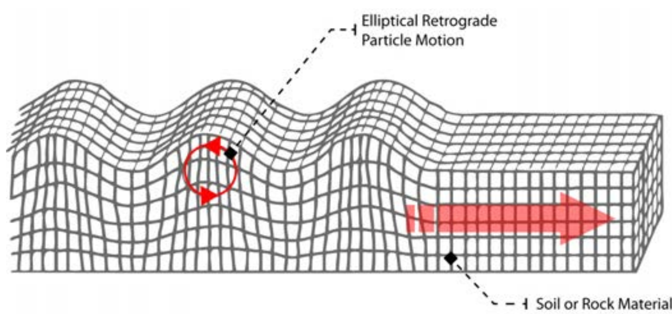

FIGURE 5: Typical Rayleigh Wave Propagation Profile (ISE 10/18)

Damping of surface waves in soils typically occurs as a combination of distance attenuation called 'radiation damping' and the aforementioned material damping. The latter is commonly approximated using a linear damping model that assumes the overall material damping increases as a function of distance between the source and receiver (i.e., the more soil between the source and receiver, the greater the mass, and the greater the material damping).

Table 1 on the following page provides a tabular representation of typical vibration sources and their effects on buildings, equipment, and humans. The peak ground velocity produced by various disturbances is given throughout a wide spectrum ranging from the infinitesimal to the severe. For most practical applications, induced vibration is a thing to be avoided, since the phenomenon is typically associated with physical discomfort, misalignment of equipment, loosening of mechanical fasteners, product defects, and skewed research results. In the case where the excitation frequency is close to resonance, or of sufficient magnitude (such as in an earthquake), severe structural damage can occur.

[2] Damping can be thought of as a type of 'drag force or resistance' that is always present to some degree in an object and serves to remove energy from the vibrating system as it moves. Artificial damping is used routinely in mechanical devices and takes the form of shock absorbers, viscous isolation materials, and simple friction.

TABLE 1: Typical Vibration Sources and Sensitivities

	Environmental Ground Vibration Sources (Typically Measured at 50 Feet from Source)			Observed Effects and Tolerances		
Peak Ground Velocity (in/Sec)	Transportation Sources	Construction Sources	Natural Sources	Structural Effects	Human Response	Typical Engineering Tolerances
100			San Francisco, CA Earthquake 4/18/06 Sana Cruz, CA Earthquake 10/17/89		Intolerable	
10		Quarry Blasting	Coalinga, CA Earthquake 5/2/83	Structural Damage Minor Damage		Human Exposure (ISO Limits) 1 Minute
		Construction Blasting		Low Probability of Damage	Extremely Unpleasant	1 Hours
1.0		Pile-Driving	Typical Moonquake		Very Unpleasant Unpleasant	8 Hours 24 Hours
0.1		Truck or Dozer		Very Safe to Buildings	Strongly Noticeable	Computers
	Subway Train (Above Tunnel)	Typical Construction Grading Equipment			Easily Noticeable	Office
0.01	Motor Vehicle Traffic on Rough Roadway	Handheld Jackhammer			Barely Perceptible	Residences
0.001	Motor Vehicle Traffic on Smooth Roadway	Blasting at 500 ft.	Micro-Meteorite Impacts		Imperceptible	Optical Microscopes
0.0001	Truck on Rough Roadway	Pile Driving at 500 ft.				Electronic Microscopes

THRESHOLDS OF SIGNIFICANCE

Numerous ground vibration standards exist to provide a general indication as to the adverse effects of ground motion on structural systems and humans. All standards provide effectively the same threshold levels based on field investigations of displacement, fatigue, and damage in conventionally constructed structures (i.e., structures built within the past 100 years). The two most common standards will be used as a threshold indicator in this report.

U.S. Bureau of Mines RI 8507 / Swiss SN640 312 Vibration Criteria

The United States Bureau of Mines provides a well-defined impact guide to vibration on structures. This criteria, which was originally developed to catalog the observable effects of blasting on structures, has been accepted for all types of ground vibration excitation, since the fundamental parameter in all cases is the peak particle velocity of the receiving structure.[3]

A modern variant based on the Bureau of Mines research, was developed under Swiss Standard SN640 312, and is applied in Europe and the United States for the purpose of limiting vibration to sensitive resource areas. These threshold levels are shown in Table 2, and will be applied as the structural construction impact threshold for the 661 Bear Valley Tentative Subdivision as it constitutes the most conservative ground motion threshold for proposed construction activities.

TABLE 2: Construction Vibration Thresholds of Significance

Vibration Frequency (Hz.)	Maximum Peak Particle Velocity (in/sec)	Maximum Peak Particle Velocity (VdB re. 1.0 μin/sec)
< 30	0.12	101.6
30 to 60	0.15	103.5
> 60	0.24	107.6

Human Vibration Standards

The International Organization for Standardization (ISO) Standard 2631 Part 2 entitled "*Evaluation of human exposure to whole body vibration - Continuous and shock induced vibration in buildings*" contains guidelines pertaining to human exposure to vibration. The recommended continuous excitation levels are based upon various types of activities and building occupancy. The ISO human vibration standards are shown in the last column of Table 1. These standards are only applicable in cases where adverse impacts, or annoyance, to humans are suspected to be encountered.

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[3] The standards are based upon the Bureau of Mines report RI 8507 entitled "*Structure Response and Damage Produced by Ground Vibrations from Surface Blasting*". This criterion presented, which is similar to the earlier Bureau of Mines *Bulletin 656*, sets the maximum peak particle velocity as a function of frequency.

APPROACH AND METHODOLOGY

Dynamic soil testing at the Fourth Avenue Apartments site was performed on 10/18/18 using two Kinemetrics *Ranger Model SS-1* moving-coil short period field seismometers as shown in Figure 6.[4] The seismometers were connected through shielded coaxial cable to a two-channel Larson Davis Model 2900 FFT spectrum analyzer for analysis and recording.[5]

For the testing in question, ISE instrumented an area adjacent to existing structures with the seismometers positioned exactly 50-feet apart in the vertical 'z-axis' response direction. The measurement spectrum examined, ranged between 0.8 Hz and 10 kHz, which is greater than the entire usable range of expected civil vibration problems. The cable length used was at least 100 feet to ensure adequate isolation of the experimenter and the monitoring location. The generator constants for the seismometers used was 8,457 mV/in/sec and 9,070 mV/in/sec with natural periods of one second each.

FIGURE 6: Onsite Seismometer Configuration (ISE 10/18)

A series of hammer blows was applied to a four-inch-square cross-sectional wooden block using a rubber mallet. This impulse generated a uniform transverse (shear) stress wave in the soil in accordance with Saint-Venant's Principle. The resulting ground motion, as a function of frequency, was measured at the closest (source) seismometer, as well as at the 50-foot distant (receiver) seismometer. Subtracting the resulting waveforms, and correcting for geometric attenuation, provided an estimate of the material damping present in the soil as a function of frequency. The measured results were then frequency-truncated at a point where it was observed that no ground excitation due to the hammer blow was indicated. This was typically around 1,000 Hz.

---

[4] These instruments, which are the terrestrial version of the lunar seismometer developed for NASA, are direct velocity-reading instrument capable of measuring inertial changes into the micro-inch-per-second range (the equivalent of footfalls one city block away).

[5] All testing and calibration is performed by ISE's Acoustics and Vibration Laboratory using a LORAN-C and Rubidium atomic frequency and time standard traceable to National Institute of Standards & Technology (NIST). The time and frequency calibration signal has a long-term stability of 10^{-10}. Specifications for traceability can be obtained at *www.nist.gov*.

FINDINGS AND RECOMMENDATIONS

Existing Soil Conditions

The area containing the proposed Fourth Avenue Apartments site is of an *Antioch Series Type*, as shown in Figure 7 on Page 11 of this report. Antioch soils consist of a very shallow to moderately shallow graduated composite, ranging from light brownish gray and brown medium acidity loam, to light yellowish brown moderately alkaline clay and clay loam.[6,7]

Antioch soils forms on nearly level, to strongly sloping, alluvial fans and terraces at elevations of less than 1,100 feet, and slopes less than three (3) percent This type of soil is moderately well to somewhat poorly drained, with slow to medium runoff, and very slow permeability.

Dynamic Soil Testing Findings

The results of the dynamic soil testing are shown in Figure 8 on Page 12 of this report. The testing indicated a high level of surface wave attenuation as a function of frequency.

Between 2.0 to 30 Hz. there is an increasing trend of greater soil damping reaching a peak level of 0.36 dB/ft signal loss in the 31.5 Hz band. Above 31.5 Hz., and to 50 Hz., a slight drop in signal attenuation was noted. A second sharp increase in soil damping was indicated between 50 Hz. to approximately 160 Hz., at which point no wave transmissibility was noted. Throughout the entire frequency range of interest (2.0 to 1,000 Hz.), the RMS soil attenuation level was found to be 0.47 dB/ft.

Required Construction Setback Distances

Solving the general equation for radiation damping due to a Rayleigh wave under an assumed linear soil damping model, one can numerically back-calculate the required separation distance from a known ground excitation event to achieve compliance with the SN640 312 standard shown previously shown in Table 2.

Exact day-to-day construction methods for the Fourth Avenue Apartments site are unknown at this time, but could produce worst-case impulsive ground excitation of no more than 1.0 in/sec peak particle velocity PPV (120.0 VdB PPV). This maximum level was utilized for the purposes of calculation of a recommended setback distance from any sensitive area within the project site. The results are shown in Table 3 on Page 13 of this report.

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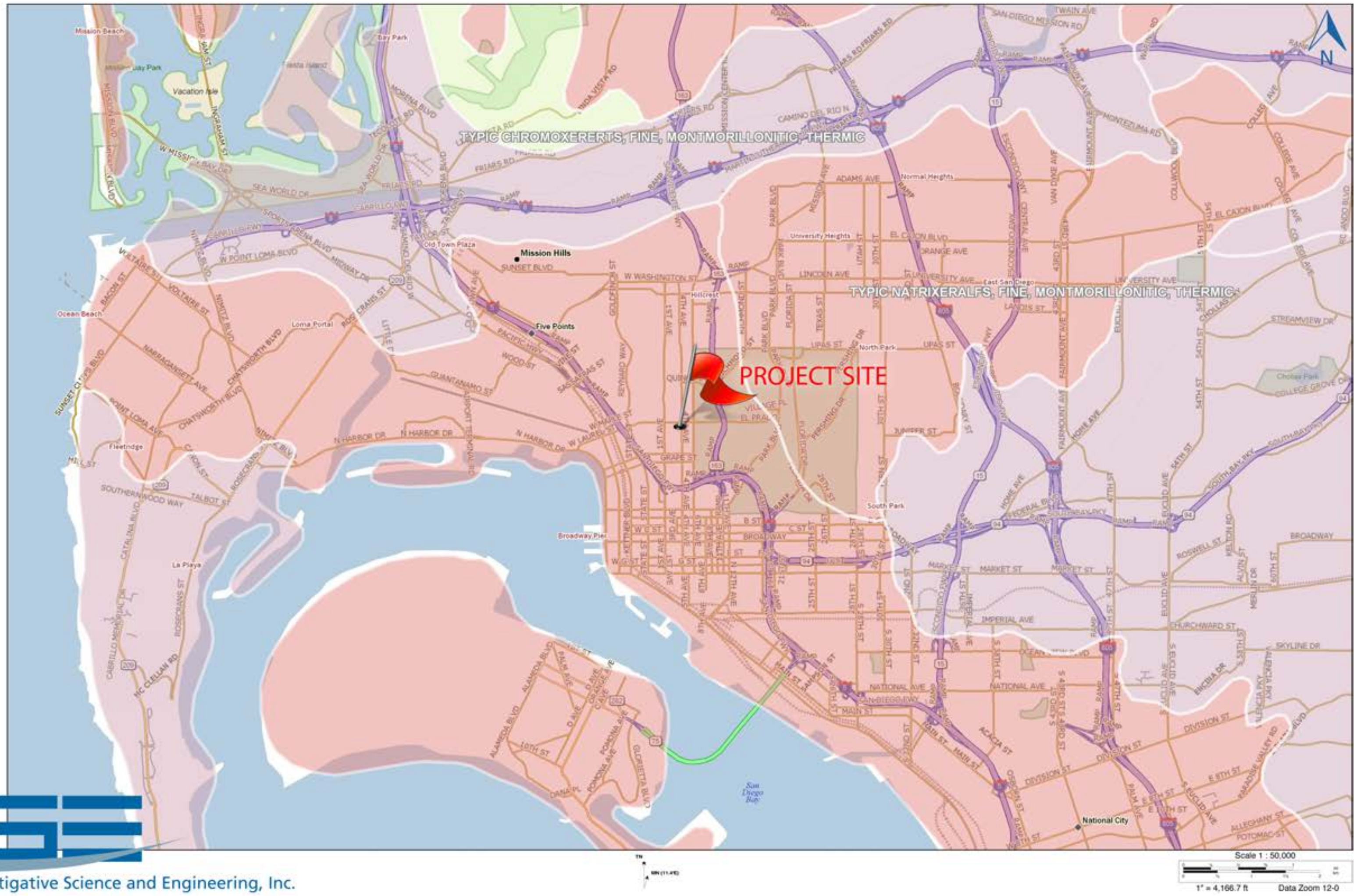
[6] Source: United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Series Database, 10/18.

[7] These soil types are located within the following taxonomic classes: TYPIC NATRIXERALFS, FINE, MONTMORILLONITIC, THERMIC.



Investigative Science and Engineering, Inc.

FIGURE 7: Soil Conditions Surrounding Project Site (ISE 10/18)

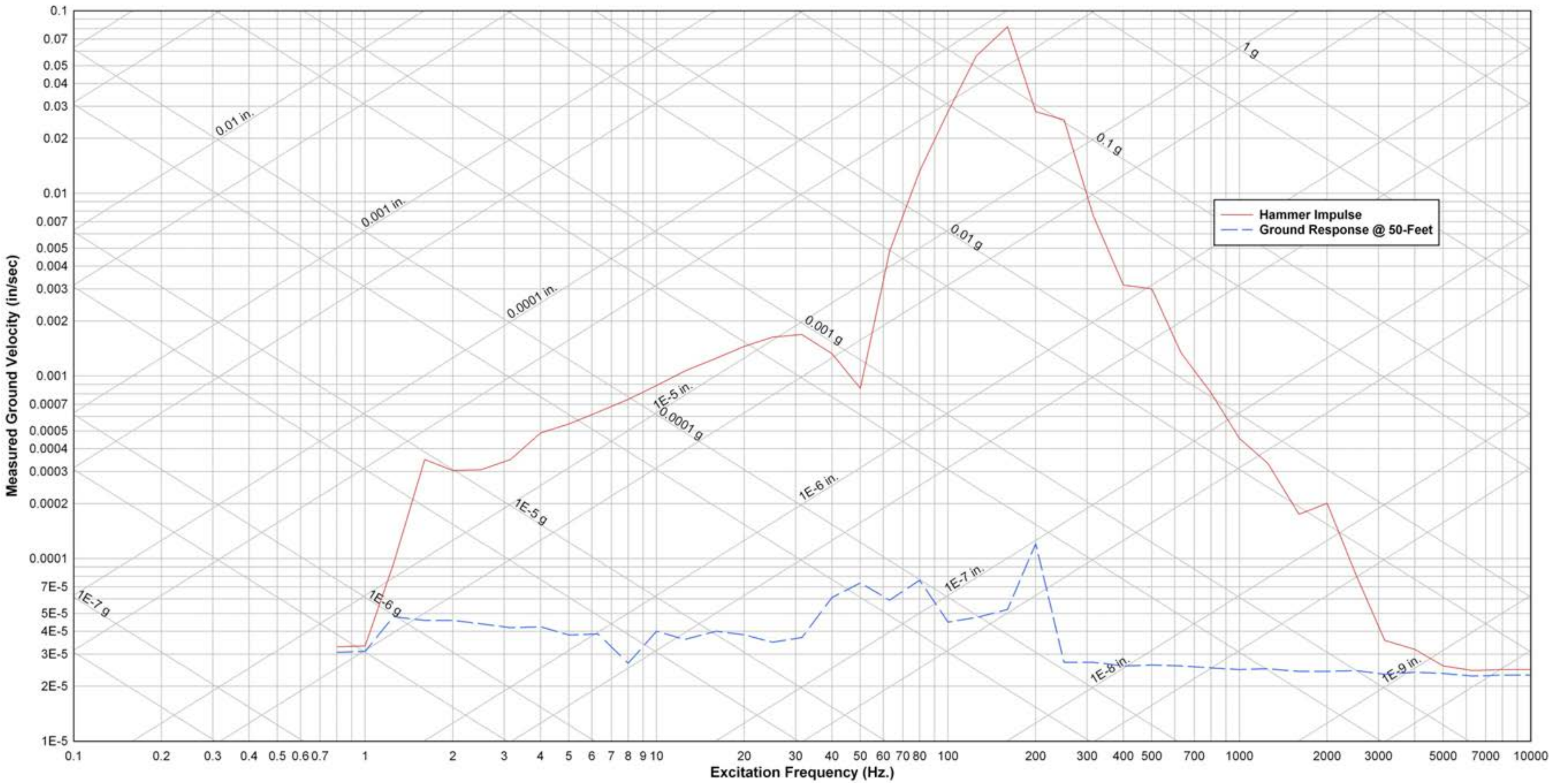


FIGURE 8: Measured Dynamic Soil Response at Fourth Avenue Apartments Site (ISE 10/18)

TABLE 3: Recommended Construction Setback Distances

One-Third Octave Band Vibration Frequency Component (Hz.)	Maximum Allowable Peak Particle Velocity (VdB re. 1.0 µin/sec)	Minimum Recommended Setback Distances in Feet for 1.0 in/sec Ground Excitation
2	101.6	314
2.5	101.6	250
3.15	101.6	162
4	101.6	103
5	101.6	84
6.3	101.6	75
8	101.6	55
10	101.6	62
12.5	101.6	53
16	101.6	52
20	101.6	48
25	101.6	44
31.5	101.6	40
40	101.6	56
50	101.6	90
63	103.5	33
80	103.5	22
100	103.5	17
125	103.5	16
160	107.6	15
200	107.6	21
250	107.6	16
315	107.6	20
400	107.6	24
500	107.6	24
630	107.6	30
800	107.6	36
1000	107.6	48

Thus, for anticipated ground excitation not exceeding 1.0 in/sec PPV, the separation distances shown in Table 3 were found to be adequate to preclude the presence of an impact to either structures or humans. Due to the close proximity of existing structures within the setback distances identified above for all reasonable excitation frequencies, it is recommended that onsite vibration monitoring occur during underground excavation and/or large impactive or vibration-generating activities to provide engineering feedback to the contractor.

Ground motion levels found to approach the applicable structural thresholds previously identified would be mitigated on case-by-case basis. Such measures could include, but not be limited to, in-situ source-receiver dynamic isolation methods, reoperation of construction means-and-methods to produce lower aggregate peak vibration levels, and base isolation of vibration generating equipment found to be problematic.

CERTIFICATION OF ACCURACY AND QUALIFICATIONS

This report was prepared by Investigative Science and Engineering, Inc. (ISE). The members of its professional staff contributing to the report are listed below:

Rick Tavares *(rtavares@ise.us)*	Ph.D. Civil Engineering M.S. Structural Engineering M.S. Mechanical Engineering B.S. Aerospace Engineering / Engineering Mechanics
Karen Tavares *(ktavares@ise.us)*	B.S. Electrical Engineering

ISE affirms to the best of its knowledge and belief that the statements and information contained herein are in all respects true and correct as of the date of this report. Content and information contained within this report is intended only for the subject project and is protected under 17 U.S.C. §§ 101 through 810.

Should the reader have any questions regarding the findings and conclusions presented in this report, please do not hesitate to contact ISE at (760) 787-0016.

Approved as to Form and Content:

Rick Tavares

Rick Tavares, Ph.D.

Project Principal
Investigative Science and Engineering, Inc. (ISE)

INDEX OF IMPORTANT TERMS

4^{TH} AVENUE APARTMENTS

SAN DIEGO, CA

PROJECT NUMBER: 588751

WASTE MANAGEMENT PLAN

PREPARED FOR:

CITY OF SAN DIEGO
ENVIRONMENTAL SERVICES DEPARTMENT
9601 RIDGEHAVEN COURT, MS 1102-A
SAN DIEGO, CA 92123

PREPARED BY:

ACRM ARCHITECTS + INTERIORS
1045 14^{TH} STREET, SUITE 100
SAN DIEGO, CA 92101
T. 619.398.3480
F. 619.398.3488
WWW.ACRMA.COM

MAY 2018

TABLE OF CONTENTS

1 INTRODUCTION

The purpose of this Waste Management Plan (WMP) for the *4th Avenue Apartments* project in the City of San Diego is to provide analysis of the solid waste impacts anticipated for the *4th Avenue Apartments* project. The goal of this WMP is to identify sufficient measures to minimize potential impacts of the *4th Avenue Apartments* project on solid waste services such that significant impacts are avoided. Two acceptable approaches to managing waste are to reduce the tons disposed to 60 tons or less, or to provide diversion of 75 percent or more, thus meeting the goal established by Assembly Bill 341.

The 10,060 square foot *4th Avenue Apartments* project site is located one parcel north, of the northwest corner of 4th Avenue and Kalmia Street, San Diego, California 92101 (see Figure 1, *4th Avenue Apartments – Project Location Aerial Map*). The project's site is within the Uptown Community Plan area and is zoned CC-3-9 with the equivalent residential density of the RM-4-10 zone. The current condition of the project site is an undeveloped vacant lot. Surrounding the lot, are two-story multi-family residential buildings with minor commercial professional services and offices within these adjacent properties. Directly across 4th Ave (east side of street) are high-density multi-family residential buildings.

The proposed project involves the excavation and export of 4,710 cubic yards (c.y.) of dirt and construction of a mixed-use development with the majority of the project consisting of multi-family residential, a ground-floor commercial retail space, street-level parking and a subterranean parking level. The project will be six-stories above street level and have (36) thirty-six residential units and 1,085 net square feet of commercial space. A total of 21parking spaces will be provided. The project is being designed to comply with Cal-Green standards (see Figure 2, *4th Avenue Apartments – Site Plan*).

Figure 1
4th Avenue Apartments – Project Location Aerial Map

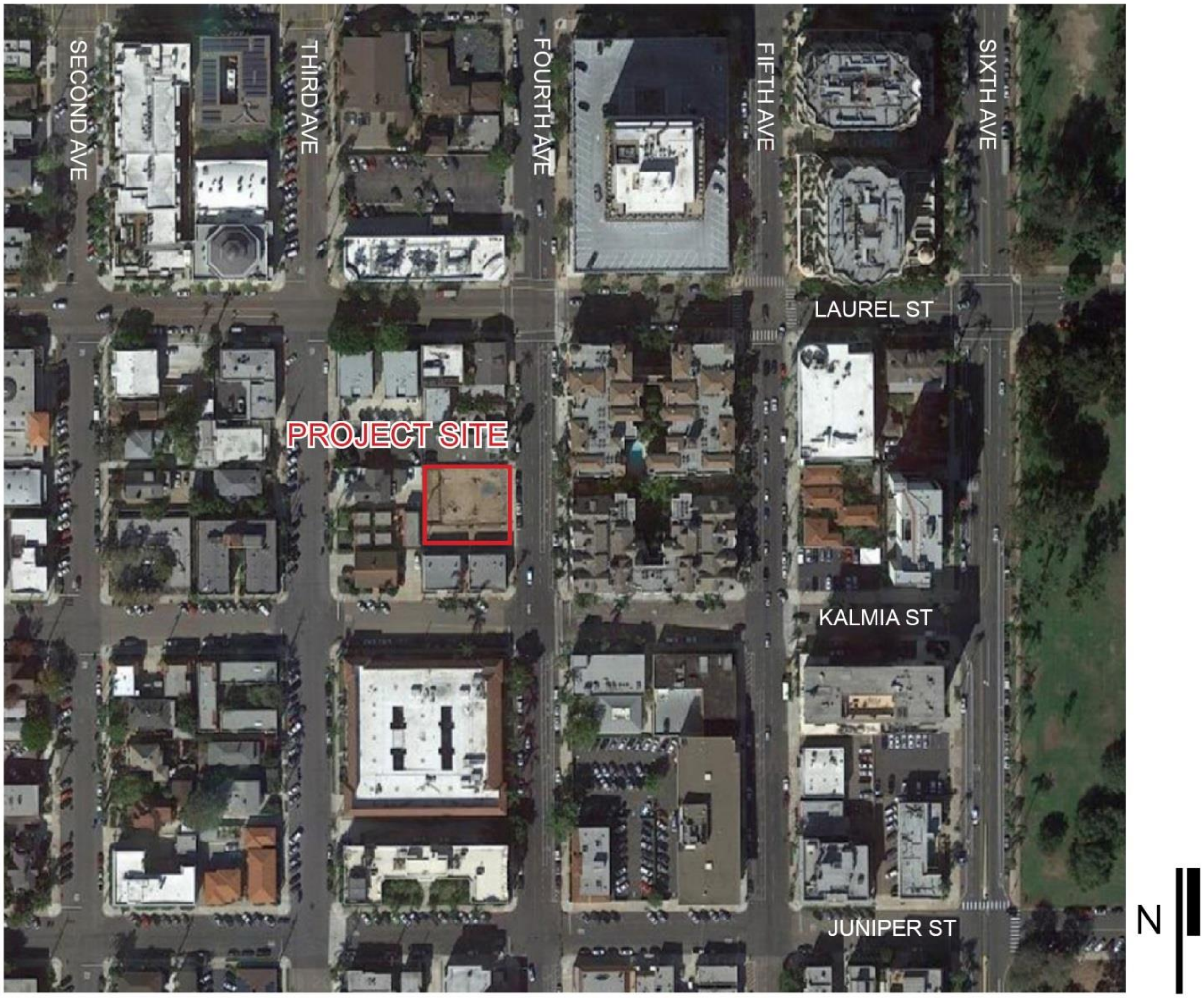
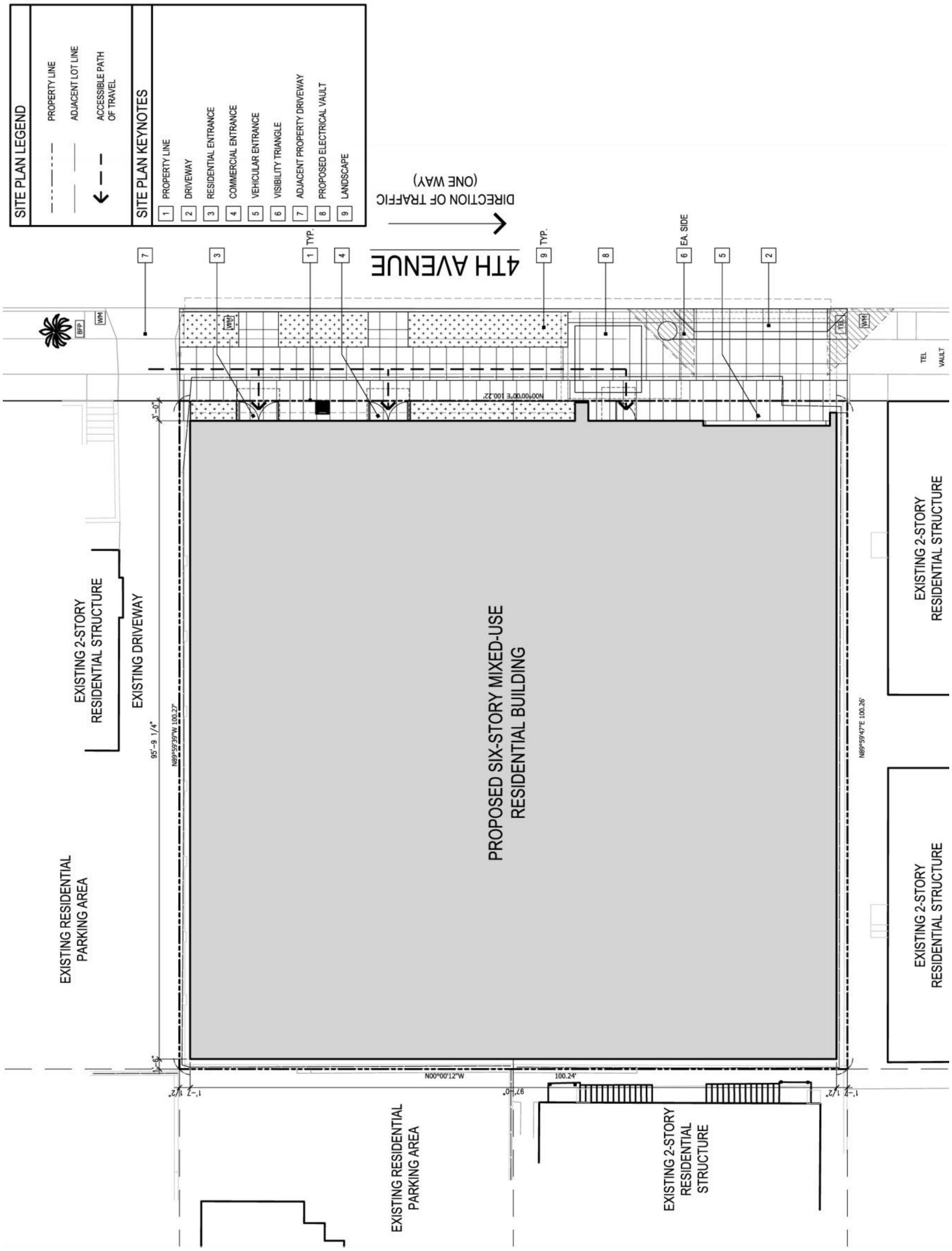


Figure 2
4th Avenue Apartments – Site Plan



This WMP consists of two sections corresponding to the implementation of site development: the *Construction Phase* (includes site excavation) and the *Occupancy Phase* (post-construction). The WMP addresses the projected amount of waste that could be generated by the project based on current City generation rates and estimates; waste reduction goals; and recommended techniques to achieve the waste reduction goals, such as recycling. Construction of the project is anticipated to take approximately 24-months. Construction would take place in one phase and is estimated to begin August 2019.

Waste disposal sites and recycling methods and opportunities may change from those available today; however, it is not expected that waste diversion and disposal sites listed in Table 3, *Minimum Exterior Refuse and Recyclable Material Storage Areas for Commercial Development*, would change by the time the project is anticipated to begin construction. This WMP includes the following general information known at the time the WMP was prepared:

- Projected waste generation calculations and identification of types of waste materials generated;
- Source separation techniques for waste generated;
- How materials will be re-used on-site;
- Name and location of current recycling, re-use, and landfill facilities where waste will be disposed of if not re-used on site;
- A “buy recycled” program;
- Measures to be implemented directed at reducing construction debris;
- Method(s) for communicating waste reduction and recycling goals to subcontractors;
- A general time line for construction and development; and
- A list of required progress and inspections by City staff, based on current ordinances.

2 BACKGROUND

In 1989, the California Legislature passed Assembly Bill (AB) 939: Integrated Waste Management Act, which mandated that all cities reduce waste disposed in landfills from generators within their borders by 50 percent by the year 2000. AB 939 required all local governments to prepare a Source Reduction and Recycling Element, which incorporates waste management policies and programs to achieve the mandated waste reduction. Since 1990, the City has diverted more than 50 percent of its generated waste stream from disposal. This bill specified that solid waste should be considered by the equation GENERATED = DISPOSED + DIVERTED. “Diverted” materials are put into a *hierarchy* in the law, as follows:

- First *source reduction*, such as using a reusable bag, making double-sided copies, or other measure that stops waste at the source.
- Secondary measures include *recycling* and *composting*. Because these measures often have transportation and processing impacts, they are considered less preferable than source reduction.
- In the Public Resources Code, various methods of *transformation* for energy production are limited to ten percent of the total waste reduction target.

In 2008, SB 1016 was chaptered. Known as the Solid Waste Disposal Measurement Act, SB 1016 maintained the 50 percent diversion requirement, but changed to a disposal-based measurement system, expressed as the 50 percent Equivalent Per Capita Disposal Target. This built upon AB 939 by implementing a simplified and timelier indicator of jurisdiction performance that focuses on reported disposal at Board-permitted disposal facilities. This established a goal of not recycling more, but disposing of less. AB 341: Jobs and Recycling, chaptered in 2011, was intended to create green jobs by expanding recycling to every multi-family dwelling and business. It charged CalRecycle with responsibility for ensuring that the State is diverting at least 75 percent of solid waste that is generated within the State by 2020. SB 1016 establishes that compliance with State law is measured by reducing the amount of waste material requiring disposal, and AB 341 increases the diversion target to 75 percent.

Additional local regulation pertaining to solid waste management includes the City of San Diego's Municipal Code Ch. 14 Art. 2 Div. 8: Sec. 142.0810, Sec. 142.0820, Ch. 6 Art. 6 Div. 7; Sec. 66.0706, Sec. 66.0709, Sec. 66.0710; and Ch. 6 Art. 6 Div. 6; Sec. 66.0711, Sec. 66.0604, Sec. 66.0606. These statues designate refuse and recycling space allocation requirements for:

- On-site refuse and recyclable material storage requirements,
- Diversion of construction and demolition debris regulations, and
- Diversion of recyclable materials generated from residential facilities, businesses, commercial/institutional facilities, apartments, condominiums, and special events requiring a City permit.

The City of San Diego has established a threshold of 40,000 square feet of development as generating sufficient waste (60 tons) to have a potentially cumulatively significant impact on solid waste services. The *4th Avenue Apartments* project as proposed exceeds this threshold. The purpose of this WMP is to identify measures that would be implemented to reduce this potential solid waste impacts such that significant impacts are avoided.

The City Recycling Ordinance is found in Municipal Code Sec. 66.0701 et. seq. It requires the provision of recycling service for all single-family residences; and commercial facilities and multi-family residences with service for four cubic yards or more. In addition, the ordinance also requires development of educational materials to ensure occupants are informed about the City's ordinance and recycling services including information on types of recyclable materials accepted.

Construction and Demolition (C&D) Debris Diversion Deposit Program applies to all applicants for building, demolition, and removal permits. This ordinance requires that the applicant post a deposit (Table1, *C&D Debris Deposit Table*). The deposit is not returned until the applicant demonstrates that a minimum amount of the material generated has been diverted from disposal in landfills. Mixed construction debris recycling facilities in San Diego are evaluated quarterly to determine how much of the throughput is recycled, and how much is a "residual" material requiring disposal. Facilities that accept mixed debris typically achieve a 68 percent or less diversion rate. Single materials recyclers, such as metal recyclers, often achieve a nearly 100 percent diversion rate. When comingled materials are sent to a mixed facility, the 75 percent diversion goal established by AB 341 will not be met. Depending on the project, to ensure that the overall diversion goal is attained, some materials must often be separated and trucked to facilities with higher diversion rates, such as aggregate and metal recyclers.

Table 1
C&D Debris Deposit Table

Building Category	Sq. Ft. Subject to Ordinance*	Deposit per Sq. Ft.	Range of Deposits
Residential New Construction	500-125,000 detached 500-100,000 attached	$0.40	$200-$50,000 $200-$40,000
Non-residential New Construction	1,000-25,000 commercial 1,000-75,000 industrial	$0.20	$200-$5,000 $200-$15,000
Non-residential Alterations	286 with no maximum	$0.70	$200 and up
Residential Demolition	286 with no maximum	$0.70	$200 and up
Non-residential Demolition	1,000 with no maximum	$0.20	$200 and up
Roof Tear-off	All projects	-	$200
Residential Alterations	500 and above	-	$1,000

* Projects under the minimum square footage subject to the ordinance are exempt from the C&D debris recycling deposit.

2.1 EXTERIOR REFUSE AND RECYCLABLE MATERIAL STORAGE AREA REQUIREMENTS

The *4th Avenue Apartments* project would develop in one phase over an approximate 24-months period. Development is anticipated to begin August 2019. Because the *4th Avenue Apartments* project includes residential and non-residential development, exterior refuse and recyclable material storage areas will be provided in accordance with City regulations per Chapter 14, Art. 2, Div. 8: Refuse and Recyclable Material Storage Regulations, Sec. 142.0820 and Sec. 142.0830.

2.2 EXTERIOR REFUSE AND RECYCLABLE MATERIAL STORAGE AREA FOR 4TH AVENUE APARTMENTS

The *4th Avenue Apartments* project would develop a mixed-use project with a total of 36 residential units and 1,085 net square feet of commercial retail space. Table 2, *Minimum Exterior and Recyclable Material Storage Areas for Residential Development*, shows the required amount of refuse and recyclable storage areas for the project's residential element. As shown in Table 2, the project would be required to provide 96 square feet each of exterior refuse and recyclable material storage area, for a total of 192 square feet of material storage area. Table 3, *Minimum Exterior and Recyclable Material Storage Areas for Commercial Development*, shows the required amount of refuse and recyclable storage areas for the project's commercial retail element. As shown in Table 3, the project would be required to provide 12 square feet each of exterior refuse and recyclable material storage area, for a total of 24 square feet of material storage area.

Table 2
Minimum Exterior Refuse and Recyclable Material Storage Areas for Residential Development

Number of Dwelling Units per Development	Minimum Refuse Storage Area per Development (square feet)	Minimum Recyclable Material Storage Area per Development (square feet)	Total Minimum Storage Area per Development (square feet)
2-6	12	12	24
7-15	24	24	48
16-25	48	48	96
26-50	96	96	192
51-75	144	144	288
76-100	192	192	384
101-125	240	240	480
126-150	288	288	576
151-175	336	336	672
176-200	384	384	768
201+	384 plus 48 square feet for every 25 dwelling units above 201	384 plus 48 square feet for every 25 dwelling units above 201	768 plus 96 square feet for every 25 dwelling units above 201

Source: City of San Diego Municipal Code, Chapter 14, Article 2, Division 8: Refuse and Recyclable Material Storage Regulations, Sec. 142.0820, Table 142-08B, current edition.

Table 3
Minimum Exterior Refuse and Recyclable Material Storage Areas for Commercial Development

Gross Floor Area per Development (square feet)	Minimum Refuse Storage Area per Development (square feet)	Minimum Recyclable Material Storage Area per Development (square feet)	Total Minimum Storage Area per Development (square feet)
0-5,000	12	12	24
5,001-10,000	24	24	48
10,001-25,000	48	48	96
25,001-50,000	96	96	192
50,001-75,000	144	144	288
75,001-100,000	192	192	384
100,001+	192 plus 48 square feet for every 25,000 square feet of building area above 100,001	192 plus 48 square feet for every 25,000 square feet of building area above 100,001	384 plus 96 square feet for every 25,000 square feet of building area above 100,001

Source: City of San Diego Municipal Code, Chapter 14, Article 2, Division 8: Refuse and Recyclable Material Storage Regulations, Sec. 142.0830, Table 142-08C, current edition.

3 EXISTING CONDITIONS

The *4th Avenue Apartments* project site encompasses approximately 10,060 square feet of previously graded but undeveloped land. The project is located on 4th Avenue, between Laurel Street and Kalmia Street.

4 PROPOSED CONDITIONS

The proposed project involves excavation of the existing lot and construction of a mixed-use development (approximately 59,360 gross square feet) consisting of residential, commercial retail, and street level and underground parking. The project would be a maximum of (6) six stories in height and would have a total of (36) thirty-six residential units and 1,085 net square feet of commercial retail space. A total of 21parking spaces will be provided. The project is being designed to comply with Cal-Green standards (see Figure 2, *4th Avenue Apartments – Site Plan*).

Construction will be completed in one phase over a 24-month period with construction anticipated to begin in August 2019. Construction practices will comply with local, State, and Federal regulations regarding handling of building materials to ensure waste minimization requirements are met.

5 CONSTRUCTION WASTE

Construction activities would generate packaging materials and unpainted wood, including wood pallets, and other miscellaneous debris. Construction debris would be separated on-site into material-specific containers to facilitate reuse and recycling and to increase the efficiency of waste reclamation and/or would be collected by a contracted waste hauler and separated at the facility. Source separation of materials at the construction site is essential to 1) ensure appropriate waste diversion rate, 2) minimize costs associated with transportation and disposal, and 3) facilitate compliance with the C&D ordinance. The types of construction waste anticipated to be generated include:

- Concrete
- Masonry/tile
- Cardboard
- Carpet, Padding/Foam
- Drywall
- Landscape Debris
- Mixed C&D Debris
- Roofing Materials
- Scrap Metal
- Scrap Wood
- Unpainted Wood and Pallets
- Garbage/Trash

Materials to be recycled would be redirected to appropriate recipients selected from ESD's directory of facilities that recycle construction materials, scrap metal, and yard waste.

5.1 RECYCLED CONSTRUCTION MATERIALS

The *4th Avenue Apartments* project will implement a target of 20 percent recycled material.

5.2 MANAGING CONSTRUCTION MATERIAL

Demolition and construction would occur over a period of approximately 24 months. ESD staff would be present for an early pre-construction meeting to evaluate waste segregation, signage, and salvage.

The project site is the location of an existing undeveloped vacant lot. Approximately 4,710 cubic yards (c.y.) of dirt will be exported and 16.7 tons of concrete waste, which would be recycled. Table 4, *4th Avenue Apartments Waste Generation – Demolition*, summarized the type and amount of demolition materials, as well as diversion/disposal.

Table 4
4TH Avenue Apartments Waste Generation - Demolition

Material Type	Estimated Waste Quantity (tons)	Handling	Estimated Diversion (tons)	Estimated Disposal (tons)
DEMOLITION WASTE				
Asphalt and Concrete	16.7	**Hanson Aggregates** 9229 Harris Plant Road San Diego, CA 92145 (100% Diversion)	16.7	0
TOTAL	16.7		16.7	0

In accordance with State diversion targets, a minimum of 75 percent of construction materials will be recycled. Materials to be recycled would be redirected to appropriate recipients selected from ESD's directory of facilities that recycle demolition materials, scrap metal, and yard waste.

To facilitate management of construction materials, the developer shall identify one person or agency connected with the proposed development to act as Solid Waste Management Coordinator, whose responsibility it becomes to work with all contractors and subcontractors to ensure material separation and coordinate proper disposal and diversion of waste generated. The Solid Waste Management Coordinator will help to ensure all diversion practices outlined in this Waste Management Plan are upheld and communicate goals to all contractors involved efficiently.

The responsibilities of the Solid Waste Management Coordinator, include, but are not limited to, the following:

- Review the Solid Waste Management Plan including responsibilities of Solid Waste Management Coordinator.
- Review and update procedures as needed for material separation and verify availability of containers and bins needed to avoid delays.
- Review and update procedures for periodic solid waste collection and transportation to recycling and disposing facilities.
- The authority to issue stop work orders if proper procedures are not being allowed.

The contractors will perform daily inspections of the construction site to ensure compliance with the requirements of the Waste Management Plan and all other applicable laws and ordinances and report directly to Solid Waste Management Coordinator. Daily inspections will include verifying the availability and number of dumpsters based on amount of debris being generated, correct labeling of dumpsters, proper sorting and segregation materials, and salvaging of excess materials. Additionally, the following apply:

- Solid Waste Management Coordinator will be responsible for educating contractors and subcontractors regarding waste management plan requirements and ensuring that contractors and subcontractors carry out the measures described in the WMP.
- Solid Waste Management Coordinator will ensure ESD attendance at a Precon and assure compliance with segregation requirements, and verification of recycled content in base materials.
- Recycling areas will be clearly identified with large signs, approved by ESD, and sufficient amounts of material-specific bins will be provided for necessary segregation.
- Recycling bins will be placed in areas that are readily accessible to contractors/subcontractors and in areas that will minimize misuse or contamination by employees and the public.
- Solid Waste Management Coordinator will be responsible for ensuring that contamination rates in bins remain below 5 percent by weight of the bin.

Table 5, *4th Avenue Apartments Waste Generation – Construction*, is included below to summarize the types of waste generated, the approximately amount of each waste type diverted, and the approximate overall amount remaining to be disposed of in landfills. Construction waste processing facilities that may be used for the construction phase include but are not limited to those facilities listed in Table 5. Because certified diversion rates and authorized facilities are updated quarterly and the decision on which facility will be contracted for waste hauling will be made at the time of construction based on market conditions and the facility's certified rate, the developer reserves the right to select any authorized facility as long as the facility is City-certified to meet minimum diversion requirements.

Table 5
4TH Avenue Apartments Waste Generation - Construction

Material Type	Estimated Waste Quantity (tons)	Handling	Estimated Diversion (tons)	Estimated Disposal (tons)
CONSTRUCTION WASTE				
Asphalt and Concrete	56.17	**Hanson Aggregates** 9229 Harris Plant Road San Diego, CA 92145 (100% Diversion)	56.17	0
Brick/Masonry/ Tile	16.05	**Vulcan Materials Company Carroll Canyon Landfill** 10051 Black Mountain Road San Diego, CA 92126 (100% Diversion)	16.05	0
Cardboard	1.58	**Allan Company** 6733 Consolidated Way San Diego, CA 92121 (100% Diversion)	1.58	0
Carpet, Padding/Foam	0.80	**DFS Flooring** 10178 Willow Creek Road San Diego, CA 92131 (100% Diversion)	0.80	
Drywall	11.24	**EDCO Station Transfer and BuyBack Center** 8184 Commercial Street La Mesa, CA 91942 (70% Diversion)	7.87	3.37
Landscape Debris	1.61	**Miramar Greenery** 5180 Convoy Street San Diego, CA 92111 (100% Diversion)	1.61	
Mixed C&D Debris	48.15	**Otay C&D/Inert Debris Processing Facility** 1700 Maxwell Road Chula Vista, CA 91913 (70% Diversion)	33.71	14.44
Roofing Materials	0.81	**LEED Recycling** 8725 Miramar Place San Diego, CA 92121 (100% Diversion)	0.81	
Scrap Metal	3.9	**Allan Company** 6733 Consolidated Way San Diego, CA 92121 (100% Diversion)	3.9	
Unpainted Wood & Pallets	19.26	**Miramar Greenery** 5180 Convoy Street San Diego, CA 92111 (100% Diversion)	19.26	
Garbage/Trash	0.81	**Miramar Landfill** 5180 Convoy Street San Diego, CA 92111 (0% Diversion)	0.81	
TOTAL	160.38		142.57	17.81

Construction debris will be separated onsite into material-specific containers, corresponding to the materials types in Table 5, to facilitate reuse and recycling and to increase the efficiency of waste reclamation. The *4th Avenue Apartments* project will implement a target of 20 percent recycled material and 75 percent for landfill diversion. As shown in Table 5, the applicant has the goal of 89 percent diversion rate of the construction materials generated by the project are expected to be diverted from landfills.

6 OCCUPANCY PHASE

While the construction phase for the *4th Avenue Apartments* project occurs as a one-time waste generation event as construction of the project proceeds, tenant/owner occupancy requires an on-going plan to manage waste disposal to meet the waste reduction goals established by the City and State.

6.1 SOLID WASTE RECYCLING

The following table expresses the anticipated refuse and recyclable storage requirements based on Table 142-08B and 142.08C of the City of San Diego Municipal Code.

Table 6
Minimum Exterior Refuse and Recyclable Material Storage Areas for 4th Avenue Apartments

Land Use	Gross Floor Area/Units	Minimum Refuse Storage Area (square feet)	Minimum Recyclable Material Storage Area (square feet)	Total Minimum Storage Area (square feet)
Residential	36 units	96	96	192
Commercial Retail	1,085 sq. ft.	12	12	24
TOTAL		108	108	216

As shown in Table 7, *Estimated Solid Waste Generation from the 4th Avenue Apartments*, during occupancy, the expected generated waste per year from the 4th Avenue Apartments project when fully occupied would be approximately 46.2 tons.

Table 7
Estimated Solid Waste Generation from the 4th Avenue Apartments – Occupancy Phase

Use	Intensity	Waste Generation Rate	Estimated Waste Generated (tons/year)
Residential	36 units	1.2 tons/year/unit	43.2
Commercial Retail	1,085 sq. ft.	0.0028 tons/year/sq. ft.	3.0
		TOTAL	46.2

On-site recycling services shall be provided to all tenants/residents within the *4th Avenue Apartments.* Tenants/residents with the *4th Avenue Apartments* project that receive solid waste collection service shall participate in a recycling program by separating recyclable materials from other solid waste and depositing the recyclable materials in the recycling container provided for the occupants. Recycling services are required by Section 66.0707 of the City of San Diego Land Development Code. Based on current requirements, these services shall include the following:

- Collection of recyclable material as frequently as necessary to meet demand;
- Collection of plastic bottles and jars, paper, newspaper, metal containers, cardboard, and glass containers;
- Collection of other recyclable materials for which markets exist, such as scrap metal, wood pallets;
- Collection of food waste for recycling by composting, where available (prior to issuance of building and occupancy permits, the project proponent will meet with representatives from ESD to ensure that their educational materials and haulers can comply with the requirements for this service);
- Use of recycling receptacles or containers which comply with the standards in the Container and Signage Guidelines established by the City of San Diego Environmental Services Department;
- Designated recycling collection and storage areas;

- Signage on all recycling receptacles, containers, chutes, and/or enclosures which complies with the standards described in the Container and Signage Guidelines established by the City of San Diego Environmental Services Department

As required by Section 66.0707 of the City of San Diego Land Development Code, the building management or other designated personnel shall ensure that occupants are educated about the recycling services as follows:

- Information, including the types of recyclable materials accepted, the location of recycling containers, and the occupants responsibility to recycle shall be distributed to all occupants annually;
- All new occupants shall be given information and instruction upon occupancy;
- All occupants shall be given information and instructions upon any change in recycling service to the commercial facility.

6.2 LANDSCAPING AND GREEN WASTE RECYCLING

Plant material selection will be guided by the macro- and micro-climate characteristics of the project site and surrounding region to encourage long-term sustainability without the excessive use of water pesticides and fertilizers. Irrigation of these areas, where practical, will utilize reclaimed water applied via low precipitation rate spray heads, drip emitters, or other highly efficient systems. Landscape maintenance would include the collection of green waste and disposal of green waste at recycling centers that accept green waste. This will help further reduce the waste generated by developments within the *4th Avenue Apartments* during the occupancy phases.

7 CONCLUSION

The City of San Diego Development Services Department is requiring that this WMP be prepared and submitted to the City of San Diego's ESD. Since the project is in the design phase, this is only a preliminary plan, which specifies the intent to meet the requirements of PRC 939 and City ordinances. This WMP will be implemented to the fullest degree of accuracy and efficiency. Additionally, the project will be required to adhere to City ordinances, including the *Construction and Demolition Debris Diversion Deposit Program*, the City's *Recycling Ordinance*, and the *Refuse and Recyclable Materials Storages Regulations*. The WMP plan for the *4th Avenue Apartments* project is designed to implement and adhere to all city ordinances and regulations with regards to waste management. The measures in the WMP would ensure that significant impacts relative to solid waste are avoided.

Prior to the issuance of any grading or construction permits, the Solid Waste Coordinator will ensure ESD's attendance at a Precon. The Solid Waste Coordinator will ensure that 1) the proposed approach to contractor education is approved, 2) the written specifications for base materials, concrete pavers, decomposed granite, and mulch, is approved, and 3) that the ESD inspector approves the separate waste containers, signage, and hauling contract(s) for the following materials:

- Asphalt/concrete
- Brick/masonry/tile
- Cardboard
- Carpet/padding/foam
- Drywall
- Landscape debris
- Mixed C&D debris
- Scrap metal
- UNTREATED woodwaste
- Refuse

The project would be designed to achieve 75+ percent of construction waste to be source reduced and/or recycled. While diversion activities during occupancy will achieve only 40 percent diversion and will not achieve the State target of 75 percent, the project incorporates several measures above and beyond the requirements of local ordinance.

- First, the project exceeds ordinance requirements and even the State waste reduction target during construction.
- Second, the project includes landscaping that will reduce yardwaste, and will provide transportation to a composting facility for the yard waste that is produced. The project proponent will ensure that ESD reviews the landscaping plans and hauling contract for the facility to verify that waste reduction goals are met.

The project would target 20 percent of solid waste to be recycled material and 75 percent for landfill diversion.

These measures ensure that the waste generated by the project will be properly managed and that solid waste services will not be impacted.

The following measures apply to the project to reduce cumulative impacts on solid waste to below a level of significance:

I. Prior to Permit Issuance or Bid opening/Bid award
    a. LDR Plan check
        i. Prior to the issuance of any construction permit, including but is not limited to, demolition, grading, building or any other construction permit, the Assistant Deputy Director (ADD) Environmental Designee shall verify that all of the requirements of the Refuse & Recyclable Materials Storage Regulations and all of the requirements of the waste management plan are shown and noted on the appropriate construction documents. All requirements, notes and graphics shall be in substantial conformance with the conditions and exhibits of the associated discretionary approval.

The construction documents shall include a waste management plan. Notification shall be sent to:

MMC Environmental Review Specialist
Development Service Department
9601 Ridgehaven Court
Ste. 220, MS 1102 B
San Diego, CA 92123 1636
T. 619.980.7122

Environmental Services Department (ESD)
9601 Ridgehaven Court
Ste. 210, MS 1102A
San Diego, CA 92123 1636
T. 858.573.1236

II. Prior to Start of Construction
   a. Grading and Building Permit – Prior to issuance of any grading or building permit, the permittee shall be responsible to arrange a preconstruction meeting to coordinate the implementation of the WMP. The Precon Meeting that shall include: the Construction Manager, Building/Grading Contractor; MMC: and ESD and the Building Inspector and/or the RE (whichever is applicable) to verify that implementation of the waste management plan shall be performed in compliance with the plan approved by LDR and San Diego ESD, to ensure that impacts to solid waste facilities are below a level of significance.
      i. At the Precon Meeting, the Permittee shall submit reduced copies (11”x17”) of the approved waste management plan to the RE, BI, MMC, and ESD.
      ii. Prior to the start of construction, the Permittee/Construction Manager shall submit a construction schedule to the RE, BI, MMC, and ESD.

III. During Construction
The Permittee/Construction Manager shall call for inspections by the RE/BI and both MMC and ESD, who will periodically visit the demolition/construction site to verify implementation of the waste management plan. The Consultant Site Visit Record (CSVR) shall be sued to document the Daily Waste Management Activity/Progress.

IV. Post Construction
   a. For any demolition or construction permit, a final results report shall be submitted to both MMC and ESD for review and approval to the satisfaction of the City. MMC will coordinate the approval with ESD and issue the approval notification. ESD will review/approve City Recycling Ordinance-required educational materials prior to occupancy.