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Environmental Assessment
Determinations and Compliance Findings for HUD-assisted Projects
24 CFR Part 58

Project Information

Project Name: Opportunity to Advance Sustainability, Innovation and Social Inclusion (OASIS) Clean Technology Park

Responsible Entity: University of California

Grant Recipient (if different than Responsible Entity): The University of California through its University of California, Riverside campus

State/Local Identifier: California/University of California, Riverside

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Certifying Officer Name and Title: Dr. Kim A. Wilcox, Chancellor

Consultant (if applicable): HELIX Environmental Planning, Inc.

Direct Comments to:

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Project Location: The project is located at 1200 University Avenue and portions of 1150 and 1160 University Avenue in the City of Riverside (City) within the University of California, Riverside (UCR) West Campus (Attachment 1, Figure 1, *UCR Campus*; Attachment 2, Figure 2, *Project Site Location*). The project site is located west of the Interstate 215/State Route 60 (I-215/SR 60) freeway on the south side of University Avenue. Two existing vehicular access points serve the site from University Avenue: the signalized intersection at University Village and a secondary ingress/egress driveway approximately 300 feet west of the southbound on-ramp to the I-215/SR 60 freeway. Additional access is available from Everton Place, south of the project site. Two internal access roads connect Everton Place from the south to University Avenue at the north. The site is depicted on the USGS topographic map for the Riverside East, California 7.5-minute quadrangle.

Description of the Proposed Project [24 CFR 50.12 & 58.32; 40 CFR 1508.25]**:** The project proposes academic research and laboratory, offices, and academic instruction uses/assembly and exhibition spaces within an approximately five-acre project site owned by UCR. UCR proposes to demolish the existing 196,641 gross square foot (gsf) University Extension (UNEX) building and an approximately 54,000 square foot (sf) parking structure, surface parking, hardscape, and landscape. Subsequent to demolition activities, UCR proposes to develop new research laboratory, office, and academic instruction building(s) up to three stories in height, totaling approximately 70,000 gsf. The approximately 42,000 gsf of academic research and laboratory space would include laboratories, maker space, and dry labs. The approximately 21,000 gsf of office space would include office suites and shared community resources. The remaining approximately 7,000 gsf of shared community spaces would include classrooms, meeting and conference rooms, lobby and event space, and other shared gathering spaces. The project also includes usable open space, multimodal circulation, a service area, and landscape and hardscape improvements (Attachment 3, Figure 3, *Conceptual Site Plan*).

The proposed development would be concentrated in the northwestern portion of the site. The northern area of the project site, along the University Avenue frontage, would focus on community-oriented spaces. The site would feature integrated outdoor gathering spaces likely along the University Avenue frontage and adjacent to the proposed building(s).

The area immediately south of the building footprint would feature an approximately 3,000 sf working yard and service area for fleet servicing and storage. The working yard and storage area would be fenced and secured, with gated access from the western drive aisle and a loading dock connected to the southern portion of the building. The southern portion of the site would be left vacant for potential future development[1]. Landscape and hardscape would be provided throughout the site, as well as approximately 125 permitted parking stalls and 15 visitor parking stalls. A multimodal corridor for pedestrians, bicycles, and other micro-mobility vehicles would be provided along the eastern edge of the project site with connections to on-site open space areas and off-site circulation elements. Off-site improvements that would be required as part of the proposed project include signal modification at the intersection of University Avenue and University Village at the northern entrance to the project site, and crosswalk restriping on Everton Place to the south of the project site.

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[1] Future development within the project site that is not currently included in the proposed project would be subject to future funding and separate environmental analyses.

Construction activities are anticipated to begin around Spring 2024 and last for approximately 28 months. Construction activities would include demolition, site preparation, grading, building construction, architectural coating, and paving. Approximately 250,641 sf of building area and 100,125 sf (approximately 2.3 acres) of hardscape would be demolished during construction, resulting in approximately 16,135 tons of demolition material. Approximately 195,000 sf (approximately 4.5 acres) of the project site would be graded. Approximately 10,600 cubic yards (cy) of soil would be excavated (cut) and 12,190 cy would be required for fill during grading activities, requiring 1,590 cy of soil import. Approximately 90,000 sf (approximately 2.1 acres) of the project site would be surfaced with asphalt and concrete. The maximum depth of ground disturbance during project construction would be approximately 6 feet.

Statement of Purpose and Need for the Proposal [40 CFR 1508.9(b)]: The purpose of the project is to develop a sustainability, innovation, and social inclusion hub within the City's Innovation Corridor to build upon existing regional partnerships and connections with the California Air Resources Board (CARB), the City, the counties of Riverside and San Bernardino, and other community partners. The project is needed to facilitate various programs and initiatives related to regional economic development through solutions-driven applied research, innovation, entrepreneurship, and workforce development around sustainability, clean technology, and social inclusion.

Existing Conditions and Trends [24 CFR 58.40(a)]: The project site is located within an urbanized portion of the City within the UCR West Campus. The land use designation for the site in UCR's 2021 Long Range Development Plan (LRDP)[2] is University Avenue Gateway. The approximately five-acre project site includes the existing 196,641 gsf UNEX building, an approximately 54,000 sf parking structure, surface parking, hardscape, and landscape.

The existing UNEX building is a five-story concrete structure that is slated for demolition as part of the proposed project. The building was originally built as a hotel in 1968 and expanded in 1984 to include additional rooms and the two and a half-story parking structure. Purchased by UCR in 1992, the UNEX building was converted into offices, classrooms, and gathering space for UCR's use until it was abandoned in 2022 due to seismic deficiency. Seismic analysis conducted for the parking structure indicates that major upgrades would be required to retain the structure, and it also is proposed for demolition as part of the project.

Existing land uses surrounding the OASIS Clean Technology Park site include University Avenue followed by University Village and commercial uses to the north; Everton Place followed by surface parking, International Village, and land-based research to the south; surface parking (Parking Lots 50 and 51) followed by the Gage Canal, the California Department of Transportation (Caltrans) service yard, and the I-215/SR 60 freeway to the east; and commercial and multi-family residential uses to the west (see Attachment 2, Figure 2, *Project Site Location*). University Avenue is an active arterial and public transit corridor, lined with a mix of primarily low-rise commercial and retail uses that include restaurants, office space, a theater, and gas stations. A section of University Avenue between UCR and downtown Riverside has been designated by the City as an "Innovation Corridor," envisioned for orientation around research,

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[2] UCR's 2021 LRDP is a comprehensive land use plan that guides physical development on UCR's main campus to accommodate projected enrollment increases and new and expanded program initiatives.

innovation, and clean technology. Approximately one block southwest of the project site is the CARB Southern California Headquarters.

In absence of the project, the site would remain in its current condition, with the existing UNEX building and parking structure, which require major upgrades to address seismic deficiencies if UCR were to retain the structures. Without the proposed project, the site would continue to be unused and would not become a sustainability, innovation, and social inclusion hub or provide a gateway for the UCR campus and the City's "Innovation Corridor."

Funding Information

Grant Number	HUD Program	Funding Amount
B-22-CP-CA-0105	FY2022 Community Project Funding Grant	$1,500,000

Estimated Total HUD Funded Amount: $1,500,000

Estimated Total Project Cost (HUD and non-HUD funds) [24 CFR 58.32(d)]**:** $65M

Compliance with 24 CFR 50.4, 58.5, and 58.6 Laws and Authorities

Record below the compliance or conformance determinations for each statute, executive order, or regulation. Provide credible, traceable, and supportive source documentation for each authority. Where applicable, complete the necessary reviews or consultations and obtain or note applicable permits of approvals. Clearly note citations, dates/names/titles of contacts, and page references. Attach additional documentation as appropriate.

Compliance Factors: Statutes, Executive Orders, and Regulations listed at 24 CFR §58.5 and §58.6	Are formal compliance steps or mitigation required?	Compliance determinations
STATUTES, EXECUTIVE ORDERS, AND REGULATIONS LISTED AT 24 CFR 50.4 and 58.6		
Airport Hazards 24 CFR Part 51 Subpart D	Yes ☐ No ☒	The project site is not located within 2,500 feet (approximately 0.5 mile) of a civil airport runway or 15,000 feet (approximately 2.8 miles) of a military airfield runway. The nearest civil airport (Flabob Airport) is approximately 4 miles west of the project site. The nearest military airfield runway is approximately 6 miles southeast of the project site at March Air Reserve Base/Inland Port Airport. *Source:* [Attachment 4, Proximity to Airports Maps]

Compliance Factors: Statutes, Executive Orders, and Regulations listed at 24 CFR §58.5 and §58.6	Are formal compliance steps or mitigation required?	Compliance determinations
Coastal Barrier Resources Coastal Barrier Resources Act, as amended by the Coastal Barrier Improvement Act of 1990 [16 USC 3501]	Yes ☐ No ☒	No coastal barrier resources under the protection of the Coastal Barrier Resource Act occur in California. The Coastal Barrier Resources Act does not apply. *Source:* [Attachment 5, Coastal Barrier Resources Map, a]
Flood Insurance Flood Disaster Protection Act of 1973 and National Flood Insurance Reform Act of 1994 [42 USC 4001-4128 and 42 USC 5154a]	Yes ☐ No ☒	The project site is not within a hazard zone for tsunami, seiche, flood, or dam failure. The project site is within Flood Zone X, or an Area of Minimal Flood Hazard. The project site is not located in a Special Flood Hazard Area. *Source:* [Attachment 6, FEMA Flood Insurance Map, b]
STATUTES, EXECUTIVE ORDERS, AND REGULATIONS LISTED AT 24 CFR 50.4 & 58.5		
Clean Air Clean Air Act, as amended, particularly section 176(c) & (d); 40 CFR Parts 6, 51, 93	Yes ☒ No ☐	The project site is in the South Coast Air Basin (SCAB) and is subject to the jurisdiction of the South Coast Air Quality Management District (SCAQMD). The SCAB is designated nonattainment for the federal and State ozone standards (1-hour and 8-hour), the State standard for particulate matter (PM) 10 microns or less in diameter (PM_{10}), the federal 24-hour standard for PM 2.5 microns or less in diameter ($PM_{2.5}$), and the State and federal annual $PM_{2.5}$ standard. The SCAB is in attainment of all other federal and State standards. Per guidelines set forth by the department of Housing and Urban Development (HUD), because the project is in a nonattainment area for ozone and particulate matter, conformity with the State Implementation Plan (SIP) must be demonstrated. The SIP is a comprehensive plan that describes how an area will attain federal and State ambient air quality standards. A project would comply with the SIP if it were deemed consistent with the local air quality management plan and its criteria pollutant

Compliance Factors: Statutes, Executive Orders, and Regulations listed at 24 CFR §58.5 and §58.6	Are formal compliance steps or mitigation required?	Compliance determinations
		emissions remain below the local air district's significance thresholds. The 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) and 2022 Air Quality Management Plan (AQMP) were developed by the SCAQMD to achieve the federal and State ambient air quality standards. Construction of the project would generate temporary air pollutant emissions associated with fugitive dust (PM_{10} and $PM_{2.5}$) from ground disturbance and exhaust emissions (nitrogen oxides and carbon monoxide) from construction vehicles. The project would be required to comply with SCAQMD Rules 53, 401, 402, 403, 473, 475, 1113, and 1403, which identify measures to reduce air quality impacts at construction sites within the SCAB. Also, construction equipment greater than 50 horsepower would be required to be Tier 4 or better per the 2021 LRDP Environmental Impact Report (EIR) Mitigation Measure (MM) GHG-1 Measure CR-1. Construction of the project would not exceed the SCAQMD regional construction daily emission thresholds; therefore, project construction would not conflict with the SIP, RTP/SCS or AQMP, violate an air quality standard or contribute to an existing or projected violation, result in a cumulatively considerable increase in ozone or PM emissions, or expose receptors to substantial pollutant concentrations. Project operational emissions were calculated to be well below regulatory thresholds for maximum daily air quality emissions, including ozone and PM. Additionally, emissions would be below existing conditions based on the 2021 LRDP EIR baseline (operation of UNEX) since the project would not have on-site pollutant emissions from

Compliance Factors: Statutes, Executive Orders, and Regulations listed at 24 CFR §58.5 and §58.6	Are formal compliance steps or mitigation required?	Compliance determinations
		energy sources and would decrease the building area on the site. Based on these factors, emissions of criteria pollutants are anticipated to be *de minimis* and would not be regionally significant. Because the project would be consistent with the 2021 LRDP development program, which is factored into the SCAQMD's modeling for the AQMP, and would not exceed pollutant emission thresholds for the SCAB, the project is presumed to be compliant with the SIP and consistent with the Clean Air Act. No formal compliance steps are required regarding the SCAQMD Rules; however, while emissions would be *de minimis*, portions of the 2021 LRDP EIR MM GHG-1 would continue to be implemented and would further reduce construction and operation air quality impacts. *Source:* [Attachment 7, Supporting Air Quality and GHG Emissions Documentation, c, d]
Coastal Zone Management Coastal Zone Management Act, sections 307(c) & (d)	Yes No ☐ ☒	There is no coastal zone within Riverside County and the project site is not within the California Coastal Zone, as defined by the California Coastal Act (Public Resources Code, Division 20, Section 3000 Et. Seq.). *Source:* [Attachment 8, California Coastal Zones, e]
Contamination and Toxic Substances 24 CFR Part 50.3(i) & 58.5(i)(2)	Yes No ☐ ☒	The project site does not contain known underground storage tanks and is not a site with a restricted land use covenant for toxic substances. No open hazardous materials cases were identified within one mile of the project site in the GeoTracker and Department of Toxic Substances (DTSC) EnviroStor databases. *Source:* [Attachment 9, Geotracker and EnviroStor Database Searches, f, g]

Compliance Factors: Statutes, Executive Orders, and Regulations listed at 24 CFR §58.5 and §58.6	Are formal compliance steps or mitigation required?	Compliance determinations
Endangered Species Endangered Species Act of 1973, particularly section 7; 50 CFR Part 402	Yes ☐ No ☒	The project site is currently developed/ disturbed and is not identified as containing special-status species or habitat areas. No sensitive habitat is present on the project site and the project is outside of survey areas for burrowing owls. *Source:* [h]
Explosive and Flammable Hazards 24 CFR Part 51 Subpart C	Yes ☐ No ☒	The project does not include development, construction, or rehabilitation that would increase residential densities or convert non-residential uses to residential uses. As a result, the project would not expose residents to potential hazards associated with above ground storage tanks or explosive or flammable hazards. While the proposed laboratory uses for the project would require the use of some hazardous materials related to research and academics, the project is not considered a "hazardous facility" because it would not primarily store, handle, or process flammable or combustible chemicals. Hazardous facilities are described as bulk fuel storage facilities or refineries and the proposed project would not include a hazardous facility.
Farmlands Protection Farmland Protection Policy Act of 1981, particularly sections 1504(b) and 1541; 7 CFR Part 658	Yes ☐ No ☒	The project site is currently developed with urban land uses and is classified as "Urban and Built-Up Land" by the California Department of Conservation. The site does not contain prime or unique farmland, or other farmland of statewide or local importance. *Source:* [Attachment 10, Riverside County Important Farmland Map, i]

Compliance Factors: Statutes, Executive Orders, and Regulations listed at 24 CFR §58.5 and §58.6	Are formal compliance steps or mitigation required?	Compliance determinations
Floodplain Management Executive Order 11988, particularly section 2(a); 24 CFR Part 55	Yes ☐ No ☒	The project site is not within the 100-year floodplain and would not adversely affect floodplain management or result in impacts associated with locating the project within a floodplain. *Source:* [Attachment 6, FEMA Flood Insurance Map, b]
Historic Preservation National Historic Preservation Act of 1966, particularly sections 106 and 110; 36 CFR Part 800	Yes ☒ No ☐	The National Historic Preservation Act regulates the protection of historic structures that are generally older than 50 years. The project site is developed with a five-story former Holiday Inn that was originally constructed in 1968 and expanded in 1984. The building was purchased by UCR and renovated in 1992 for use as an educational building by the UNEX program. The project would involve the demolition of the building. A Section 106 review was completed for the project and reached a finding of No Historic Properties Affected (see Attachment 11). Specifically, the property does not meet National Register of Historic Places (NRHP) and California Register of Historical Resources (CRHR) designation criteria as an individually significant resource. Based on the Historical Resource Evaluation DPR forms, the building does not meet any of the criteria of eligibility used by the National Historic Preservation Act. The building is not individually representative of important events that have made a significant contribution to the broad patterns of regional history or the cultural heritage of California or the United States. Historical research failed to identify any specific individual directly and significantly associated with UCR or generally to local, state, or national history. The building is not associated with a locally important architect or planner,

Compliance Factors: Statutes, Executive Orders, and Regulations listed at 24 CFR §58.5 and §58.6	Are formal compliance steps or mitigation required?	Compliance determinations
		is not considered to be a good example of Mid-Century Modern commercial architecture, and did not employ innovative construction techniques or materials. The property on which the building is sited has not previously been found to have information that contributed to our understanding of human history or prehistory, and the building itself is not considered to be an important source of information about the history of the area. Therefore, no formal compliance steps or mitigation related to historic properties per the National Historic Preservation Act are required. Geotechnical investigations conducted for the proposed project indicated that the site is underlain by 1 to 8 feet of undocumented fill that varies in thickness across the site, with an average depth of approximately 3.5 feet. The undocumented fill is underlain by alluvial fan deposits, which have the potential to contain undiscovered archaeological resources. UCR's standard contract specifications address the protection and recovery of buried archaeological resources, including human remains, as required by the 2021 LRDP EIR MM CUL-2 through MM CUL-4. These measures identify steps to be taken if previously undiscovered archaeological resources, including human remains, are discovered during ground disturbing activities. With inclusion of a qualified archaeological monitor meeting the Secretary of the Interior's Professional Qualification Standards for archaeology and Native American monitor during ground disturbing construction activities into undisturbed native soils,

Compliance Factors: Statutes, Executive Orders, and Regulations listed at 24 CFR §58.5 and §58.6	Are formal compliance steps or mitigation required?	Compliance determinations
		compliance with 24 CFR Part 58 has been completed. *Source:* [Attachment 11, Historic Resources Assessment, Attachment 12, Geotechnical Investigation Report, j, k]
Noise Abatement and Control Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978; 24 CFR Part 51 Subpart B	Yes No ☐ ☒	Noise abatement and control pursuant to 24 CFR Part 51, Subpart B, applies to projects in high noise areas that would affect future use at the project site. Specifically, projects located within 1,000 feet of major roadways, within 3,000 feet of a railroad, or within 15 miles of an airfield are considered areas that may need noise abatement if noise levels exceed 65 A-weighted decibels (dBA) equivalent noise level (Leq) under existing conditions. The project site is located near the I-215/SR 60 freeway and is within 15 miles of two airports. There are no railroads within 3,000 feet of the project site. Ambient noise levels at the project site were measured to range from 52.7 to 67.4 dBA Leq, where the highest noise levels are experienced along University Avenue from traffic noise. In addition, the LRDP EIR anticipates that at buildout of the development program, noise levels at 50 feet from the University Avenue centerline would be 66 dBA Community Noise Equivalent Level. The proposed building would be set back from the roadway where the ambient noise levels would be below 65 dBA Leq, which is considered an acceptable noise level and requires no special approvals or requirements. *Source:* [Attachment 13, Supporting Noise Documentation, d, l]

Compliance Factors: Statutes, Executive Orders, and Regulations listed at 24 CFR §58.5 and §58.6	Are formal compliance steps or mitigation required?	Compliance determinations
Sole Source Aquifers Safe Drinking Water Act of 1974, as amended, particularly section 1424(e); 40 CFR Part 149	Yes ☐ No ☒	The project site is not located within an area supported by a sole source aquifer. Sole source aquifers are defined and designated under the provisions of Section 1424(e) of the federal Safe Drinking Water Act. There are no such designated aquifers within the City. According to the sole source aquifer maps maintained by the U.S. Environmental Protection Agency (USEPA), the nearest aquifer is in the Campo area of San Diego County, more than 100 miles south of the project site. *Source:* [Attachment 14, Sole Source Aquifers Map, m]
Wetlands Protection Executive Order 11990, particularly sections 2 and 5	Yes ☐ No ☒	No protected wetlands were identified within the project site and impacts to the nearby Gage Canal would be avoided, as it is outside of the project site limits. *Source:* [h]
Wild and Scenic Rivers Wild and Scenic Rivers Act of 1968, particularly section 7(b) and (c)	Yes ☐ No ☒	No designated wild or scenic rivers are located within the City. *Source:* [Attachment 15, Wild and Scenic Rivers Map, n]
ENVIRONMENTAL JUSTICE		
Environmental Justice Executive Order 12898	Yes ☐ No ☒	The project would provide research labs, offices, and classroom space at the UCR campus and would not remove existing housing or otherwise displace minority or low-income communities. Additionally, because the proposed project would not cause high and adverse environmental impacts, it would not cause high and adverse environmental impacts that disproportionately affect low income or minority populations. The campus is a national leader in research of air pollution and alternative fuels. To leverage this expertise and proximity to the CARB Southern California Headquarters, the project

Compliance Factors: Statutes, Executive Orders, and Regulations listed at 24 CFR §58.5 and §58.6	Are formal compliance steps or mitigation required?	Compliance determinations
		would enhance collaboration between the two entities, synergizing research and tech transfer efforts focused on clean technologies and to be able to showcase to the community. The project would be in compliance with Executive Order 12898.

Environmental Assessment Factors [24 CFR 58.40; Ref. 40 CFR 1508.8 &1508.27] Recorded below is the qualitative and quantitative significance of the effects of the proposal on the character, features and resources of the project area. Each factor has been evaluated and documented, as appropriate and in proportion to its relevance to the proposed action. Verifiable source documentation has been provided and described in support of each determination, as appropriate. Credible, traceable, and supportive source documentation for each authority has been provided. Where applicable, the necessary reviews or consultations have been completed and applicable permits of approvals have been obtained or noted. Citations, dates/names/titles of contacts, and page references are clear. Additional documentation is attached, as appropriate. **All conditions, attenuation or mitigation measures have been clearly identified.**

Impact Codes: Use an impact code from the following list to make the determination of impact for each factor.
(1) Minor beneficial impact
(2) No impact anticipated
(3) Minor Adverse Impact – May require mitigation
(4) Significant or potentially significant impact requiring avoidance or modification which may require an Environmental Impact Statement

Environmental Assessment Factor	Impact Code	Impact Evaluation
LAND DEVELOPMENT		
Conformance with Plans / Compatible Land Use and Zoning / Scale and Urban Design	2	The City of Riverside General Plan, which includes the UCR main campus, identifies UCR as a public facility/institutional land use. UCR is part of the University of California (UC) school system, a constitutionally created entity of the State of California; as such, the campus is not subject to municipal regulations, such as the general plans for the County and City of Riverside. The project is consistent with the land use designations, objectives, population forecasts, and building space projections in the 2021 LRDP, which is the applicable land use plan for the UCR main campus and the project. Specifically, the project would result in the addition of approximately 80 new employees, which would be

Environmental Assessment Factor	Impact Code	Impact Evaluation
		approximately 2.9 percent of the faculty/staff increase projected in the 2021 LRDP. The project site is in an area designated as University Avenue Gateway in the 2021 LRDP, which allows for the development of the proposed project. There are no identified airport hazards in applicable airport planning documents for the Flabob Airport or March Air Reserve Base/Inland Port. The project would be consistent with campus population projections within the 2021 LRDP, which inform local planning efforts, and the project would be consistent with applicable land use and planning documents. The project would involve the development of a sustainability, innovation, and social inclusion hub in the designated University Avenue Gateway area and would contribute to the overall implementation of the 2021 LRDP. As a result, the project would have a beneficial impact related to conformance with applicable plans regulating land use, zoning, scale, and urban design. *Source*: [o, p]
Soil Suitability/ Slope/ Erosion/ Drainage/ Storm Water Runoff	2	**Soil Suitability**. According to the preliminary Geotechnical Investigation prepared for the project, there is low potential for hazards to structures related to liquefaction and expansive soils. No impact related to soil suitability is anticipated. **Slope and Erosion**. The project site and surrounding areas are characterized by very flat to moderately flat topography. Because the site currently contains impervious concrete and asphalt surfaces, the Hydrology Study prepared for the project concluded development of open space amenities would decrease the amount of impervious surface on site and would therefore not result in a substantial increase in flow rate or erosion compared to the existing conditions. No impact related to slope and erosion is anticipated. **Drainage and Storm Water Runoff**. The project would adhere to applicable water quality standards during construction through implementation of a Storm Water Pollution Prevention Plan, which would identify best management practices for storm water pollutant control. On site landscaping, drainage features, and storm water infrastructure to be provided as part of the project would accommodate storm water during project operation, which would be properly conveyed to the existing storm water

Environmental Assessment Factor	Impact Code	Impact Evaluation
		system. As such, runoff is not anticipated to exceed the capacity of existing storm water systems or provide substantial additional sources of polluted runoff, and no impact to drainage or storm water runoff is anticipated. *Source:* [Attachment 12: Geotechnical Investigation Report, Attachment 16, Preliminary Hydrology Study, Attachment 17, Preliminary Stormwater Quality Management Plan, k, q, r]
Hazards and Nuisances including Site Safety and Noise	3	**Hazards**. UCR is currently a licensed generator of hazardous waste, which includes chemical, radioactive, and biohazardous (infectious) waste. The laboratory uses proposed by the project would involve the routine transport, use, and disposal of hazardous materials. The use, storage, transport, and disposal of hazardous materials within OASIS Clean Technology Park would be guided by existing and future federal, State, County, and UCR regulations designed to maximize the safety of UCR personnel, students, the public, and the environment. The project would not emit or release hazardous waste or emissions. Numerous buildings on the UCR campus are assumed to contain some form of asbestos containing materials and/or lead-based paints (LBP) due to their age, as well as fluorescent light ballasts containing polychlorinated biphenyls. Building materials may also be contaminated by spills or aerosol releases of radioactive or chemical hazardous materials used in the building, and elemental mercury may be present in research laboratory sink traps, cupboard floor spaces, or in sewer pipes. If such contamination is identified to be present during demolition of the existing structures on the project site, exposure to potentially hazardous materials would be minimized through required worker training, appropriate engineering and administrative controls, in combination with the use of protective equipment in accordance with existing campus health and safety practices (such as the UCR Asbestos Management Plan), and federal and State regulations. In the event that LBP and other lead-containing materials are present during construction, protocol pursuant to California Division of Occupational Safety and Health (Cal/OSHA) regulations regarding LBPs and lead-containing materials would be followed.

Environmental Assessment Factor	Impact Code	Impact Evaluation
		California Code of Regulations Title 8, Section 1532.1, requires testing, monitoring, containment, and disposal of LBPs and lead-containing materials in such a manner that exposure levels do not exceed Cal/OSHA standards. If potentially hazardous materials are encountered during construction or redevelopment, UCR Environmental Health and Safety (EH&S) would conduct a comprehensive assessment of the situation in coordination with the appropriate regulatory authority, such as the Riverside County Department of Environmental Health (RCDEH). The proposed project includes the demolition of the UNEX building as well as the associated parking structure and hardscape areas. Disturbance of soil containing existing hazardous materials, soil vapor, and/or contaminated groundwater during construction could create a significant hazard to the public or the environment, which would be a minor adverse impact that would require mitigation (2021 LRDP EIR MM HAZ-1 and MM-HAZ-4). In accordance with MM HAZ-1, UCR conducted a comprehensive Hazardous Materials Report in which all visible and readily accessible asbestos-containing building materials in the existing structures, along with their quantities and locations, were identified. The construction contractor would be responsible for remediation of all hazardous materials and must follow all applicable safety protocols in accordance with Cal/OSHA, USEPA, and EH&S requirements. Per MM HAZ-4, preparation of a Site Management Plan (SMP) would be required. Additionally, the project would adhere to applicable federal, State, County, and UCR regulations for managing hazardous materials during project construction and operation. Implementation of MM HAZ-1 and MM HAZ-4 would avoid a minor adverse impact related to hazards. **Site Safety**. The project would include open space and amenities for pedestrians in the form of plazas, porches, courtyards, and working yards. The working yard and storage area would be fenced and secured, with gated access from the western drive aisle, and would include a loading dock connected to the southern portion of the building. Adequate access for emergency vehicles would be required by continuing best practice (CBP) WF-2, which specifies that prior to construction, the Campus Fire Marshal and City of Riverside Fire Department shall coordinate and may identify

Environmental Assessment Factor	Impact Code	Impact Evaluation
		alternative travel routes for site safety. Implementation of CBP WF-2 from the 2021 LRDP EIR would avoid a minor adverse impact related to site safety. **Noise**. Ambient noise levels at the project site were measured to range from 52.7 to 67.4 dBA Leq, where the highest noise levels are experienced along University Avenue from traffic noise. In addition, the LRDP EIR anticipates at buildout of the development program, noise levels at 50 feet from the University Avenue centerline would be 66 dBA Community Noise Equivalent Level. The proposed building would be set back from the roadway where the ambient noise levels would be below 65 dBA Leq, which is considered an acceptable noise level and requires no special approvals or requirements. *Source:* [Attachment 13, Supporting Noise Documentation, d, l]
SOCIOECONOMIC		
Employment and Income Patterns	1	During construction, development of the project site would generate temporary employment opportunities. Once constructed, the project would accommodate a net increase of approximately 80 employees (and no increase in students). Accordingly, the project would have a beneficial effect related to employment and income patterns.
Demographic Character Changes, Displacement	1	Development of the project site would be considered infill development as the project site is currently within an area developed with existing UCR land uses. The project would provide research opportunities by redeveloping a site that currently contains a seismically deficient building and parking structure. The project would not remove existing housing or otherwise displace minority or low-income communities. All construction would occur within the project site and adjacent roadways (i.e., signal modification at the intersection of University Avenue and University Village and crosswalk restriping on Everton Place) and would not disrupt adjacent utilities. As such, the project would not adversely affect community character or displace existing residents and would have a beneficial effect from redeveloping an outdated site that is unusable due to seismic deficiencies with a sustainability, innovation, and social inclusion hub.

Environmental Assessment Factor	Impact Code	Impact Evaluation
Environmental Justice	2	The project would provide research labs, offices, and classroom space at the UCR campus and would not remove existing housing or otherwise displace minority or low-income communities. Because the proposed project would not cause high and adverse environmental impacts, it would not cause high and adverse environmental impacts that disproportionately affect low-income or minority populations. The campus is a national leader in research of air pollution and alternative fuels. To leverage this expertise and proximity to the CARB Southern California Headquarters, the project would enhance collaboration between the two entities, synergizing research and tech transfer efforts focused on clean technologies and to be able to showcase to the community.
COMMUNITY FACILITIES AND SERVICES		
Educational and Cultural Facilities	2	The project includes new educational opportunities with research labs, offices, and classroom space as part of the UCR West Campus. The project includes open space amenities and would be a sustainability, innovation, and social inclusion hub that would feature outdoor gathering spaces with seating areas and a multimodal path, providing connections through the site with a campus-like setting. The project is estimated to increase faculty and staff population by additional approximately 80 people, which could result in the introduction of school aged-children to the area. Public schools in the area include Long Fellow Elementary School, University Heights Middle School, and John W. North High School, among others. The project would not increase student enrollment at any one school in a manner that would result in an adverse effect. Similarly, with respect to libraries, it is possible that those employed at the project site may utilize public libraries, the closest of which is the SPC Jesus S. Duran Eastside Library on Chicago Avenue, approximately 0.5-mile west of the project site. Campus libraries would also be available for the project occupants. Based on the relatively small population size of the project, adverse effects associated with exceeding the service population of the library are not anticipated. As a result, the project would have no impact on education and cultural facilities.

Environmental Assessment Factor	Impact Code	Impact Evaluation
Commercial Facilities	1	The project would occur on the UCR campus and would replace existing campus facilities that are currently unusable due to seismic deficiencies. The project would demolish the existing UNEX building and parking structure that was previously used by UCR in operation of the UNEX program and would not result in the removal of existing commercial facilities. The proposed development would be in proximity to existing commercial facilities, and the project is expected to increase the client base for these businesses. As such, the project would have a beneficial impact on commercial facilities.
Health Care and Social Services	2	The project would involve the development of a sustainability, innovation, and social inclusion hub resulting in a net increase of approximately 80 additional faculty and staff (and no additional students), or approximately 2.9 percent of the anticipated increase in faculty and staff in the 2021 LRDP EIR. Students would be served by the Student Health & Counseling Center on campus (388 W. Linden Street). The additional faculty and staff may represent additional health care and social services users that are not currently in the area, which would represent some additional demand for health care and social services. Several health care and social services are offered within one mile of the project site, with a concentration at the intersection of University Avenue and Chicago Avenue. Services include Neighborhood Healthcare Eastside Health Center (1970 University Avenue), Riverside County Substance Abuse (3525 Presley Avenue), and the County of Riverside Mental Health Clinic (769 Blaine Street). Based on the relatively small size of the project and the availability of services throughout the area, no impacts to nearby health care and social services facilities are anticipated.
Solid Waste Disposal / Recycling	2	Project implementation would involve demolition and grading activities that would produce green waste, asphalt/concrete, and other construction and demolition waste. Project operations would contribute to additional non-recyclable/non-reusable waste that would be deposited at the CR&R Perris Transfer Station and Material Recovery Facility, which has a maximum permitted daily capacity of approximately 3,287 tons per day. Project demolition is expected to produce approximately 16,135 tons of debris over 120 days, or approximately 134.5 tons of debris per day, which is well within the daily permitted capacity of the facility.

Environmental Assessment Factor	Impact Code	Impact Evaluation
		Additionally, the handling of all debris and waste generated during construction would be subject to the latest California Green Building Standards Code requirements and the California Integrated Waste Management Act of 1989. Project operations associated with approximately 80 new employees are projected to result in 0.2 tons per day, which does not account for UCR's waste/source reduction and recycling program which includes sorting and separating wastes and the expansion of composting procedures. The campus has constructed a transfer station on the West Campus north of Parking Lot 30, where UCR collects the recyclables and waste on campus, including from the project site, and delivers these materials to the transfer station for hauling. A third-party vendor picks up the recyclable material for recycling. UCR delivers waste in UCR haul trucks to the Nelson Transfer Station from which Burrtec Waste Industries then transports 100 percent of the non-recyclable material to waste-to-energy facility. UCR composts all green waste on campus. The proposed project would implement features of the UC 2023 Sustainable Practices Policy, which directs UCR to reduce total per capita municipal solid waste generation by 25 percent and 50 percent from 2015/2016 levels by 2025 and 2030, respectively. The project would not impact solid waste disposal and recycling operations in the area. *Source:* [Attachment 7, Supporting Air Quality and GHG Emissions Documentation, c]
Waste Water / Sanitary Sewers	2	The City's Sewage Systems Services Program and Treatment Services unit collects, treats, and disposes of all waste water generated by the UCR campus, including the project site. An existing sewer lateral connects the UNEX building to a sewer main in University Avenue. The project would construct branches to this lateral within the project footprint to accommodate proposed waste water flows. Proposed project implementation would decrease the total building area on the site and wastewater generation would be decreased from existing conditions based on the 2021 LRDP EIR baseline (operation of UNEX). The project would not impact wastewater or sanitary sewers. *Source:* [Attachment 18, Sewer Capacity Study, s]

Environmental Assessment Factor	Impact Code	Impact Evaluation
Water Supply	2	The campus has a combined fire and domestic water system that is sufficient to serve the proposed project. Riverside Public Utilities provides potable water to the campus, which is used both in buildings and for landscape irrigation. In addition, UCR has a private on-campus water system that conveys potable water throughout the campus, as needed. All potable water, fire water, and irrigation water supplies are distributed to the project site through the City's existing domestic water system. The project would not require upgrades to the existing laterals for domestic water service but would require installation of a new fire water line, backflow preventer, and fire hydrant. The irrigation system would meet or exceed the State of California Model Efficient Landscape Ordinance (Assembly Bill 1881 requirements) and the UCR requirements for a water efficient landscape. Dedicated site irrigation for the proposed project site would be provided from the existing domestic water lateral line, water meter, and backflow preventer at the property line adjacent to University Avenue. The project would not impact water supply. *Source:* [Attachment 19: Water Capacity Study, t]
Public Safety - Police, Fire and Emergency Medical	2	**Police**. The campus is served by the University of California Police Department, which has sufficient officers and staff to respond to all police related incidents on the campus. The proposed project would serve existing campus populations and add approximately 80 new faculty and staff to the campus population on a site that is currently developed and within University of California Police Department's service area. No increase in population would occur such that new police facilities would be required to serve the project. **Fire and Emergency Medical**. The Riverside Fire Department provides fire protection, fire inspection services, community education, and emergency preparedness and training for the City, including UCR. While UCR has a Fire Prevention Program for its campus, the campus also maintains a Memorandum of Understanding with the State Fire Marshal to allow UC personnel to serve as local campus fire marshals, deputy fire marshals, and fire inspectors. The project site is already developed and within Riverside Fire Department's service area. Implementation of the proposed project would replace the existing UNEX building and parking structure

Environmental Assessment Factor	Impact Code	Impact Evaluation
		with a much smaller facility. Development of the project would not substantially increase the demand for fire protection services, nor would it require new fire facilities beyond those that exist or are already planned. The project would not impact public safety, including police and fire/emergency medical services.
Parks, Open Space and Recreation	1	The proposed project would add approximately 80 new faculty and staff to the campus population (and no new students) on a site that is currently developed and served by the 28.7 acres of land within the campus that is designated for Recreation & Athletics use. No increase in population would occur such that new parks, open space, and recreation facilities would be required to serve the project. The project would be constructed on a developed site in an urban and developed area. There are no parks, open space, or recreational amenities on site. The project would include open spaces in the form of plazas, porches, and courtyards to serve the building users. Features would include outdoor gathering spaces with seating areas and pedestrian amenities such as shade, seating, and lighting throughout the landscaped areas. A multimodal corridor for pedestrians, bicycles, and other micro-mobility vehicles would be provided along the eastern edge of the development project site with connections to on-site open space areas and off-site circulation elements. As such, the project would have a beneficial impact on parks, open space, and recreation.
Transportation and Accessibility	2	The proposed project would serve existing campus populations and add approximately 80 new faculty and staff to the campus population on a site that is currently developed and accessible from major roadways and freeways. Pedestrian circulation and access to and from the project site would be provided by existing sidewalks and the project would provide a new north-south multimodal pathway connecting Everton Place to University Avenue. Bicycle lanes that currently exist on both sides of University Avenue would be maintained. Existing transit service on University Avenue would continue to serve the project site and campus. Existing circulation, access, and alternative transportation facilities would be maintained.

Environmental Assessment Factor	Impact Code	Impact Evaluation
NATURAL FEATURES		
Unique Natural Features, Water Resources	2	The Gage Canal is located near the project site; however, it is an irrigation facility that is partially underground and does not represent a unique natural feature or water resource. The Gage Canal is separated from the project site by surface parking lots and is not part of the project boundary. The project would not impact unique natural features or water resources.
Vegetation, Wildlife	3	The project site, which is developed/disturbed and surrounded by existing development, does not provide suitable habitat to support special-status plant or wildlife species. Vegetation communities and trees within and surrounding the campus, including the project site, have the potential to provide for avian nesting that could be affected by construction activities involving the removal of trees. Birds flying in the area could be impacted by the installation of glass surfaces. Furthermore, several bat species, including the special-status western yellow bat (*Lasiurus xanthinus*) and pallid bat (*Antrozous pallidus*), may forage and roost in areas in and around the project site on existing buildings, culverts, mature trees, and rock outcrops. Minor adverse impacts to nesting birds, flying birds, and bats would require implementation of 2021 LRDP EIR MM BIO-2 through MM BIO-4. *Source*: [d]
Other Factors	2	No other factors have been identified which would result in an impact on natural features.
CLIMATE AND ENERGY		
Climate Change Impacts	3	Construction emissions generated by the proposed project would result in a total of approximately 1,176 metric tons of carbon dioxide equivalent (MT CO_2e) over the 28-month construction period, with average annual emissions of approximately 107 MT CO_2e over the remaining LRDP development program period of 11 years. The proposed project's construction emissions would be less than seven percent of the annualized construction emissions identified in the 2021 LRDP EIR (i.e., 1,618 MT CO_2e per year). In combination with other projects proposed at UCR within the same period (School of Business, Undergraduate Teaching and Learning Facility, and North District Phase 2), annualized construction emissions would total approximately 416 MT CO_2e and would represent approximately 26 percent of the annual construction emissions anticipated in the 2021 LRDP EIR.

Environmental Assessment Factor	Impact Code	Impact Evaluation
		Operational emissions sources would include energy and water demand for the proposed building(s) and solid waste and mobile trips generated by the population increase of approximately 80 employees. As required by 2021 LRDP EIR MM GHG-1 Measure EN3, the project would achieve 20 percent beyond Title 24 Energy Efficiency requirements. Compared to emissions resulting from continued operation of the existing building, the project would decrease annual GHG emissions during building operation. *Source*: [Attachment 7, Supporting Air Quality and GHG Emissions Documentation, c, d]
Energy Efficiency	3	Project construction activities would result in a temporary increase in energy consumption, primarily through the combustion of fuels in construction vehicles, worker commute vehicles, and construction equipment. The proposed project would also consume energy during operation for building heating and cooling, refrigeration, lighting, electricity, and equipment when occupied and in use. New employee vehicle trips and fleet vehicle trips associated with project operations would also be a source of energy consumption. As required by 2021 LRDP EIR MM GHG-1 Measure CR1, the project would utilize construction equipment with Tier 4 engines. Also, per MM GHG-1 Measure EN3 and University of California policy, the proposed project would incorporate project design features that would minimize energy usage, including the achievement of minimum Leadership in Energy and Environmental Design (LEED) Gold certification but striving for LEED Platinum certification. Indoor water use would be reduced with low-flow fixtures, and façade and window insulation would be optimized for climate and reduced air-conditioning usage. Outdoor water use would be reduced through the selection of native and adapted plant species that reduce irrigation requirements. Recycled materials and materials from regional sources would be used where possible. *Source*: [d]

Additional Studies Performed:

- Attachment 1: Figure 1, UCR Campus
- Attachment 2: Figure 2, Project Site Location

- Attachment 3: Figure 3, Conceptual Site Plan
- Attachment 4: Proximity to Airports Maps
- Attachment 5: Coastal Barrier Resources Map
- Attachment 6: FEMA Flood Insurance Rate Map
- Attachment 7: Supporting Air Quality and GHG Emissions Documentation
- Attachment 8: California Coastal Zones
- Attachment 9: Geotracker and EnviroStor Database Searches
- Attachment 10: Riverside County Important Farmland Map
- Attachment 11: Historic Resources Assessment: State of California Department of Parks and Recreation Primary Record—UC Riverside University Extension Center (UNEX)
- Attachment 12: Geotechnical Investigation Report
- Attachment 13: Supporting Noise Documentation
- Attachment 14: Sole Source Aquifers Map
- Attachment 15: Wild and Scenic Rivers Map
- Attachment 16: Preliminary Hydrology Study
- Attachment 17: Preliminary Water Quality Management Plan
- Attachment 18: Sewer Capacity Study
- Attachment 19: Water Capacity Study
- Attachment 20: Distribution List

Field Inspection (Date and completed by)**:** February 8, 2023, completed by Vanessa Toscano
List of Sources, Agencies and Persons Consulted [40 CFR 1508.9(b)]**:**

a. United States Fish and Wildlife Service (USFWS). *Coastal Barrier Resources Act*. Available at: https://www.fws.gov/program/coastal-barrier-resources-act/maps-and-data. Accessed January 2024.

b. Federal Emergency Management Agency (FEMA). *FEMA's National Flood Hazard Layer Viewer*. *Flood Insurance Rate Map Number 06065C0727G*. Available at: https://map1.msc.fema.gov/firm?id=06065C0727G. Accessed January 2024.

c. HELIX Environmental Planning, Inc. *Supporting Air Quality and Greenhouse Gas Emissions Documentation for the University of California, Riverside OASIS Park Project*. January 2024.

d. University of California, Riverside. *University of California, Riverside 2021 Long Range Development Plan, Final Environmental Impact Report, State Clearinghouse No. 2020070120.* November 2021. https://pdc.ucr.edu/environmental-planning-ceqa#2021-long-range-development-pl. Accessed March 2024.

e. California Coastal Commission. *Coastal Zone Boundary*. Available at: https://www.coastal.ca.gov/maps/czb/. Accessed January 2024.

f. California State Water Resources Control Board. *Geotracker*. Available at: https://geotracker.waterboards.ca.gov/map/?CMD=runreport&myaddress=1200+University+Ave%2C+Riverside%2C+CA+92507. Accessed January 2024.

g. Department of Toxic Substances Controls (DTSC). *EnviroStor Map*. Available at: https://www.envirostor.dtsc.ca.gov/public/map/?myaddress=1200+university+avenue%2C+riverside%2C+ca. Accessed January 2024.

h. Psomas. *Biological Resources Constraints Report for Long Range Development Plan at University of California, Riverside*. March 13, 2019.

i. California Department of Conservation. *Riverside County Important Farmland 2020, Sheet 1 of 3*. Available at: https://www.conservation.ca.gov/dlrp/fmmp/Pages/Riverside.aspx. Accessed January 2024.

j. HELIX Environmental Planning, Inc. *Historic Resources Assessment: State of California Department of Parks and Recreation Primary Record—UC Riverside University Extension Center (UNEX)*. January 2024.

k. Twining, Inc. *Geotechnical Investigation Report, Proposed OASIS Park, University of California, Riverside, Riverside, California*. June 2023.

l. HELIX Environmental Planning, Inc. *Supporting Noise Documentation for the University of California, Riverside OASIS Park Project*. January 2024.

m. United States Environmental Protection Agency (USEPA). *Sole Source Aquifers Interactive Map*. Available at: https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=9ebb047ba3ec41ada1877155fe31356b. Accessed January 2024.

n. United States National Park Service. Interactive Map of NPS Wild and Scenic Rivers. Available at: https://www.nps.gov/orgs/1912/plan-your-visit.htm. Accessed January 2024.

o. Riverside County Airport Land Use Commission. *Compatibility Plan Policy Document*. December 2004. Available at: https://rcaluc.org/sites/g/files/aldnop421/files/2023-06/Flabob.pdf. Accessed January 2024.

p. Riverside County Airport Land Use Commission. *March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan*. November 2014. Available at: https://rcaluc.org/sites/g/files/aldnop421/files/2023-06/March.pdf. Accessed January 2024.

q. Psomas. *Preliminary Hydrology Study for University of California, Riverside – OASIS Park*. September 2023.

r. Psomas. *Preliminary Stormwater Quality Management Plan for University of California, Riverside – OASIS Park*. September 2023.

s. Psomas. *UCR OASIS Park – Sewer Capacity Study for CEQA Purposes*. September 2023.

t. Psomas. *UCR OASIS Park – Water Capacity Study for CEQA Purposes*. September 2023.

List of Permits Obtained:
Project Design Approval by the Regents or its delegate of the University of California
Accessibility Compliance by the Division of the State Architect
Fire/Life Safety by the State of California Fire Marshal
Access by the City of Riverside Fire Department
Encroachments Permits by the City of Riverside Public Works, if necessary

Public Outreach [24 CFR 50.23 & 58.43]**:**

UCR staff hosted two community meetings related to the proposed project. On March 22, 2023, the first community meeting was held to share information about the proposed project and solicit community feedback on the project design. A second community meeting was held on September 6, 2023, where UCR staff provided a progress update on the proposed project design and described the project that would be subject to environmental analysis.

Distribution of the Finding of No Significant Effect (FONSI) and Request for Release of Funds (RROF) is being conducted per 24 CFR Section 58.43 to individuals and groups known to be interested in University activities; tribal contacts provided by the Native American Heritage Commission for the project; appropriate local, State, and Federal agencies; the Region 9 Office of the USEPA; and the HUD Los Angeles Field Office (see Attachment 20). The FONSI/RROF will be published in the Press-Enterprise on March 14, 2024.

Cumulative Impact Analysis [24 CFR 58.32]**:**

The proposed project would not be expected to contribute to a significant cumulative impact under NEPA because it would consist of an urban infill project that would be (A) located on a site suitable for future UCR campus development, (B) consistent with the site's general plan land use and zoning designations (the 2021 LRDP), and (C) located on/near existing transit routes, including University Avenue, which is an active arterial and public transit corridor, lined with a mix of primarily low-rise commercial and retail uses that include restaurants, office space, a theater, and gas stations. State and local planning guidelines encourage the development of urban infill in areas served by transit and near commercial and cultural amenities because this type of development contributes less to cumulative effects on the environment in comparison to the development of previously undisturbed sites (many of which contain native vegetation and wildlife species) in more remote locations with fewer transit connections.

Alternatives [24 CFR 58.40(e); 40 CFR 1508.9]

The project would demolish the existing UNEX building and parking structure and develop research laboratory, offices, and academic instruction building(s) up to three stories in height, totaling approximately 70,000 gsf. Consideration of an off-site alternative or reduced project alternative is not warranted because no significant impacts that cannot be avoided were identified. No other modifications or alternate uses were considered for the project.

No Action Alternative [24 CFR 58.40(e)]:

If the project is not implemented, the existing site would remain developed with an uninhabitable building and parking structure with seismic deficiencies, and insignificant (as mitigated) impacts of the project would be avoided. Without construction of the project, the benefits associated with implementing UCR's 2021 LRDP and facilitating various programs and initiatives related to regional economic development through solutions-driven applied research, innovation, entrepreneurship, and workforce development around sustainability, clean technology, and social inclusion would not occur.

Summary of Findings and Conclusions: The proposed project would not result in significant effects on the natural or human environment. This finding is based on the relatively small size of the project and its location within a developed property along a major transportation corridor in a developed urban area with mitigation monitoring and reporting requirements, both of which minimize the potential for adverse environmental effects. The project would conform to applicable federal, State, local, and UCR regulations associated with air emissions, hazardous materials, noise, biological resources and related environmental resources addressed herein.

Mitigation Measures and Conditions [40 CFR 1505.2(c)]

Compliance with the following SCAQMD rules and applicable MMs and CBP from the UCR 2021 LRDP EIR Mitigation Monitoring and Reporting Program would be sufficient to avoid or reduce potential adverse environmental effects associated with the proposed project.

Law, Authority, or Factor	Mitigation Measure
SCAQMD Rule 53	**Rule 53 – Specific Air Contaminants (Riverside County).** For sulfur compounds, a person shall not discharge into the atmosphere from any single source within the following areas of Riverside County, sulfur compounds in any state or combination thereof, in excess of the following concentrations at the point of discharge: (1) In the west-central area, 0.05 percent by volume calculated as sulfur dioxide (SO_2); (2) In all portions of Riverside County not within the west-central area, 0.15 percent by volume calculated as sulfur dioxide (SO_2). For fluorine compounds, emission shall be controlled to the maximum degree technically feasible in respect to the process or operation causing such emission, but no emission shall be permissible which may cause injury to the property of others.

Law, Authority, or Factor	Mitigation Measure
SCAQMD Rule 401	**Rule 401 – Visible Emissions.** A person shall not discharge into the atmosphere from any single source of emission whatsoever any air contaminant for a period or periods aggregating more than 3 minutes in any 1 hour that is as dark or darker in shade as that designated No. 1 on the Ringelmann Chart, as published by the United States Bureau of Mines; or of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in the rule.
SCAQMD Rule 402	**Rule 402 – Nuisance.** A person shall not discharge from any source whatsoever such quantities of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or that endanger the comfort, repose, health, or safety of any such persons or the public, or that cause, or have a natural tendency to cause, injury or damage to business or property. The provisions of this rule do not apply to odors emanating from agricultural operations necessary for the growing of crops or the raising of fowl or animals.
SCAQMD Rule 403	**Rule 403 – Fugitive Dust.** This rule is intended to reduce the amount of PM entrained in the ambient air as a result of anthropogenic (human-made) fugitive dust sources by requiring actions to prevent, reduce, or mitigate fugitive dust emissions.
	Rule 403 applies to any activity or human-made condition capable of generating fugitive dust and identifies measures to reduce fugitive dust. This includes soil treatment for exposed soil areas. Treatment shall include, but not necessarily be limited to, periodic watering, application of environmentally safe, non-toxic soil stabilization materials, and/or roll compaction as appropriate. As indicated in SCAQMD's guidance they are "increasing reliance on non-toxic chemical dust suppressants to stabilize soils."
SCAQMD Rule 473	**Rule 473 – Disposal of Solid and Liquid Wastes.** A person shall not burn any combustible refuse in any incinerator except in a multiple-chamber incinerator or in equipment found by the Air Pollution Control Officer to be equally effective for the purpose of air pollution control. A person is also prohibited from discharging into the atmosphere from any incinerator or other equipment except as allowed by the rule.
SCAQMD Rule 475	**Rule 475 – Electric Power Generating Equipment.** A person shall not discharge into the atmosphere from any equipment having a maximum rating of more than 10 net megawatts used to produce electric power, for which a permit to build, erect, install or expand is required after May 7, 1976, air contaminants that exceed the provisions in the rule.

Law, Authority, or Factor	Mitigation Measure
SCAQMD Rule 1113	**Rule 1113 – Architectural Coatings.** No person shall apply or solicit the application of any architectural coating (e.g., paint) within the SCAQMD with volatile organic compounds (VOC) content in excess of the values specified in a table incorporated in the rule.
SCAQMD Rule 1403	**Rule 1403 – Asbestos Emissions from Demolition/Renovation Activities.** This rule governs work practice requirements for asbestos in all renovation and demolition activities. The purpose of the rule is to protect the health and safety of the public by limiting dangerous emissions from the removal and associated disturbance of asbestos-containing materials (ACM). Rule 1403 applies to owners and operators of any demolition or renovation activity, and the associated disturbance of asbestos-containing material, any asbestos storage facility, or any active waste disposal site. These regulations require testing of any facility being demolished or renovated for the presence of all friable and Class I and II non-friable ACM. They also establish notification procedures, removal procedures, handling operations, and warning label requirements. Approved procedures for ACM removal to protect surrounding uses include HEPA filtration, the glovebag method, wetting, and some methods of dry removal.
UCR 2021 LRDP EIR	**MM BIO-2 Nesting Bird Avoidance:** Prior to issuance of grading permits, the following measures shall be implemented: • To avoid disturbance of nesting and special-status bird species protected by the Migratory Bird Treaty Act and California Fish and Game Code, activities related to the project, including but not limited to, vegetation removal, ground disturbance, and construction and demolition shall occur outside of the bird breeding season (February 15 through August 31). If construction must be initiated during the peak nesting season, vegetation removal and/or tree removal should be planned to occur outside the nesting season (September 1 to February 14), and a preconstruction nesting bird survey shall be conducted no more than 3 days prior to initiation of construction activities. The nesting bird preconstruction survey shall be conducted on foot inside the project site disturbance areas. If an active avian nest is discovered during the preconstruction clearance survey, construction activities shall stay outside of a 50- to 200-foot buffer for common nesting birds around the active nest, as determined by a biologist. For listed and raptor species, this buffer shall be expanded to 500 feet or as determined by a biologist.

Law, Authority, or Factor	Mitigation Measure
	• Inaccessible areas shall be surveyed from afar using binoculars to the extent practical. The survey shall be conducted by a qualified biologist familiar with the identification of avian species known to occur in western Riverside County. If nests are found, an appropriate avoidance buffer shall be determined by a qualified biologist and demarcated by a qualified biologist with bright orange construction fencing, flagging, construction lathe, or other means to mark the boundary. Effective buffer distances are highly variable and based on specific project stage, bird species, stage of nesting cycle, work type, and the tolerance of a particular bird pair. The buffer may be up to 500 feet in diameter, depending on the species of nesting bird found and the biologist's observations. If nesting birds are located adjacent to the project site with the potential to be affected by construction activity noise above 60 dBA Leq (see Section 4.11, Noise, of the LRDP EIR for definitions and discussion of noise levels), a temporary noise barrier shall be erected consisting of large panels designed specifically to be deployed on construction sites for reducing noise levels at sensitive receptors. If 60 dBA Leq is exceeded,
	an acoustician would require the construction contractor to make operational and barrier changes to reduce noise levels to 60 dBA during the breeding season (February 15 through August 31). Noise monitoring shall occur during operational changes and installation of barriers to ensure their effectiveness. All construction personnel shall be notified as to the existence of the buffer zone and to avoid entering the buffer zone during the nesting season. No parking, storage of materials, or construction activities shall occur within this buffer until the avian biologist has confirmed that breeding/nesting is completed, and the young have fledged the nest. Encroachment into the buffer shall occur only at the discretion of the qualified biologist, if it is determined such encroachment will not adversely impact the nesting birds.

Law, Authority, or Factor	Mitigation Measure
UCR 2021 LRDP EIR	**MM BIO-3 Bird Strike Avoidance:** To reduce bird strike mortality and injury of special-status bird species from collisions with clear and reflective sheet glass and plastic, construction of glass-fronted buildings or other structures using exposed glass (e.g., glass-topped walls) shall incorporate measures to minimize the risk of bird strikes. This may include: (1) the use of opaque or uniformly textured/patterned/etched glass, (2) angling of glass downward so that the ground instead of the surrounding habitat or sky is reflected, (3) installation of one-way film that results in opaque or translucent covering when viewed from either side of the glass, (4) installation of a uniformly dense dot pattern created as ceramic frit on both sides of the glass, and/or (5) installation of a striped or grid pattern of clear ultraviolet-reflecting and ultraviolet-absorbing film applied to both sides of the glass. It should be noted that single decals (e.g., falcon silhouettes or large eye patterns) are ineffective and are not recommended unless the entire glass surface is uniformly covered with the objects or patterns.
UCR 2021 LRDP EIR	**MM BIO-4 Bat Preconstruction Survey:** To avoid disturbance of special-status bat species during maternity season (approximately March through September), a preconstruction roosting bat survey shall be conducted by a qualified bat biologist on potential roost structures identified by the bat biologist and mature vegetation no more than 30 days prior to initiation of construction activities if construction activities must occur during the roosting season. If future projects would impact rocky outcrops, mature vegetation, existing buildings, or other structures that could be used for roosting, a passive acoustic survey shall identify the species using the area for day/night roosting. If special-status roosting bats are present and their roosts would be impacted, a qualified bat biologist should prepare a plan to identify the proper exclusionary methods. Removal of mature trees should be monitored by a qualified bat biologist and occur by pushing down the entire tree (without trimming or limb removal) using heavy equipment and leaving the felled tree on the ground untrimmed and undisturbed for a period of at least 24 hours. To exclude bats from buildings/structures or rocky outcrops, exclusion measures should be installed on crevices by placing one-way exclusionary devices that allow bats to exit but not enter the crevice.

Law, Authority, or Factor	Mitigation Measure
UCR 2021 LRDP EIR	**MM CUL-2 Tribal Cultural Resources/Archaeological Monitoring:** Prior to commencement of ground disturbing activities into an area with a medium or high potential to encounter undisturbed native soils including Holocene alluvium soils, as determined by UCR, UCR shall hire a qualified archaeological monitor meeting the Secretary of the Interior's Professional Qualification Standards for archaeology (National Park Service 1983) to identify archaeological resources and cultural resources of potential Native American origin. Where development occurs in the southeastern quadrant of campus, and in areas containing Val Verde Pluton geologic features considered highly sensitive to prehistoric archaeological resources, UCR shall hire a qualified archaeologist and a Native American monitor to reduce impacts to potential archaeological and/or tribal cultural resources. The monitor(s) shall be on-site during any construction activities that involve ground disturbance. The on-site monitoring shall end when project-related ground disturbing activities are completed, or, in consultation with the lead agency and tribes as appropriate and based on observed conditions, monitoring may be reduced or eliminated prior to completion of ground-disturbing activities, when the monitor(s) has indicated that the project site has a low potential to encounter tribal cultural resources (TCR)/ archaeological resources. Consolidated monitoring efforts (e.g., archaeological monitoring/tribal cultural/paleontological monitoring) may occur if the individual monitor meets the applicable qualifications, except for development in the southeastern quadrant as detailed above.
UCR 2021 LRDP EIR	**MM CUL-3 Construction Worker Training:** For projects requiring TCR/archaeological monitoring, the monitor shall provide preconstruction training for all earthmoving construction personnel prior to the start of any ground disturbing activities, regarding how to recognize the types of TCRs and/or archaeological resources that may be encountered and to instruct personnel about actions to be taken in the event of a discovery. UCR Planning, Design & Construction Project Manager/contractor shall retain documentation showing when training of personnel was completed.

Law, Authority, or Factor	Mitigation Measure
UCR 2021 LRDP EIR	**MM CUL-4 Unanticipated Discovery of Tribal Cultural Resources/Archaeological Resources:** If previously undiscovered TCRs and/or archaeological resources are identified during construction, all ground disturbing activities within 100 feet of the resource shall halt, UCR Planning, Design & Construction staff shall be notified, and the find shall be evaluated by a qualified archaeologist meeting the Secretary of the Interior standards to determine whether it is a unique archaeological resource, as defined by CEQA. If the discovery appears to be Native American in origin, a tribal representative will be contacted within 24 hours of discovery to determine whether it is a TCR, as defined by CEQA. If the find is neither a unique archaeological resource nor a TCR, work may resume. If the find is determined to be a unique archaeological resource or TCR, the archaeologist and the tribal representative, as appropriate, shall make recommendations to UCR Planning, Design & Construction staff on the measures that will be implemented, including, but not limited to, preservation in place, excavation, relocation, and further evaluation of the discoveries pursuant to CEQA. Preservation in place (i.e., avoidance) is the preferred method of mitigation for impacts to TCRs/archaeological resources. If UCR determines that preservation in place is not feasible, the archaeologist shall design and implement a treatment plan, prepare a report, and salvage the material, as appropriate. Any important artifacts recovered during monitoring shall be cleaned, catalogued, and analyzed, with the results presented in a report of findings that meets professional standards. Work on-site may commence upon completion of any fieldwork components of the treatment plan.

Law, Authority, or Factor	Mitigation Measure
UCR 2021 LRDP EIR	**MM GHG-1 Implement On-Campus GHG Emissions Reduction Measures:** UCR shall implement the following GHG emissions reduction measures by scope emissions category: Scope 2 (Electricity Consumption and Generation) • Measure [Energy] EN3: UCR shall work to obtain 100 percent clean-sourced electricity through either Riverside Public Utilities (RPU) and/or through the installation of on-site clean-sourced electricity sources for all new buildings by 2025. In addition, UCR shall establish annual budgets that include funding to purchase 100 percent clean-sourced energy. Furthermore, all newly constructed building projects, other than wet lab research laboratories, shall be designed, constructed, and commissioned to outperform the California Building Code (Title 24 portion of the California Code of Regulations) energy efficiency standards by at least 20 percent. Finally, UCR shall incorporate solar PV as feasibly possible for newly constructed and majorly-renovated buildings with the maximum system size, highest solar panel efficiency, and greatest system performance. Scope 3 (Waste Generation, Business Air Travel, On-site Transportation, Water Consumption, Carbon Sequestration, and Construction) • Measure [Construction] CR1: UCR shall reduce construction-related GHG emissions on campus 10 percent by 2025 and 25 percent by 2035 through emission reduction controls and/or electric equipment requirements in line with contract obligations. Specifically, UCR shall require off-road diesel-powered construction equipment greater than 50 horsepower to meet the Tier 4 emission standards as well as construction equipment to be outfitted with BACT devices certified by CARB and emissions control devices that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similar-sized engine. In addition, UCR shall develop zero waste procurement guidelines and processes for campus construction projects and integrate into purchasing RFP language as part of campus procurement.
UCR 2021 LRDP EIR	**MM HAZ-1 Property Assessment – Phase I and II ESAs:** During the pre-planning stage of campus projects on previously developed sites or on agricultural lands (current or historic), and in coordination with EH&S, UCR shall obtain documentation from EH&S or prepare a Phase I Environmental Site Assessment (ESA) assessing the land use history of the proposed project site

Law, Authority, or Factor	Mitigation Measure
	and identify potential hazardous materials concerns, including, but not limited to, fuel tanks, chemical storage, presence of elemental mercury, elevator pistons and associated hydraulic oil reservoirs and piping, heating-oil USTs, or agricultural uses. If the Phase I ESAs, or similar documentation, identify recognized environmental conditions or potential concern areas, a Phase II ESA would be conducted in coordination with EH&S to determine whether the soil, groundwater, and/or soil vapor has been impacted at concentrations exceeding regulatory screening levels for residential or commercial/industrial type land uses (as applicable). If the Phase II ESA concludes that the site is or may be impacted and could affect the planned development, assessment, remediation, or corrective action (e.g., removal of contaminated soil, in-situ treatment, capping, engineering controls) would be conducted prior to or during construction under the oversight of federal, State, and/or local agencies (e.g., USEPA, DTSC, Regional Water Quality Control Board, Riverside Fire Department, RCDEH) and in full compliance with current and applicable federal and State laws and regulations, including but are not limited to the California Environmental Quality Act (CEQA). Assessment, remediation, or corrective action must be evaluated under CEQA prior to commencing the assessment, remediation, or correction action. Additionally, Voluntary Cleanup Agreements may be used for parcels where remediation or long-term monitoring is necessary.
UCR 2021 LRDP EIR	**MM HAZ-4 Construction Site Management Plan:** If impacted soils are identified pursuant to activities conducted through Mitigation Measures MM HAZ-1, MM HAZ-2, or MM HAZ-3; or encountered during construction (soil disturbance), UCR shall prepare a Construction Site Management Plan (SMP) for the proposed redevelopment project area to address potential issues that may be encountered during redevelopment activities involving subsurface work. The Construction SMP objectives shall include: • Communicating information to proposed project construction workers about environmental conditions • Presenting measures to mitigate potential risks to the environment, construction workers, and other nearby receptors from potential exposure to hazardous substances that may be associated with unknown conditions or unexpected underground structures

Law, Authority, or Factor	Mitigation Measure
	• Presenting protocols for management of known contaminated soil or groundwater encountered during construction activities. The Construction SMP shall identify the proposed project contacts, responsibilities, and notification requirements and outline the procedures for health and safety, soil management, contingency measures for discovery of unexpected underground structures, erosion, dust, and odor management, groundwater management, waste management, stormwater management, and written records and reporting. The Construction SMP shall be reviewed and approved by UCR prior to issuance of grading permits.
UCR 2021 LRDP EIR	**CBP WF-2 Construction – Alternative Travel Routes:** Prior to campus construction activities and/or roadway closures, the Campus Fire Marshal, as delegated by the State Fire Marshal, and in cooperation with the City of Riverside Fire Department shall ensure that adequate access for emergency vehicles is provided or identify alternative travel routes.

Determination:

☒ **Finding of No Significant Impact** [24 CFR 58.40(g)(1); 40 CFR 1508.27]
The project will not result in a significant impact on the quality of the human environment.

☐ **Finding of Significant Impact** [24 CFR 58.40(g)(2); 40 CFR 1508.27]
The project may significantly affect the quality of the human environment.

Preparer Signature: DocuSigned by: Vanessa Toscano 4C27875856104FB... Date: 3/12/2024 | 12:54 PM PDT

Name/Title/Organization: Vanessa Toscano, Principal Planner, HELIX Environmental Planning, Inc.

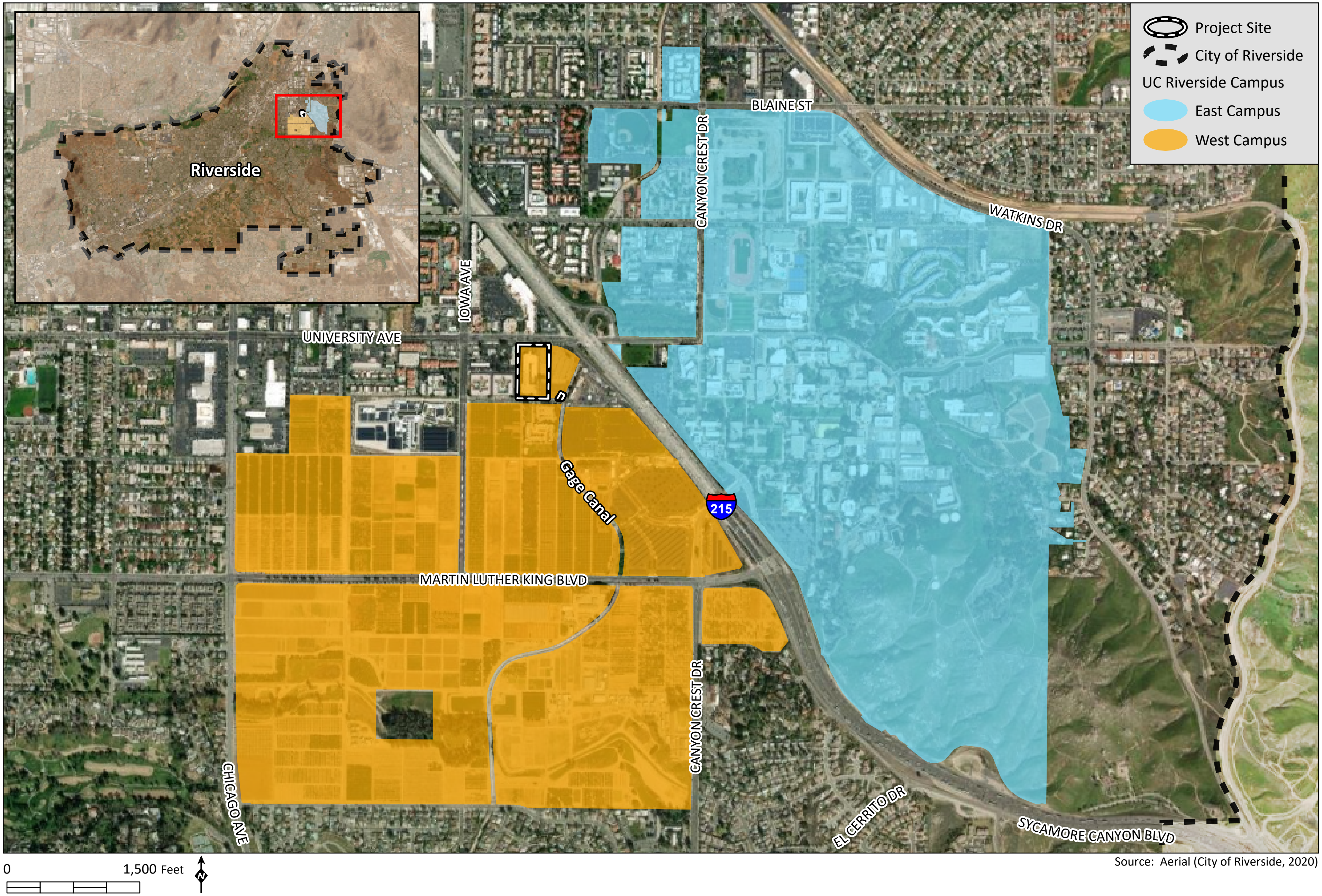
Certifying Officer Signature: Date: 3/12/2024

Name/Title: Dr. Kim A. Wilcox

This original, signed document and related supporting material must be retained on file by the Responsible Entity in an Environmental Review Record (ERR) for the activity/project (ref: 24 CFR Part 58.38) and in accordance with recordkeeping requirements for the HUD program(s).

Attachment 1

Figure 1, UCR Campus



Source: Aerial (City of Riverside, 2020)

I:\PROJECTS\U\UCRiverside_00886\00004_OasisPark\Map\Add\Addendum.aprx Fig2-2_Campus : 00866.4.1 : 2/6/2024 - SAB

HELIX
Environmental Planning

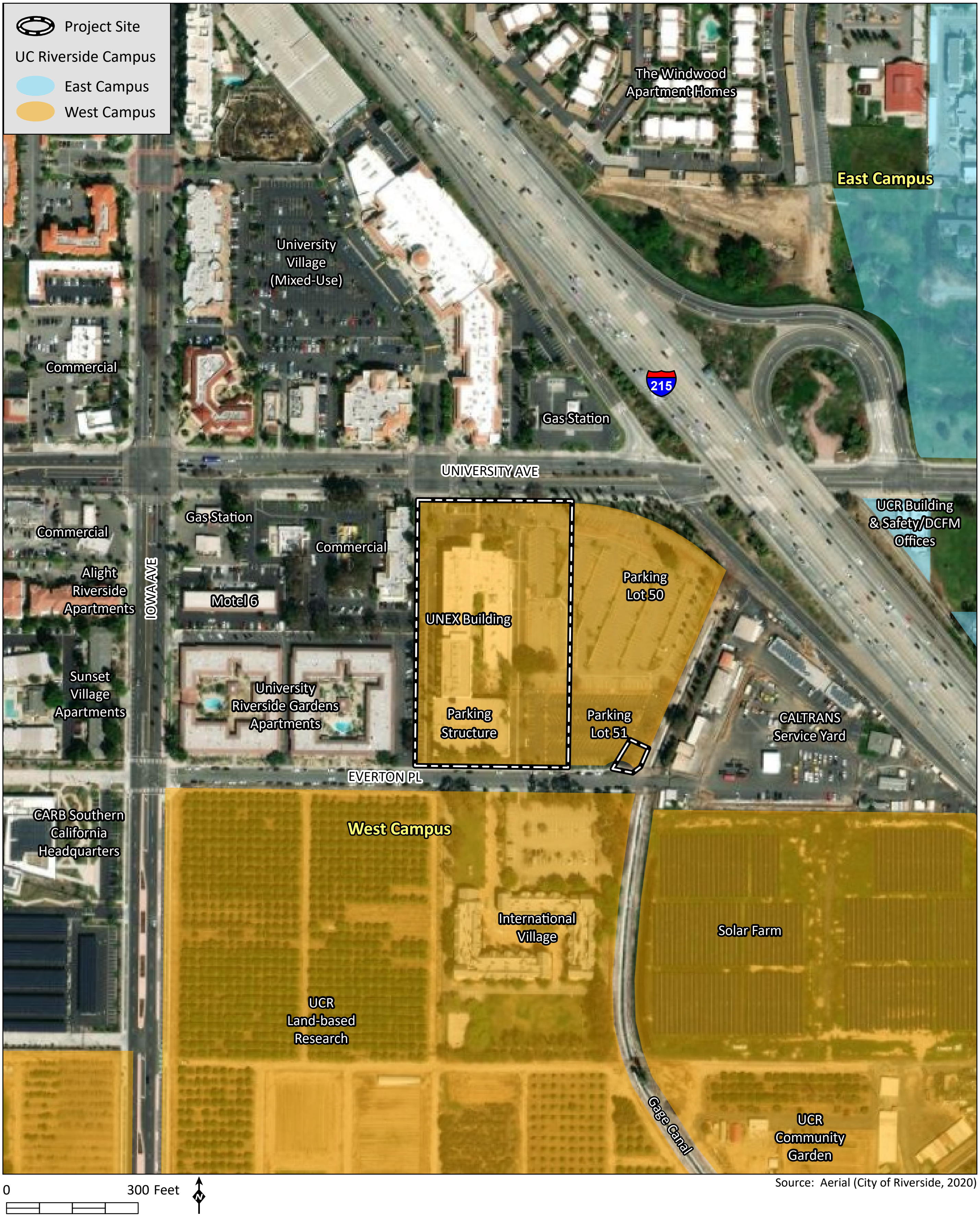
UCR Campus

Figure 2-1

Attachment 2

Figure 2, Project Site Location

I:\PROJECTS\U\UCRiverside_00886\00004_OasisPark\Map\Add\Addendum.aprx Fig2-3_ProjSite : 00886.4.1 : 2/6/2024 - SAB



Source: Aerial (City of Riverside, 2020)

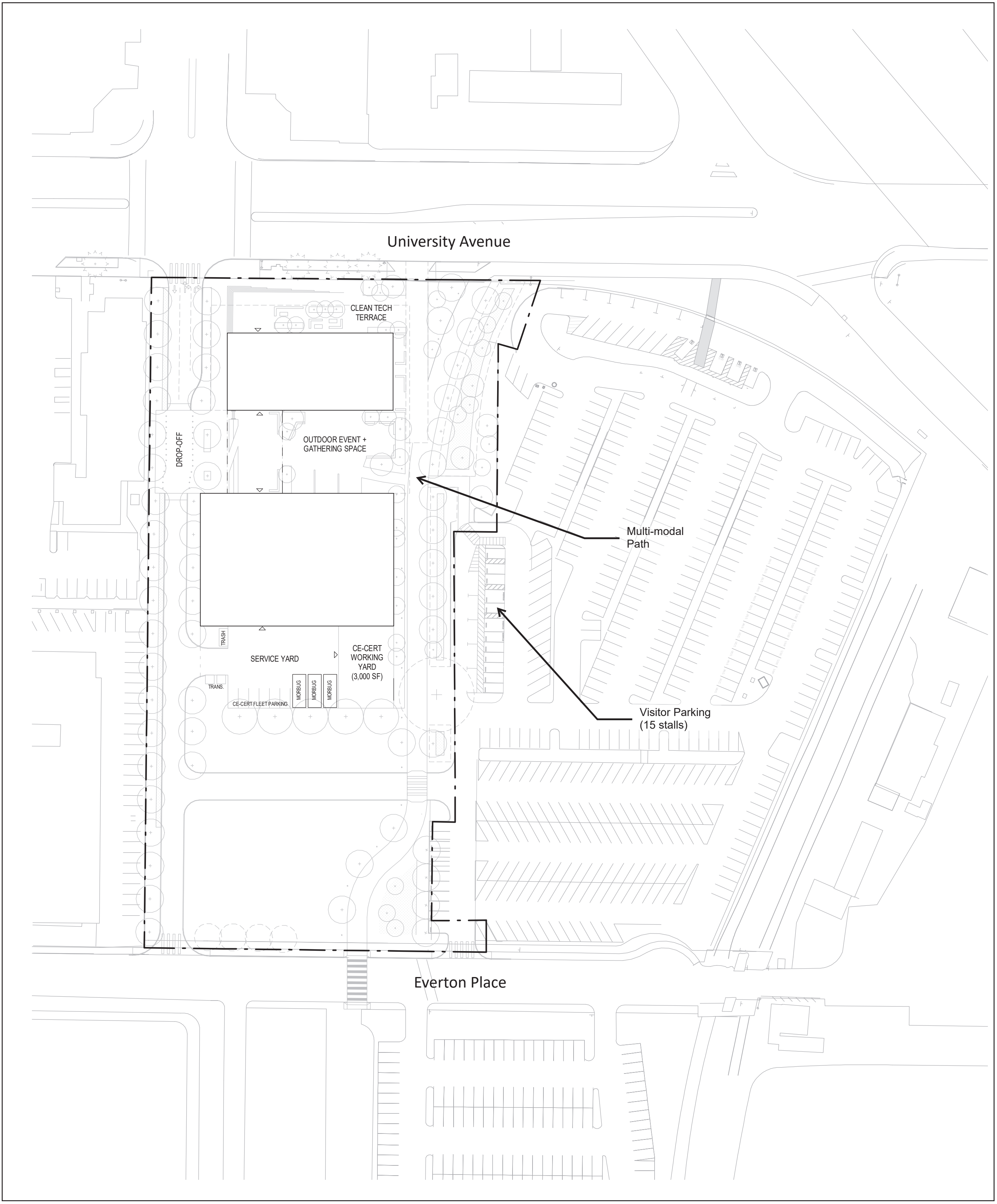
HELIX Environmental Planning

Project Site Location

Figure 2

Attachment 3

Figure 3, Conceptual Site Plan



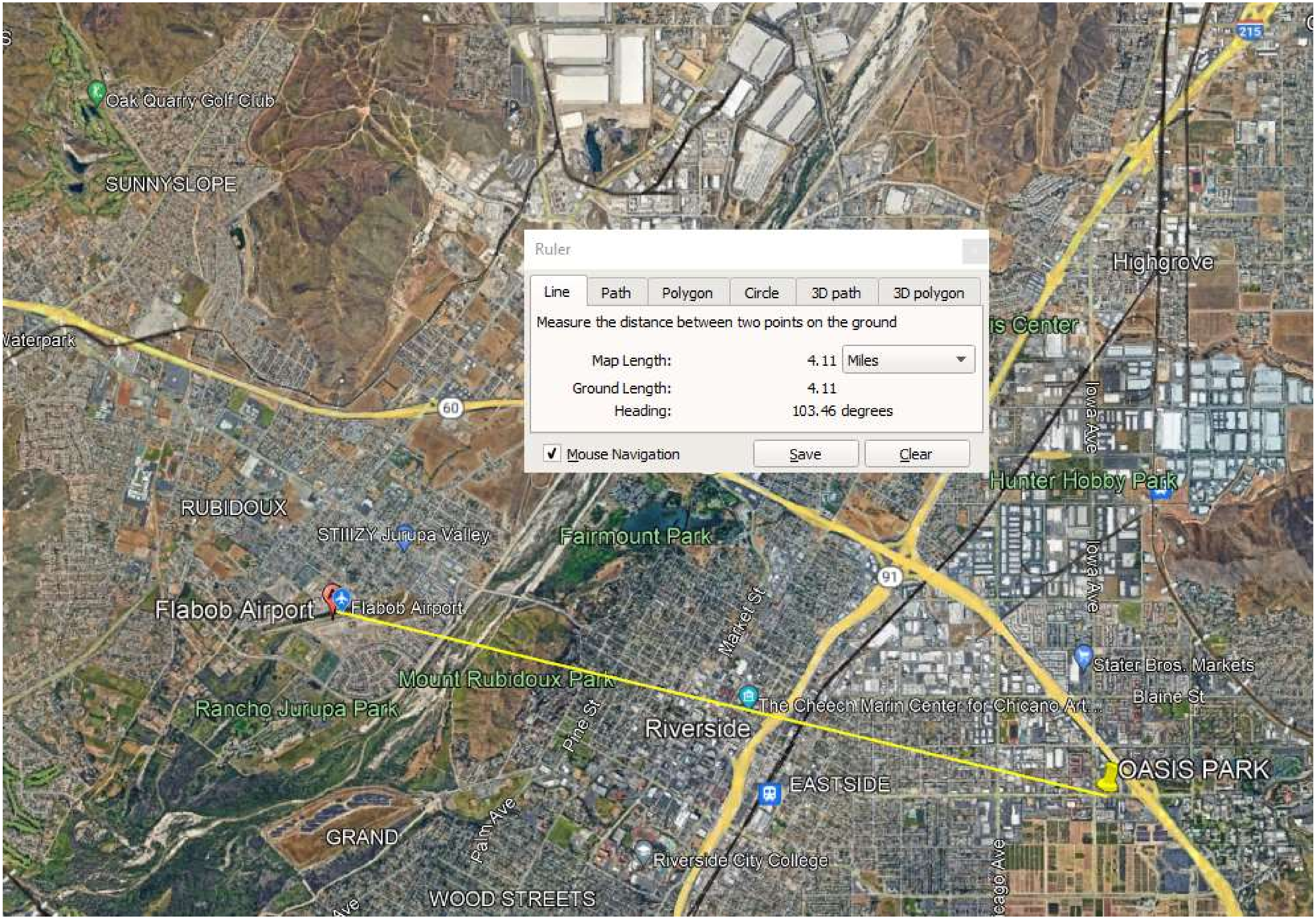
I:\PROJECTS\U\UCRiverside_00886\00004_OasisPark\Map\Add\Fig2-4_ConcSitePlan.indd 00886.2.1 7/20/2023 - SAB

Conceptual Site Plan

Figure 3

Attachment 4

Proximity to Airports Maps



Ruler

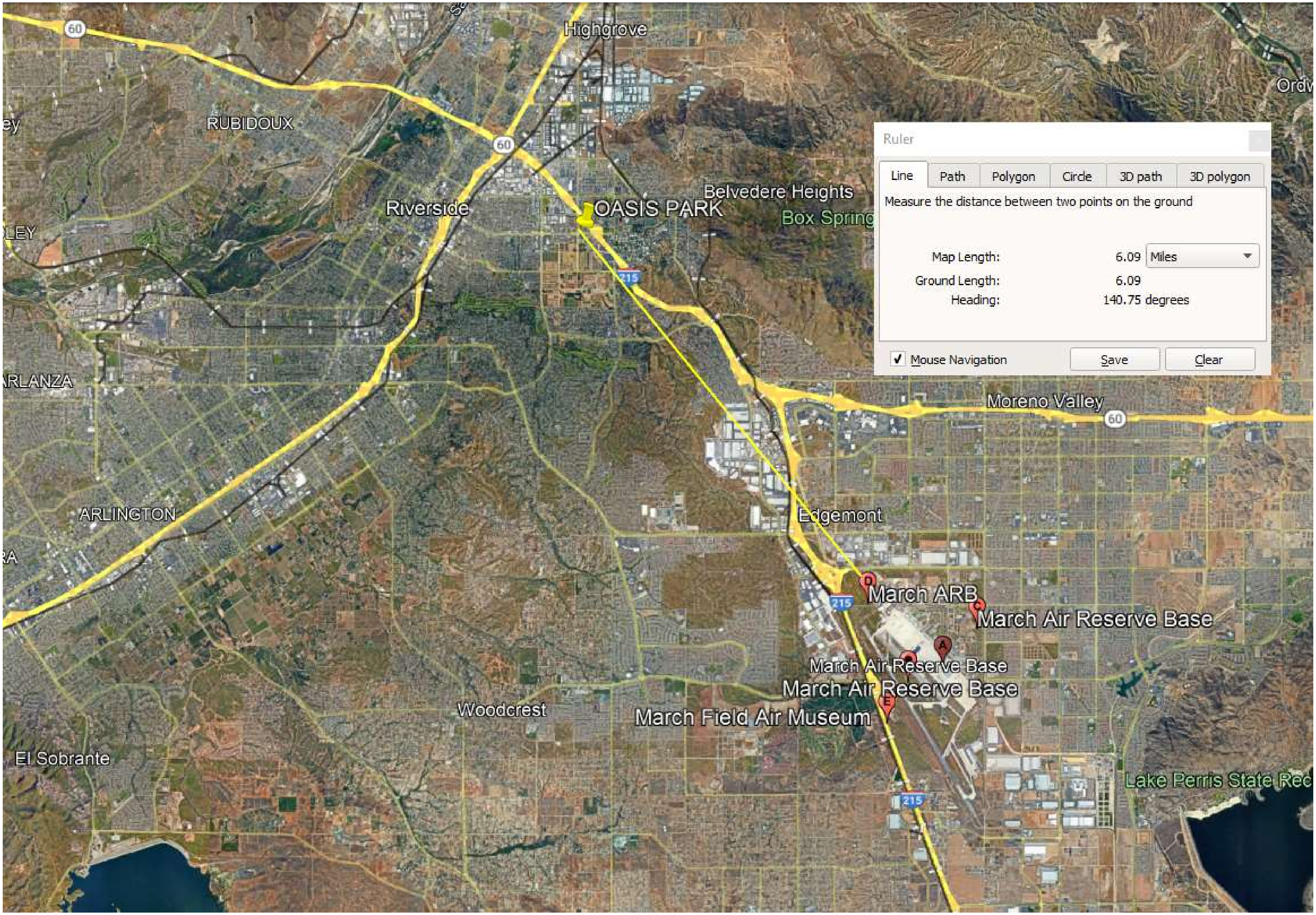
Measure the distance between two points on the ground

Map Length: 4.11 Miles

Ground Length: 4.11

Heading: 103.46 degrees

☑ Mouse Navigation



Measure the distance between two points on the ground

Map Length: 6.09 Miles

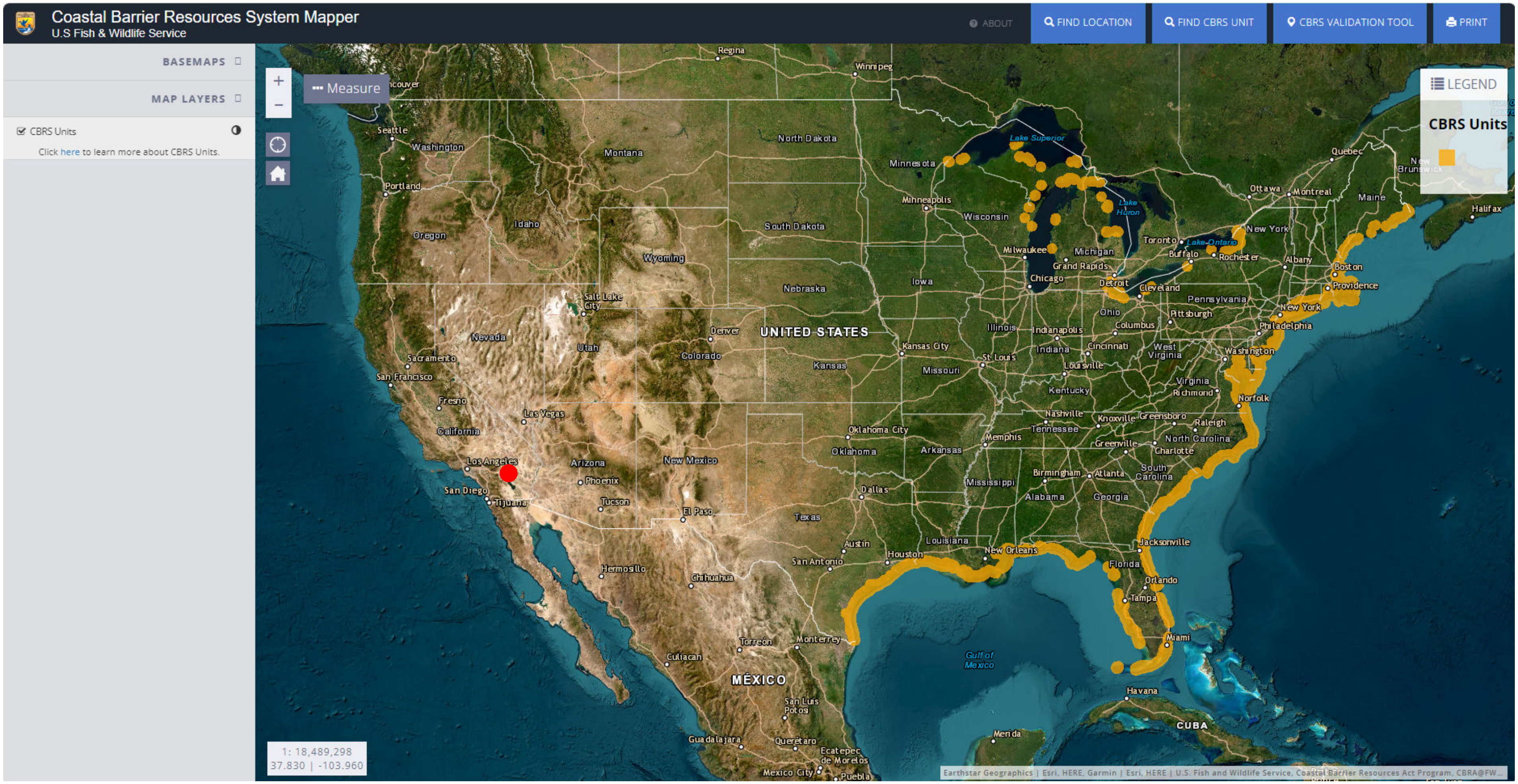
Ground Length: 6.09

Heading: 140.75 degrees

☑ Mouse Navigation

Attachment 5

Coastal Barrier Resources Map



Click here to learn more about CBRS Units.

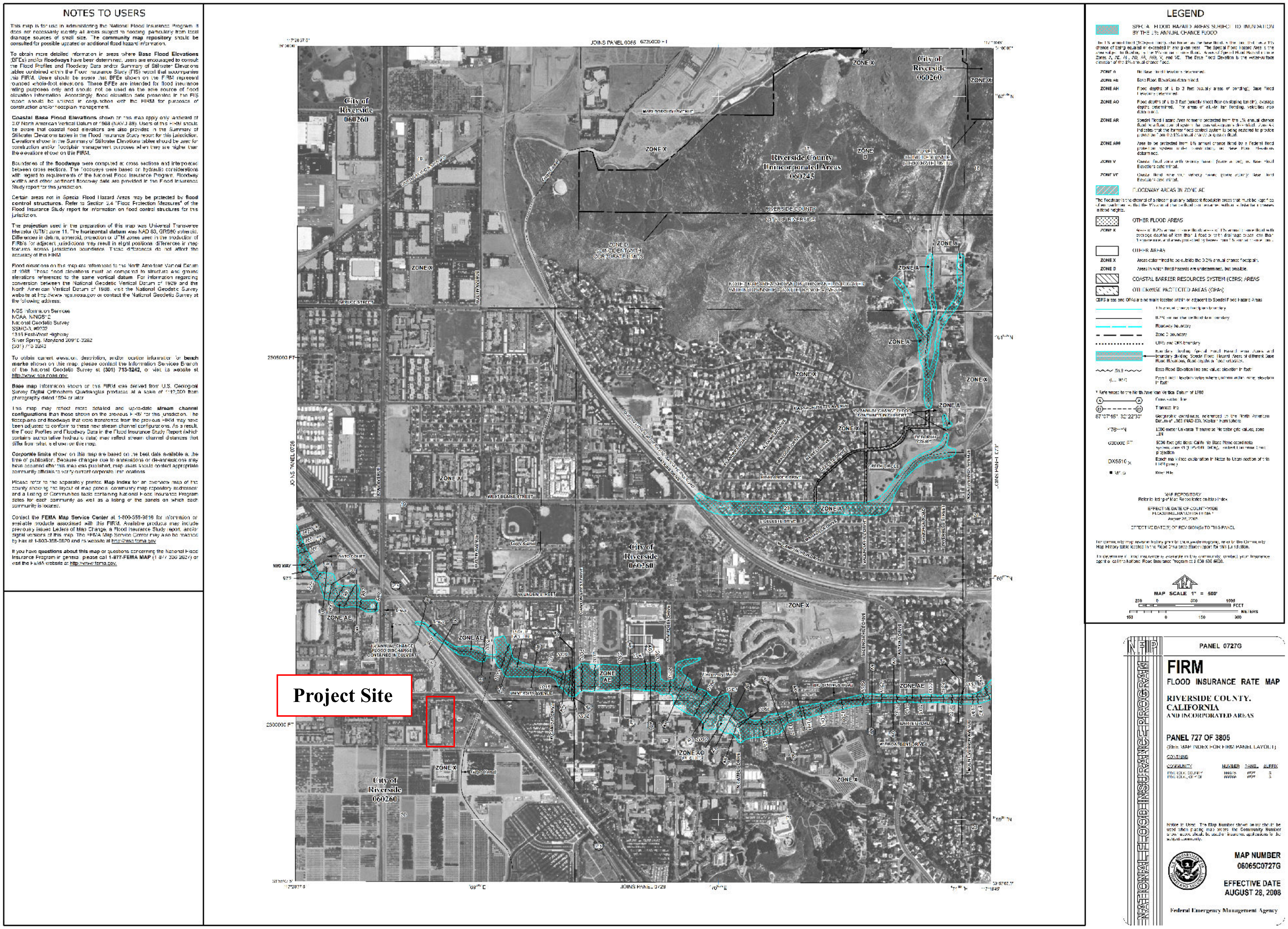
● Approximate Project Site Location

Source: https://fwsprimary.wim.usgs.gov/CBRSMapper-v2/

Attachment 6

FEMA Flood Insurance Rate Map

Attachment 6: FEMA Flood Insurance Map No. 06065C0727G



NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later.

This map may reflect more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

LEGEND

▨ SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

▨ FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

▨ OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

☐ OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

▨ COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

▨ OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)——(A)	Cross section line
(23)- - -(23)	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4276000N	1000-meter Universal Transverse Mercator grid values, zone 11N
600000 FT	5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
■ M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
August 28, 2008

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

100 0 150 300 METERS

NFIP

PANEL 0727G

FIRM

FLOOD INSURANCE RATE MAP

RIVERSIDE COUNTY,
CALIFORNIA
AND INCORPORATED AREAS

PANEL 727 OF 3805

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
RIVERSIDE COUNTY	060245	0727	G
RIVERSIDE, CITY OF	060260	0727	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06065C0727G

EFFECTIVE DATE
AUGUST 28, 2008

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

Attachment 7

Supporting Air Quality and GHG Emissions Documentation

UCR OASIS Park - Clean Power Mix Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	UCR OASIS Park - Clean Power Mix
Construction Start Date	4/1/2024
Operational Year	2027
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.20
Precipitation (days)	14.2
Location	33.97475953331494, -117.33758367490393
County	Riverside-South Coast
City	Riverside
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	5490
EDFZ	11
Electric Utility	City of Riverside
Gas Utility	Southern California Gas
App Version	2022.1.1.21

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description

Office Park	28.0	1000sqft	0.64	28,000	53,578	—	—	—
Research & Development	42.0	1000sqft	0.96	42,000	—	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

Sector	#	Measure Title
Construction	C-5	Use Advanced Engine Tiers
Energy	E-1	Buildings Exceed 2019 Title 24 Building Envelope Energy Efficiency Standards

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	38.5	37.5	35.2	84.1	0.07	2.04	3.14	4.85	1.78	1.43	2.31	—	8,048	8,048	0.27	0.44	6.55	8,191
Mit.	35.4	35.0	10.0	82.0	0.07	0.85	3.14	3.66	0.70	1.43	1.52	—	8,048	8,048	0.27	0.44	6.55	8,191
% Reduced	8%	7%	72%	3%	—	58%	—	24%	61%	—	34%	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.18	1.82	17.8	17.4	0.03	0.79	3.14	3.93	0.73	1.43	2.16	—	3,595	3,595	0.13	0.16	0.06	3,646
Mit.	0.66	0.58	3.59	16.3	0.03	0.12	3.14	3.23	0.11	1.43	1.52	—	3,595	3,595	0.13	0.16	0.06	3,646
% Reduced	70%	68%	80%	7%	—	85%	—	18%	85%	—	30%	—	—	—	—	—	—	—

Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	13.1	12.8	15.4	31.9	0.03	0.83	1.18	2.01	0.74	0.27	1.01	—	3,521	3,521	0.12	0.17	1.20	3,576
Mit.	11.8	11.7	4.32	31.4	0.03	0.31	1.18	1.49	0.26	0.27	0.54	—	3,521	3,521	0.12	0.17	1.20	3,576
% Reduced	10%	9%	72%	2%	—	62%	—	26%	65%	—	47%	—	—	—	—	—	—	—
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.40	2.33	2.81	5.82	0.01	0.15	0.22	0.37	0.13	0.05	0.18	—	583	583	0.02	0.03	0.20	592
Mit.	2.16	2.13	0.79	5.74	0.01	0.06	0.22	0.27	0.05	0.05	0.10	—	583	583	0.02	0.03	0.20	592
% Reduced	10%	9%	72%	2%	—	62%	—	26%	65%	—	47%	—	—	—	—	—	—	—

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2024	38.5	37.5	35.2	84.1	0.07	2.04	3.14	4.85	1.78	1.43	2.31	—	8,048	8,048	0.27	0.44	6.55	8,191
2025	1.31	1.09	9.50	13.0	0.02	0.37	0.39	0.76	0.34	0.10	0.44	—	2,717	2,717	0.10	0.08	2.16	2,746
2026	1.24	31.0	8.98	12.8	0.02	0.33	0.39	0.72	0.30	0.10	0.40	—	2,705	2,705	0.10	0.08	1.99	2,733
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2024	2.18	1.82	17.8	17.4	0.03	0.79	3.14	3.93	0.73	1.43	2.16	—	3,595	3,595	0.13	0.16	0.06	3,646
2025	1.29	1.08	9.53	12.6	0.02	0.37	0.39	0.76	0.34	0.10	0.44	—	2,692	2,692	0.10	0.08	0.06	2,719
2026	1.23	1.03	9.01	12.4	0.02	0.33	0.39	0.72	0.30	0.10	0.40	—	2,680	2,680	0.10	0.08	0.05	2,707
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2024	13.1	12.8	15.4	31.9	0.03	0.83	1.18	2.01	0.74	0.27	1.01	—	3,521	3,521	0.12	0.17	1.20	3,576
2025	1.11	0.93	8.18	10.8	0.02	0.32	0.33	0.65	0.29	0.08	0.38	—	2,311	2,311	0.09	0.07	0.80	2,334
2026	0.56	2.26	4.03	5.63	0.01	0.15	0.17	0.32	0.14	0.04	0.18	—	1,182	1,182	0.04	0.03	0.38	1,194
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2024	2.40	2.33	2.81	5.82	0.01	0.15	0.22	0.37	0.13	0.05	0.18	—	583	583	0.02	0.03	0.20	592
2025	0.20	0.17	1.49	1.98	< 0.005	0.06	0.06	0.12	0.05	0.01	0.07	—	383	383	0.01	0.01	0.13	386
2026	0.10	0.41	0.74	1.03	< 0.005	0.03	0.03	0.06	0.02	0.01	0.03	—	196	196	0.01	0.01	0.06	198

2.3. Construction Emissions by Year, Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2024	35.4	35.0	10.0	82.0	0.07	0.85	3.14	3.66	0.70	1.43	1.52	—	8,048	8,048	0.27	0.44	6.55	8,191
2025	0.64	0.55	3.48	14.7	0.02	0.11	0.39	0.50	0.11	0.10	0.20	—	2,717	2,717	0.10	0.08	2.16	2,746
2026	0.61	31.0	3.41	14.5	0.02	0.10	0.39	0.50	0.10	0.10	0.20	—	2,705	2,705	0.10	0.08	1.99	2,733
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2024	0.66	0.58	3.59	16.3	0.03	0.12	3.14	3.23	0.11	1.43	1.52	—	3,595	3,595	0.13	0.16	0.06	3,646
2025	0.63	0.55	3.50	14.2	0.02	0.11	0.39	0.50	0.11	0.10	0.20	—	2,692	2,692	0.10	0.08	0.06	2,719
2026	0.60	0.53	3.43	14.1	0.02	0.10	0.39	0.50	0.10	0.10	0.20	—	2,680	2,680	0.10	0.08	0.05	2,707
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2024	11.8	11.7	4.32	31.4	0.03	0.31	1.18	1.49	0.26	0.27	0.54	—	3,521	3,521	0.12	0.17	1.20	3,576
2025	0.54	0.47	3.01	12.3	0.02	0.10	0.33	0.43	0.09	0.08	0.17	—	2,311	2,311	0.09	0.07	0.80	2,334
2026	0.28	2.04	1.60	6.35	0.01	0.05	0.17	0.22	0.05	0.04	0.09	—	1,182	1,182	0.04	0.03	0.38	1,194
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2024	2.16	2.13	0.79	5.74	0.01	0.06	0.22	0.27	0.05	0.05	0.10	—	583	583	0.02	0.03	0.20	592
2025	0.10	0.09	0.55	2.24	< 0.005	0.02	0.06	0.08	0.02	0.01	0.03	—	383	383	0.01	0.01	0.13	386
2026	0.05	0.37	0.29	1.16	< 0.005	0.01	0.03	0.04	0.01	0.01	0.02	—	196	196	0.01	0.01	0.06	198

2.4. Operations Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.54	3.12	0.64	8.59	0.01	0.01	1.13	1.14	0.01	0.29	0.30	45.5	1,520	1,565	4.64	0.09	5.25	1,712
Mit.	1.54	3.12	0.64	8.59	0.01	0.01	1.13	1.14	0.01	0.29	0.30	45.5	1,496	1,541	4.64	0.09	5.25	1,688
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	2%	2%	—	—	—	1%
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.94	2.55	0.66	4.87	0.01	0.01	1.13	1.14	0.01	0.29	0.30	45.5	1,429	1,474	4.64	0.09	1.25	1,618
Mit.	0.94	2.55	0.66	4.87	0.01	0.01	1.13	1.14	0.01	0.29	0.30	45.5	1,405	1,450	4.64	0.09	1.25	1,594
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	2%	2%	—	—	—	1%
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.03	2.64	0.50	5.67	0.01	0.01	0.80	0.81	0.01	0.20	0.21	45.5	1,090	1,135	4.62	0.07	2.41	1,274
Mit.	1.03	2.64	0.50	5.67	0.01	0.01	0.80	0.81	0.01	0.20	0.21	45.5	1,066	1,112	4.62	0.07	2.41	1,250
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	2%	2%	—	—	—	2%
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.19	0.48	0.09	1.03	< 0.005	< 0.005	0.15	0.15	< 0.005	0.04	0.04	7.53	180	188	0.76	0.01	0.40	211

Mit.	0.19	0.48	0.09	1.03	< 0.005	< 0.005	0.15	0.15	< 0.005	0.04	0.04	7.53	177	184	0.76	0.01	0.40	207
% Reduced	—	—	—	—	—	—	—	—	—	—	—	—	2%	2%	—	—	—	2%

2.5. Operations Emissions by Sector, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Sector	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	1.00	0.94	0.62	5.55	0.01	0.01	1.13	1.14	0.01	0.29	0.30	—	1,323	1,323	0.06	0.06	4.11	1,348
Area	0.54	2.18	0.03	3.04	< 0.005	0.01	—	0.01	< 0.005	—	< 0.005	—	12.5	12.5	< 0.005	< 0.005	—	12.6
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	182	182	0.00	0.00	—	182
Water	—	—	—	—	—	—	—	—	—	—	—	8.90	2.77	11.7	0.91	0.02	—	40.9
Waste	—	—	—	—	—	—	—	—	—	—	—	36.6	0.00	36.6	3.66	0.00	—	128
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.14	1.14
Total	1.54	3.12	0.64	8.59	0.01	0.01	1.13	1.14	0.01	0.29	0.30	45.5	1,520	1,565	4.64	0.09	5.25	1,712
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.94	0.88	0.66	4.87	0.01	0.01	1.13	1.14	0.01	0.29	0.30	—	1,244	1,244	0.07	0.07	0.11	1,266
Area	—	1.68	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	182	182	0.00	0.00	—	182
Water	—	—	—	—	—	—	—	—	—	—	—	8.90	2.77	11.7	0.91	0.02	—	40.9
Waste	—	—	—	—	—	—	—	—	—	—	—	36.6	0.00	36.6	3.66	0.00	—	128
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.14	1.14
Total	0.94	2.55	0.66	4.87	0.01	0.01	1.13	1.14	0.01	0.29	0.30	45.5	1,429	1,474	4.64	0.09	1.25	1,618
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Mobile	0.66	0.62	0.48	3.59	0.01	0.01	0.80	0.81	0.01	0.20	0.21	—	897	897	0.05	0.05	1.27	914
Area	0.37	2.02	0.02	2.09	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	8.57	8.57	< 0.005	< 0.005	—	8.61
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	182	182	0.00	0.00	—	182
Water	—	—	—	—	—	—	—	—	—	—	—	8.90	2.77	11.7	0.91	0.02	—	40.9
Waste	—	—	—	—	—	—	—	—	—	—	—	36.6	0.00	36.6	3.66	0.00	—	128
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.14	1.14
Total	1.03	2.64	0.50	5.67	0.01	0.01	0.80	0.81	0.01	0.20	0.21	45.5	1,090	1,135	4.62	0.07	2.41	1,274
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.12	0.11	0.09	0.65	< 0.005	< 0.005	0.15	0.15	< 0.005	0.04	0.04	—	148	148	0.01	0.01	0.21	151
Area	0.07	0.37	< 0.005	0.38	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.42	1.42	< 0.005	< 0.005	—	1.42
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	30.1	30.1	0.00	0.00	—	30.1
Water	—	—	—	—	—	—	—	—	—	—	—	1.47	0.46	1.93	0.15	< 0.005	—	6.78
Waste	—	—	—	—	—	—	—	—	—	—	—	6.06	0.00	6.06	0.61	0.00	—	21.2
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.19	0.19
Total	0.19	0.48	0.09	1.03	< 0.005	< 0.005	0.15	0.15	< 0.005	0.04	0.04	7.53	180	188	0.76	0.01	0.40	211

2.6. Operations Emissions by Sector, Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Sector	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	1.00	0.94	0.62	5.55	0.01	0.01	1.13	1.14	0.01	0.29	0.30	—	1,323	1,323	0.06	0.06	4.11	1,348
Area	0.54	2.18	0.03	3.04	< 0.005	0.01	—	0.01	< 0.005	—	< 0.005	—	12.5	12.5	< 0.005	< 0.005	—	12.6
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	158	158	0.00	0.00	—	158
Water	—	—	—	—	—	—	—	—	—	—	—	8.90	2.77	11.7	0.91	0.02	—	40.9
Waste	—	—	—	—	—	—	—	—	—	—	—	36.6	0.00	36.6	3.66	0.00	—	128
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.14	1.14

Total	1.54	3.12	0.64	8.59	0.01	0.01	1.13	1.14	0.01	0.29	0.30	45.5	1,496	1,541	4.64	0.09	5.25	1,688
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.94	0.88	0.66	4.87	0.01	0.01	1.13	1.14	0.01	0.29	0.30	—	1,244	1,244	0.07	0.07	0.11	1,266
Area	—	1.68	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	158	158	0.00	0.00	—	158
Water	—	—	—	—	—	—	—	—	—	—	—	8.90	2.77	11.7	0.91	0.02	—	40.9
Waste	—	—	—	—	—	—	—	—	—	—	—	36.6	0.00	36.6	3.66	0.00	—	128
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.14	1.14
Total	0.94	2.55	0.66	4.87	0.01	0.01	1.13	1.14	0.01	0.29	0.30	45.5	1,405	1,450	4.64	0.09	1.25	1,594
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.66	0.62	0.48	3.59	0.01	0.01	0.80	0.81	0.01	0.20	0.21	—	897	897	0.05	0.05	1.27	914
Area	0.37	2.02	0.02	2.09	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	8.57	8.57	< 0.005	< 0.005	—	8.61
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	158	158	0.00	0.00	—	158
Water	—	—	—	—	—	—	—	—	—	—	—	8.90	2.77	11.7	0.91	0.02	—	40.9
Waste	—	—	—	—	—	—	—	—	—	—	—	36.6	0.00	36.6	3.66	0.00	—	128
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.14	1.14
Total	1.03	2.64	0.50	5.67	0.01	0.01	0.80	0.81	0.01	0.20	0.21	45.5	1,066	1,112	4.62	0.07	2.41	1,250
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.12	0.11	0.09	0.65	< 0.005	< 0.005	0.15	0.15	< 0.005	0.04	0.04	—	148	148	0.01	0.01	0.21	151
Area	0.07	0.37	< 0.005	0.38	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.42	1.42	< 0.005	< 0.005	—	1.42
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	26.2	26.2	0.00	0.00	—	26.2
Water	—	—	—	—	—	—	—	—	—	—	—	1.47	0.46	1.93	0.15	< 0.005	—	6.78
Waste	—	—	—	—	—	—	—	—	—	—	—	6.06	0.00	6.06	0.61	0.00	—	21.2
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.19	0.19
Total	0.19	0.48	0.09	1.03	< 0.005	< 0.005	0.15	0.15	< 0.005	0.04	0.04	7.53	177	184	0.76	0.01	0.40	207

3. Construction Emissions Details

3.1. Demolition (2024) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	38.2	37.4	32.4	81.2	0.05	1.99	—	1.99	1.74	—	1.74	—	5,297	5,297	0.22	0.04	—	5,316
Demolition	—	—	—	—	—	—	1.84	1.84	—	0.28	0.28	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	12.6	12.3	10.6	26.7	0.02	0.66	—	0.66	0.57	—	0.57	—	1,742	1,742	0.07	0.01	—	1,748
Demolition	—	—	—	—	—	—	0.61	0.61	—	0.09	0.09	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.29	2.24	1.94	4.87	< 0.005	0.12	—	0.12	0.10	—	0.10	—	288	288	0.01	< 0.005	—	289
Demolition	—	—	—	—	—	—	0.11	0.11	—	0.02	0.02	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.15	0.14	0.13	2.30	0.00	0.00	0.36	0.36	0.00	0.08	0.08	—	396	396	0.02	0.01	1.57	402
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.10	0.04	2.66	0.64	0.02	0.04	0.61	0.65	0.04	0.17	0.22	—	2,354	2,354	0.04	0.38	4.98	2,474
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.04	0.05	0.60	0.00	0.00	0.12	0.12	0.00	0.03	0.03	—	121	121	0.01	< 0.005	0.22	123
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.03	0.01	0.92	0.21	0.01	0.01	0.20	0.21	0.01	0.06	0.07	—	774	774	0.01	0.12	0.70	812
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.11	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	20.1	20.1	< 0.005	< 0.005	0.04	20.3
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	< 0.005	0.17	0.04	< 0.005	< 0.005	0.04	0.04	< 0.005	0.01	0.01	—	128	128	< 0.005	0.02	0.12	135

3.2. Demolition (2024) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	35.1	34.8	7.21	79.1	0.05	0.81	—	0.81	0.66	—	0.66	—	5,297	5,297	0.22	0.04	—	5,316
Demolition	—	—	—	—	—	—	1.84	1.84	—	0.28	0.28	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	11.6	11.5	2.37	26.0	0.02	0.27	—	0.27	0.22	—	0.22	—	1,742	1,742	0.07	0.01	—	1,748
Demolition	—	—	—	—	—	—	0.61	0.61	—	0.09	0.09	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.11	2.09	0.43	4.75	< 0.005	0.05	—	0.05	0.04	—	0.04	—	288	288	0.01	< 0.005	—	289
Demolition	—	—	—	—	—	—	0.11	0.11	—	0.02	0.02	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.15	0.14	0.13	2.30	0.00	0.00	0.36	0.36	0.00	0.08	0.08	—	396	396	0.02	0.01	1.57	402
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.10	0.04	2.66	0.64	0.02	0.04	0.61	0.65	0.04	0.17	0.22	—	2,354	2,354	0.04	0.38	4.98	2,474

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.04	0.05	0.60	0.00	0.00	0.12	0.12	0.00	0.03	0.03	—	121	121	0.01	< 0.005	0.22	123
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.03	0.01	0.92	0.21	0.01	0.01	0.20	0.21	0.01	0.06	0.07	—	774	774	0.01	0.12	0.70	812
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.11	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	20.1	20.1	< 0.005	< 0.005	0.04	20.3
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.01	< 0.005	0.17	0.04	< 0.005	< 0.005	0.04	0.04	< 0.005	0.01	0.01	—	128	128	< 0.005	0.02	0.12	135

3.3. Site Preparation (2024) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.52	1.28	12.7	13.1	0.02	0.56	—	0.56	0.52	—	0.52	—	2,077	2,077	0.08	0.02	—	2,084
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.08	0.07	0.70	0.72	< 0.005	0.03	—	0.03	0.03	—	0.03	—	114	114	< 0.005	< 0.005	—	114

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.01	0.13	0.13	< 0.005	0.01	—	0.01	0.01	—	0.01	—	18.8	18.8	< 0.005	< 0.005	—	18.9
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.05	0.05	0.83	0.00	0.00	0.13	0.13	0.00	0.03	0.03	—	144	144	0.01	< 0.005	0.57	146
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.04	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	7.34	7.34	< 0.005	< 0.005	0.01	7.44
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.22	1.22	< 0.005	< 0.005	< 0.005	1.23
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.4. Site Preparation (2024) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e

Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.20	0.20	1.02	12.0	0.02	0.04	—	0.04	0.04	—	0.04	—	2,077	2,077	0.08	0.02	—	2,084
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.06	0.66	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	114	114	< 0.005	< 0.005	—	114
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.01	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	18.8	18.8	< 0.005	< 0.005	—	18.9
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.05	0.05	0.83	0.00	0.00	0.13	0.13	0.00	0.03	0.03	—	144	144	0.01	< 0.005	0.57	146
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.04	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	7.34	7.34	< 0.005	< 0.005	0.01	7.44
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.22	1.22	< 0.005	< 0.005	< 0.005	1.23
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.5. Grading (2024) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.08	1.75	16.7	16.4	0.02	0.77	—	0.77	0.71	—	0.71	—	2,595	2,595	0.11	0.02	—	2,604
Dust From Material Movement	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	2.08	1.75	16.7	16.4	0.02	0.77	—	0.77	0.71	—	0.71	—	2,595	2,595	0.11	0.02	—	2,604

Dust From Material Movemen	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.11	0.10	0.92	0.90	< 0.005	0.04	—	0.04	0.04	—	0.04	—	142	142	0.01	< 0.005	—	143
Dust From Material Movemen	—	—	—	—	—	—	0.15	0.15	—	0.07	0.07	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.02	0.17	0.16	< 0.005	0.01	—	0.01	0.01	—	0.01	—	23.5	23.5	< 0.005	< 0.005	—	23.6
Dust From Material Movemen	—	—	—	—	—	—	0.03	0.03	—	0.01	0.01	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.07	0.06	0.06	1.04	0.00	0.00	0.16	0.16	0.00	0.04	0.04	—	180	180	0.01	0.01	0.71	183
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.03	0.01	0.94	0.23	0.01	0.02	0.22	0.23	0.02	0.06	0.08	—	833	833	0.02	0.13	1.76	876
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.07	0.06	0.07	0.79	0.00	0.00	0.16	0.16	0.00	0.04	0.04	—	165	165	0.01	0.01	0.02	167
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.03	0.01	0.98	0.23	0.01	0.02	0.22	0.23	0.02	0.06	0.08	—	834	834	0.01	0.13	0.05	874
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	9.18	9.18	< 0.005	< 0.005	0.02	9.30
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.05	0.01	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	45.7	45.7	< 0.005	0.01	0.04	47.9
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.52	1.52	< 0.005	< 0.005	< 0.005	1.54
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	7.56	7.56	< 0.005	< 0.005	0.01	7.94

3.6. Grading (2024) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.35	0.33	2.05	15.3	0.02	0.07	—	0.07	0.07	—	0.07	—	2,595	2,595	0.11	0.02	—	2,604
Dust From Material Movement	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.35	0.33	2.05	15.3	0.02	0.07	—	0.07	0.07	—	0.07	—	2,595	2,595	0.11	0.02	—	2,604
Dust From Material Movement	—	—	—	—	—	—	2.76	2.76	—	1.34	1.34	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.02	0.11	0.84	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	142	142	0.01	< 0.005	—	143
Dust From Material Movement	—	—	—	—	—	—	0.15	0.15	—	0.07	0.07	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.02	0.15	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	23.5	23.5	< 0.005	< 0.005	—	23.6
Dust From Material Movement	—	—	—	—	—	—	0.03	0.03	—	0.01	0.01	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.07	0.06	0.06	1.04	0.00	0.00	0.16	0.16	0.00	0.04	0.04	—	180	180	0.01	0.01	0.71	183
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.03	0.01	0.94	0.23	0.01	0.02	0.22	0.23	0.02	0.06	0.08	—	833	833	0.02	0.13	1.76	876

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.07	0.06	0.07	0.79	0.00	0.00	0.16	0.16	0.00	0.04	0.04	—	165	165	0.01	0.01	0.02	167
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.03	0.01	0.98	0.23	0.01	0.02	0.22	0.23	0.02	0.06	0.08	—	834	834	0.01	0.13	0.05	874
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	9.18	9.18	< 0.005	< 0.005	0.02	9.30
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.05	0.01	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	45.7	45.7	< 0.005	0.01	0.04	47.9
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.52	1.52	< 0.005	< 0.005	< 0.005	1.54
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	< 0.005	< 0.005	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	7.56	7.56	< 0.005	< 0.005	0.01	7.94

3.7. Building Construction (2024) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.25	1.05	9.67	11.2	0.02	0.42	—	0.42	0.39	—	0.39	—	2,051	2,051	0.08	0.02	—	2,058
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.26	0.22	2.02	2.34	< 0.005	0.09	—	0.09	0.08	—	0.08	—	429	429	0.02	< 0.005	—	430
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	0.04	0.37	0.43	< 0.005	0.02	—	0.02	0.01	—	0.01	—	71.0	71.0	< 0.005	< 0.005	—	71.2
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.12	0.11	0.13	1.41	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	296	296	0.01	0.01	0.03	300
Vendor	0.02	0.01	0.42	0.13	< 0.005	0.01	0.10	0.10	0.01	0.03	0.03	—	356	356	0.01	0.05	0.03	373
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.03	0.31	0.00	0.00	0.06	0.06	0.00	0.01	0.01	—	62.7	62.7	< 0.005	< 0.005	0.12	63.6
Vendor	< 0.005	< 0.005	0.09	0.03	< 0.005	< 0.005	0.02	0.02	< 0.005	0.01	0.01	—	74.5	74.5	< 0.005	0.01	0.09	77.9
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.06	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	10.4	10.4	< 0.005	< 0.005	0.02	10.5
Vendor	< 0.005	< 0.005	0.02	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	12.3	12.3	< 0.005	< 0.005	0.01	12.9
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.8. Building Construction (2024) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.52	0.46	3.04	12.8	0.02	0.11	—	0.11	0.11	—	0.11	—	2,051	2,051	0.08	0.02	—	2,058
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.11	0.10	0.63	2.68	< 0.005	0.02	—	0.02	0.02	—	0.02	—	429	429	0.02	< 0.005	—	430
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.02	0.12	0.49	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	71.0	71.0	< 0.005	< 0.005	—	71.2
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.12	0.11	0.13	1.41	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	296	296	0.01	0.01	0.03	300
Vendor	0.02	0.01	0.42	0.13	< 0.005	0.01	0.10	0.10	0.01	0.03	0.03	—	356	356	0.01	0.05	0.03	373
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.03	0.31	0.00	0.00	0.06	0.06	0.00	0.01	0.01	—	62.7	62.7	< 0.005	< 0.005	0.12	63.6
Vendor	< 0.005	< 0.005	0.09	0.03	< 0.005	< 0.005	0.02	0.02	< 0.005	0.01	0.01	—	74.5	74.5	< 0.005	0.01	0.09	77.9
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.06	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	10.4	10.4	< 0.005	< 0.005	0.02	10.5
Vendor	< 0.005	< 0.005	0.02	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	12.3	12.3	< 0.005	< 0.005	0.01	12.9
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.9. Building Construction (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.17	0.98	9.02	11.2	0.02	0.37	—	0.37	0.34	—	0.34	—	2,051	2,051	0.08	0.02	—	2,058
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.17	0.98	9.02	11.2	0.02	0.37	—	0.37	0.34	—	0.34	—	2,051	2,051	0.08	0.02	—	2,058

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.01	0.84	7.73	9.56	0.02	0.32	—	0.32	0.29	—	0.29	—	1,758	1,758	0.07	0.01	—	1,764
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.18	0.15	1.41	1.74	< 0.005	0.06	—	0.06	0.05	—	0.05	—	291	291	0.01	< 0.005	—	292
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.12	0.10	0.10	1.73	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	316	316	0.01	0.01	1.16	320
Vendor	0.02	0.01	0.39	0.12	< 0.005	0.01	0.10	0.10	0.01	0.03	0.03	—	351	351	0.01	0.05	1.00	368
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.11	0.09	0.11	1.31	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	290	290	0.01	0.01	0.03	294
Vendor	0.02	0.01	0.40	0.12	< 0.005	0.01	0.10	0.10	0.01	0.03	0.03	—	351	351	0.01	0.05	0.03	367
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.09	0.08	0.10	1.18	0.00	0.00	0.25	0.25	0.00	0.06	0.06	—	252	252	0.01	0.01	0.43	255
Vendor	0.01	0.01	0.35	0.10	< 0.005	< 0.005	0.08	0.09	< 0.005	0.02	0.03	—	301	301	0.01	0.05	0.37	315
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.02	0.01	0.02	0.22	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	41.7	41.7	< 0.005	< 0.005	0.07	42.3
Vendor	< 0.005	< 0.005	0.06	0.02	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	—	49.8	49.8	< 0.005	0.01	0.06	52.2
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.10. Building Construction (2025) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.50	0.45	2.99	12.8	0.02	0.11	—	0.11	0.10	—	0.10	—	2,051	2,051	0.08	0.02	—	2,058
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.50	0.45	2.99	12.8	0.02	0.11	—	0.11	0.10	—	0.10	—	2,051	2,051	0.08	0.02	—	2,058
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.43	0.38	2.56	11.0	0.02	0.09	—	0.09	0.09	—	0.09	—	1,758	1,758	0.07	0.01	—	1,764
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.08	0.07	0.47	2.00	< 0.005	0.02	—	0.02	0.02	—	0.02	—	291	291	0.01	< 0.005	—	292

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.12	0.10	0.10	1.73	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	316	316	0.01	0.01	1.16	320
Vendor	0.02	0.01	0.39	0.12	< 0.005	0.01	0.10	0.10	0.01	0.03	0.03	—	351	351	0.01	0.05	1.00	368
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.11	0.09	0.11	1.31	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	290	290	0.01	0.01	0.03	294
Vendor	0.02	0.01	0.40	0.12	< 0.005	0.01	0.10	0.10	0.01	0.03	0.03	—	351	351	0.01	0.05	0.03	367
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.09	0.08	0.10	1.18	0.00	0.00	0.25	0.25	0.00	0.06	0.06	—	252	252	0.01	0.01	0.43	255
Vendor	0.01	0.01	0.35	0.10	< 0.005	< 0.005	0.08	0.09	< 0.005	0.02	0.03	—	301	301	0.01	0.05	0.37	315
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.01	0.02	0.22	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	41.7	41.7	< 0.005	< 0.005	0.07	42.3
Vendor	< 0.005	< 0.005	0.06	0.02	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	—	49.8	49.8	< 0.005	0.01	0.06	52.2
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.11. Building Construction (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.12	0.93	8.53	11.1	0.02	0.32	—	0.32	0.30	—	0.30	—	2,050	2,050	0.08	0.02	—	2,057
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.12	0.93	8.53	11.1	0.02	0.32	—	0.32	0.30	—	0.30	—	2,050	2,050	0.08	0.02	—	2,057
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.46	0.38	3.50	4.56	0.01	0.13	—	0.13	0.12	—	0.12	—	843	843	0.03	0.01	—	845
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.08	0.07	0.64	0.83	< 0.005	0.02	—	0.02	0.02	—	0.02	—	139	139	0.01	< 0.005	—	140
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.11	0.09	0.09	1.61	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	309	309	0.01	0.01	1.05	313
Vendor	0.02	0.01	0.37	0.11	< 0.005	0.01	0.10	0.10	0.01	0.03	0.03	—	345	345	0.01	0.05	0.94	362
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.10	0.09	0.10	1.22	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	284	284	< 0.005	0.01	0.03	288
Vendor	0.02	0.01	0.38	0.12	< 0.005	0.01	0.10	0.10	0.01	0.03	0.03	—	346	346	0.01	0.05	0.02	362
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.04	0.04	0.04	0.52	0.00	0.00	0.12	0.12	0.00	0.03	0.03	—	118	118	< 0.005	< 0.005	0.19	120
Vendor	0.01	< 0.005	0.16	0.05	< 0.005	< 0.005	0.04	0.04	< 0.005	0.01	0.01	—	142	142	< 0.005	0.02	0.17	149
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.10	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	19.6	19.6	< 0.005	< 0.005	0.03	19.8
Vendor	< 0.005	< 0.005	0.03	0.01	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	23.5	23.5	< 0.005	< 0.005	0.03	24.6
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.12. Building Construction (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.49	0.43	2.95	12.8	0.02	0.10	—	0.10	0.09	—	0.09	—	2,050	2,050	0.08	0.02	—	2,057
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.49	0.43	2.95	12.8	0.02	0.10	—	0.10	0.09	—	0.09	—	2,050	2,050	0.08	0.02	—	2,057
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.20	0.18	1.21	5.26	0.01	0.04	—	0.04	0.04	—	0.04	—	843	843	0.03	0.01	—	845
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.04	0.03	0.22	0.96	< 0.005	0.01	—	0.01	0.01	—	0.01	—	139	139	0.01	< 0.005	—	140
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.11	0.09	0.09	1.61	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	309	309	0.01	0.01	1.05	313
Vendor	0.02	0.01	0.37	0.11	< 0.005	0.01	0.10	0.10	0.01	0.03	0.03	—	345	345	0.01	0.05	0.94	362
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.10	0.09	0.10	1.22	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	284	284	< 0.005	0.01	0.03	288
Vendor	0.02	0.01	0.38	0.12	< 0.005	0.01	0.10	0.10	0.01	0.03	0.03	—	346	346	0.01	0.05	0.02	362
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.04	0.04	0.04	0.52	0.00	0.00	0.12	0.12	0.00	0.03	0.03	—	118	118	< 0.005	< 0.005	0.19	120
Vendor	0.01	< 0.005	0.16	0.05	< 0.005	< 0.005	0.04	0.04	< 0.005	0.01	0.01	—	142	142	< 0.005	0.02	0.17	149

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.10	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	19.6	19.6	< 0.005	< 0.005	0.03	19.8
Vendor	< 0.005	< 0.005	0.03	0.01	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	23.5	23.5	< 0.005	< 0.005	0.03	24.6
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.13. Paving (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.75	0.63	5.49	7.59	0.01	0.23	—	0.23	0.21	—	0.21	—	1,157	1,157	0.05	0.01	—	1,161
Paving	—	0.30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.04	0.03	0.27	0.37	< 0.005	0.01	—	0.01	0.01	—	0.01	—	57.1	57.1	< 0.005	< 0.005	—	57.3
Paving	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.05	0.07	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	9.45	9.45	< 0.005	< 0.005	—	9.48

Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.08	0.07	0.07	1.26	0.00	0.00	0.23	0.23	0.00	0.05	0.05	—	241	241	0.01	0.01	0.82	245
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	11.1	11.1	< 0.005	< 0.005	0.02	11.2
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.83	1.83	< 0.005	< 0.005	< 0.005	1.86
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.14. Paving (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.45	0.39	2.55	7.99	0.01	0.10	—	0.10	0.10	—	0.10	—	1,157	1,157	0.05	0.01	—	1,161
Paving	—	0.30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.02	0.13	0.39	< 0.005	0.01	—	0.01	< 0.005	—	< 0.005	—	57.1	57.1	< 0.005	< 0.005	—	57.3
Paving	—	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.02	0.07	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	9.45	9.45	< 0.005	< 0.005	—	9.48
Paving	—	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.08	0.07	0.07	1.26	0.00	0.00	0.23	0.23	0.00	0.05	0.05	—	241	241	0.01	0.01	0.82	245
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	< 0.005	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	11.1	11.1	< 0.005	< 0.005	0.02	11.2
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.83	1.83	< 0.005	< 0.005	< 0.005	1.86
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.15. Architectural Coating (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.15	0.12	0.86	1.13	< 0.005	0.02	—	0.02	0.02	—	0.02	—	134	134	0.01	< 0.005	—	134
Architectural Coatings	—	30.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.05	0.07	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	7.68	7.68	< 0.005	< 0.005	—	7.71
Architectural Coatings	—	1.78	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.27	1.27	< 0.005	< 0.005	—	1.28
Architectural Coatings	—	0.32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.02	0.32	0.00	0.00	0.06	0.06	0.00	0.01	0.01	—	61.8	61.8	< 0.005	< 0.005	0.21	62.7
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	3.31	3.31	< 0.005	< 0.005	0.01	3.35
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	< 0.005	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	0.55	0.55	< 0.005	< 0.005	< 0.005	0.56
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.16. Architectural Coating (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.15	0.12	0.86	1.13	< 0.005	0.02	—	0.02	0.02	—	0.02	—	134	134	0.01	< 0.005	—	134
Architectural Coatings	—	30.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.05	0.07	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	7.68	7.68	< 0.005	< 0.005	—	7.71
Architectural Coatings	—	1.78	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.27	1.27	< 0.005	< 0.005	—	1.28
Architectural Coatings	—	0.32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.02	0.32	0.00	0.00	0.06	0.06	0.00	0.01	0.01	—	61.8	61.8	< 0.005	< 0.005	0.21	62.7
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	3.31	3.31	< 0.005	< 0.005	0.01	3.35
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	< 0.005	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	0.55	0.55	< 0.005	< 0.005	< 0.005	0.56
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.1. Mobile Emissions by Land Use

4.1.1. Unmitigated

Mobile source emissions results are presented in Sections 2.6. No further detailed breakdown of emissions is available.

4.1.2. Mitigated

Mobile source emissions results are presented in Sections 2.5. No further detailed breakdown of emissions is available.

4.2. Energy

4.2.1. Electricity Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	40.9	40.9	0.00	0.00	—	40.9
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	141	141	0.00	0.00	—	141
Total	—	—	—	—	—	—	—	—	—	—	—	—	182	182	0.00	0.00	—	182
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	40.9	40.9	0.00	0.00	—	40.9
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	141	141	0.00	0.00	—	141
Total	—	—	—	—	—	—	—	—	—	—	—	—	182	182	0.00	0.00	—	182
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	6.77	6.77	0.00	0.00	—	6.77
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	23.3	23.3	0.00	0.00	—	23.3
Total	—	—	—	—	—	—	—	—	—	—	—	—	30.1	30.1	0.00	0.00	—	30.1

4.2.2. Electricity Emissions By Land Use - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	35.6	35.6	0.00	0.00	—	35.6
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	122	122	0.00	0.00	—	122
Total	—	—	—	—	—	—	—	—	—	—	—	—	158	158	0.00	0.00	—	158
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	35.6	35.6	0.00	0.00	—	35.6
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	122	122	0.00	0.00	—	122
Total	—	—	—	—	—	—	—	—	—	—	—	—	158	158	0.00	0.00	—	158
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	5.89	5.89	0.00	0.00	—	5.89
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	20.3	20.3	0.00	0.00	—	20.3
Total	—	—	—	—	—	—	—	—	—	—	—	—	26.2	26.2	0.00	0.00	—	26.2

4.2.3. Natural Gas Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Research & Development	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Research & Development	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Research & Development	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00

4.2.4. Natural Gas Emissions By Land Use - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Research & Development	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Research & Development	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Research & Development	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00

4.3. Area Emissions by Source

4.3.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Source	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	—	1.50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	—	0.18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.54	0.50	0.03	3.04	< 0.005	0.01	—	0.01	< 0.005	—	< 0.005	—	12.5	12.5	< 0.005	< 0.005	—	12.6
Total	0.54	2.18	0.03	3.04	< 0.005	0.01	—	0.01	< 0.005	—	< 0.005	—	12.5	12.5	< 0.005	< 0.005	—	12.6
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	—	1.50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	—	0.18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	1.68	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	—	0.27	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Architectural	—	0.03	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.07	0.06	< 0.005	0.38	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.42	1.42	< 0.005	< 0.005	—	1.42
Total	0.07	0.37	< 0.005	0.38	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.42	1.42	< 0.005	< 0.005	—	1.42

4.3.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Source	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	—	1.50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	—	0.18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.54	0.50	0.03	3.04	< 0.005	0.01	—	0.01	< 0.005	—	< 0.005	—	12.5	12.5	< 0.005	< 0.005	—	12.6
Total	0.54	2.18	0.03	3.04	< 0.005	0.01	—	0.01	< 0.005	—	< 0.005	—	12.5	12.5	< 0.005	< 0.005	—	12.6
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	—	1.50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	—	0.18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Total	—	1.68	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	—	0.27	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	—	0.03	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.07	0.06	< 0.005	0.38	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.42	1.42	< 0.005	< 0.005	—	1.42
Total	0.07	0.37	< 0.005	0.38	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.42	1.42	< 0.005	< 0.005	—	1.42

4.4. Water Emissions by Land Use

4.4.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	3.56	1.32	4.88	0.37	0.01	—	16.6
Research & Development	—	—	—	—	—	—	—	—	—	—	—	5.34	1.46	6.80	0.55	0.01	—	24.4
Total	—	—	—	—	—	—	—	—	—	—	—	8.90	2.77	11.7	0.91	0.02	—	40.9
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Office Park	—	—	—	—	—	—	—	—	—	—	—	3.56	1.32	4.88	0.37	0.01	—	16.6
Research & Development	—	—	—	—	—	—	—	—	—	—	—	5.34	1.46	6.80	0.55	0.01	—	24.4
Total	—	—	—	—	—	—	—	—	—	—	—	8.90	2.77	11.7	0.91	0.02	—	40.9
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	0.59	0.22	0.81	0.06	< 0.005	—	2.75
Research & Development	—	—	—	—	—	—	—	—	—	—	—	0.88	0.24	1.13	0.09	< 0.005	—	4.03
Total	—	—	—	—	—	—	—	—	—	—	—	1.47	0.46	1.93	0.15	< 0.005	—	6.78

4.4.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	3.56	1.32	4.88	0.37	0.01	—	16.6
Research & Development	—	—	—	—	—	—	—	—	—	—	—	5.34	1.46	6.80	0.55	0.01	—	24.4
Total	—	—	—	—	—	—	—	—	—	—	—	8.90	2.77	11.7	0.91	0.02	—	40.9
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Office Park	—	—	—	—	—	—	—	—	—	—	—	3.56	1.32	4.88	0.37	0.01	—	16.6
Research & Development	—	—	—	—	—	—	—	—	—	—	—	5.34	1.46	6.80	0.55	0.01	—	24.4
Total	—	—	—	—	—	—	—	—	—	—	—	8.90	2.77	11.7	0.91	0.02	—	40.9
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	0.59	0.22	0.81	0.06	< 0.005	—	2.75
Research & Development	—	—	—	—	—	—	—	—	—	—	—	0.88	0.24	1.13	0.09	< 0.005	—	4.03
Total	—	—	—	—	—	—	—	—	—	—	—	1.47	0.46	1.93	0.15	< 0.005	—	6.78

4.5. Waste Emissions by Land Use

4.5.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	14.6	0.00	14.6	1.46	0.00	—	51.2
Research & Development	—	—	—	—	—	—	—	—	—	—	—	22.0	0.00	22.0	2.19	0.00	—	76.8
Total	—	—	—	—	—	—	—	—	—	—	—	36.6	0.00	36.6	3.66	0.00	—	128

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	14.6	0.00	14.6	1.46	0.00	—	51.2
Research & Development	—	—	—	—	—	—	—	—	—	—	—	22.0	0.00	22.0	2.19	0.00	—	76.8
Total	—	—	—	—	—	—	—	—	—	—	—	36.6	0.00	36.6	3.66	0.00	—	128
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	2.42	0.00	2.42	0.24	0.00	—	8.48
Research & Development	—	—	—	—	—	—	—	—	—	—	—	3.64	0.00	3.64	0.36	0.00	—	12.7
Total	—	—	—	—	—	—	—	—	—	—	—	6.06	0.00	6.06	0.61	0.00	—	21.2

4.5.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	14.6	0.00	14.6	1.46	0.00	—	51.2
Research & Development	—	—	—	—	—	—	—	—	—	—	—	22.0	0.00	22.0	2.19	0.00	—	76.8
Total	—	—	—	—	—	—	—	—	—	—	—	36.6	0.00	36.6	3.66	0.00	—	128

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	14.6	0.00	14.6	1.46	0.00	—	51.2
Research & Development	—	—	—	—	—	—	—	—	—	—	—	22.0	0.00	22.0	2.19	0.00	—	76.8
Total	—	—	—	—	—	—	—	—	—	—	—	36.6	0.00	36.6	3.66	0.00	—	128
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	2.42	0.00	2.42	0.24	0.00	—	8.48
Research & Development	—	—	—	—	—	—	—	—	—	—	—	3.64	0.00	3.64	0.36	0.00	—	12.7
Total	—	—	—	—	—	—	—	—	—	—	—	6.06	0.00	6.06	0.61	0.00	—	21.2

4.6. Refrigerant Emissions by Land Use

4.6.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.07	0.07
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.07	1.07

Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.14	1.14
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.07	0.07
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.07	1.07
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.14	1.14
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.01	0.01
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.18	0.18
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.19	0.19

4.6.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.07	0.07
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.07	1.07
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.14	1.14

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.07	0.07
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.07	1.07
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.14	1.14
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Office Park	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.01	0.01
Research & Development	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.18	0.18
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.19	0.19

4.7. Offroad Emissions By Equipment Type

4.7.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.7.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.8. Stationary Emissions By Equipment Type

4.8.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.8.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.9. User Defined Emissions By Equipment Type

4.9.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.9.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetatio	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.4. Soil Carbon Accumulation By Vegetation Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.5. Above and Belowground Carbon Accumulation by Land Use Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.6. Avoided and Sequestered Emissions by Species - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Demolition	Demolition	4/1/2024	8/17/2024	6.00	120	—
Site Preparation	Site Preparation	8/18/2024	9/10/2024	6.00	20.0	—
Grading	Grading	9/11/2024	10/3/2024	6.00	20.0	—
Building Construction	Building Construction	10/4/2024	6/24/2026	6.00	539	—
Paving	Paving	7/19/2026	8/8/2026	6.00	18.0	—
Architectural Coating	Architectural Coating	6/25/2026	7/18/2026	6.00	21.0	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

Demolition	Tractors/Loaders/Backh	Diesel	Average	1.00	8.00	84.0	0.37
Demolition	Rubber Tired Dozers	Diesel	Average	2.00	8.00	367	0.40
Demolition	Concrete/Industrial Saws	Diesel	Average	1.00	8.00	33.0	0.73
Demolition	Crushing/Proc. Equipment	Gasoline	Average	1.00	8.00	12.0	0.85
Demolition	Rubber Tired Loaders	Diesel	Average	3.00	8.00	150	0.36
Demolition	Excavators	Diesel	Average	3.00	8.00	36.0	0.38
Site Preparation	Rubber Tired Dozers	Diesel	Average	1.00	7.00	367	0.40
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Average	3.00	8.00	84.0	0.37
Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Grading	Tractors/Loaders/Backhoes	Diesel	Average	2.00	7.00	84.0	0.37
Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Building Construction	Cranes	Diesel	Average	1.00	6.00	367	0.29
Building Construction	Forklifts	Diesel	Average	3.00	6.00	82.0	0.20
Building Construction	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
Building Construction	Tractors/Loaders/Backhoes	Diesel	Average	3.00	6.00	84.0	0.37
Building Construction	Welders	Diesel	Average	1.00	8.00	46.0	0.45
Paving	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Paving	Pavers	Diesel	Average	1.00	6.00	81.0	0.42
Paving	Paving Equipment	Diesel	Average	1.00	8.00	89.0	0.36
Paving	Rollers	Diesel	Average	2.00	7.00	36.0	0.38
Paving	Cement and Mortar Mixers	Diesel	Average	2.00	6.00	10.0	0.56
Architectural Coating	Air Compressors	Diesel	Average	1.00	6.00	37.0	0.48

5.2.2. Mitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Demolition	Tractors/Loaders/Backhoes	Diesel	Tier 4 Final	1.00	8.00	84.0	0.37
Demolition	Rubber Tired Dozers	Diesel	Tier 4 Final	2.00	8.00	367	0.40
Demolition	Concrete/Industrial Saws	Diesel	Average	1.00	8.00	33.0	0.73
Demolition	Crushing/Proc. Equipment	Gasoline	Average	1.00	8.00	12.0	0.85
Demolition	Rubber Tired Loaders	Diesel	Tier 4 Final	3.00	8.00	150	0.36
Demolition	Excavators	Diesel	Average	3.00	8.00	36.0	0.38
Site Preparation	Rubber Tired Dozers	Diesel	Tier 4 Final	1.00	7.00	367	0.40
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Tier 4 Final	3.00	8.00	84.0	0.37
Grading	Graders	Diesel	Tier 4 Final	1.00	8.00	148	0.41
Grading	Tractors/Loaders/Backhoes	Diesel	Tier 4 Final	2.00	7.00	84.0	0.37
Grading	Rubber Tired Dozers	Diesel	Tier 4 Final	1.00	8.00	367	0.40
Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Building Construction	Cranes	Diesel	Tier 4 Final	1.00	6.00	367	0.29
Building Construction	Forklifts	Diesel	Tier 4 Final	3.00	6.00	82.0	0.20
Building Construction	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
Building Construction	Tractors/Loaders/Backhoes	Diesel	Tier 4 Final	3.00	6.00	84.0	0.37
Building Construction	Welders	Diesel	Average	1.00	8.00	46.0	0.45
Paving	Tractors/Loaders/Backhoes	Diesel	Tier 4 Final	1.00	8.00	84.0	0.37
Paving	Pavers	Diesel	Tier 4 Final	1.00	6.00	81.0	0.42
Paving	Paving Equipment	Diesel	Tier 4 Final	1.00	8.00	89.0	0.36

Paving	Rollers	Diesel	Average	2.00	7.00	36.0	0.38
Paving	Cement and Mortar Mixers	Diesel	Average	2.00	6.00	10.0	0.56
Architectural Coating	Air Compressors	Diesel	Average	1.00	6.00	37.0	0.48

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Demolition	—	—	—	—
Demolition	Worker	27.5	18.5	LDA,LDT1,LDT2
Demolition	Vendor	—	10.2	HHDT,MHDT
Demolition	Hauling	33.6	20.0	HHDT
Demolition	Onsite truck	—	—	HHDT
Site Preparation	—	—	—	—
Site Preparation	Worker	10.0	18.5	LDA,LDT1,LDT2
Site Preparation	Vendor	—	10.2	HHDT,MHDT
Site Preparation	Hauling	0.00	20.0	HHDT
Site Preparation	Onsite truck	—	—	HHDT
Grading	—	—	—	—
Grading	Worker	12.5	18.5	LDA,LDT1,LDT2
Grading	Vendor	—	10.2	HHDT,MHDT
Grading	Hauling	11.9	20.0	HHDT
Grading	Onsite truck	—	—	HHDT
Building Construction	—	—	—	—
Building Construction	Worker	22.4	18.5	LDA,LDT1,LDT2
Building Construction	Vendor	11.5	10.2	HHDT,MHDT
Building Construction	Hauling	0.00	20.0	HHDT

Building Construction	Onsite truck	—	—	HHDT
Paving	—	—	—	—
Paving	Worker	17.5	18.5	LDA,LDT1,LDT2
Paving	Vendor	—	10.2	HHDT,MHDT
Paving	Hauling	0.00	20.0	HHDT
Paving	Onsite truck	—	—	HHDT
Architectural Coating	—	—	—	—
Architectural Coating	Worker	4.48	18.5	LDA,LDT1,LDT2
Architectural Coating	Vendor	—	10.2	HHDT,MHDT
Architectural Coating	Hauling	0.00	20.0	HHDT
Architectural Coating	Onsite truck	—	—	HHDT

5.3.2. Mitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Demolition	—	—	—	—
Demolition	Worker	27.5	18.5	LDA,LDT1,LDT2
Demolition	Vendor	—	10.2	HHDT,MHDT
Demolition	Hauling	33.6	20.0	HHDT
Demolition	Onsite truck	—	—	HHDT
Site Preparation	—	—	—	—
Site Preparation	Worker	10.0	18.5	LDA,LDT1,LDT2
Site Preparation	Vendor	—	10.2	HHDT,MHDT
Site Preparation	Hauling	0.00	20.0	HHDT
Site Preparation	Onsite truck	—	—	HHDT
Grading	—	—	—	—
Grading	Worker	12.5	18.5	LDA,LDT1,LDT2
Grading	Vendor	—	10.2	HHDT,MHDT

Grading	Hauling	11.9	20.0	HHDT
Grading	Onsite truck	—	—	HHDT
Building Construction	—	—	—	—
Building Construction	Worker	22.4	18.5	LDA,LDT1,LDT2
Building Construction	Vendor	11.5	10.2	HHDT,MHDT
Building Construction	Hauling	0.00	20.0	HHDT
Building Construction	Onsite truck	—	—	HHDT
Paving	—	—	—	—
Paving	Worker	17.5	18.5	LDA,LDT1,LDT2
Paving	Vendor	—	10.2	HHDT,MHDT
Paving	Hauling	0.00	20.0	HHDT
Paving	Onsite truck	—	—	HHDT
Architectural Coating	—	—	—	—
Architectural Coating	Worker	4.48	18.5	LDA,LDT1,LDT2
Architectural Coating	Vendor	—	10.2	HHDT,MHDT
Architectural Coating	Hauling	0.00	20.0	HHDT
Architectural Coating	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
Architectural Coating	0.00	0.00	105,000	35,000	—

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (Building Square Footage)	Acres Paved (acres)
Demolition	0.00	0.00	0.00	350,766	—
Grading	1,900	—	20.0	0.00	—
Paving	0.00	0.00	0.00	0.00	2.06

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Office Park	2.06	100%
Research & Development	0.00	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2024	0.00	787	0.03	< 0.005
2025	0.00	600	0.03	< 0.005
2026	0.00	449	0.03	< 0.005

5.9. Operational Mobile Sources

5.9.1. Unmitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year
Total all Land Uses	266	0.00	0.00	69,350	1,594	0.00	0.00	415,683

5.9.2. Mitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year
Total all Land Uses	266	0.00	0.00	69,350	1,594	0.00	0.00	415,683

5.10. Operational Area Sources

5.10.1. Hearths

5.10.1.1. Unmitigated

5.10.1.2. Mitigated

5.10.2. Architectural Coatings

Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
0	0.00	105,000	35,000	—

5.10.3. Landscape Equipment

Season	Unit	Value
Snow Days	day/yr	0.00
Summer Days	day/yr	250

5.10.4. Landscape Equipment - Mitigated

Season	Unit	Value
Snow Days	day/yr	0.00
Summer Days	day/yr	250

5.11. Operational Energy Consumption

5.11.1. Unmitigated

Electricity (kWh/yr) and CO2 and CH4 and N2O and Natural Gas (kBTU/yr)

Land Use	Electricity (kWh/yr)	CO2	CH4	N2O	Natural Gas (kBTU/yr)
Office Park	533,389	28.0	0.0000	0.0000	0.00
Research & Development	1,834,039	28.0	0.0000	0.0000	0.00

5.11.2. Mitigated

Electricity (kWh/yr) and CO2 and CH4 and N2O and Natural Gas (kBTU/yr)

Land Use	Electricity (kWh/yr)	CO2	CH4	N2O	Natural Gas (kBTU/yr)
Office Park	464,053	28.0	0.0000	0.0000	0.00
Research & Development	1,595,629	28.0	0.0000	0.0000	0.00

5.12. Operational Water and Wastewater Consumption

5.12.1. Unmitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
Office Park	1,857,800	849,517
Research & Development	2,786,700	0.00

5.12.2. Mitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
Office Park	1,857,800	849,517
Research & Development	2,786,700	0.00

5.13. Operational Waste Generation

5.13.1. Unmitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
Office Park	27.2	—
Research & Development	40.7	—

5.13.2. Mitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
Office Park	27.2	—
Research & Development	40.7	—

5.14. Operational Refrigeration and Air Conditioning Equipment

5.14.1. Unmitigated

Land Use Type	Equipment Type	Refrigerant	GWP	Quantity (kg)	Operations Leak Rate	Service Leak Rate	Times Serviced
Office Park	Household refrigerators and/or freezers	R-134a	1,430	0.02	0.60	0.00	1.00
Office Park	Other commercial A/C and heat pumps	R-410A	2,088	< 0.005	4.00	4.00	18.0
Research & Development	Household refrigerators and/or freezers	R-134a	1,430	0.45	0.60	0.00	1.00

Research & Development	Other commercial A/C and heat pumps	R-410A	2,088	< 0.005	4.00	4.00	18.0

5.14.2. Mitigated

Land Use Type	Equipment Type	Refrigerant	GWP	Quantity (kg)	Operations Leak Rate	Service Leak Rate	Times Serviced
Office Park	Household refrigerators and/or freezers	R-134a	1,430	0.02	0.60	0.00	1.00
Office Park	Other commercial A/C and heat pumps	R-410A	2,088	< 0.005	4.00	4.00	18.0
Research & Development	Household refrigerators and/or freezers	R-134a	1,430	0.45	0.60	0.00	1.00
Research & Development	Other commercial A/C and heat pumps	R-410A	2,088	< 0.005	4.00	4.00	18.0

5.15. Operational Off-Road Equipment

5.15.1. Unmitigated

Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

5.15.2. Mitigated

Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

5.16. Stationary Sources

5.16.1. Emergency Generators and Fire Pumps

Equipment Type	Fuel Type	Number per Day	Hours per Day	Hours per Year	Horsepower	Load Factor

5.16.2. Process Boilers

Equipment Type	Fuel Type	Number	Boiler Rating (MMBtu/hr)	Daily Heat Input (MMBtu/day)	Annual Heat Input (MMBtu/yr)

5.17. User Defined

Equipment Type	Fuel Type

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

5.18.2.2. Mitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	26.3	annual days of extreme heat
Extreme Precipitation	2.65	annual days with precipitation above 20 mm
Sea Level Rise	0.00	meters of inundation depth
Wildfire	1.71	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	3	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A

Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.

The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.

The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	3	1	1	3
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.

The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.

The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	97.6
AQ-PM	79.4
AQ-DPM	88.9
Drinking Water	77.4
Lead Risk Housing	43.1
Pesticides	0.00
Toxic Releases	54.7
Traffic	85.6
Effect Indicators	—
CleanUp Sites	47.0
Groundwater	0.00
Haz Waste Facilities/Generators	76.0
Impaired Water Bodies	0.00
Solid Waste	52.9
Sensitive Population	—
Asthma	23.8
Cardio-vascular	16.9
Low Birth Weights	88.0
Socioeconomic Factor Indicators	—
Education	53.4
Housing	98.5

Linguistic	76.1
Poverty	96.7
Unemployment	99.0

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	—
Employed	—
Median HI	—
Education	—
Bachelor's or higher	—
High school enrollment	—
Preschool enrollment	—
Transportation	—
Auto Access	—
Active commuting	—
Social	—
2-parent households	—
Voting	—
Neighborhood	—
Alcohol availability	—
Park access	—
Retail density	—
Supermarket access	—
Tree canopy	—

Housing	—
Homeownership	—
Housing habitability	—
Low-inc homeowner severe housing cost burden	—
Low-inc renter severe housing cost burden	—
Uncrowded housing	—
Health Outcomes	—
Insured adults	—
Arthritis	99.7
Asthma ER Admissions	57.0
High Blood Pressure	99.4
Cancer (excluding skin)	99.8
Asthma	12.1
Coronary Heart Disease	99.7
Chronic Obstructive Pulmonary Disease	96.5
Diagnosed Diabetes	99.6
Life Expectancy at Birth	0.0
Cognitively Disabled	66.4
Physically Disabled	96.9
Heart Attack ER Admissions	76.0
Mental Health Not Good	18.5
Chronic Kidney Disease	99.6
Obesity	86.4
Pedestrian Injuries	0.0
Physical Health Not Good	82.3
Stroke	99.7
Health Risk Behaviors	—

Binge Drinking	63.5
Current Smoker	26.1
No Leisure Time for Physical Activity	36.0
Climate Change Exposures	—
Wildfire Risk	0.0
SLR Inundation Area	0.0
Children	87.9
Elderly	99.5
English Speaking	0.0
Foreign-born	0.0
Outdoor Workers	86.7
Climate Change Adaptive Capacity	—
Impervious Surface Cover	74.8
Traffic Density	0.0
Traffic Access	55.8
Other Indices	—
Hardship	0.0
Other Decision Support	—
2016 Voting	0.0

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	82.0
Healthy Places Index Score for Project Location (b)	—
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	Yes
Project Located in a Low-Income Community (Assembly Bill 1550)	Yes
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Construction: Construction Phases	Construction schedule provided by UCR and project design teams.
Construction: Paving	Estimated hardscape area provided by Miller Hull, conservatively assumed to be 100% asphalt for modeling purposes.
Construction: Off-Road Equipment	Construction equipment list provided by UCR and project design teams.
Construction: Dust From Material Movement	Import estimates plus 20 percent for use in modeling provided by Miller Hull.
Characteristics: Utility Information	UCR policy to purchase 100% renewable energy mix from RPU by 2025 when project would be operational. Emissions factors in CO2e for RPU 100% renewable energy mix from 2022 Power Content Label applied to project electricity.
Operations: Energy Use	Energy use intensity based on 2021 LRDP EIR assumptions for academic/administrative uses (65 kBtu/sf/year) and lab/complex uses (149kBtu/sf/year). No natural gas connections will be made for the project.
Construction: Electricity	—
Operations: Water and Waste Water	Indoor water use based on 2021 LRDP EIR projections of 66.35 gallons per gsf building area. Outdoor water use per CalEEMod default.
Operations: Solid Waste	Waste generation based on rate of 0.85 ton of waste per capita from 2021 LRDP EIR and employment generation of 80 individuals.

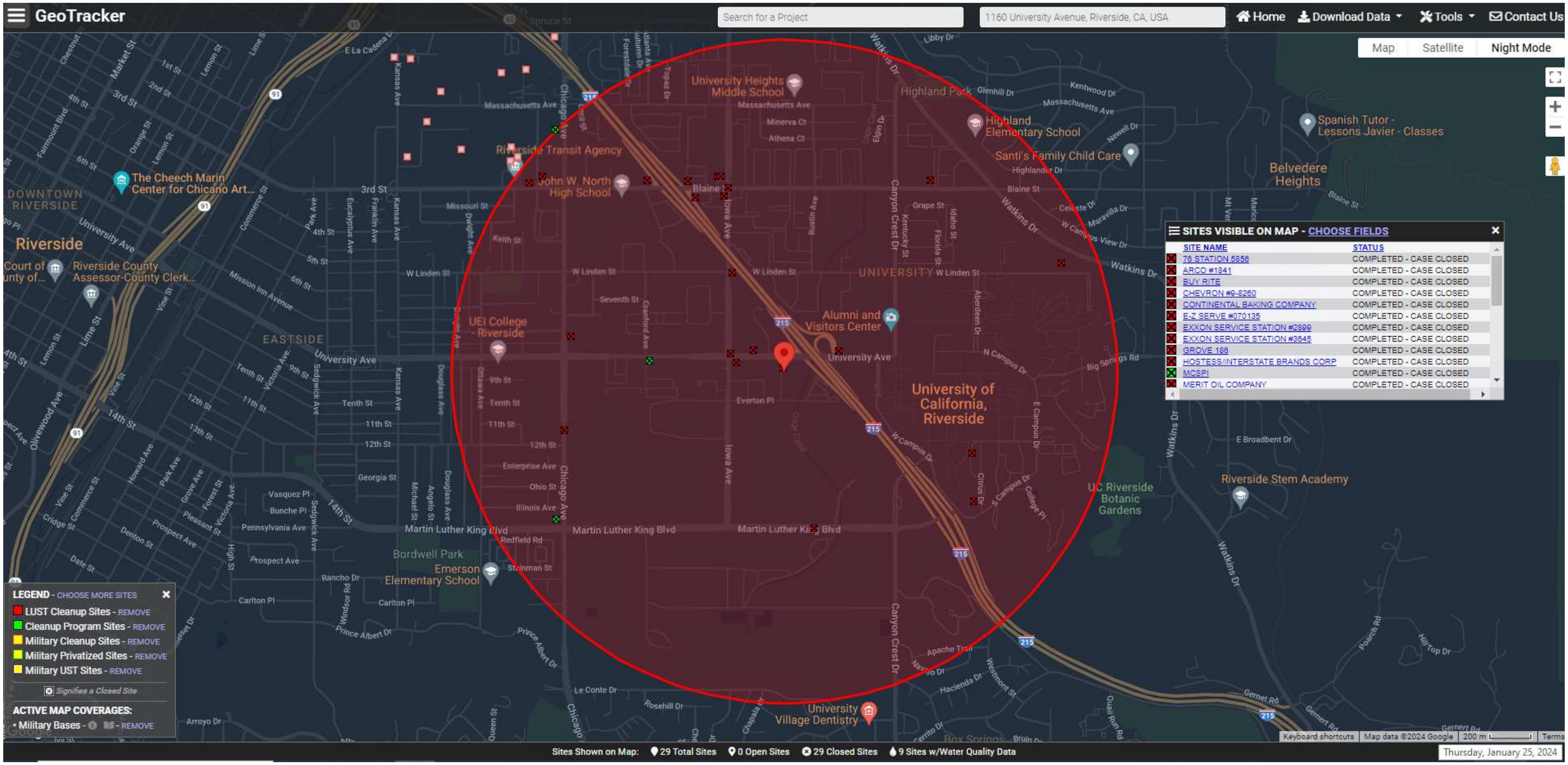
Attachment 8

California Coastal Zones

Source: https://www.coastal.ca.gov/maps/czb/

Attachment 9

Geotracker and EnviroStor Database Searches



1160 University Avenue, Riverside, CA, USA

SITES VISIBLE ON MAP - CHOOSE FIELDS

	SITE NAME	STATUS
☒	76 STATION 5856	COMPLETED - CASE CLOSED
☒	ARCO #1841	COMPLETED - CASE CLOSED
☒	BUY RITE	COMPLETED - CASE CLOSED
☒	CHEVRON #9-8260	COMPLETED - CASE CLOSED
☒	CONTINENTAL BAKING COMPANY	COMPLETED - CASE CLOSED
☒	E-Z SERVE #070135	COMPLETED - CASE CLOSED
☒	EXXON SERVICE STATION #2899	COMPLETED - CASE CLOSED
☒	EXXON SERVICE STATION #3645	COMPLETED - CASE CLOSED
☒	GROVE 186	COMPLETED - CASE CLOSED
☒	HOSTESS/INTERSTATE BRANDS CORP	COMPLETED - CASE CLOSED
☒	MCSPI	COMPLETED - CASE CLOSED
☒	MERIT OIL COMPANY	COMPLETED - CASE CLOSED

LEGEND - CHOOSE MORE SITES

- 🟥 LUST Cleanup Sites - REMOVE
- 🟩 Cleanup Program Sites - REMOVE
- 🟨 Military Cleanup Sites - REMOVE
- 🟨 Military Privatized Sites - REMOVE
- 🟨 Military UST Sites - REMOVE

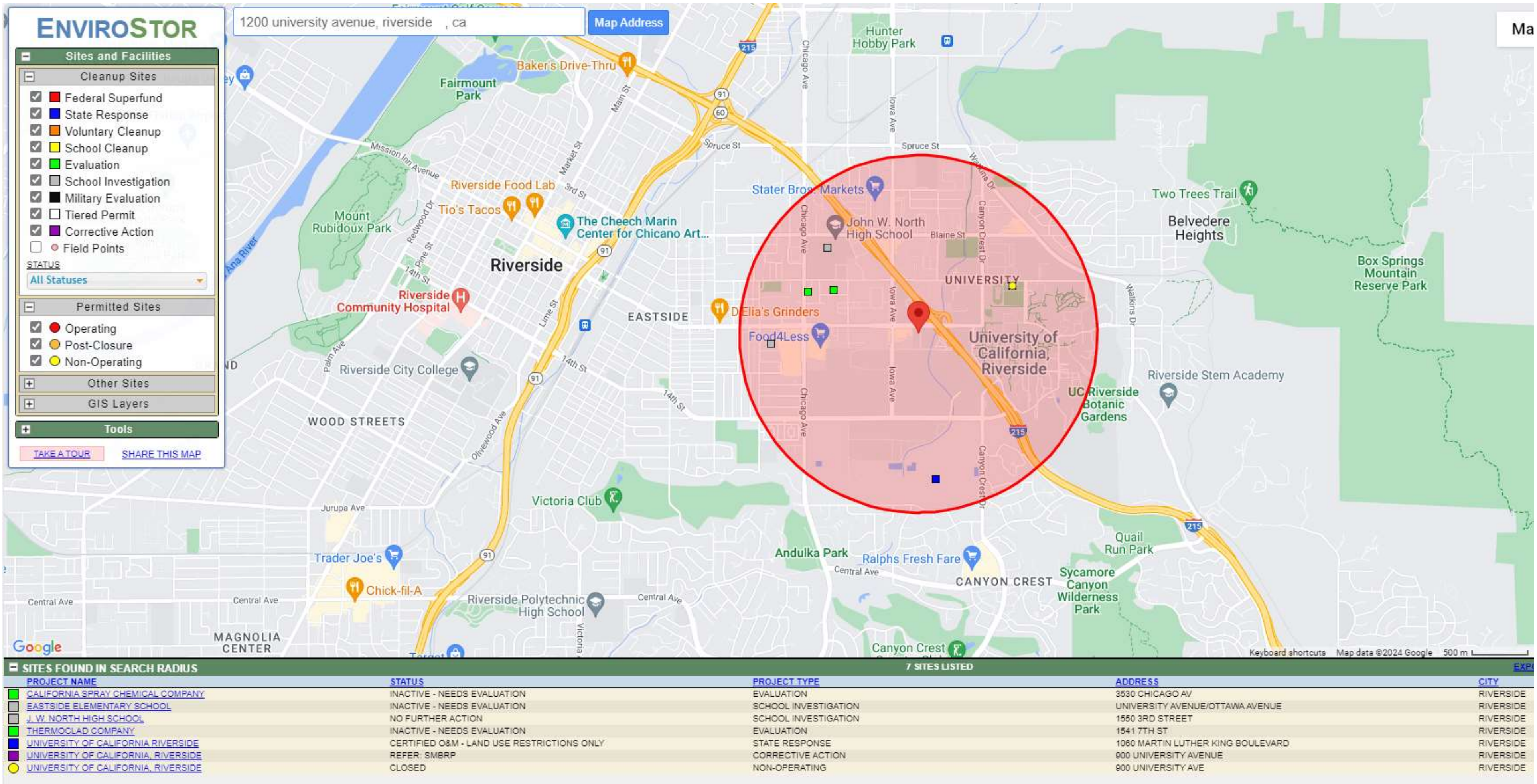
☒ *Signifies a Closed Site*

ACTIVE MAP COVERAGES:

- Military Bases - REMOVE

Sites Shown on Map: 29 Total Sites 0 Open Sites 29 Closed Sites 9 Sites w/Water Quality Data

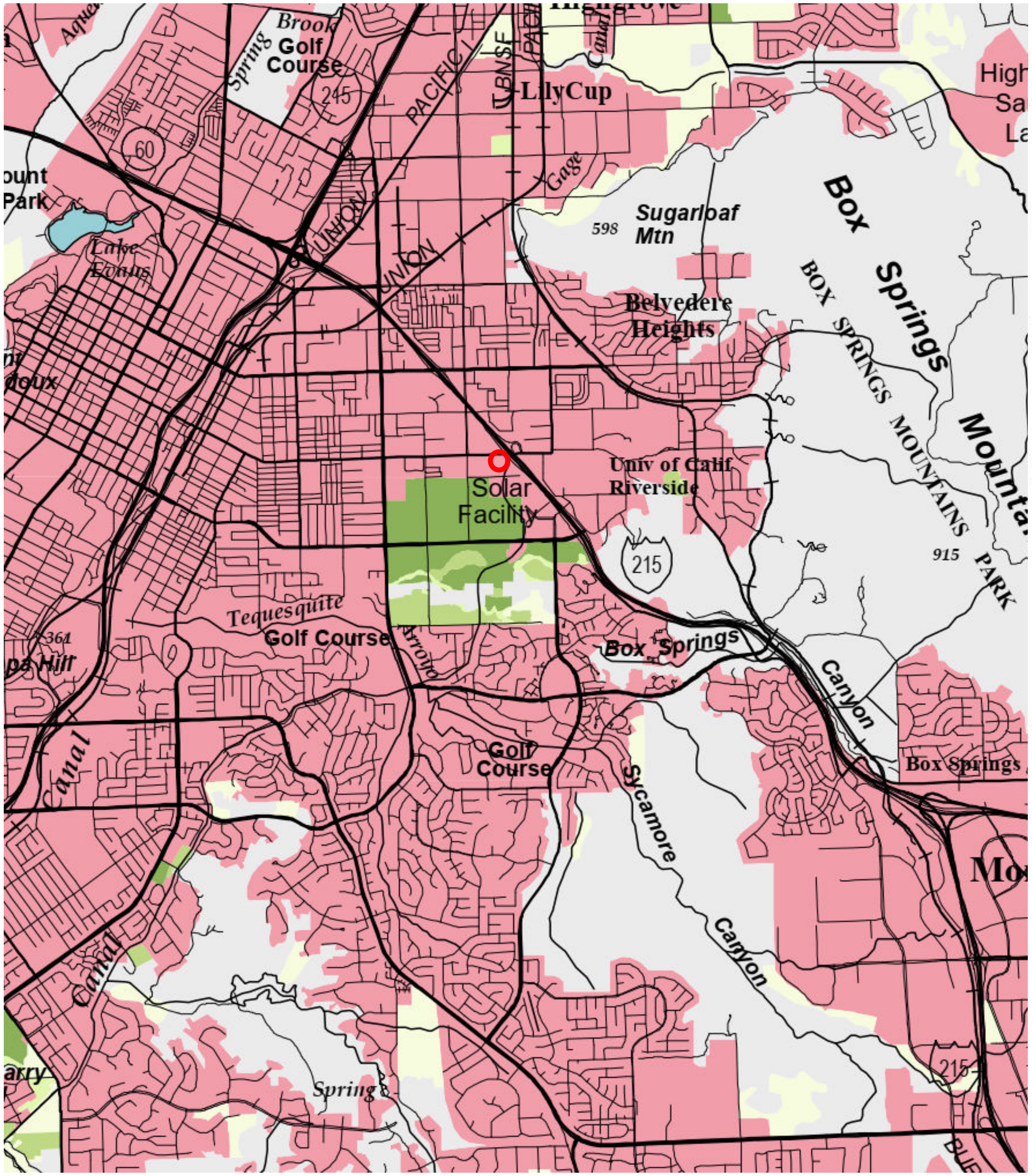
Thursday, January 25, 2024



Attachment 10

Riverside County Important Farmland Map

Riverside County Important Farmland 2020



⭕ Approximate Project Site Location

🟩 PRIME FARMLAND

PRIME FARMLAND HAS THE BEST COMBINATION OF PHYSICAL AND CHEMICAL FEATURES ABLE TO SUSTAIN LONG-TERM AGRICULTURAL PRODUCTION. THIS LAND HAS THE SOIL QUALITY, GROWING SEASON, AND MOISTURE SUPPLY NEEDED TO PRODUCE SUSTAINED HIGH YIELDS. LAND MUST HAVE BEEN USED FOR IRRIGATED AGRICULTURAL PRODUCTION AT SOME TIME DURING THE FOUR YEARS PRIOR TO THE MAPPING DATE.

🟩 FARMLAND OF STATEWIDE IMPORTANCE

FARMLAND OF STATEWIDE IMPORTANCE IS SIMILAR TO PRIME FARMLAND BUT WITH MINOR SHORTCOMINGS, SUCH AS GREATER SLOPES OR LESS ABILITY TO STORE SOIL MOISTURE. LAND MUST HAVE BEEN USED FOR IRRIGATED AGRICULTURAL PRODUCTION AT SOME TIME DURING THE FOUR YEARS PRIOR TO THE MAPPING DATE.

🟨 UNIQUE FARMLAND

UNIQUE FARMLAND CONSISTS OF LESSER QUALITY SOILS USED FOR THE PRODUCTION OF THE STATE'S LEADING AGRICULTURAL CROPS. THIS LAND IS USUALLY IRRIGATED, BUT MAY INCLUDE NONIRRIGATED ORCHARDS OR VINEYARDS AS FOUND IN SOME CLIMATIC ZONES IN CALIFORNIA. LAND MUST HAVE BEEN CROPPED AT SOME TIME DURING THE FOUR YEARS PRIOR TO THE MAPPING DATE.

⬜ FARMLAND OF LOCAL IMPORTANCE

SOILS THAT WOULD BE CLASSIFIED AS PRIME AND STATEWIDE BUT LACK AVAILABLE IRRIGATION WATER. LANDS PLANTED TO DRYLAND CROPS OF BARLEY, OATS, AND WHEAT.

LANDS PRODUCING MAJOR CROPS FOR RIVERSIDE COUNTY BUT THAT ARE NOT LISTED AS UNIQUE CROPS. THESE CROPS ARE IDENTIFIED AS RETURNING ONE MILLION OR MORE DOLLARS ON THE 1980 RIVERSIDE COUNTY AGRICULTURE CROP REPORT. CROPS IDENTIFIED ARE PERMANENT PASTURE (IRRIGATED), SUMMER SQUASH, OKRA, EGGPLANT, RADISHES, AND WATERMELONS.

DAIRYLANDS, INCLUDING CORRALS, PASTURE, MILKING FACILITIES, HAY AND MANURE STORAGE AREAS IF ACCOMPANIED WITH PERMANENT PASTURE OR HAYLAND OF 10 ACRES OR MORE.

LANDS IDENTIFIED BY CITY OR COUNTY ORDINANCE AS AGRICULTURAL ZONES OR CONTRACTS, WHICH INCLUDES RIVERSIDE CITY "PROPOSITION R" LANDS. LANDS PLANTED TO JOJOBA WHICH ARE UNDER CULTIVATION AND ARE OF PRODUCING AGE.

🟫 GRAZING LAND

GRAZING LAND IS LAND ON WHICH THE EXISTING VEGETATION IS SUITED TO THE GRAZING OF LIVESTOCK.

🟥 URBAN AND BUILT-UP LAND

URBAN AND BUILT-UP LAND IS OCCUPIED BY STRUCTURES WITH A BUILDING DENSITY OF AT LEAST 1 UNIT TO 1.5 ACRES, OR APPROXIMATELY 6 STRUCTURES TO A 10-ACRE PARCEL. COMMON EXAMPLES INCLUDE RESIDENTIAL, INDUSTRIAL, COMMERCIAL, INSTITUTIONAL FACILITIES, CEMETERIES, AIRPORTS, GOLF COURSES, SANITARY LANDFILLS, SEWAGE TREATMENT, AND WATER CONTROL STRUCTURES.

⬜ OTHER LAND

OTHER LAND IS LAND NOT INCLUDED IN ANY OTHER MAPPING CATEGORY. COMMON EXAMPLES INCLUDE LOW DENSITY RURAL DEVELOPMENTS, BRUSH, TIMBER, WETLAND, AND RIPARIAN AREAS NOT SUITABLE FOR LIVESTOCK GRAZING, CONFINED LIVESTOCK, POULTRY, OR AQUACULTURE FACILITIES, STRIP MINES, BORROW PITS, AND WATER BODIES SMALLER THAN 40 ACRES. VACANT AND NONAGRICULTURAL LAND SURROUNDED ON ALL SIDES BY URBAN DEVELOPMENT AND GREATER THAN 40 ACRES IS MAPPED AS OTHER LAND.

🟦 WATER

PERENNIAL WATER BODIES WITH AN EXTENT OF AT LEAST 40 ACRES.

Source: https://www.conservation.ca.gov/dlrp/fmmp/Pages/Riverside.aspx

Attachment 11

Historic Resources Assessment: State of California Department of Parks and Recreation Primary Record—UC Riverside University Extension Center (UNEX)

State of California ☐ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code ____________ Reviewer ____________________ Date __________________

Page 1 **of** 13 ***Resource Name or #:** (Assigned by recorder) UC Riverside University Extension Center (UNEX)

P1. Other Identifier: # P5722 (“Appendix B. 2021 Long Range Development Plan -Project No. 958098- Campus-wide Results, 2020 Historic Resources Survey” by Rincon Consultants, Inc.)

***P2. Location:** ☐ **Not for Publication** ☐ **Unrestricted**

***a. County** Riverside **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad** Riverside East, Calif. **Date** 1967 (Rev 1980) **T** 2S; **R** 4W ☐**Sec** 30
c. Address 1200 University Avenue City Riverside Zip 92507
d. UTM: (Give more than one for large and/or linear resources) Zone 11S, 468827 mE/ 3759434 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
APN: 000151965

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

See Continuation Sheet

***P3b. Resource Attributes:** (List attributes and codes) HP5. Hotel/motel (1974-1992); HP15. Educational building (1992-present)

***P4. Resources Present:** ☐Building ☐ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)

P5b. Description of Photo: (view, date, accession #)
North (primary) façade, view southeast (Google Earth)

***P6. Date Constructed/Age and Source:** ☐Historic ☐ Prehistoric ☐ Both 1968, 1984 (Architectural plans and original building permit)

***P7. Owner and Address:**
University of California, Riverside
900 University Avenue
Riverside, CA 92521

***P8. Recorded by:**
Nelson White, M.S.H.P.
HELIX Environmental Planning, Inc.
7578 El Cajon Blvd.
La Mesa, CA 91942

***P9. Date Recorded:**
January 22, 2024

***P10. Survey Type:** (Describe)
Intensive Survey

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
None

***Attachments:** ☐NONE ☐Location Map ☐Continuation Sheet ☐Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

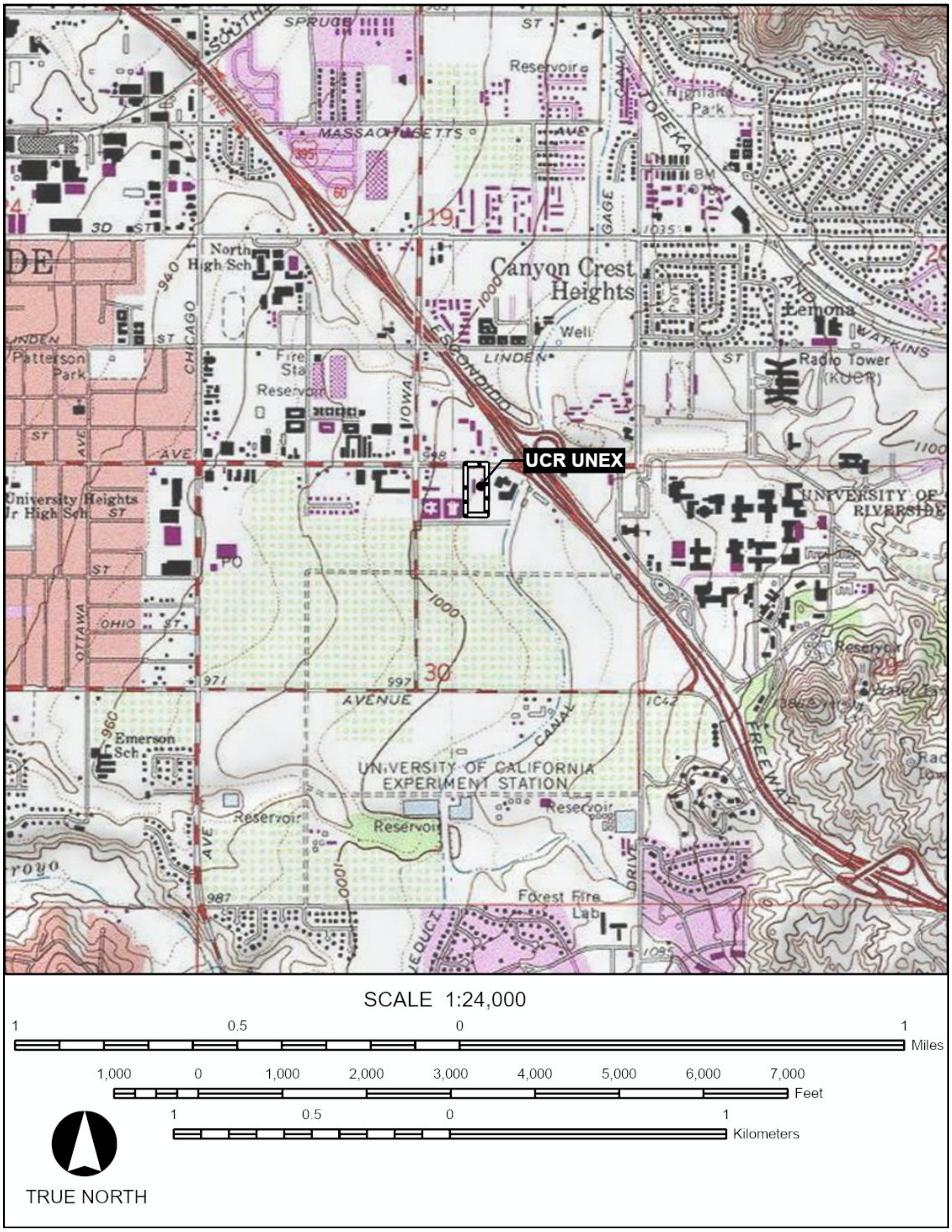
State of California - The Resources Agency Primary #
DEPARTMENT OF PARKS AND RECREATION HRI#

LOCATION MAP

Trinomial

Page 2 **of** 13 ***Resource Name or #** (Assigned by recorder) UC Riverside University Extension Center (UNEX)

***Map Name:** Riverside East, Calif. ***Scale:** 1:24,000 ***Date of map:** 1967 (PR 1980)



State of California ♁ The Resources Agency Primary #
DEPARTMENT OF PARKS AND RECREATION HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) UC Riverside University Extension Center (UNEX) ***NRHP Status Code** 6Z
Page 3 **of** 13

B1. Historic Name: Holiday Inn of America
B2. Common Name: UNEX
B3. Original Use: Hotel B4. Present Use: Unoccupied educational building
***B5. Architectural Style:** Mid-Century Modern
***B6. Construction History:** (Construction date, alterations, and date of alterations)

See Continuation Sheet

***B7. Moved?** ■**No** ☐**Yes** ☐**Unknown** **Date:** N/A **Original Location:** N/A
***B8. Related Features:**
Parking garage, swimming pool.

B9a. Architect: Rissman and Rissman Associates; Homer A. Rissman building, designer; Marshall W. Rissman, architect
b. Builder: Unknown
***B10. Significance: Theme** N/A **Area** N/A
Period of Significance N/A **Property Type** N/A **Applicable Criteria** N/A (Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

See Continuation Sheet

B11. Additional Resource Attributes: (List attributes and codes) None
***B12. References:**

City of Riverside, California. Various dates. Building Permits.

County of Riverside Assessor's Office records, various dates.

"Guide to the Homer Rissman Architectural Records." University of Nevada Las Vegas Special Collections and Archives. 2019

"Holiday Inn Slated for Shopping Center." *Los Angeles Times*, October 4, 1964, H21.

Manning, Mary and Koch, Ed. "Obituary of Homer Rissman." *Los Vegas Sun*. October 4, 2001.

Rincon Consultants, Inc. *2021 Long Range Development Plan. Historic Resources Survey Report. Project No. 958098*. Prepared for University of California, Riverside. May 2021.

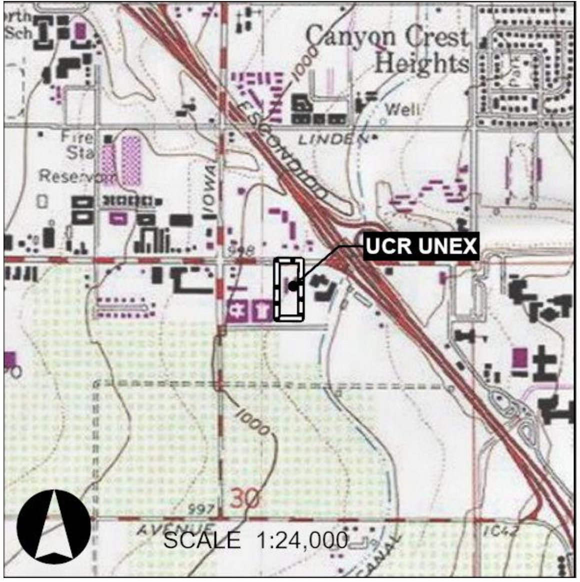
Rissman and Rissman Associates. Architectural plans for 1200 University Avenue. 1967.

Rissman and Rissman Associates. Architectural plans for 1200 University Avenue. 1984.

B13. Remarks: N/A
***B14. Evaluator:** Nelson White, M.S.H.P.
***Date of Evaluation:** January 22, 2024

(This space reserved for official comments.)

(Sketch Map with north arrow required.)



Page 4 **of** 13 ***Resource Name or #** (Assigned by recorder) UC Riverside University Extension Center (UNEX)
***Recorded by:** Nelson White, M.S.H.P. ***Date** January 22, 2024 ■ Continuation ☐ Update

***P3a. Description**

Located west of the central UCR campus (west of I-215), the UC Riverside University Extension Building (UNEX), is situated on the south side of University Avenue. The UNEX building was designed by architects Rissman & Rissman Associates in two phases: 1968 and 1984. Its present U-shape plan consists of three components: 1) one-story east wing, 2) five-story west wing, and 3) a three-deck parking garage. The exterior walls consist primarily of reinforced poured concrete clad in cement plaster. Fenestration consists of metal-framed fixed and sliding windows. It is capped by flat roofs. The architectural description begins with the north (primary) façade and continues counterclockwise to the west, south, and east elevations.

The north (primary) façade is asymmetrical. The one-story east wing (1968) has seven evenly spaced large windows divided into nine lites each. It is capped by a decorative mansard parapet finished with metal standing seam panels. At center is a replacement pair of metal-framed glass doors surrounded by fixed glass panels (date unknown). A replacement entry portico projects north from the entrance (date unknown). It has a barrel shaped roof, with metal bracing, supported at the north end by two metal posts. The west wing of the façade (1968) is five stories. This section is blind. It is accentuated by recessed horizontal scores at each floor. The far west corner is recessed and features non-original decorative metal I-beam bracing (date unknown).

The west elevation is divided into three parts: the five-story north section of the west wing (1968), the five-story central section of the west wing (1984), and the three-deck parking garage (1984). The north section is divided into 10 bays that are visually divided vertically and horizontally by the projecting structural elements. The bays of the ground story vary in arrangement of windows and doors, while those of the upper four stories are consistent with three windows per bay and floor. The metal bracing of the northwest corner wraps around to this section, extending four bays on ground and second stories before receding a bay with each story from the third to the fifth story. The elevation has a deep, but narrow, recess between the original north and added central sections. The central section is divided into 10 bays that are visually divided vertically and horizontally by recessed scores. Each bay and floor exhibit a window centered within a chamfered recess. The ground story and fifth story appear to be visually taller than the rest with more blank walls above the windows than on the other three stories. The south bay is blind. The south parking garage section projects from the rest of the elevation by approximately 20 feet. The garage is largely open with pre-cast concrete railings on each deck.

The south elevation is symmetrical. Consisting entirely of the parking garage, the elevation is largely blind with only the southwest and southeast corners open to the parking decks.

The east elevation is divided into four parts: parking garage (1984), a walled courtyard, the one-story addition (1984), and the original one-story section (1968). From south to north the parking garage on this elevation is three decks with the same openness as on the west elevation. Vehicular entrances and exits are located at the south and north ends of the east elevation of the garage. The next section exhibits a wall and open pedestrian entry into the enclosed courtyard. The entry exhibits a decorative metal arch with diagonal bracing (date unknown) mimicking that of the entry portico of the north façade. The central and north one-story wings are blind. A narrow span of decorative mansard parapet, matching that of the north façade, acts as a visual demarcation between the 1984 addition and the original 1968 north section. An enclosed passageway, that projects from the lower half of the elevation, spans across most of the east wing (1984). The east elevation of the west wing is visible above and behind the east wing. It is largely identical to its east elevation with the most noticeable difference being the decorative metal bracing applied to the south end of the north section (as opposed to the north end).

The UNEX building is largely surrounded by pavement for vehicular passage and parking. Mature trees and lawn accentuate the north and south ends of the property.

Page 5 **of** 13 ***Resource Name or #** (Assigned by recorder) UC Riverside University Extension Center (UNEX)

***Recorded by:** Nelson White, M.S.H.P. ***Date** January 22, 2024 ■ Continuation ☐ Update

P5a. Photo – continued

Figure 1. Overview of north (primary) façade, view south (Google Earth)

Figure 2. West elevation, view southeast (Google Earth)

Figure 3. West and south elevations, view northeast (Google Earth)

Figure 4. South end of east elevation, view west (Google Earth)

***Resource Name or #** (Assigned by recorder) UC Riverside University Extension Center (UNEX)

***Recorded by:** Nelson White, M.S.H.P. ***Date** January 22, 2024 ■ Continuation ☐ Update

Figure 5. Central section of east elevation, view southwest (Google Earth)

Figure 6. North end of east elevation, view southeast (Google Earth)

Primary#
HRI #
Trinomial

Page 8 **of** 13 ***Resource Name or #** (Assigned by recorder) UC Riverside University Extension Center (UNEX)
***Recorded by:** Nelson White, M.S.H.P. ***Date** January 22, 2024 ■ Continuation ☐ Update

***B6. Construction History:**

The “UC Riverside University Extension Center” (UNEX) was designed and built in two phases: 1968 and 1984 for Holiday Inn of America. Rissman & Rissman Associates were the architects for both phases (a brief biography of the firm follows this construction history). Designed in the Mid-Century Modern style, the building was U-shaped in plan. The original north section is comprised of the east and west wings and housed public spaces on the ground floor: reception, a coffee shop, dining room, cocktail lounge, and kitchen. The south end of the one-story east wing housed a banquet room. A rectangular pool was situated south of the east wing. The five-story west wing housed 118 hotel rooms.

In 1984 the hotel was expanded with two additions. A one-story addition was added to the east wing to house more banquet rooms. The previous pool was removed and a new smaller one and spa were installed south of the new east wing (no longer extant). To the west wing a new five-story addition was added with 19 hotel rooms per floor for a total of 95. A three-deck parking garage was added to the south of the east and west wings.

In 1992 the University purchased the property. The first floor was converted into classrooms and gathering space and the upper floors largely retained their configuration as hotel rooms, housing offices and visiting researchers.

Since its original construction in 1968, known alterations to the exterior include the three additions (1984), removal of the Holiday Inn branding (presumably in 1992), possible alteration of the entry canopy (date unknown), removal of the 1984 pool and spa, and the addition of the metal bracing to parts of the original hotel wing (date unknown).

Rissman & Rissman

The 1968 and 1984 architectural plans for the UNEX building indicate that Rissman & Rissman Associates were the architects for both phases of construction. The firm was founded in 1960 by brothers Homer A. Rissman (1927-2001) and Marshall W. Rissman (1923-1981), who had previously practiced separately. Rissman & Rissman were prolific designers and renovators of hotels, casinos, and country clubs, often in the Mid-Century Modern style, in Southern California and Las Vegas. As the “in-house” architects for Holiday Inn, Marshall created prototypical franchise designs that were used throughout Southern California. An early example of this was the 1964 Holiday Inn in West Covina, which was five stories tall and featured poured concrete and window walls. In Southern California the firm designed such hotels as Palm Springs Riviera Hotel (1956 and 1975), Pen & Quill (1962), Holiday Inn (West Covina, 1964), and the Holiday Inn (Westwood, 1971). In Las Vegas the firm designed expansions to the Hacienda, Tropicana (1964), Dunes, Tally Ho (1961), Castaways, and the Silver Slipper. Arguably the firm’s most recognizable commission is the tent-shaped Circus Circus (1968) in Las Vegas. In 1974 the Woodwork Institute of California gave the Award of Excellence to the firm for their design of the Holiday Casino (Las Vegas). In 2001 the American Institute of Architects posthumously awarded Homer with the Lifetime Achievement award.

***B6. Construction History:**

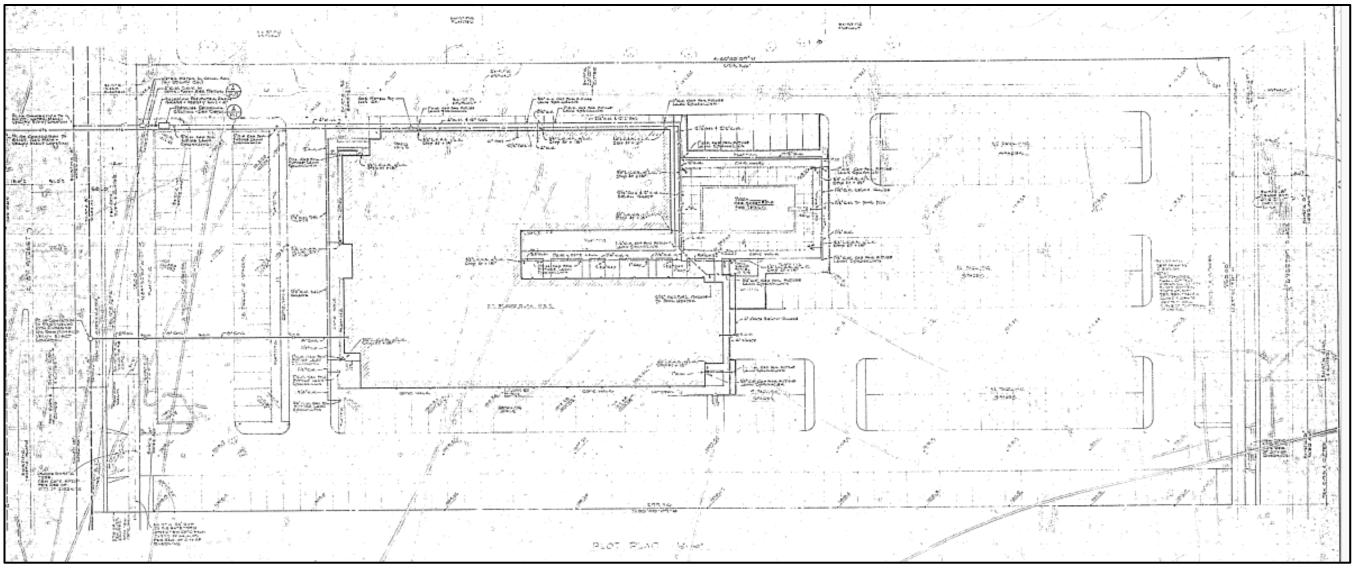


Figure 1. Site Plan of 1200 University Avenue, 1968 (Rissman & Rissman Associates)

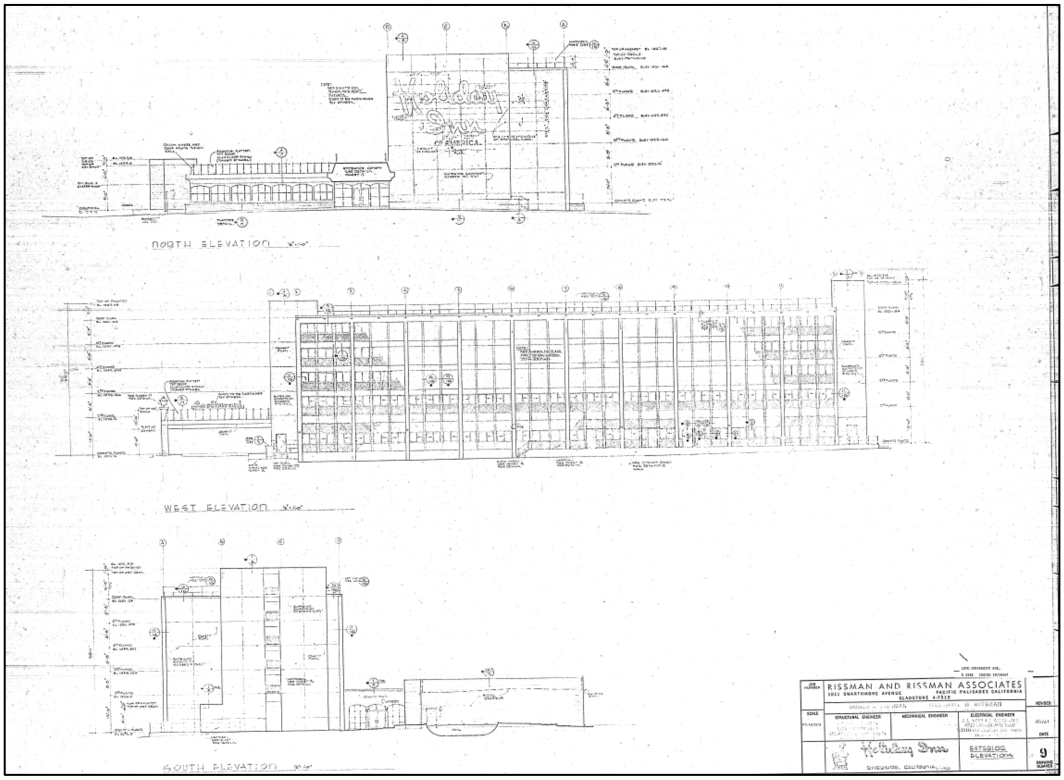


Figure 2. North, west, and south elevations, 1968 (Rissman & Rissman Associates)

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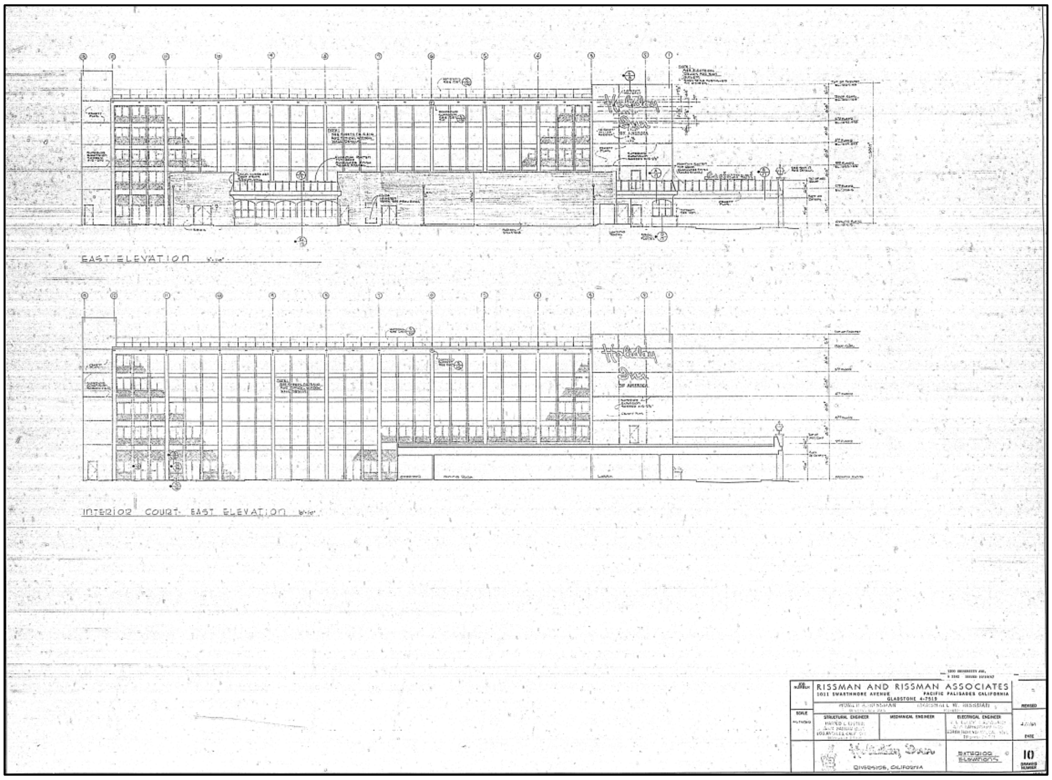

Figure 1. East elevations, 1968 (Rissman & Rissman Associates)

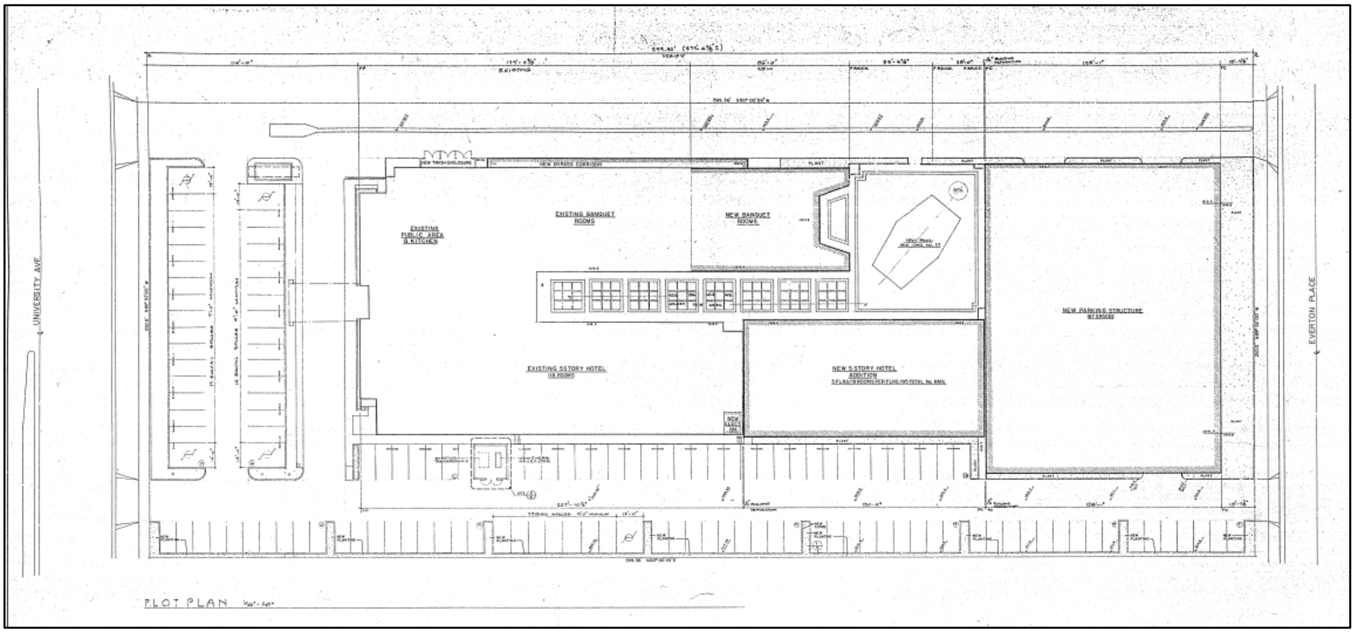

Figure 2. Altered site plan of 1200 University Avenue, 1984 (Rissman & Rissman Associates)

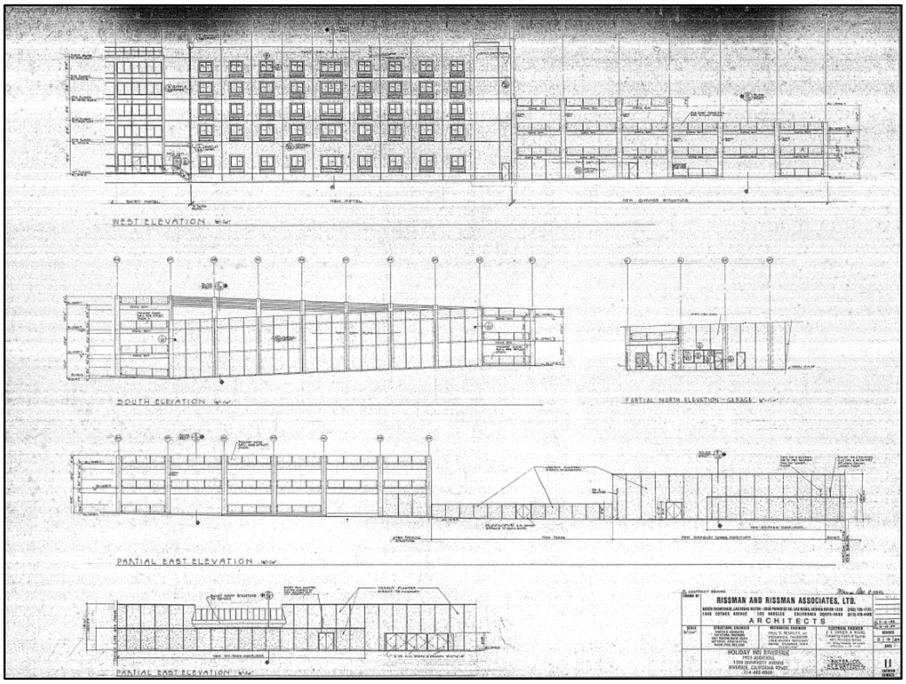

Figure 5. West, south, and east elevations, 1984 (Rissman & Rissman Associates)

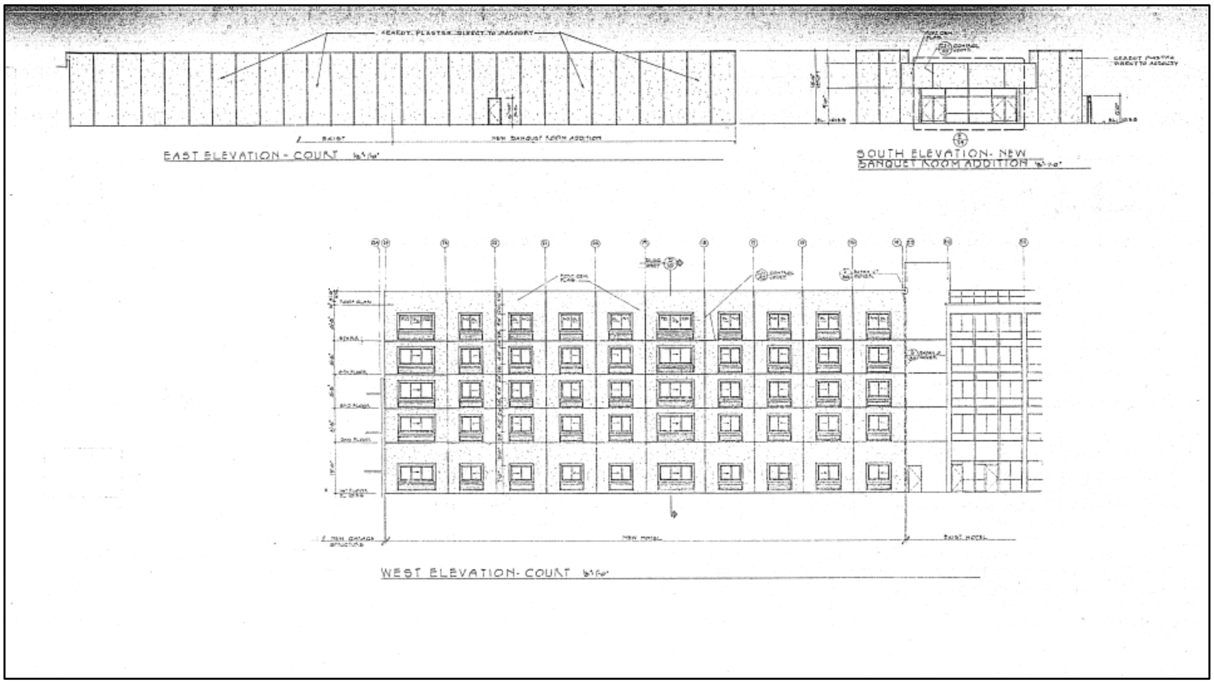

Figure 6. East, south, and west elevations, 1984 (Rissman & Rissman Associates)

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***B10. Significance:**

The Mid-Century Modern-style UNEX building, constructed in 1968 and 1984, is presently owned by the University of Riverside. Therefore, this evaluation utilized the 2020 *Historic Resources Survey Report's* historic contexts and eligibility standards, specifically: **a)** Context #2: Riverside's Postwar Boom, 1945-1975; Theme: Postwar Institutional Expansion in Riverside; Subtheme: Founding of the University of California, Riverside, 1953-1975; **b)** Context #3: Social and Cultural Development, 1953-1975; Theme: Civil Rights Movement and Student Activism at UCR and Theme: Initiatives in Cultural Diversity, Ethnic Studies, and Student Support; and **c)** Context #4: Architecture and Design, 1916-1975; Theme: Modernism in Riverside.

With its original 1968 construction date, the UNEX building falls outside two periods associated with UCR's construction chronology: 1) UCR College of Letters and Sciences, 1953-1958 and 2) Creation of UCR "General Campus," 1959-1967.

Previous Evaluation

As part of the *Campus-Wide Results* of the *2020 Historic Resources Survey*, Rincon Environmental Consultants recommended the UNEX building is not a historical resource.

NRHP and CRHR Evaluation

Criteria A/1

Two of the *Historic Resources Survey's* contexts were utilized to evaluate the UNEX building under Criteria A/1.

- Context #2: Riverside's Postwar Boom, 1945-1975;
    - Theme: Postwar Institutional Expansion in Riverside;
        - Subtheme: Founding of the University of California, Riverside, 1953-1975
- Context #3: Social and Cultural Development, 1935-1975,
    - Theme: Civil Rights Movement and Student Activism at UCR and
    - Theme: Initiatives in Cultural Diversity, Ethnic Studies, and Student Support.

The UNEX building does not meet eligibility standards for the *Historic Resources Survey's* Contexts #2 and #3. Although the UNEX building was originally constructed (1968) during the period of significance for the historic context and themes, it was built as and functioned as a Holiday Inn from 1968 to 1992. It was not a part of UCR until the University acquired the property in 1992. Research to date does not indicate a strong "association with the postwar institutional expansion of Riverside and the opening decades of UCR" (Context #2), a strong "association with the Civil Rights Movement and era of student activism" (Context #3), nor a strong association with Cultural Diversity, Ethnic Studies, and Student Support (Context #3).

In addition, research to date does not indicate the UNEX building to have a strong association with any event, pattern of events, or trend that made a significant contribution to local, state, or national history.

Although the UNEX building was constructed during the Era of Transition, 1968-1975 of UCR's construction chronology, which was characterized by enrollment decline, it was built as and functioned as a Holiday Inn from 1968 to 1992. It was not a part of UCR until the University acquired the property in 1992. Research to date does not indicate a strong association with this period of UCR's history.

Therefore, the UNEX building is not eligible under Criteria A/1 for listing in the NRHP and the CRHR.

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Criteria B/2

Two of the *Historic Resources Survey's* contexts were utilized to evaluate the UNEX building under Criteria B/2.

- Context #2: Riverside's Postwar Boom, 1945-1975;
  - Theme: Postwar Institutional Expansion in Riverside;
    - Subtheme: Founding of the University of California, Riverside, 1953-1975
- Context #3: Social and Cultural Development, 1935-1975,
  - Theme: Civil Rights Movement and Student Activism at UCR and
  - Theme: Initiatives in Cultural Diversity, Ethnic Studies, and Student Support.

The UNEX building does not meet eligibility standards for the *Historic Resources Survey's* Contexts #2 and #3. Although the UNEX building was originally constructed (1968) during the period of significance for the historic context and themes, research to date does not indicate a strong "association with a prominent individual who played a significant role in the university's founding, development, or achievements" (Context #2), a strong "association with an individual who played in significant role in the Civil Rights Movement and era of student activism" (Context #3), nor a strong association with an individual who played a significant role in UCR's Cultural Diversity, Ethnic Studies, and Student Support (Context #3).

In addition, although hundreds of Holiday Inn employees and UCR employees and students were associated with the UNEX building over nearly six decades since its construction, research to date does not indicate a strong or direct association between any of them and any demonstrably important contributions to local, state, or national history.

Therefore, the UNEX building is not eligible under Criteria B/2 for listing in the NRHP and the CRHR.

Criteria C/3

One of the *Historic Resources Survey's* contexts were utilized to evaluate the UNEX building under Criteria C/3.

- *Context #4:* Architecture and Design, 1916-1975;
  - Theme: Modernism in Riverside.

The UNEX building exhibits some characteristics and construction methods of Mid-Century Modern commercial architecture in its simple geometric volumes, horizontal massing, lack of ornamentation, flat roofs, poured concrete and glass. However, as its form, design, and materials are common for the period and style, it is an unexceptional example of Mid-Century Modern commercial architecture. Nor is there any indication that innovative or experimental construction methods were used.

Likewise, the UNEX building does not meet eligibility standards for the *Historic Resources Survey's* Context #4: Architecture and Design: Associated Architectural Styles, Architects, and Design Professionals, Theme: Modernism in Riverside. The UNEX building was designed by Rissman & Rissman Associates, who are not listed in the Architects section of the *Historic Resources Survey's* Context #4. Compared to examples recommended eligible by the *Survey* (Social Sciences-Humanities Building (Watkins Hall) and Costo Hall) that better exemplify the style's character-defining features, the UNEX building does not "exhibit quality of design through distinctive features and/or represent an excellent, intact example of the style at UCR." Moreover, although designed by Rissman & Rissman Associates, the 1984 additions to the UNEX building are less than 50 years old and have not achieved historic significance in their own right.

While Rissman & Rissman Associates were a prolific Southern California firm that contributed to the built environment of the region, the UNEX building is not recognized as a notable example of their work generally or within the region. The building was one of several Southern California prototypical designs by the firm for Holiday Inn. It was neither the first of these nor the last. The firm is not listed in the Architects of Modernism section of the City of Riverside's *Modernism Context Statement*. The firm was arguably best known for its hotels in Las Vegas. The UNEX (former Holiday Inn) building was not widely published upon its construction, nor did it receive any local or peer awards.

Because it does not embody distinctive characteristics of a type, period or method of construction, does not possess high artistic value, nor is it a notable example of a master architect, it is not eligible under Criteria C/3 for listing in the NRHP and the CRHR.

Summary

Based on the preceding investigation and analysis, the UNEX building is not individually eligible for listing in the NRHP and the CRHR. Therefore, the UNEX building is not a historical resource for the purposes of the California Environmental Quality Act (CEQA) nor a historic property for the purposes of Section 106 of the National Historic Preservation Act of 1966.

Attachment 12

Geotechnical Investigation Report

TWINING

Engineering a Better Tomorrow

Geotechnical Investigation Report

Proposed OASIS Park
University of California, Riverside
Riverside, California

Prepared for:

University of California, Riverside
1223 University Avenue, Suite 240
Riverside, CA 92507

June 29, 2023
Project No.: 220759.3

TWINING

2883 East Spring Street
Suite 300
Long Beach CA 90806

Tel 562.426.3355
Fax 562.426.6424

June 29, 2023
Project No.: 220759.3

Ms. Daneca Stevens
Project Manager
Planning, Design, and Construction
University of California, Riverside
1223 University Avenue, Suite 240
Riverside, CA 92507

Subject: **Geotechnical Investigation Report**
Proposed OASIS Park
University of California, Riverside
Riverside, California

Dear Ms. Stevens,

In accordance with your request and authorization, we are presenting the results of our geotechnical investigation for the proposed OASIS Park project located at the University of California, Riverside in Riverside, California. The purpose of our investigation is to characterize subsurface conditions of the site and evaluate seismic and geologic hazards at the site.

This report was prepared in accordance with the requirements of the 2022 California Building Code (2022 CBC) and ASCE 7-16 (ASCE, 2017). The geotechnical engineer of record from the Design/Build team shall utilize this report and provide geotechnical recommendations for the construction and design of the proposed project.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding this report or if we can be of further service, please do not hesitate to contact the undersigned.

Respectfully submitted,
TWINING, INC.

PAUL C. SOLTIS
G-2606
Ex. 12/31/24

Doug Crayton
Staff Engineer

Paul Soltis, PE 56140, GE 2606
Vice President, Geotechnical Engineering

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1. INTRODUCTION

This report presents the results of the geotechnical investigation performed by Twining, Inc. (Twining) for the proposed OASIS Park project located at University of California, Riverside in Riverside, California. A description of the site and the proposed improvements is provided in the following section. The objectives of this investigation have been to characterize subsurface conditions of the site and evaluate seismic and geologic hazards at the site. Our investigation was performed in conformance with the 2022 California Building Code (2022 CBC) and ASCE 7-16 (ASCE, 2017).

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The overall OASIS site is located at the existing Parking Lot 50 and 1200 University Avenue on University of California, Riverside campus in Riverside, California, as shown on Figure 1 – Site Location Map. The approximate site coordinates are latitude 33.974715°N and longitude 117.336899°W, on the Riverside East, California 7½-Minute Quadrangle, according to the United States Geological Survey (USGS) topographic maps (USGS 2022). The overall OASIS site is bound by University Avenue on the north, the Gage Canal on the east, Everton Place on the south, and commercial properties on the west. The western third of the site is currently occupied by the University Extension building, a four-story parking garage, and surface parking lots. The eastern portion of the site is covered by Parking Lots 50 and 51. Three buildings previously occupied the site of Lot 50 and were demolished around 2017. The site covers approximately 8.25 acres. The site is relatively flat with a surface elevation that varies from approximately 1011 feet mean sea level (msl) in the northwest corner, to 1024 feet msl in the northeast corner, to 1022 feet msl in the southeast corner, to 1013 feet msl in the southwest corner. Twining previously conducted borings in September of 2017 for an abandoned Outpatient Pavilion project that was planned for Parking Lot 50. The borings from that investigation and this current investigation are used in the preparation of this report.

The proposed project will consist of the construction of a new technology park consisting of research laboratories, technology incubator, training facilities, hybrid-learning room, offices, community spaces, other supporting uses, and parking on the western portion of the OASIS Site. Associated improvements such as new flatwork, landscape areas, and utilities are also expected. We note that a conceptual plan layout of the proposed development is not available at the time of preparation of this report. The scope of our report is to provide a comprehensive evaluation of the site; we note that additional borings/investigation may be required depending on the actual locations of the new structures relative to completed boring locations. A site plan and the locations of our borings are depicted on Figure 2 – Site Plan and Boring Location Map.

3. SCOPE OF WORK

Our scope of work included review of background information, pre-field activities and field exploration, laboratory testing, and report preparation. These tasks are described in the following subsections.

3.1. Literature Review

We reviewed readily available background data including published geologic maps, topographic maps, aerial photographs, seismic hazard maps and literature, and flood hazard maps relevant to the subject site. Relevant information has been incorporated into this report. A partial list of literature reviewed is presented in the "Selected References" section of this report.

3.2. Pre-Field Activities

Before starting our exploration program, we performed a geotechnical site reconnaissance to observe the general surficial conditions at the site and to select field exploration locations. After exploration locations were delineated, Underground Service Alert was notified of the planned locations a minimum of 72 hours prior to excavation. Additionally, existing as-built utility plans were reviewed by Twining and the University to determine if the proposed boring locations conflicted with existing underground utilities.

3.3. Field Exploration

The field exploration consisted of drilling, testing, sampling, and logging of 8 exploratory borings (B-9 through B-14, P-1, and P-2) and percolation testing in 2 of the borings (P-1 and P-2) conducted at the site on December 1 and 2, 2022. The approximate exploration locations are shown on Figure 2 – Site Plan and Boring Location Map. Additionally, Twining previously conducted 8 borings at the site in September and October of 2017. The locations of those borings are also shown on Figure 2.

The borings were advanced to approximate depths of 5 to 51.5 feet below ground surface (bgs) using a CME-75 truck-mounted drill rig equipped with 8-inch-diameter hollow-stem-auger (HSA). All borings were first excavated to 5 feet bgs using a hand-auger to clear potential underground utilities.

Drive samples of the soils were obtained from the borings using a Standard Penetration Test (SPT) sampler without room for liner and a modified California split-spoon sampler. The samplers were driven using a 140-pound automatic hammer falling approximately 30 inches. The blow counts to drive the samplers were recorded, and subsurface conditions encountered in the borings were logged by a Twining field engineer under the supervision of a California Registered Geotechnical Engineer. Bulk samples were collected from the upper 5-foot soil cuttings. The samples were transported to Twining's geotechnical engineering laboratory in Long Beach, California for examination and testing.

In-situ percolation testing was performed in borings P-1 and P-2, which were advanced to 5 feet bgs, to provide estimates of infiltration rate of the site soils. In 2017 Twining conducted percolation tests at borings B-7 and B-8 at depths of 30 feet and 10 feet, respectively. The results of the infiltration testing are discussed in Appendix A – Field Exploration.

Upon completion of exploration, the borings deeper than 5 feet were backfilled with lean concrete grout. The 5-foot-deep borings were backfilled with soil cuttings. The surface was repaired to match existing conditions.

Detailed descriptions of the field exploration and the soils encountered during the current and previous drilling are presented in Appendix A – Field Exploration.

3.4. Geotechnical Laboratory Testing

Laboratory tests were performed on selected samples obtained from the borings to aid in the soil classification and to evaluate the engineering properties of site soils. The following tests were performed in general accordance with ASTM and Caltrans standards:

- In-situ moisture and density (ASTM D2937),
- #200 Wash (ASTM D1140),
- Atterberg Limits (ASTM D4318),
- Expansion Index (ASTM D4829),

- Consolidation (ASTM D2435),
- Direct shear (ASTM D3080),
- Maximum dry density and optimum moisture content (ASTM D1557),
- Resistance value (R-value) (ASTM D2844), and
- Corrosivity (Caltrans test methods CT417, CT422, and CT 643).

Detailed laboratory test procedures and results are presented in Appendix B – Laboratory Testing.

3.5. Report Preparation

We compiled and analyzed the data collected from our field exploration and laboratory testing. We performed engineering analyses based on our literature review and data from field exploration and laboratory testing programs. Our analyses included the following:

- Site geology, and subsurface conditions,
- Groundwater conditions,
- Geologic hazards and seismic design parameters, and
- Liquefaction potential and seismic settlement.

We prepared this report to present our conclusions from this investigation.

4. GEOLOGY AND SUBSURFACE CONDITIONS

The regional and site geology and subsurface conditions are described in this section, based on our data review and field investigation. A portion of the geologic map is reproduced as Figure 3 – Geologic Map. Detailed subsurface conditions are presented in Appendix A – Field Exploration.

4.1. Regional Geology

The project site is located within the central portion of the Perris Block, a relatively stable terrain which is bounded on the north by the Cucamonga fault zone, on the east by the San Jacinto fault zone, on the south by the San Felipe fault zone, and on the west by the Elsinore fault zone. The Perris Block, in turn, is situated within the northern portion of the Peninsular Ranges geomorphic province. The Peninsular Range province occupies the southwestern portion of the state, south of the Transverse Ranges and west of the Colorado geomorphic provinces.

The Peninsular Ranges province is characterized generally by northwest-trending mountains and valleys, traversed by northwest-trending faults. Within the Perris Block, the predominant rock exposures comprise a multitude of Cretaceous-age plutonic emplacements known collectively as the southern California batholith. Locally these plutons intruded Jurassic-age metavolcanic and metasedimentary rocks and Paleozoic-age limestone, schist, and gneiss. Valleys are mantled by Quaternary-age alluvial fan deposits and recent alluvium derived from erosion of the adjacent mountains.

According to geologic mapping published by the Dibblee Geological Foundation (Dibblee, 2003), the project site is underlain by Pleistocene alluvial fan deposits (map symbol: Qoa). These deposits are described as “deposits of sand, minor gravel, tan to light reddish brown.” A portion of this geologic map is reproduced as Figure 3, Regional Geologic Map.

4.2. Surface and Subsurface Conditions

Earth materials encountered during our subsurface investigation generally consist of a thin layer of undocumented fill underlain by alluvial fan deposits which extend to the total depth of exploration. Based on our field observations, the undocumented fill consists of silty sand on the order of 1 to 8 feet in thickness, with the average depth of approximately 3.5 feet. It should be noted that the undocumented fill thickness may vary across the site. The alluvial deposits consist predominantly of medium dense to very dense sand with varying amounts of fines.

Detailed information regarding the exploratory excavations is presented in Appendix A - Field Exploration.

4.3. Groundwater

Groundwater was not encountered within our exploratory borings drilled to a maximum depth of approximately 51½ feet below the existing grade. Based on our review of the California Water Resource website, the groundwater level is reportedly situated at a depth greater than 150 feet below the ground surface. Groundwater conditions may vary across the site due to stratigraphic and hydrologic conditions and may change over time because of seasonal and meteorological fluctuations, or of activities by humans at this and nearby site.

5. GEOLOGIC HAZARDS AND SEISMIC DESIGN CONSIDERATIONS

The site is in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered high during the design life of the proposed development. The hazards associated with seismic activity in the vicinity of the site area discussed in the following sections.

5.1. Active Faulting and Surface Fault Rupture

The subject site is not located within a State of California Alquist-Priolo Earthquake Fault Zone (Alquist-Priolo EFZ, formerly known as a Special Studies Zone) (Hart and Bryant, 1997). The closest know active fault to the site is the San Jacinto fault, located approximately 6.21 miles to the northeast from the project site. It is our opinion that the likelihood of fault rupture occurring at the site during the design life of the proposed improvements is low.

5.2. Liquefaction Potential

Liquefaction is the phenomenon in which loosely deposited granular soils with silt and clay contents of less than approximately 35 percent, and non-plastic silts located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration results in the loss of grain-to-grain contact due to a rapid rise in pore water pressure and causes the soil to behave as a fluid for a short period of time.

Liquefaction is generally known to occur in loose, saturated, relatively clean, fine-grained cohesionless soils at depths shallower than approximately 50 feet. Factors to consider in the evaluation of soil liquefaction potential include groundwater conditions, soil type, grain size distribution, relative density, degree of saturation, and both the intensity and duration of ground motion. Other phenomena associated with soil liquefaction include sand boils, ground oscillation, and loss of foundation bearing capacity.

The California Geological Survey (CGS) has not published literature or maps within the project site that would indicate a state-designated Zone of Required Investigation for Liquefaction. However, Riverside County has mapped the site in an area of “Low” concern for liquefaction. Based on the depth of groundwater approximately 150 feet bgs, and site subsurface conditions, it is our opinion that liquefaction potential at the site is low.

5.3. Seismic Settlement Potential

Seismic settlement can occur when loose to medium dense granular materials densify during seismic shaking and liquefaction. Seismic settlement may occur in dry, unsaturated, as well as saturated soils. Based on the results of our field exploration, we believe that seismic settlement is possible at the site. The geotechnical engineer of record for the Design/Build team should evaluate the possibility of seismic settlement at the site.

5.4. Landslides

The area of the project site is not within an area with the potential for earthquake-induced landslides. Considering the site is flat and not close to significant slopes, the potential for earthquake-induced landslides to occur at the site is considered negligible.

5.5. Tsunamis and Seiches

Tsunamis are waves generated by massive landslides near or under sea water. Based on California Official Tsunami Inundation Maps, the site is not located on any State of California Tsunami Inundation Map for Emergency Planning. The potential for the site to be adversely impacted by earthquake-induced tsunamis is negligible.

Seiches are standing wave oscillations of an enclosed water body after the original driving force has dissipated. The potential for the site to be adversely impacted by earthquake-induced seiches is considered negligible due to the lack of any significant enclosed bodies of water located in the vicinity of the site.

5.6. Flooding

The Federal Emergency Management Agency (FEMA) has prepared flood insurance rate maps (FIRMs) for use in administering the National Flood Insurance Program, effective September 26, 2008. Based on our review of online FEMA flood mapping, the site is located within Zone X with minimal flood hazard.

5.7. Deaggregated Seismic Source Parameters

We performed a seismic hazard de-aggregation analysis for the peak ground acceleration with a probability of exceedance of 2% in 50 years. The analysis used the USGS Unified Hazard Tool based on the 2014 USGS seismic source model. The results of the analysis indicate the controlling modal moment magnitude and fault distance are 8.1 Mw and 6.3 miles (10.1 km), respectively.

5.8. Site Class for Seismic Design

Based on the SPT resistance, it is our opinion that Site Class D may be used for the project seismic design according to Chapter 20 of ASCE 7-16.

5.9. Seismic Design Parameters

Seismic design for new buildings should be based on the 2022 CBC and ASCE 7-16. As the site is classified as seismic Site Class D and the mapped spectral acceleration parameter at period 1-second, S_1, is greater than 0.2 g, the 2022 CBC requires a site-specific ground motion hazard analysis following Section 11.4.7 of ASCE 7-16 for new buildings.

Alternatively, Exception 2 in Section 11.4.8 of ASCE 7-16 may be used for the project new buildings in lieu of the site-specific ground motion hazard analysis. For seismic design of new buildings based on this exception, seismic design parameters in Table 1 may be used, based on site coordinates of latitude 33.974715°N and longitude 117.336899°W.

Table 1 – Seismic Design Parameters Based on 2022 CBC and ASCE 7-16 for Design Based on Exception 2 in Section 11.4.8 of ASCE 7-16

Design Parameters	Value
Site Class	D
Mapped Spectral Acceleration Parameter at Period of 0.2-Second, S_s (g)	1.5
Mapped Spectral Acceleration Parameter at Period 1-Second, S_1 (g)	0.6
Site Coefficient, F_a	1
Site Coefficient, F_v	1.7
Adjusted MCE_R[1] Spectral Response Acceleration Parameter, S_{MS} (g)	1.5
Adjusted MCE_R[1] Spectral Response Acceleration Parameter, S_{M1} (g)	1.02
Design Spectral Response Acceleration Parameter, S_{DS} (g)	1
Design Spectral Response Acceleration Parameter, S_{D1} (g)	0.68
Risk Coefficient, C_{RS}	0.934
Risk Coefficient, C_{R1}	0.909
Peak Ground Acceleration, PGA_M[2] (g)	0.656
Seismic Design Category[3]	D
Long-Period Transition Period, T_L (seconds)	8
$T_s = S_{D1} / S_{DS}$	0.68

When using the above parameters for seismic design, the seismic design coefficient C_s should be calculated as follows:

For $T \leq 1.5T_S$, $C_S = S_{DS}/(R/I_e)$

For $T_L \geq T > 1.5T_S$, $C_S = 1.5\ S_{D1}/(T\ R/I_e)$

For $T > T_L$, $C_S = 1.5\ (S_{D1}\ T_L)/(T^2\ R/I_e)$

where

T = the fundamental period of the structure(s) determined in Section 12.8.2 of ASCE 7-16;

R = the response modification factor determined in Table 12.2-1 of ASCE 7-16; and

I_e = the importance factor determined in accordance with Section 11.5.1 of ASCE 7-16.

Notes: [1] Risk-Targeted Maximum Considered Earthquake.

[2] Peak Ground Acceleration adjusted for site effects.

[3] For S_1 greater than or equal to 0.75g, the Seismic Design Category is E for risk category I, II, and III structures and F for risk category IV structures.

6. LIMITATIONS

This report presents geotechnical data and seismic design criteria for the proposed project site. The information may be used by the project design team to develop recommendations based on the information provided. The designer should supplement this data with additional data as the deem necessary to provide thorough geotechnical design recommendations.

Due to the limited nature of our field explorations, conditions not observed and described in this report may be present on the site. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. It should be understood that conditions different from those anticipated in this report may be encountered during grading operations.

Site conditions, including groundwater elevation, can change with time as a result of natural processes or the activities of man at the subject site or at nearby sites. Changes to the applicable laws, regulations, codes, and standards of practice may occur as a result of government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Twining, Inc. has no control.

Twining performed its evaluation using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil conditions. No other warranty, either express or implied, is made as to the conclusions and recommendations contained in this report.

7. SELECTED REFERENCES

American Society of Civil Engineers, 2017, Minimum Design Loads and Associated Criteria for Buildings and Other Structures: ASCE Standard ASCE/SEI 7-16, 800 pp, ISBN 9780784414248.

ASTM, current latest version, “Soil and Rock: American Society for Testing and Materials,” vol. 4.08 for ASTM test methods D-420 to D-4914; and vol. 4.09 for ASTM test methods D-4943 to highest number.

California Buildings Standards Commission, 2022, 2022 California Building Code, California Code of Regulations, Title 24, Volume 2 of Part 2, Effective January 1, 2023.

California Geological Survey (CGS), 2008, Guidelines for Evaluating and Mitigating Seismic Hazards in California.

City of Riverside, 2018, “Figure PS-2 Liquefaction Zones, Public Safety Element, Riverside General Plan, 2025”, amended February.

Dibblee, T.W., and Minch, J.A., 2003, “Geologic map of the Riverside East/South ½ of San Bernardino South quadrangles, San Bernardino and Riverside County, California,” 1:24,000 scale, Dibblee Geological Foundation, Map DF-109.

National Association of Corrosion Engineers (NACE), 1984, Corrosion Basics, an Introduction.

Pradel, D., 1998, Procedure to Evaluate Earthquake-Induced Settlements in Dry Sandy Soils, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 124, No. 4, 364-368.

Romanoff, Melvin, 1989, Underground Corrosion, NBS Circular 579. Reprinted by NACE. Houston, TX, pp. 166–167.

U.S. Geological Survey (USGS), 2022, USGS 1:24000-scale Riverside East Quadrangle, California, 7.5-Minute Series.

TWINING

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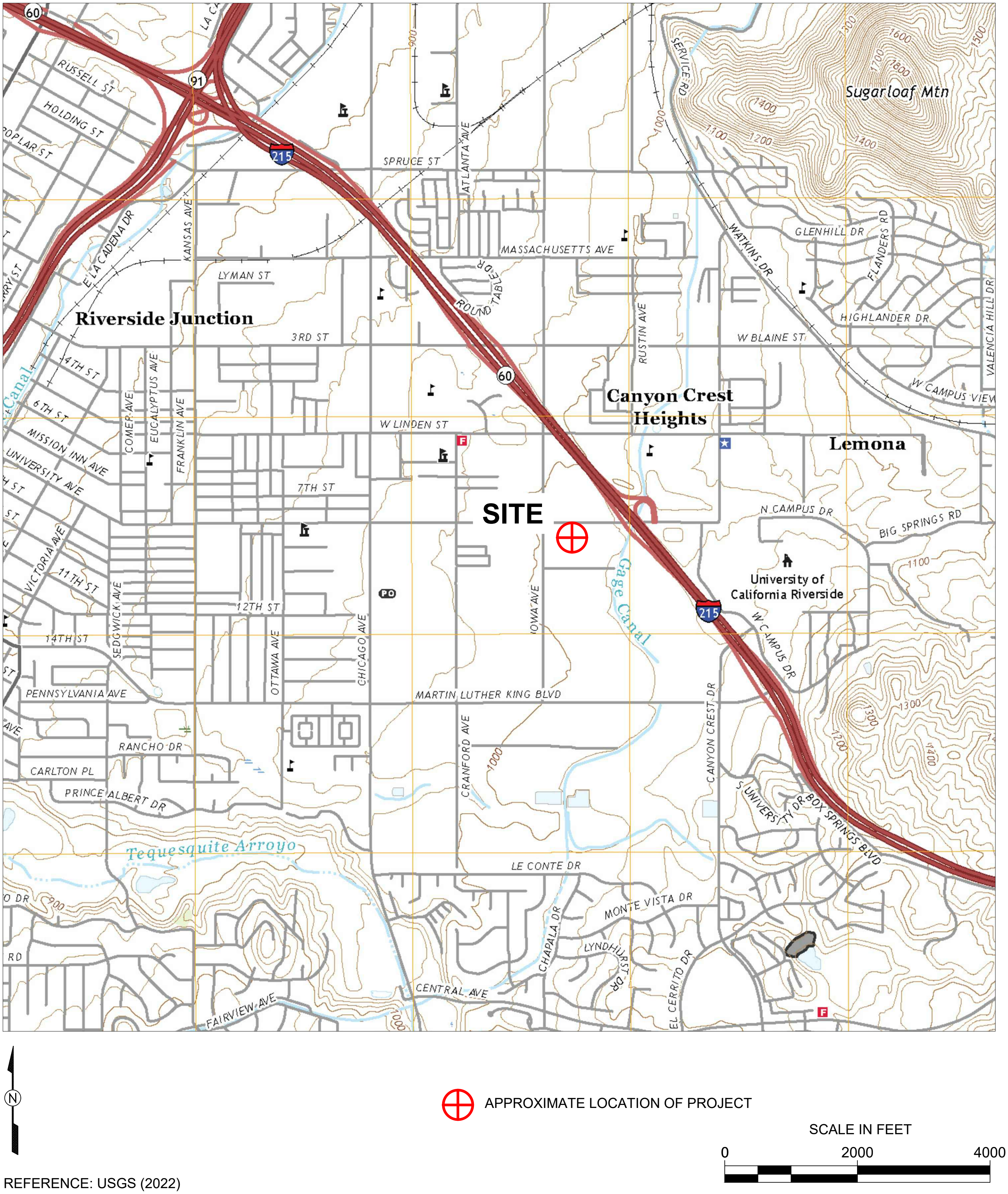
FIGURES



REFERENCE: USGS (2022)

TWINING

SITE LOCATION MAP

OASIS PARK
UNIVERSITY OF CALIFORNIA
RIVERSIDE, CA

PROJECT NO.	REPORT DATE	FIGURE 1
220759.3	June 2023	

NOTE: ALL DIMENSIONS AND LOCATIONS ARE APPROXIMATE

TWINING

REFERENCE: GOOGLE EARTH (2022)

LEGEND

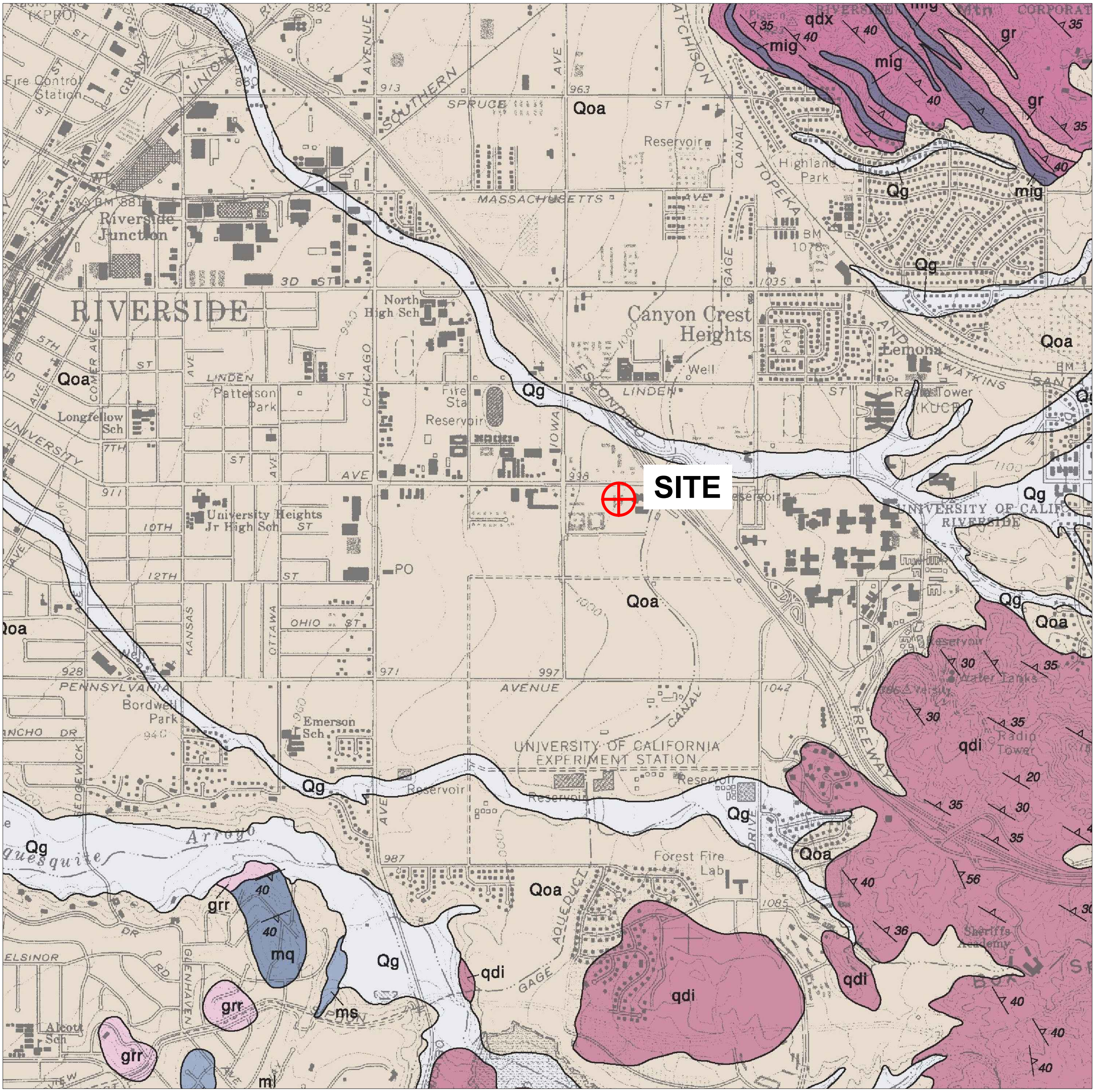
B-1 TD=51.5' ✦ APPROXIMATE LOCATION OF BORING BY TWINING (2022) TOTAL DEPTH IN FEET

P-1 TD=5' ▲ APPROXIMATE LOCATION OF BORING BY TWINING (2017) TOTAL DEPTH IN FEET

SITE PLAN AND BORING LOCATION MAP

OASIS PARK
UNIVERSITY OF CALIFORNIA, RIVERSIDE
RIVERSIDE, CA

PROJECT No. 220759.3	REPORT DATE June 2023	FIGURE 2



Qoa	Alluvial fan deposits of sand, minor gravel
Qg	Alluvial gravel and sand of stream channels
qdi	Quartz diorite (tonalite)
qdx	Quartz diorite, xenolith rich

N

SCALE IN FEET

0 2000 4000

REFERENCE: DIBBLEE (2003)

TWINING

GEOLOGIC MAP

OASIS PARK
UNIVERSITY OF CALIFORNIA
RIVERSIDE, CA

PROJECT NO.	REPORT DATE	FIGURE 4
220759.3	June 2023	

LEGEND

🟩 VERY LOW
🟨 LOW
🟨 MODERATE
🟧 HIGH
🟥 VERY HIGH

APPROXIMATE SCALE IN FEET
0 2000 4000

REFERENCE: CITY OF RIVERSIDE COUNTY (2018)

TWINING

LIQUEFACTION ZONES MAP

OASIS PARK
UNIVERSITY OF CALIFORNIA, RIVERSIDE
RIVERSIDE, CALIFORNIA

PROJECT NO. 220759.3	REPORT DATE June 2023	FIGURE 4

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APPENDIX A
FIELD EXPLORATION

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Appendix A
Field Exploration

General

The field exploration for the proposed project consisted of drilling, testing, sampling, and logging of eight exploratory borings (B-9 through B-14, P-1, and P-2) and performing percolation testing in two of the borings (P-1 and P-2). The approximate locations of the exploration are shown on Figure 2 – Site Plan and Boring Location Map.

The borings were first excavated to 5 feet below ground surface (bgs) using a hand-auger to clear potential underground utilities. Upon completion of exploration, borings B-9 through B-14 were backfilled with neat cement and the others with soil cuttings. The surface of all locations was repaired to match existing conditions, and the paved locations were patched with Portland cement concrete to match existing conditions.

Exploratory Borings

Drilling operation for the borings was performed by Baja Exploration of Escondido, California using a CME-75 truck-mounted drill rig equipped with 8-inch diameter hollow-stem-auger (HSA). The borings were advanced to a maximum depth of 5.0 to 51.5 feet bgs on December 1 and 2, 2022.

Twining previously performed eight exploratory borings at the site in 2017. Those borings are included below.

An explanation of the boring logs is presented as Figure A-1. The boring logs from the current drilling are presented on Figures A-10 through A-17. The boring logs from 2017 are presented as Figures A-2 through A-9. The boring logs describe the earth materials encountered, samples obtained, and show the field and laboratory tests performed. The logs also show the boring number, drilling date, and the name of the logger and drilling subcontractor. The borings were logged by a Twining engineer using the Unified Soil Classification System under the supervision of a registered California Geotechnical Engineer. The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual. Drive and bulk samples of representative earth materials were obtained from the borings.

Disturbed samples were obtained from select depths using a Standard Penetration Test (SPT) sampler. This sampler consists of a 2-inch O.D., 1.4-inch I.D. split barrel shaft without room for liner. Soil samples obtained by the SPT sampler were retained in plastic bags. A California modified sampler was also used to obtain drive samples of the soils from select depths. This sampler consists of a 3-inch outside diameter (O.D.), 2.4-inch inside diameter (I.D.) split barrel shaft. The samples were retained in brass rings for laboratory testing.

When the boring was drilled to a select depth, the sampler was lowered to the bottom of the boring and then driven a total of 18 inches into the soil using an automatic hammer weighing 140 pounds dropped from a height of 30 inches. The number of blows required to drive the samplers the final 12 inches is presented on the boring logs. Where sampler refusal is encountered and the sampler does not advance 18 inches, the total number of blows per number of inches advanced is presented. The blow counts given are field raw blow counts that have not been modified to account for field and/or depth conditions.

Percolation Testing

Percolation testing were performed in borings P-1 and P-2. After being advanced to 5 feet bgs using a hand-auger, the borings were drilled to 5 feet bgs again using an 8 inch-diameter, truck-mounted, hollow-stem auger. The borings were drilled under the observation of a field engineer who logged the subsurface conditions encountered and collected samples of the subsurface materials encountered.

The percolation test holes were prepared by placing approximately 1 inch of gravel at the bottom of the hole. A 3-inch diameter perforated PVC pipe wrapped in filter sock was placed at the bottom of the hole and the annular space around the pipe was backfilled with gravel.

After preparing the percolation test holes, the percolation was performed in accordance with the requirements of Riverside County. After presoaking, the test holes were filled with water to at least 12 inches above the bottom of the excavation. Measurements were recorded at 10-minute or 30-minute intervals depending on the results of the “sandy soil criteria test.” A minimum of 6 intervals were measured. The average drop that occurred over the last 3 readings was used to determine the percolation rate at each test location. Detailed test data is attached to this appendix.

A reduction factor of 3 was applied to the final measured infiltration rate to obtain the design infiltration rate. A summary of test results is presented in Table A-1, and the detailed test data is attached as Appendix D. Additionally, data from previous percolation testing performed at the site are attached as Appendix E.

Table A-1 – Infiltration Rate with a Reduction Factor of 3

Location	Depth (feet)	Infiltration Rate (in/hour)
P-1	5	0.1
P-2	5	0.4

UNIFIED SOIL CLASSIFICATION CHART

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

COARSE-GRAINED SOILS			FINE-GRAINED SOILS	
Relative Density	**SPT (blows/ft)**	**Relative Density (%)**	**Consistency**	**SPT (blows/ft)**
Very Loose	<4	0 - 15	Very Soft	<2
Loose	4 - 10	15 - 35	Soft	2 - 4
Medium Dense	10 - 30	35 - 65	Medium Stiff	4 - 8
Dense	30 - 50	65 - 85	Stiff	8 - 15
Very Dense	>50	85 - 100	Very Stiff	15 - 30
			Hard	>30

NOTE: SPT blow counts based on 140 lb. hammer falling 30 inches

Sample Symbol	Sample Type	Description
◫	SPT	1.4 in I.D., 2.0 in. O.D. driven sampler
☒	California Modified	2.4 in. I.D., 3.0 in. O.D. driven sampler
⧄	Bulk	Retrieved from soil cuttings
▯	Thin-Walled Tube	Pitcher or Shelby Tube

LABORATORY TESTING ABBREVIATIONS

ATT	Atterberg Limits
C	Consolidation
CORR	Corrosivity Series
DS	Direct Shear
EI	Expansion Index
GS	Grain Size Distribution
K	Permeability
MAX	Moisture/Density (Modified Proctor)
O	Organic Content
RV	Resistance Value
SE	Sand Equivalent
SG	Specific Gravity
TX	Triaxial Compression
UC	Unconfined Compression

TWINING

EXPLANATION FOR LOG OF BORINGS

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A-1

DATE DRILLED 9/29/17 LOGGED BY DHC **BORING NO. B-1**
DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA DRILLER 2R Drilling SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
	/					MAX		SM	Silty SAND with about 5% gravel, reddish brown to brown, dense, moist
5		☒	33						-- same
10		▯	39						-- same
15		☒	38/50 for 2"	9.2	117.7	DS			-- same
20		▯	39					SM	Silty SAND, brown, dense, moist
25		☒	45/50 for 6"	14.3	107.4	DS			-- same
30		▯	28			C		SP	Poorly graded SAND, light to dark brown to white to black, medium dense, moist
35									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 2

DATE DRILLED 9/29/17
LOGGED BY DHC
BORING NO. B-1
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
			44	6.2	109.4			SM	Silty SAND, brown, dense, moist
40			29			#200			-- medium dense
45			51	7.5	113.5			SP	Poorly graded SAND, brown to yellow to white, dense, moist
								SM	Silty SAND, light brown, dense, moist
50			39						Total Depth = 51.5 feet Backfilled on 9/29/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings.
55									
60									
65									
70									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 2

DATE DRILLED 10/9/17
LOGGED BY DHC
BORING NO. B-2
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
								SM	Silty SAND, reddish brown, moist
5			22						-- same, medium dense
10			42	9.0	121.0	C			-- same, dense
15			50 for 6"						-- same, very dense, only partial recovery
20			69	6.9	116.8				-- same, very dense
25			30						-- same, dense
30			74	3.2	121.4			SW	Well graded SAND, very dense, brown to black to red to white, moist
									Total Depth = 31.5 feet Backfilled on 10/9/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings.
35									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	FIGURE A - 3
170875.3	October 2017	

DATE DRILLED 9/29/17
LOGGED BY DHC
BORING NO. B-3
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
									3 inches of AC with no base
						MAX			
5			23					SM	Silty SAND with 5% gravel, reddish brown, medium dense, moist
10			38	3.6	119.0	C		SM	Silty SAND with 10% large grain sand, reddish brown to brown, dense, moist
15			20			#200		SM	Silty SAND, brown to reddish to light brown, medium dense, moist
20			55					SM	-- same, dense, with approximately 5% gravel, reddish brown, moist
25			15			#200		SM	-- same without gravel, medium dense
30			54	7.0	121.7	DS		SP	Poorly graded SAND, reddish brown, very dense, moist
35									

BORING LOG 170875.3 - UCR OUTPATIENT PAVILLION.GPJ TWINING LABS.GDT 1/20/23

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 4

DATE DRILLED 9/29/17
LOGGED BY DHC
BORING NO. B-3
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
			25						-- yellow to brown to red, medium dense
40			40/50 for 5"	8.9	127.6	DS		SM	Silty SAND, reddish brown, very dense, moist
45			40						-- same, dense
50			82	2.8	118.4			SP	Poorly graded SAND, light brown to white to black, very dense, moist
55									Total Depth = 51.5 feet Backfilled on 9/29/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings. Surface patched with cold-patch.
60									
65									
70									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 4

DATE DRILLED 10/9/17
LOGGED BY DHC
BORING NO. B-4
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
								SM	Silty SAND, reddish brown, moist
5		☒	48	2.7	133.6				-- same, dense, few organics
10		▯	11			#200			-- same, medium dense, light brown
15		☒	27			#200		SW	Well graded SAND, medium dense, light brown to black to white to red, moist
									Total Depth = 16.5 feet Backfilled on 10/9/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings.
20									
25									
30									
35									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 5

DATE DRILLED 10/9/17
LOGGED BY DHC
BORING NO. B-5
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
								SM	Silty SAND, reddish brown, moist
5			28						-- same, medium dense
10			85					SW	Well graded SAND, very dense, light brown with white spots, moist
15			45/50 for 5"					SM	Silty SAND, very dense, light brown, moist
20			24/50 for 6"	19.0					-- same
25			50						-- same, dense, some white spots
30			43					SW	Well graded SAND, dense, brown to orange to white to red, moist
35									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 6

DATE DRILLED 10/9/17
LOGGED BY DHC
BORING NO. B-5
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
			26			#200			-- same, more silt
40			54					SM	Silty SAND, very dense, olive brown to brown, moist, trace gravel
45			22			#200		ML	Sandy SILT, very stiff; brown, slightly moist
50			54					ML	-- same, hard, dark brown
									Total Depth = 51.5 feet Backfilled on 10/9/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings.
55									
60									
65									
70									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 6

DATE DRILLED 10/9/17
LOGGED BY DHC
BORING NO. B-6
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
5			37					SM	Silty SAND, dense, reddish brown, moist
10			11			#200		SW	Well graded SAND, medium dense, reddish brown, moist
15			34	2.6	105.4				-- same, dense
20			48					SM	Silty SAND, dense, brown with white spots, moist
25			88	8.7	130.4				-- same, very dense
30			15			#200			-- same, medium dense, reddish to olive brown
35									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 7

DATE DRILLED 10/9/17
LOGGED BY DHC
BORING NO. B-6
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		☒	58	6.5	109.9				-- same, very dense
40		☐	29						-- same, medium dense, brown with white spots
45		☒	82	12.0	117.1				-- same, very dense, olive brown
50		☐	31						-- same, dense, reddish brown
									Total Depth = 51.5 feet Backfilled on 10/9/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings.
55									
60									
65									
70									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 7

DATE DRILLED 9/29/17
LOGGED BY SL
BORING NO. B-7
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
0								SM	Silty SAND with mostly fine sand, brown, medium dense, dry
5			35						-- same
10			9						-- moist
15			24	9.5	125.3				-- mostly fine-medium sand, light brown, dry
20			29					ML	Sandy SILT, brown, dense, moist
25			34					SM	Silty SAND with few clay, reddish brown, medium dense, moist
30			19			#200			-- same
35									Total Depth = 31.5 feet Backfilled on 9/29/2017 Groundwater not encountered. Pipe inserted for percolation testing. Borehole backfilled at the completion of testing with soil cuttings.

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO. 170875.3
REPORT DATE October 2017
FIGURE A - 8

DATE DRILLED 9/29/17
LOGGED BY DHC
BORING NO. B-8
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
						■		2.5 inches of AC with no base
5			53				SM	Silty SAND with about 5% gravel, reddish brown, dense, moist
10			27					-- more silt and no gravel, medium dense
								Total Depth = 11.5 feet Backfilled on 9/29/2017 Groundwater not encountered. Pipe inserted for percolation testing. Borehole backfilled at the completion of testing with soil cuttings. Surface patched with cold-patch.
15								
20								
25								
30								
35								

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	FIGURE A - 9
170875.3	October 2017	

BORING LOG 170875.3 - UCR OUTPATIENT PAVILLION.GPJ TWINING LABS.GDT 10/25/17

DATE DRILLED 12/1/2022
LOGGED BY CDD
BORING NO. B-9
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1020 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
								SM	3 inches of asphalt with no base ARTIFICIAL FILL: Silty SAND; dark reddish brown; moist; fine grain sand; fine to coarse gravel; trace mica
								SM	ALLUVIUM: Silty SAND; dark reddish brown; moist; fine grain sand; fine to coarse gravel; trace mica
1015	5		▯	35				SM	-- same; dense; reddish brown; trace fine gravel; fine to medium grain sand
1010	10		☒	42	6.8	112.2		SM	-- same; medium dense; moist; very fine grain sand; fine gravel
1005	15		▯	21				SM	-- same; medium dense; moist; very fine grain sand; fine gravel
1000	20		☒	49	6.6	126.5		SM	-- same; dense; fine to medium grain sand
995	25		▯	35				SM	-- same; dense; light reddish brown; moist; fine to medium grain sand; fine gravel
990	30		☒	50 for 6"	7.5	111.5		SM	-- same; very dense; reddish brown with orange and black laminations; moist; fine to medium grain sand; mostly medium gravel with some fine
									Total Depth = 31.0 feet Backfilled on 12/1/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
985	35								

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 10

DATE DRILLED 12/1/2022 LOGGED BY CDD **BORING NO. B-10**
DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA DRILLER Baja Exploration SURFACE ELEVATION (ft.) 1021 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
										4 inches of asphalt concrete over 10 inches of base over 3 inches of old asphalt concrete
									SM	ARTIFICIAL FILL: Silty SAND; reddish brown; slightly moist; mostly fine grain sand with some medium
1016	5			25	6.2	112.6	C		SM	ALLUVIUM: Silty SAND; reddish brown; moist; mostly fine grain sand with some medium -- same; medium dense
1011	10			13					SM	-- same; medium dense; brown; slightly moist; mostly fine sand with some medium
1006	15			39	4.6	109.9	#200, DS		SM	-- same; medium dense; brown; slightly moist; fine to medium grain sand with less silt
1001	20			26					SM	--same; medium dense
996	25			47	2.8	109.2	#200		SW-SM	Well graded SAND with silt; dense; reddish yellow; slightly moist; fine to coarse grain sand; some organics/rootlets
991	30			30					SM	Silty SAND; dense; dark brown; moist; very fine sand; trace mica
986	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 11

DATE DRILLED 12/1/2022
LOGGED BY CDD
BORING NO. B-10
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1021 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven							
				50 for 5"	11.0	123.0			SM SM	Silty SAND; dense; dark brown; moist; very fine sand; trace mica *(continued)* -- same; very dense; reddish brown
981	40			57					SM	-- same; very dense; fine to medium grain sand
976	45			22/50 for 6"	9.3	124.1			SP-SM	Poorly graded SAND with silt; very dense; reddish brown; moist; fine to medium grain sand; micaceous
971	50			40					SM	Silty SAND; dense; reddish brown; moist; fine to medium grain sand
										Total Depth = 51.5 feet Backfilled on 12/1/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
966	55									
961	60									
956	65									
951	70									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 11

DATE DRILLED 12/1/2022
LOGGED BY CDD
BORING NO. B-11
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1019 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
										5 inches of asphalt concrete with no base
									SM	ARTIFICIAL FILL: Silty SAND; reddish brown; slightly moist; fine to medium grain sand; fine gravel
									SM	ALLUVIUM: Silty SAND; reddish brown; slightly moist; fine to medium grain sand; fine gravel
1014	5		☒	24	5.3	119.2	DS		SM	-- same; medium dense
1009	10		▯	20					SM	-- same; medium dense; brown; fine grain sand
1004	15		☒	29	10.4	105.9	C		SM	-- same; medium dense; reddish brown to yellowish brown; slightly moist; fine to medium grain sand
999	20		▯	27					SM	-- same; medium dense; brown; fine grain sand
994	25		☒	38	1.9	105.6			SP-SM	Poorly graded SAND with silt; medium dense; light yellowish brown; dry
989	30		▯	27					SM	Silty SAND; medium dense; yellowish brown; slightly moist; fine grain sand
										Total Depth = 31.0 feet Backfilled on 12/1/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
984	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 12

DATE DRILLED 12/1/2022
LOGGED BY CDD
BORING NO. B-12
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1014 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
								■		4 inches of asphalt over 6 inches of base
		/					CORR, EI, RV	▨	SM	ARTIFICIAL FILL: Silty SAND; reddish brown; dry; fine grain sand; fine to medium gravel
								▨	SM	ALLUVIUM: Silty SAND; reddish brown; dry; fine grain sand; fine to medium gravel
1009	5		☒	31	3.0	114.8	C	▨	SM	-- same; medium dense; slightly moist; fine grain sand
1004	10		▯	25			#200	▨	SP-SM	Poorly graded SAND with silt; medium dense; light yellowish brown; slightly moist; fine to medium grain sand
999	15		☒	48	4.5	106.7	DS	▨	SP-SM	-- same; dense
994	20		▯	35			#200	▨	SM	Silty SAND; dense; light yellowish brown; slightly moist; some silt layers
989	25		☒	56	2.4	116.7	C	▨	SP-SM	Poorly graded SAND with silt; dense; reddish brown; slightly moist; fine to medium grain sand
984	30		▯	45				▨	SM	Silty SAND; dense; reddish brown; slightly moist; mostly fine sand with some medium
979	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 13

DATE DRILLED 12/1/2022
LOGGED BY CDD
BORING NO. B-12
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1014 +(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
				77	5.3	112.9	DS		SM SM	Silty SAND; dense; reddish brown; slightly moist; mostly fine sand with some medium *(continued)* -- same; very dense
974	40			64					SM	-- same; very dense; light reddish brown; slightly moist; mostly fine grain sand
969	45			50 for 6"	5.1	110.9			SM	-- same; very dense; fine to medium sand
964	50			55					SM	-- same; very dense
										Total Depth = 51.5 feet Backfilled on 12/1/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
959	55									
954	60									
949	65									
944	70									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 13

DATE DRILLED 12/2/2022
LOGGED BY CDD
BORING NO. B-13
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1013 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
										5 inches of asphalt concrete with no base
									SM	ARTIFICIAL FILL: Silty SAND; brown; moist; fine grain sand; fine gravel
					10.8		DS, MAX			-- gets looser; yellowish brown
1008	5			20					SM	ALLUVIUM: Silty SAND; medium dense; yellowish brown; slightly moist; fine grain sand; fine gravel
1003	10			33	0.7	95.5	#200		SP	Poorly graded SAND; medium dense; yellowish brown; dry; fine to coarse grain sand; sample disturbed
998	15			40					SP	-- same; dense; light yellowish brown; fine to medium grain sand
993	20			52	1.6	109.5			SM	Silty SAND; dense; light yellowish brown; dry; mostly fine sand; fine gravel
988	25			34					SP-SM	Poorly graded SAND with silt; dense; light yellowish brown; slightly moist; fine to medium grain sand
983	30			40/50 for 6"	0.9	112.5	#200		SP-SM	Poorly graded SAND with silt; very dense; brown; dry; fine grain sand; fine gravel
										Total Depth = 31.0 feet Backfilled on 12/2/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
978	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 14

DATE DRILLED 12/2/2022
LOGGED BY CDD
BORING NO. B-14
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1013 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
										5 inches of asphalt concrete with no base
							CORR, EI		SM	ARTIFICIAL FILL: Silty SAND; brown; slightly moist; fine grain sand; fine gravel -- @1' some debris and brick pieces
1008	5			38	6.5	116.2	DS			-- same; medium dense; very dark brown; slightly moist; medium to coarse grain sand; fine gravel
									SP-SM	ALLUVIUM: Poorly graded SAND with silt; reddish brown; slightly moist; fine grain sand
1003	10			19			#200		SP-SM	-- same; medium dense; yellowish brown; slightly moist; fine to medium grain sand
998	15			37	2.2	106.2	C		SP-SM	-- same; medium dense
993	20			47			#200		SM	Silty SAND; dense; brown; slightly moist; fine to medium sand
988	25			62	2.6	108.4	DS		SP-SM	Poorly graded SAND with silt; dense; yellowish brown; slightly moist; fine to medium grain sand
983	30			29			#200		SM	Silty SAND; medium dense; yellowish brown; slightly moist
978	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO. 220759.3
REPORT DATE June 2023
FIGURE A - 15

DATE DRILLED 12/2/2022
LOGGED BY CDD
BORING NO. B-14
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1013 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
			☒	52	8.3	124.5			SM SM	Silty SAND; medium dense; yellowish brown; slightly moist *(continued)* -- same; dense; reddish brown; moist; fine to medium grain sand
973	40		☐	34			#200		SM	-- same; dense; brown; moist; fine grain sand
968	45		☒	46	12.2	112.1			SM	-- same; medium dense; some mica
963	50		☐	19					SM	-- same; medium dense; reddish brown; moist; fine to medium grain sand; trace fine gravel; some mica
										Total Depth = 51.5 feet Backfilled on 12/2/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
958	55									
953	60									
948	65									
943	70									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO. 220759.3
REPORT DATE June 2023

DATE DRILLED 12/2/2022
LOGGED BY CDD
BORING NO. P-1
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1012 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
										7 inches of asphalt concrete with no base
							#200		SM	ARTIFICIAL FILL: Silty SAND; brown; slightly moist; fine grain sand; trace fine gravel -- @ 1' changes to light reddish brown; trace subangular medium to coarse gravel
									SM	ALLUVIUM: Silty SAND; reddish brown; slightly moist; fine grain sand; trace fine gravel -- @3' some caliche veins -- @4' becomes denser
1007	5									Total Depth = 5.0 feet Backfilled on 12/2/2022 Backfilled with cuttings. Groundwater not encountered. Surface patched with PCC.
1002	10									
997	15									
992	20									
987	25									
982	30									
977	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO. 220759.3
REPORT DATE June 2023
FIGURE A - 16

DATE DRILLED 12/2/2022
LOGGED BY CDD
BORING NO. P-2
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1015 +(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
								■		5 inches of asphalt with no base
		▨						▨	SM	ARTIFICIAL FILL: Silty SAND; brown; slightly moist; medium grain sand; fine gravel -- @1.5' asphalt and brick debris -- @2' layer of 5" thick asphalt
		▨					#200	▨	SM	ALLUVIUM: Silty SAND; reddish brown; slightly moist; fine grain sand; some fine gravel; some organics/rootlets
1010	5									Total Depth = 5.0 feet Backfilled on 12/2/2022 Backfilled with cuttings. Groundwater not encountered. Surface patched with PCC.
1005	10									
1000	15									
995	20									
990	25									
985	30									
980	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 17

TWINING

2883 East Spring Street
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Long Beach CA 90806

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APPENDIX B
LABORATORY TESTING

TWINING

2883 East Spring Street
Suite 300
Long Beach CA 90806

Tel 562.426.3355
Fax 562.426.6424

Appendix B
Laboratory Testing

Laboratory Moisture Content and Density Tests

The moisture content and dry densities of selected driven samples obtained from the exploratory borings were evaluated in general accordance with the latest version of ASTM D2937. The results are shown on the boring logs in Appendix A and summarized in Table B-1.

No. 200 Wash Sieve

The amount of fines passing the No. 200 sieve was evaluated in accordance with ASTM D1140. The results are presented in Table B-2.

Resistance Value (R-value)

R-value testing was performed on a select bulk sample of the near-surface soils encountered at the site. The test was performed in general accordance with ASTM D2844. The result is summarized in Table B-3.

Maximum Dry Density-Optimum Moisture Content

One selected bulk sample was tested to evaluate the maximum dry density and its optimum moisture content. The test was performed in general accordance with ASTM test method D1557. The result is presented on Figure B-1.

Expansion Index

The expansion index of a select soil sample was evaluated in general accordance with ASTM D4829. The specimen was molded under a specified compactive energy at approximately 50 percent saturation. The prepared 1-inch thick by 4-inch diameter specimen was loaded with a surcharge of 144 pounds per square foot and was inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The result of expansion index test is presented in Table B-4.

Consolidation

Consolidation tests were performed on selected modified-California soil samples in general accordance with the latest version of ASTM D2435. The samples were inundated during testing to represent adverse field conditions. The percent consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample. Test results are presented on Figures B-2 through B-3 and the results from Hushmand are attached below.

Direct Shear

Direct shear tests were performed on a remolded sample and representative modified-California soil samples in general accordance with the latest version of ASTM D3080 to evaluate the shear strength characteristics of the selected materials. The samples were inundated during shearing to represent adverse field conditions. Test results are presented on Figures B-4 through B-10.

Corrosivity

Soil pH and resistivity tests were performed by Anaheim Test Lab, Inc. (ATLI) of Anaheim, California on a representative soil sample. The resistivity of the soil assumes saturated soil conditions. The chloride and sulfate contents of the selected samples were evaluated in general accordance with the latest versions of Caltrans test methods CT417, CT422, and CT 643. The test results are presented on Table B-6 and the ATLI report included in this appendix.

Table B-1 - Moisture Content and Dry Density

Boring No.	Depth (feet)	Moisture Content (%)	Dry Density (pcf)
B-9	10	6.8	112.2
B-9	20	6.6	126.5
B-9	30	7.5	111.5
B-10	5	6.2	112.6
B-10	15	4.6	109.9
B-10	25	2.8	109.2
B-10	35	11.0	123.0
B-10	45	9.3	124.1
B-11	5	5.3	119.2
B-11	15	10.4	105.9
B-11	25	1.9	105.6
B-12	5	3.0	114.8
B-12	15	4.5	106.7
B-12	25	2.4	116.7
B-12	35	5.3	112.9
B-12	45	5.1	110.9
B-13	10	0.7	95.5
B-13	20	1.6	109.5
B-13	30	0.9	112.5
B-14	5	6.5	116.2
B-14	15	2.2	106.2
B-14	25	2.6	108.4
B-14	35	8.3	124.5
B-14	45	12.2	112.1

Table B-2 - No. 200 Wash Sieve

Boring No.	Depth (feet)	Percent Passing No. 200 Sieve
B-10	15	14.2
B-10	25	8.0
B-12	10	12.0
B-12	20	31.8
B-13	10	4.3
B-13	30	10.2
B-14	10	10.4
B-14	20	30.1
B-14	30	15.7
B-14	40	46.7
P-1	1-5’ BULK	42.4
P-2	3-5’ BULK	44.4

Table B-3 Resistance Value (R-value)

Boring No.	Depth (feet)	R Value
B-12	1 - 5	40

Table B-4 - Expansion Index

Boring No.	Depth (feet)	Expansion Index	Expansion Potential
B-12	1 - 5	0	Very low
B-14	1 - 5	4	Very low

Table B-5 - Corrosivity Test Results

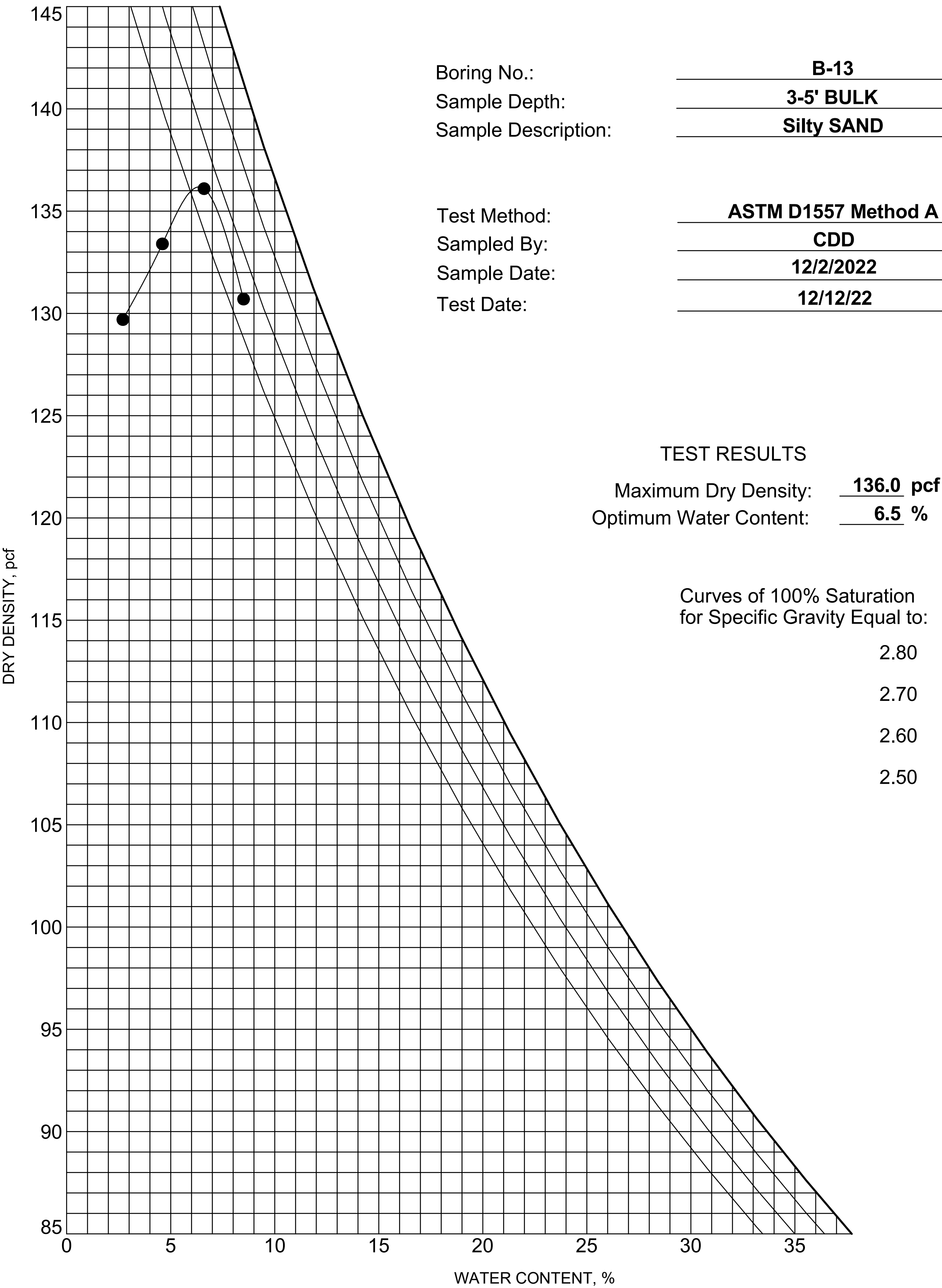
Boring No.	Depth (feet)	pH	Minimum Resistivity (ohm-cm)	Water Soluble Sulfate (ppm)	Water Soluble Chloride (ppm)
B-12	1-5	7.4	6,500	86	18
B-14	1-5	7.2	4,300	139	28

Boring No.: **B-13**
Sample Depth: **3-5' BULK**
Sample Description: **Silty SAND**

Test Method: **ASTM D1557 Method A**
Sampled By: **CDD**
Sample Date: **12/2/2022**
Test Date: **12/12/22**

TEST RESULTS

Maximum Dry Density: **136.0** **pcf**
Optimum Water Content: **6.5** **%**



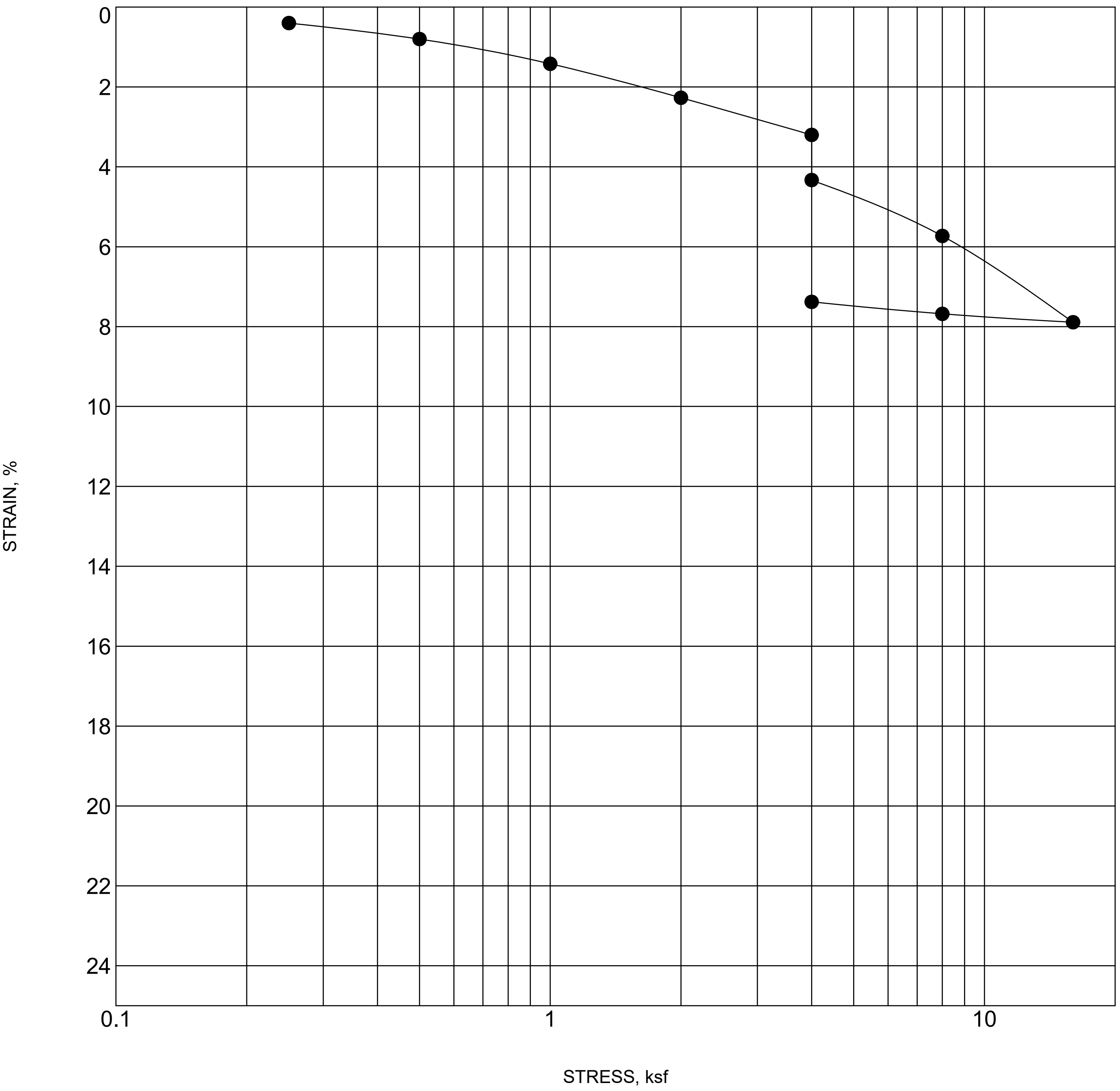
TWINING

MOISTURE-DENSITY RELATIONSHIP

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-1

COMPACTION (MODIFIED BY PAUL) 220759.3 - UCR OASIS GEOTECH.GPJ TWINING LABS.GDT 12/14/22



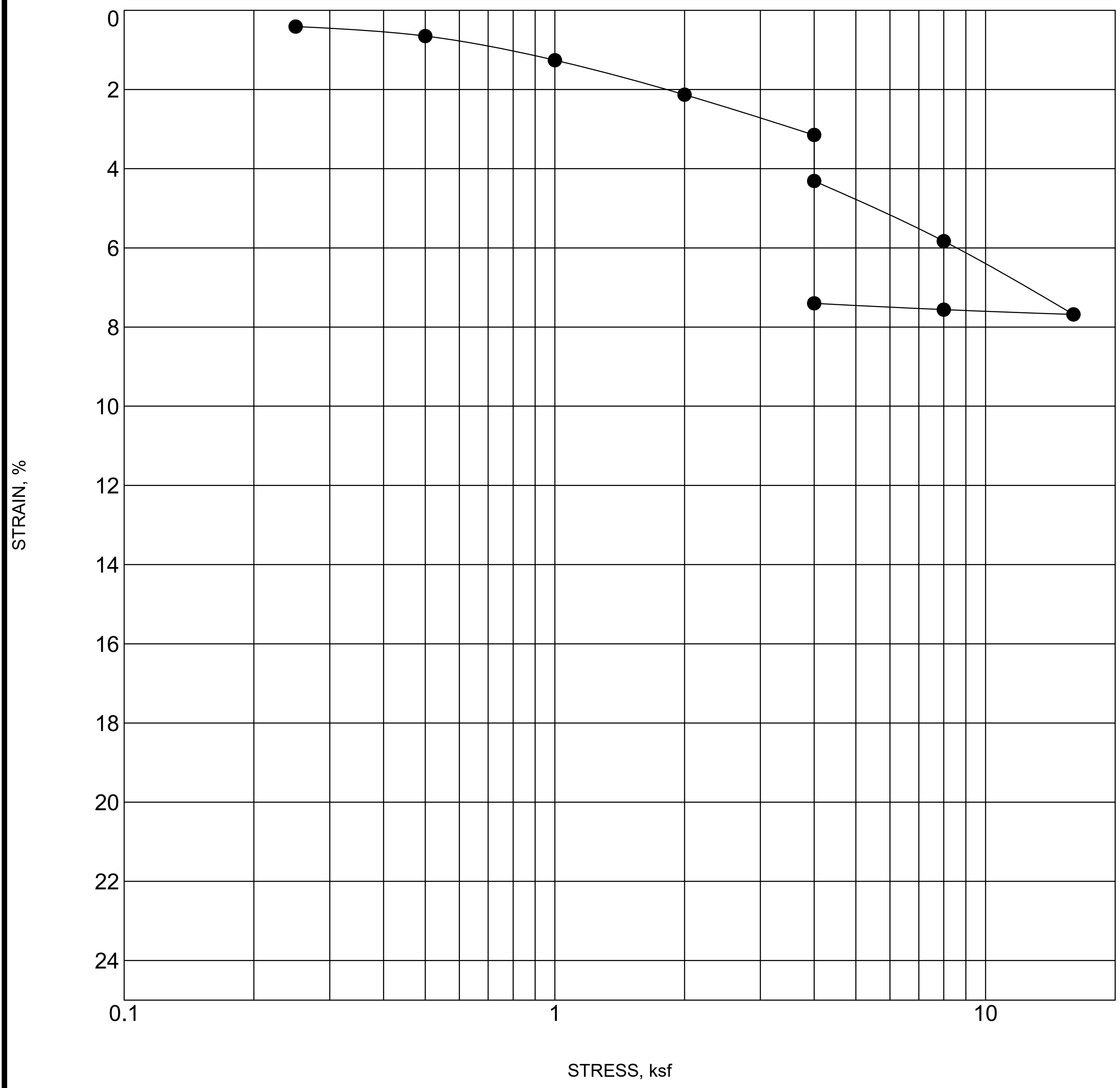
	Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-11 at 15 ft**	**Silty SAND**	**105.9**	**10.4**

TWINING

CONSOLIDATION TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-2



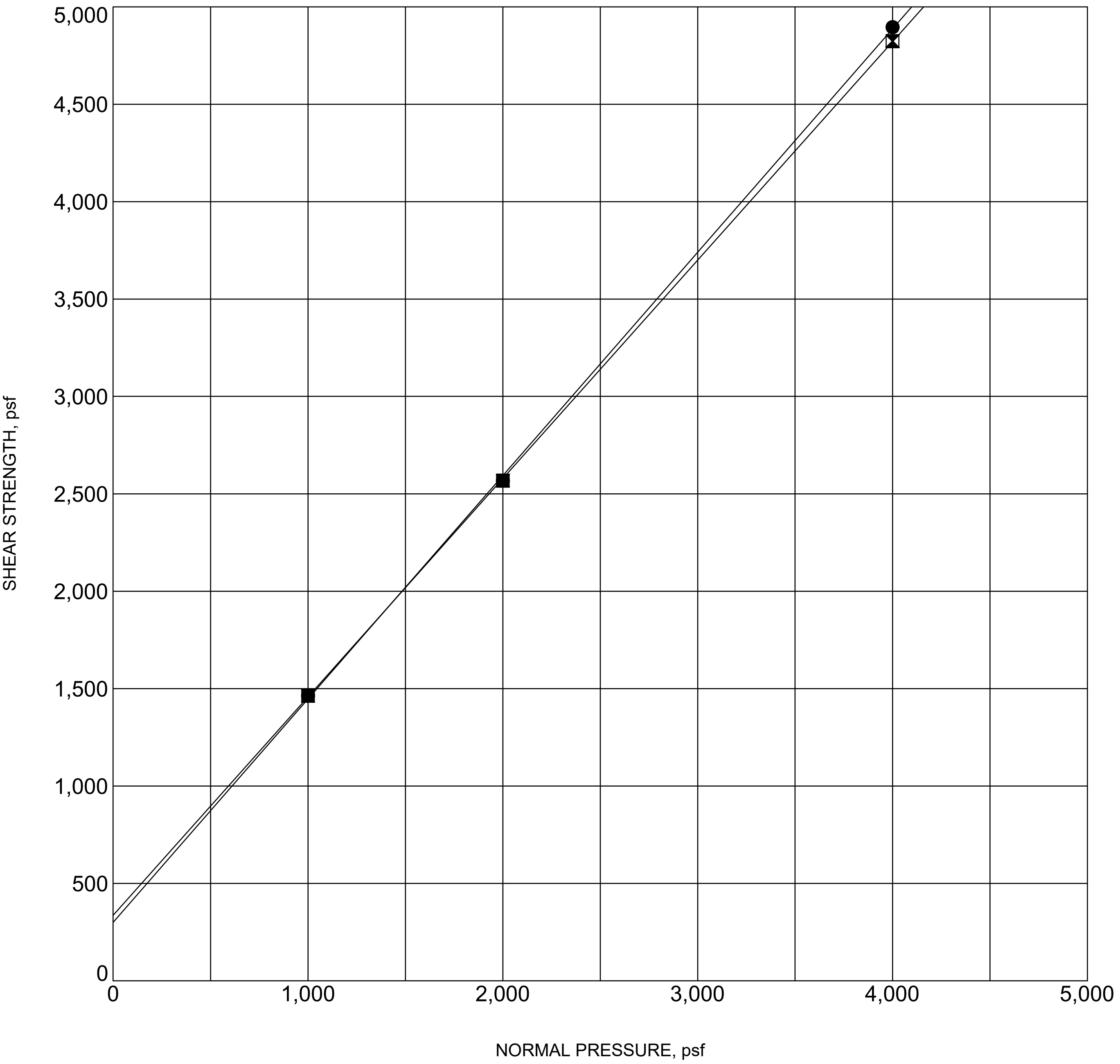
	Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-14 at 15 ft**	**Poorly graded SAND with silt**	**106.2**	**2.2**

TWINING

CONSOLIDATION TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-3



Boring No.:	B-10
Sample Depth (ft):	15
Sample Description:	Silty SAND
Strain Rate (in./min):	0.005
Dry Density (pcf):	109.9

Shear Strength Parameters

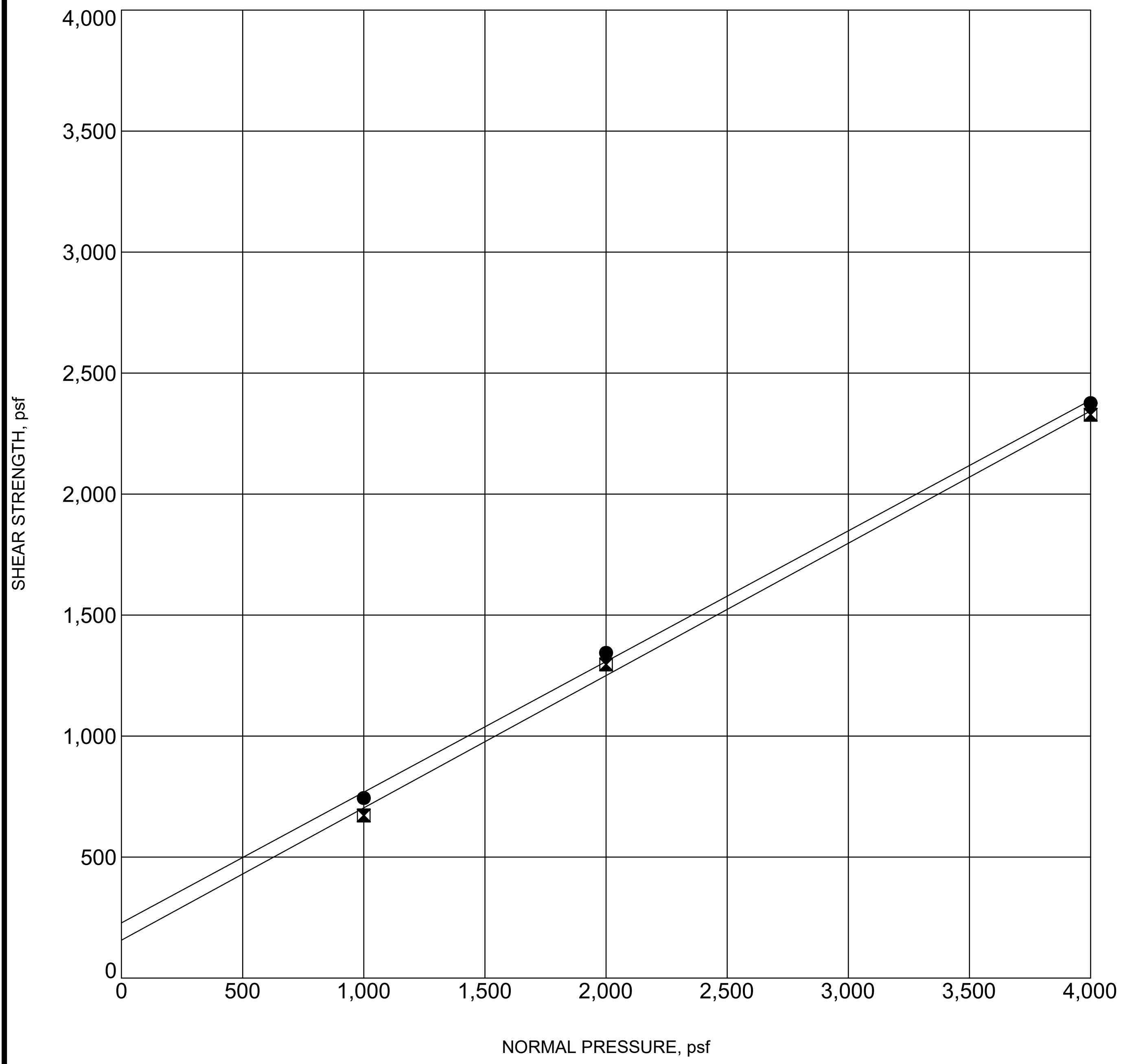
	Peak —●—	**Ultimate** —☒—
Cohesion, C (psf):	300	336
Friction Angle, Ø (deg):	49	48
Initial Moisture (%):	4.6	
Final Moisture (%):	12.7	

TWINING

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-4



Shear Strength Parameters

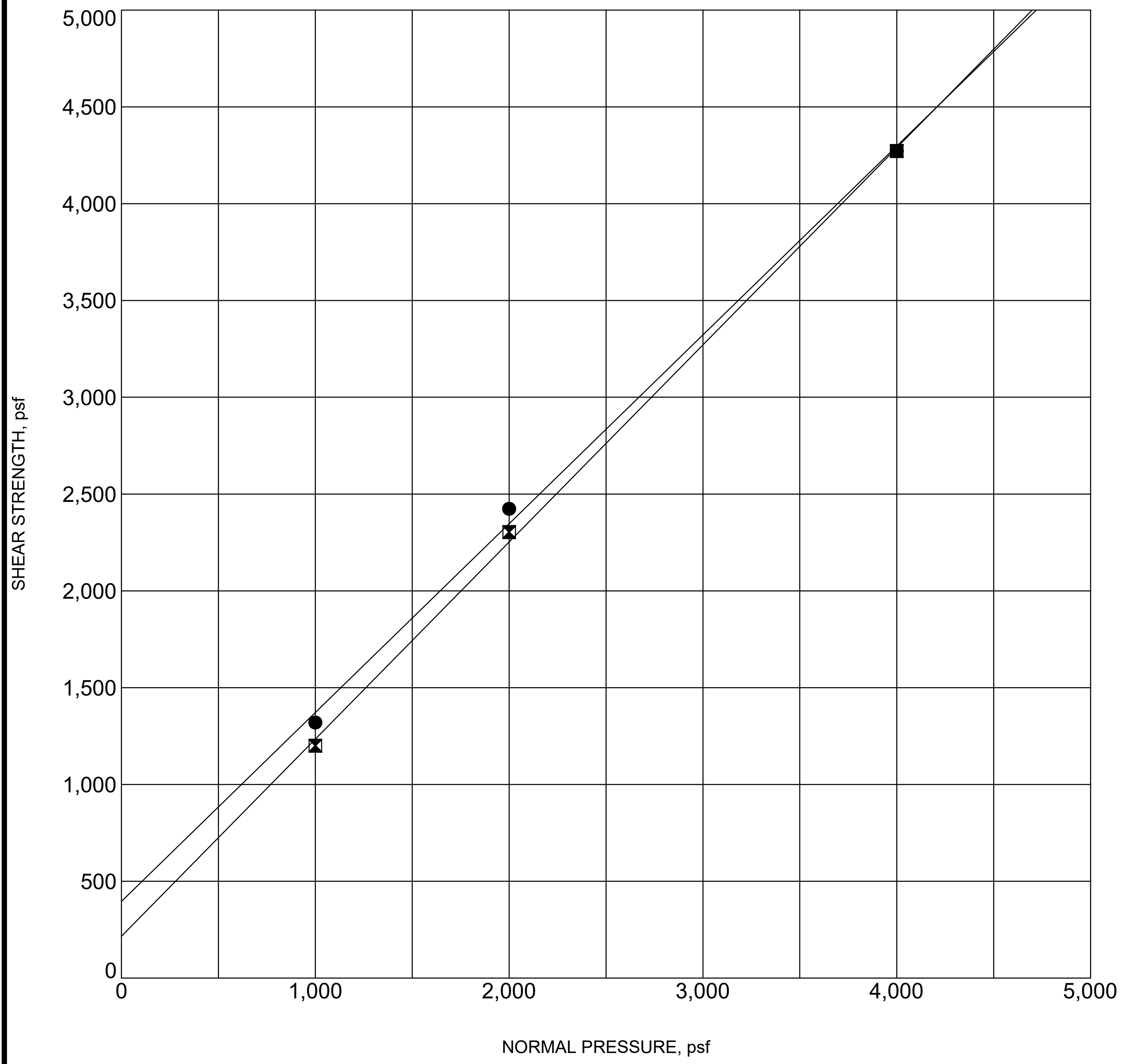
		Peak ●	Ultimate ☒
Boring No.: B-11	**Cohesion, C (psf):**	228	156
Sample Depth (ft): 5	**Friction Angle, Ø (deg):**	28	29
Sample Description: Silty SAND			
Strain Rate (in./min): 0.005	**Initial Moisture (%):**	5.3	
Dry Density (pcf): 119.2	**Final Moisture (%):**	10.1	

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-5

TWINING



Boring No.: B-12
Sample Depth (ft): 15
Sample Description: Poorly graded SAND with silt
Strain Rate (in./min): 0.005
Dry Density (pcf): 106.7

Shear Strength Parameters

	Peak —●—	Ultimate —⧗—
Cohesion, C (psf):	396	216
Friction Angle, Ø (deg):	44	46

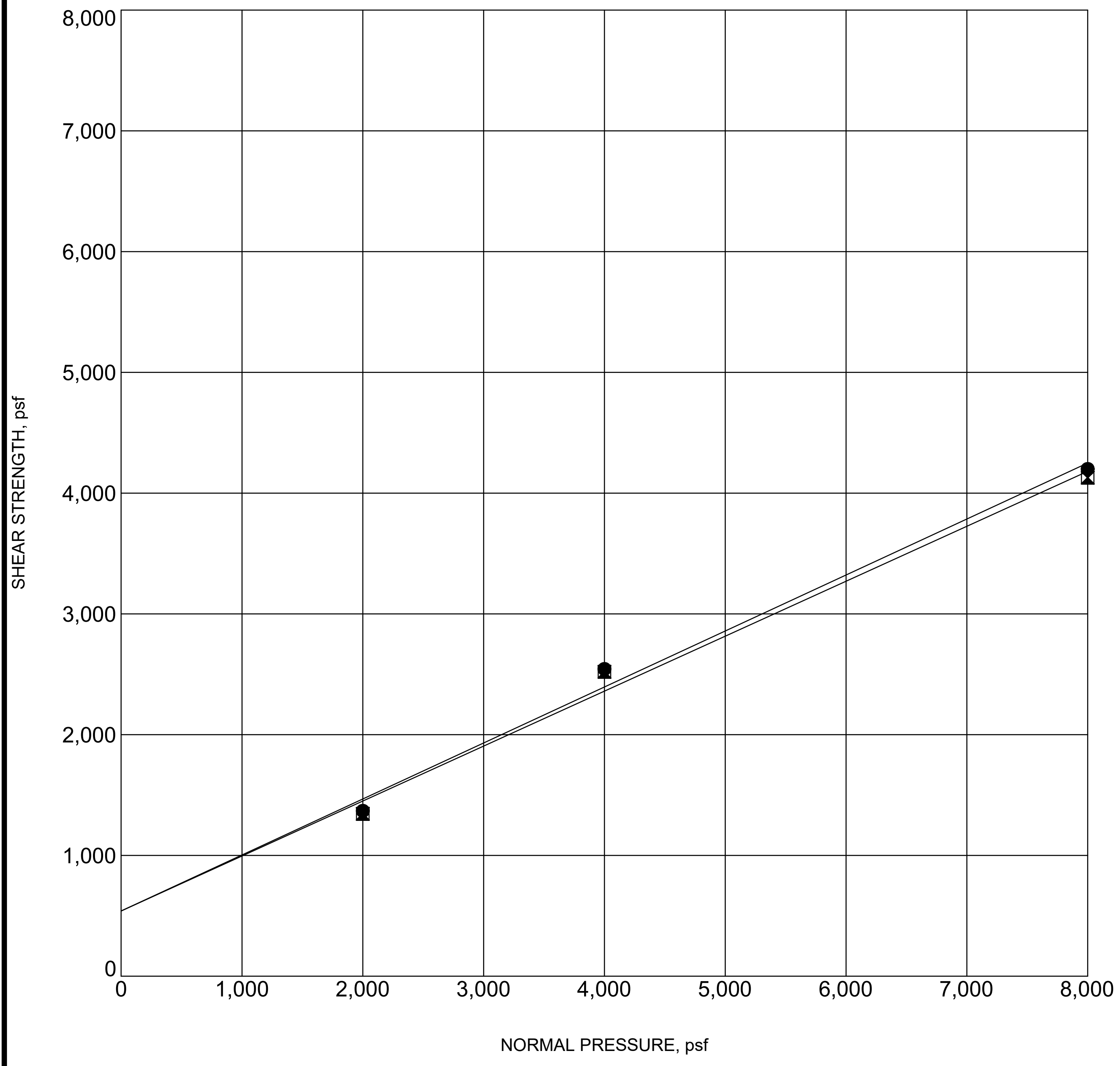
Initial Moisture (%): 4.5
Final Moisture (%): 15.7

TWINING

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-6



Boring No.:	B-12
Sample Depth (ft):	35
Sample Description:	Silty SAND
Strain Rate (in./min):	0.005
Dry Density (pcf):	112.9

Shear Strength Parameters

	Peak —●—	**Ultimate** –⧗–
Cohesion, C (psf):	540	540
Friction Angle, Ø (deg):	25	24
Initial Moisture (%):	5.3	
Final Moisture (%):	11.4	

TWINING

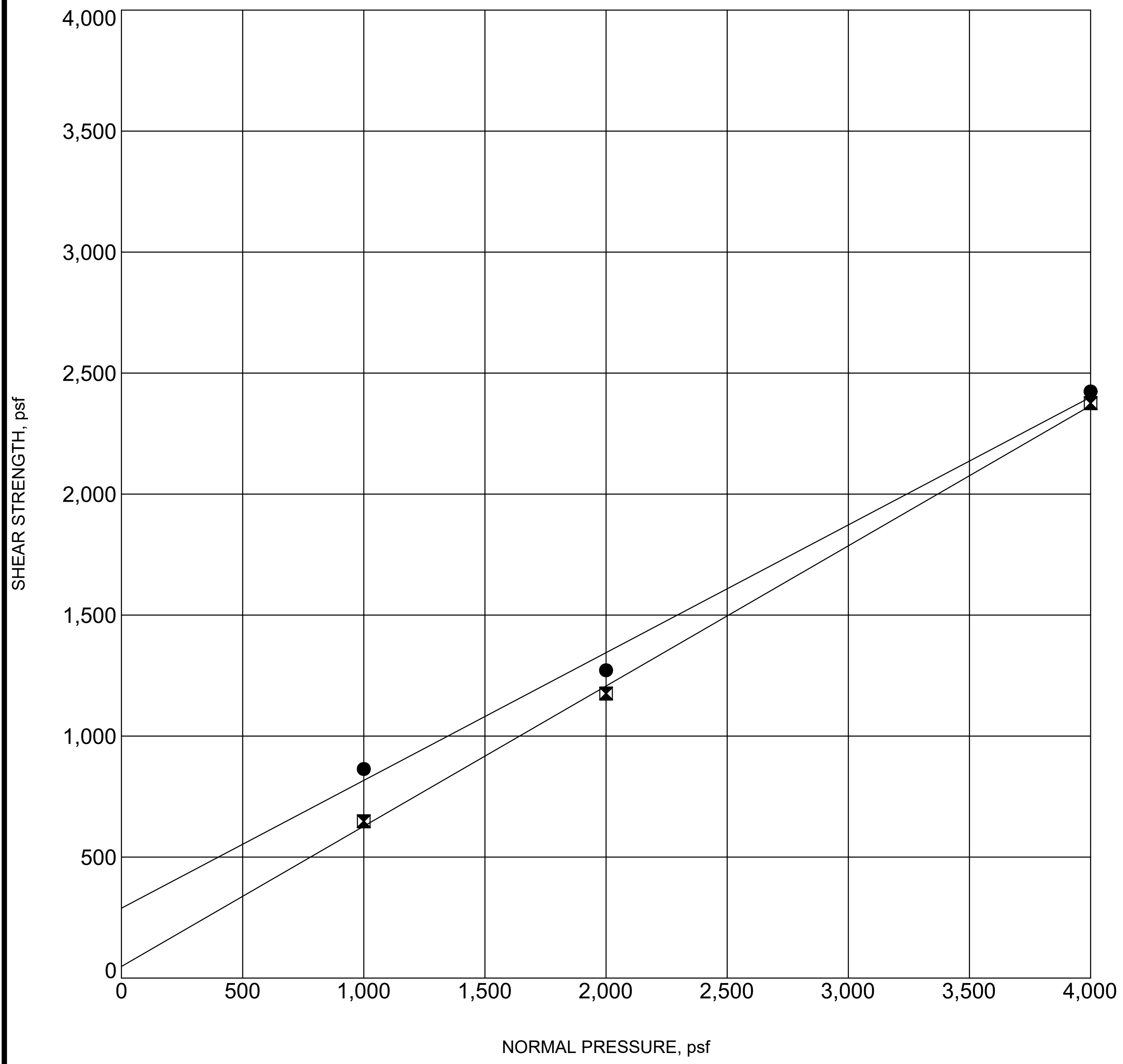
DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.
220759.3

REPORT DATE
June 2023

FIGURE B-7



Shear Strength Parameters

	Peak ●	Ultimate ☒
Cohesion, C (psf):	288	48
Friction Angle, Ø (deg):	28	30

Initial Moisture (%): 6.4
Final Moisture (%): 10.8

Boring No.: B-13
Sample Depth (ft): 3-5' BULK
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 122.6

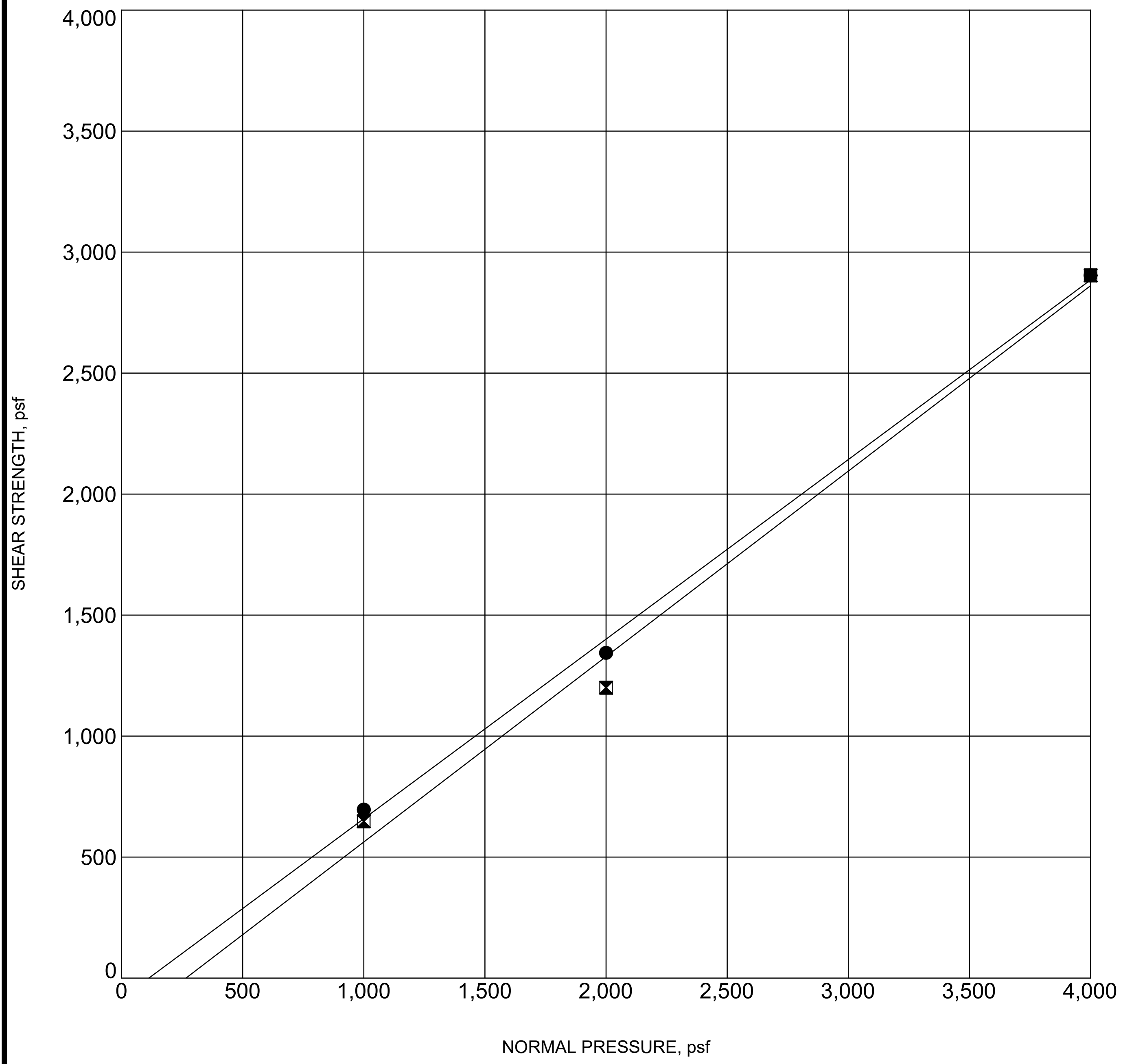
Remolded to 90% relative compaction

TWINING

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-8



Shear Strength Parameters

	Peak ●—	Ultimate ☒
Cohesion, C (psf):	0	0
Friction Angle, Ø (deg):	36	37

Boring No.: B-14
Sample Depth (ft): 5
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 116.2

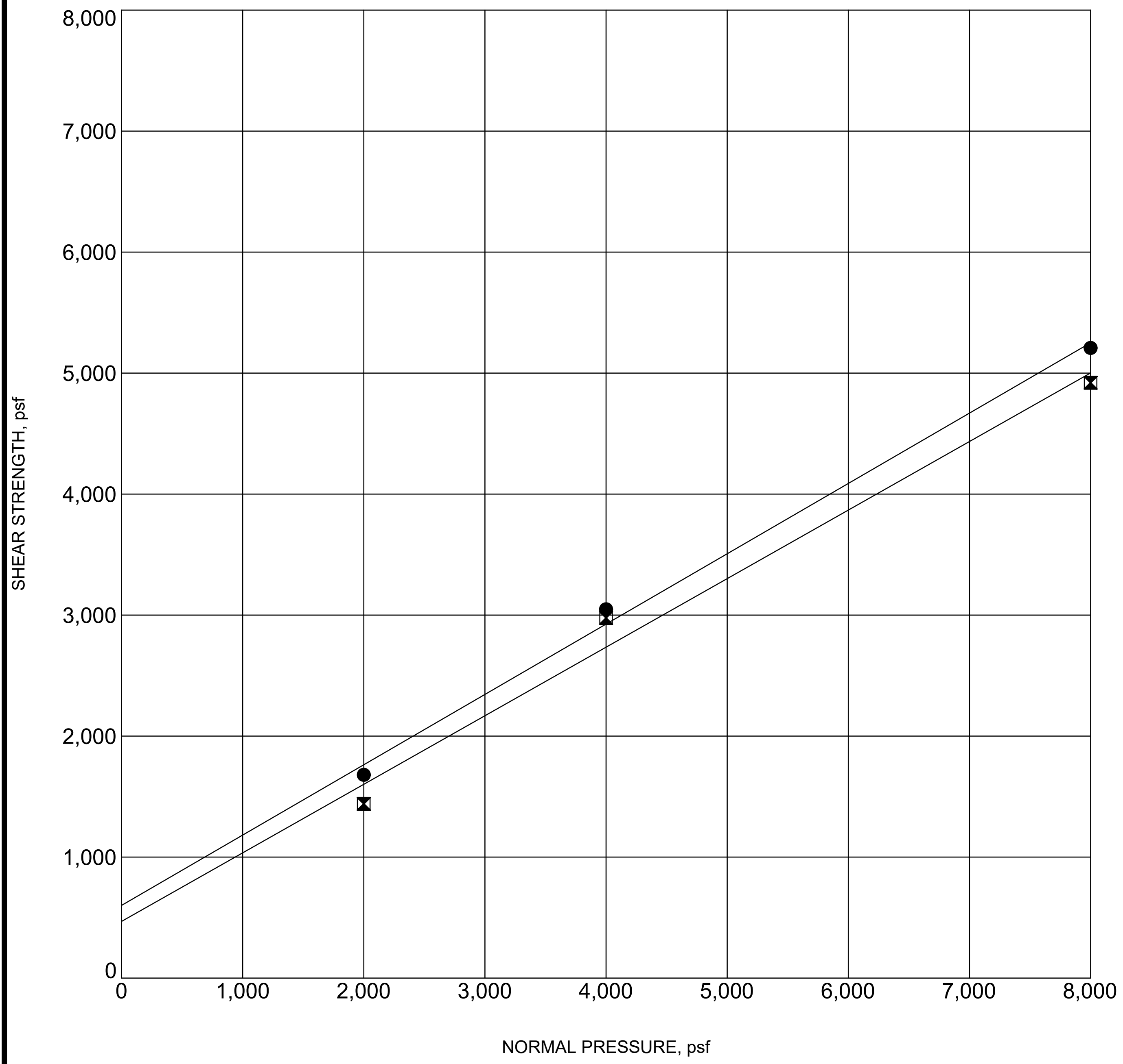
Initial Moisture (%): 6.5
Final Moisture (%): 11.6

TWINING

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-9



Shear Strength Parameters

	Peak —●—	Ultimate —☒—
Cohesion, C (psf):	600	468
Friction Angle, Ø (deg):	30	30

Initial Moisture (%): 2.6
Final Moisture (%): 14.8

Boring No.: B-14
Sample Depth (ft): 25
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 108.4

TWINING

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-10

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Hushmand Associates, Inc.
250 Goddard, Irvine,
CA 92618

p. (949) 777-1274
w. haieng.com
e. hai@haieng.com

January 16, 2023

Twining Inc.
2883 East Spring Street,
Long Beach, CA 90805

Attention: Mr. Doug Crayton

SUBJECT: Laboratory Test Result
Project Name: UCR Oasis
Project No.: 220759.3
HAI Project No.: TWI-23-001

Dear Mr. Crayton:

Enclosed is the result of the laboratory testing program conducted on samples from the above referenced project. The testing performed for this program was conducted in general accordance with the following test procedure:

Type of Test	Test Procedure
Consolidation	ASTM D2435

Attached are: three (3) Consolidation test results.

We appreciate the opportunity to provide our testing services to Twining Inc. If you have any questions regarding the test results, please contact us.

Sincerely,

M. Varsei

Kang C. Lin, BS, EIT
Laboratory Manager

Maryam Varsei, M.Sc.
Senior Staff Engineer

CONSOLIDATION TEST

ASTM D2435

Client :	Twining Inc.	*HAI Project No.:*	TWI-23-001
Project Name:	UCR Oasis	*Tested by:*	KL
Project Number:	220579.3	*Checked by:*	SD
Boring No.:	B-10	*Date:*	01/26/23
Sample No.:	R		
Type of Sample:	Undisturbed Ring		
Depth (ft):	5		
Soil Description:	Brown, Silty Sand (SM)		

Initial Total Weight	Final Total Weight	Final Dry Weight
(g)	(g)	(g)
150.48	159.18	141.11

			Initial Conditions	**Final Conditions**
Height	H	(in)	1.024	0.935
Height of Solids	H_s	(in)	0.693	0.693
Height of Water	H_w	(in)	0.125	0.241
Height of Air	H_a	(in)	0.206	0.001
Dry Density		**(pcf)**	**114.5**	**134.0**
Water Content		**(%)**	**6.6**	**12.8**
Saturation		**(%)**	**37.7**	**99.4**

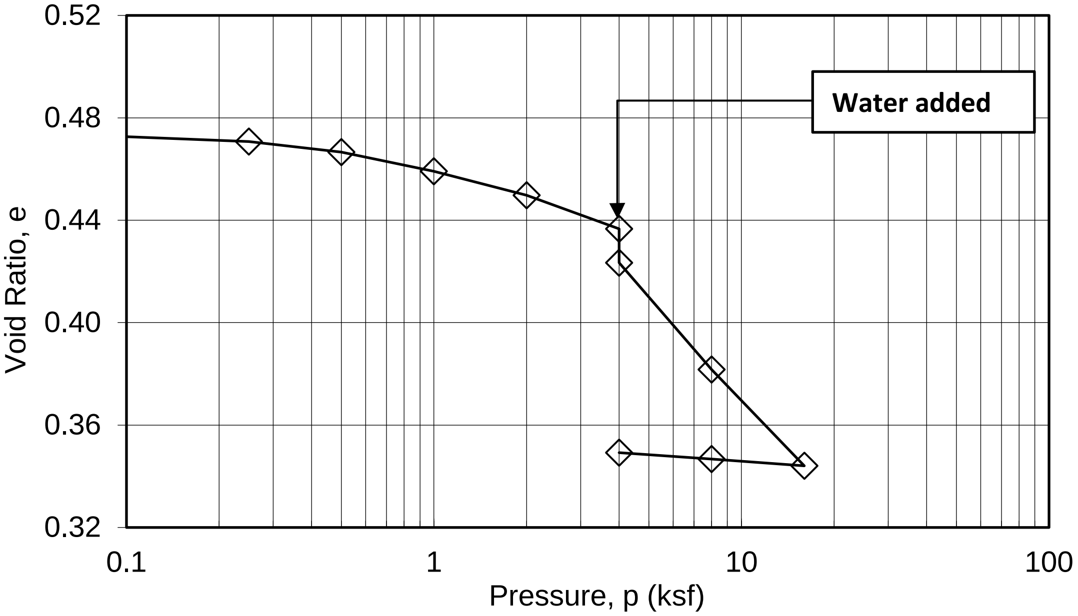
* Saturation is calcualted based on Gs= 2.71

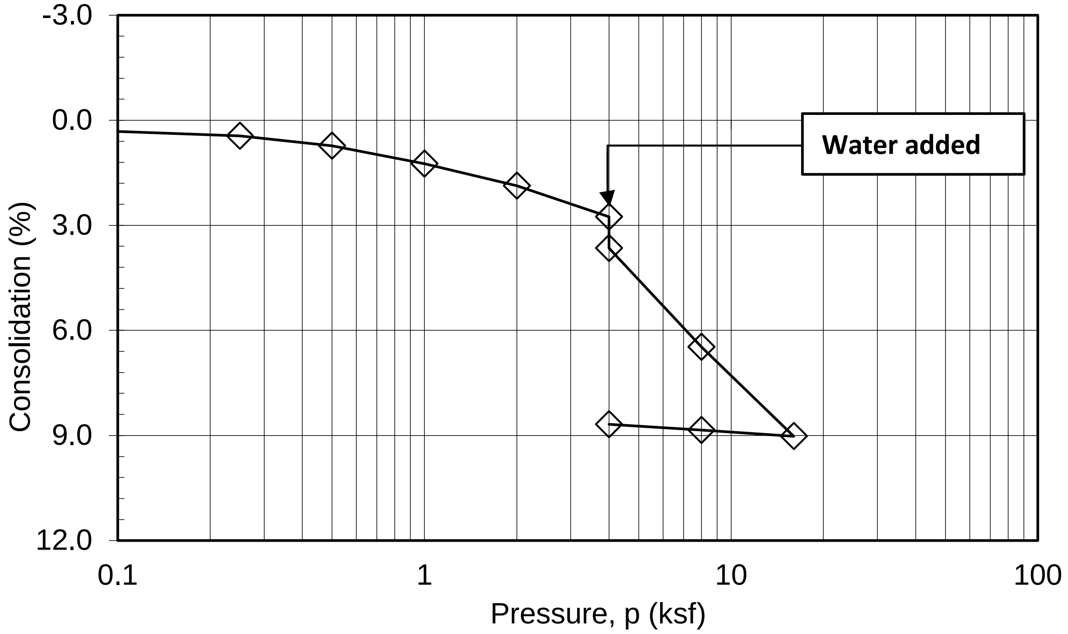
Load (ksf)	**δH (in)**	**H (in)**	**Voids (in)**	**e**	**Consol. (%)**	**a_v (ksf^{-1})**	**M_v (ksf^{-1})**	**Comment**
0.01	-------	1.0240	0.331	0.477	0			
0.25	0.0046	1.0194	0.326	0.471	0.4	2.8E-02	1.9E-02	
0.5	0.0075	1.0165	0.323	0.467	0.7	1.7E-02	1.1E-02	
1	0.0127	1.0113	0.318	0.459	1.2	1.5E-02	1.0E-02	
2	0.0191	1.0049	0.312	0.450	1.9	9.3E-03	6.4E-03	
4	0.0283	0.9957	0.303	0.437	2.8	6.6E-03	4.6E-03	
4	0.0374	0.9866	0.293	0.423	3.7	Water Added		
8	0.0663	0.9577	0.265	0.382	6.5	1.0E-02	7.5E-03	
16	0.0924	0.9316	0.238	0.344	9.0	4.7E-03	3.5E-03	
8	0.0906	0.9334	0.240	0.347	8.8	Unloaded		
4	0.0889	0.9351	0.242	0.349	8.7			

CONSOLIDATION TEST

ASTM D2435

Client :	Twining Inc.	*HAI Project No.:*	TWI-23-001
Project Name:	UCR Oasis	*Tested by:*	KL
Project Number:	220579.3	*Checked by:*	SD
Boring No.:	B-10	*Date:*	01/26/23
Sample No.:	R		
Type of Sample:	Undisturbed Ring		
Depth (ft):	5		
Soil Description:	Brown, Silty Sand (SM)		





CONSOLIDATION TEST

ASTM D2435

Client : Twining Inc.
Project Name: UCR Oasis
Project Number: 220579.3
Boring No.: B-12
Sample No.: R
Type of Sample: Undisturbed Ring
Depth (ft): 5
Soil Description: Brown, Silty Sand (SM)

HAI Project No.: TWI-23-001
Tested by: KL
Checked by: SD
Date: 01/26/23

Initial Total Weight	Final Total Weight	Final Dry Weight
(g)	(g)	(g)
140.69	153.04	136.92

			Initial Conditions	**Final Conditions**
Height	H	(in)	1.000	0.925
Height of Solids	H_s	(in)	0.673	0.673
Height of Water	H_w	(in)	0.050	0.215
Height of Air	H_a	(in)	0.277	0.038
Dry Density		**(pcf)**	**113.7**	**132.8**
Water Content		**(%)**	**2.8**	**11.8**
Saturation		**(%)**	**15.3**	**84.9**

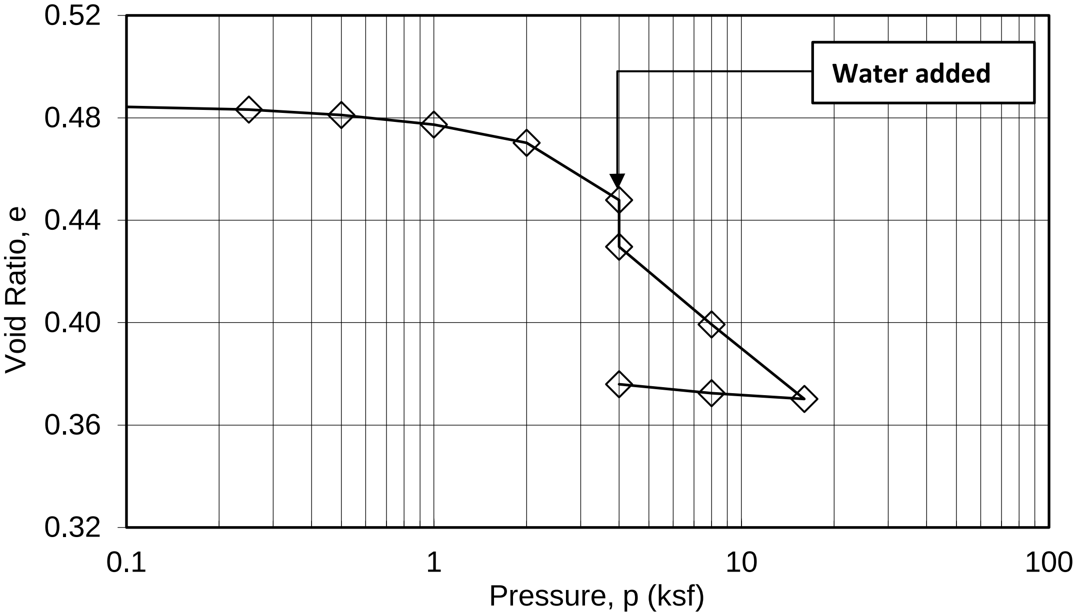
* Saturation is calcualted based on Gs= 2.71

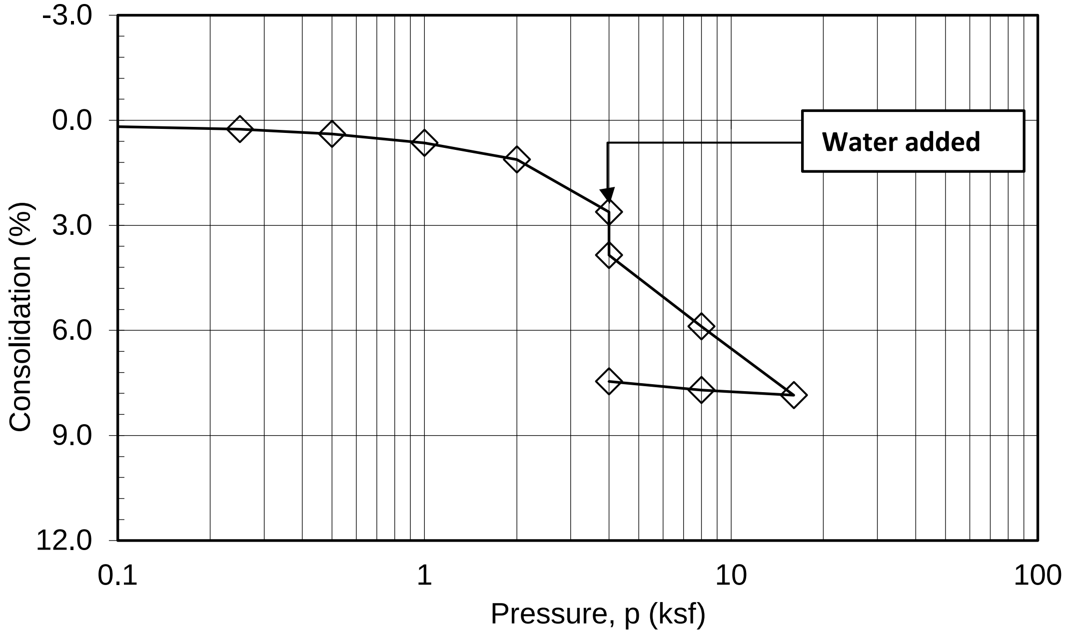
Load (ksf)	**δH (in)**	**H (in)**	**Voids (in)**	**e**	**Consol. (%)**	**a_v (ksf^{-1})**	**M_v (ksf^{-1})**	**Comment**
0.01	-------	1.0000	0.327	0.487	0			
0.25	0.0025	0.9975	0.325	0.483	0.3	1.5E-02	1.0E-02	
0.5	0.0039	0.9961	0.324	0.481	0.4	8.3E-03	5.6E-03	
1	0.0065	0.9935	0.321	0.477	0.6	7.6E-03	5.2E-03	
2	0.0112	0.9888	0.316	0.470	1.1	7.0E-03	4.8E-03	
4	0.0262	0.9738	0.301	0.448	2.6	1.1E-02	7.7E-03	
4	0.0385	0.9615	0.289	0.430	3.8	Water Added		
8	0.0589	0.9411	0.269	0.399	5.9	7.6E-03	5.4E-03	
16	0.0785	0.9215	0.249	0.370	7.8	3.6E-03	2.7E-03	
8	0.0770	0.9230	0.250	0.372	7.7	Unloaded		
4	0.0746	0.9254	0.253	0.376	7.5			

CONSOLIDATION TEST

ASTM D2435

Client :	Twining Inc.	*HAI Project No.:*	TWI-23-001
Project Name:	UCR Oasis	*Tested by:*	KL
Project Number:	220579.3	*Checked by:*	SD
Boring No.:	B-12	*Date:*	01/26/23
Sample No.:	R		
Type of Sample:	Undisturbed Ring		
Depth (ft):	5		
Soil Description:	Brown, Silty Sand (SM)		





HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

CONSOLIDATION TEST

ASTM D2435

Client :	Twining Inc.	*HAI Project No.:*	TWI-23-001
Project Name:	UCR Oasis	*Tested by:*	KL
Project Number:	220579.3	*Checked by:*	SD
Boring No.:	B-12	*Date:*	01/26/23
Sample No.:	R		
Type of Sample:	Undisturbed Ring		
Depth (ft):	25		
Soil Description:	Brown, Silty Sand (SM)		

Initial Total Weight	Final Total Weight	Final Dry Weight
(g)	(g)	(g)
141.21	148.33	130.72

			Initial Conditions	Final Conditions
Height	H	(in)	1.000	0.883
Height of Solids	H_s	(in)	0.642	0.642
Height of Water	H_w	(in)	0.140	0.234
Height of Air	H_a	(in)	0.218	0.006
Dry Density		**(pcf)**	**108.6**	**139.4**
Water Content		**(%)**	**8.0**	**13.5**
Saturation		**(%)**	**39.0**	**97.5**

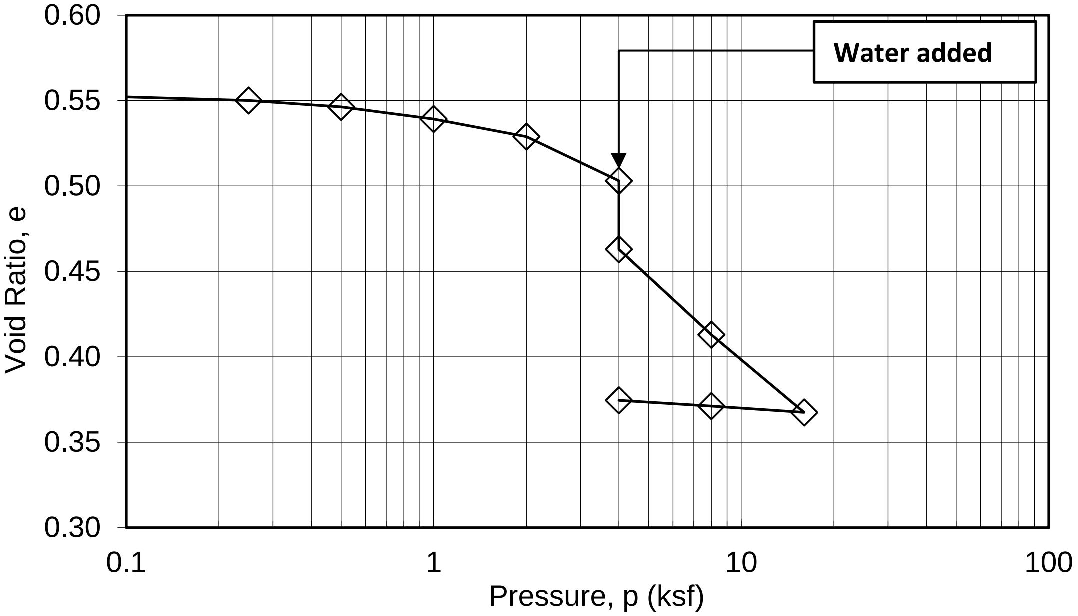
* Saturation is calcualted based on Gs= 2.71

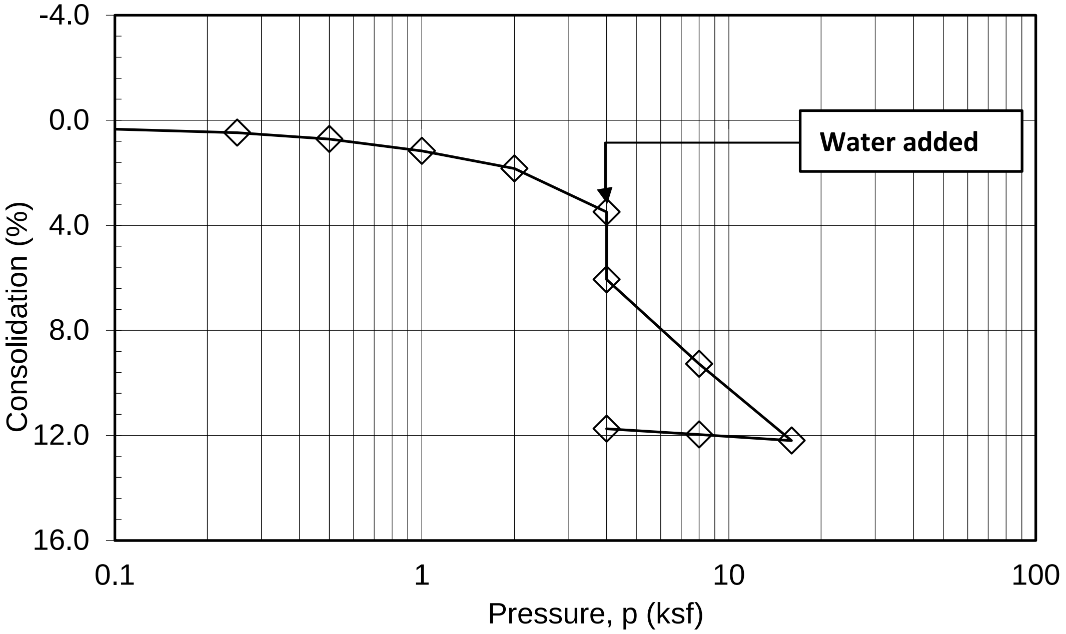
Load (ksf)	**δH (in)**	**H (in)**	**Voids (in)**	**e**	**Consol. (%)**	**a_v (ksf^{-1})**	**M_v (ksf^{-1})**	**Comment**
0.01	-------	1.0000	0.358	0.557	0			
0.25	0.0047	0.9953	0.353	0.550	0.5	3.0E-02	2.0E-02	
0.5	0.0072	0.9928	0.351	0.546	0.7	1.5E-02	1.0E-02	
1	0.0117	0.9883	0.346	0.539	1.2	1.4E-02	9.1E-03	
2	0.0184	0.9817	0.340	0.529	1.8	1.0E-02	6.8E-03	
4	0.0349	0.9651	0.323	0.503	3.5	1.3E-02	8.6E-03	
4	0.0606	0.9394	0.297	0.463	6.1	Water Added		
8	0.0927	0.9073	0.265	0.413	9.3	1.3E-02	8.9E-03	
16	0.1220	0.8781	0.236	0.368	12.2	5.7E-03	4.2E-03	
8	0.1196	0.8804	0.238	0.371	12.0	Unloaded		
4	0.1175	0.8825	0.240	0.374	11.7			

CONSOLIDATION TEST

ASTM D2435

Client :	Twining Inc.	*HAI Project No.:*	TWI-23-001
Project Name:	UCR Oasis	*Tested by:*	KL
Project Number:	220579.3	*Checked by:*	SD
Boring No.:	B-12	*Date:*	01/26/23
Sample No.:	R		
Type of Sample:	Undisturbed Ring		
Depth (ft):	25		
Soil Description:	Brown, Silty Sand (SM)		





ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949) 336-6544

DATE: 12/13/2022

TWINING LABS
3310 AIRPORT WAY
LONG BEACH, CA 90806

P.O. NO.: Soils120722

LAB NO.: C-6627, 1-2

SPECIFICATION: CT-643/417/422

MATERIAL: Soil

Project No.: 220759.3
Project: UCR Oasis
WO No.: W01-22-36016
Sample Date: 12/2/2022

ANALYTICAL REPORT

CORROSION SERIES

SUMMARY OF DATA

	pH	MIN RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
1) B-12 Bulk	7.4	6,500	86	18
2) B-14 Bulk	7.2	4,300	139	28

RESPECTFULLY SUBMITTED

ANAHEIM TEST LAB

WES BRIDGER LAB MANAGER

TWINING

2883 East Spring Street
Suite 300
Long Beach CA 90806

Tel 562.426.3355
Fax 562.426.6424

APPENDIX C
PREVIOUS LABORATORY TESTING

2883 East Spring
Street
Suite 300
Long Beach CA
90806

Tel 562.426.3355
Fax 562.426.6424

TWINING

Appendix B
Laboratory Testing

Laboratory Moisture Content and Density Tests

The moisture content and dry densities of selected driven samples obtained from the exploratory borings were evaluated in general accordance with the latest version of ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A. A Modified Proctor test was also performed on near-surface soils to determine the maximum dry density and optimum water content for compaction. The tests were performed in accordance with ASTM D 1557 Method A. The results are summarized below in Table B-1 and a copy of the curve is attached to this appendix as Figures B-1 and B-2.

Wash Sieve

The amount of fines passing the No. 200 sieve was evaluated by the wash sieve. The test procedure was in general accordance with ASTM D 1140. The results are presented in Table B-2.

Expansion Index Test

The expansion index was evaluated in general accordance with ASTM D 4829. The specimen was molded under a specified compactive energy at approximately 50 percent saturation. The prepared 1-inch thick by 4-inch diameter specimen was loaded with a surcharge of 144 pounds per square foot and was inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The result of the Expansion Index test is presented on Table B-4.

Consolidation Test

Consolidation tests were performed on a selected driven soil sample by in general accordance with the latest version of ASTM D2435. The sample was inundated during testing to represent adverse field conditions. The percent consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample. The results of the test are attached to this appendix as Figures B-3 through B-6.

Direct Shear Tests

Direct shear tests were performed on selected remolded and relatively undisturbed soil samples in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of the materials. The samples were inundated during shearing to represent adverse field conditions. The results are summarized in Table B-5. Plots can be found in Figures B-7 through B-12.

Corrosivity

Soil pH and resistivity tests were performed by Anaheim Test Lab on a representative soil sample in general accordance with the latest version of California Test Method 643. The chloride content of the selected sample was evaluated in general accordance with the latest version of California Test Method 422. The sulfate content of the selected samples was evaluated in general accordance with the latest version of California Test Method 417. The test results are presented on Table B-6.

Resistance Value (R-Value)

R-value testing was performed on a select bulk sample of the near-surface soils encountered at the site. The test was performed in general accordance with ASTM D 28444. The results are summarized in Table B-7.

Table B-1
Moisture-Density Relationship Testing

ASTM D 1557 Method A

Boring No.	Depth (feet)	Maximum Dry Density (pcf)	Optimum Water Content (%)
B-1	0 – 5	136.0	5.5
B-3	0 – 5	130.0	8.0

Table B-2
No. 200 Wash Sieve Results

Boring No.	Depth (feet)	Percent Passing #200
B-1	40	19.1
B-3	15	27.5
B-3	25	38.4
B-4	10	10.6
B-4	15	11.4
B-5	35	7.1
B-5	45	54
B-6	10	9.7
B-6	30	21.7
B-7	30	38.8

2883 East Spring
Street
Suite 300
Long Beach CA
90806

Tel 562.426.3355
Fax 562.426.6424

TWINING

Table B-4
Expansion Index Test Result

Boring No.	Depth (feet)	Expansion Index
B-8	0 – 5	9

Table B-5
Direct Shear Tests

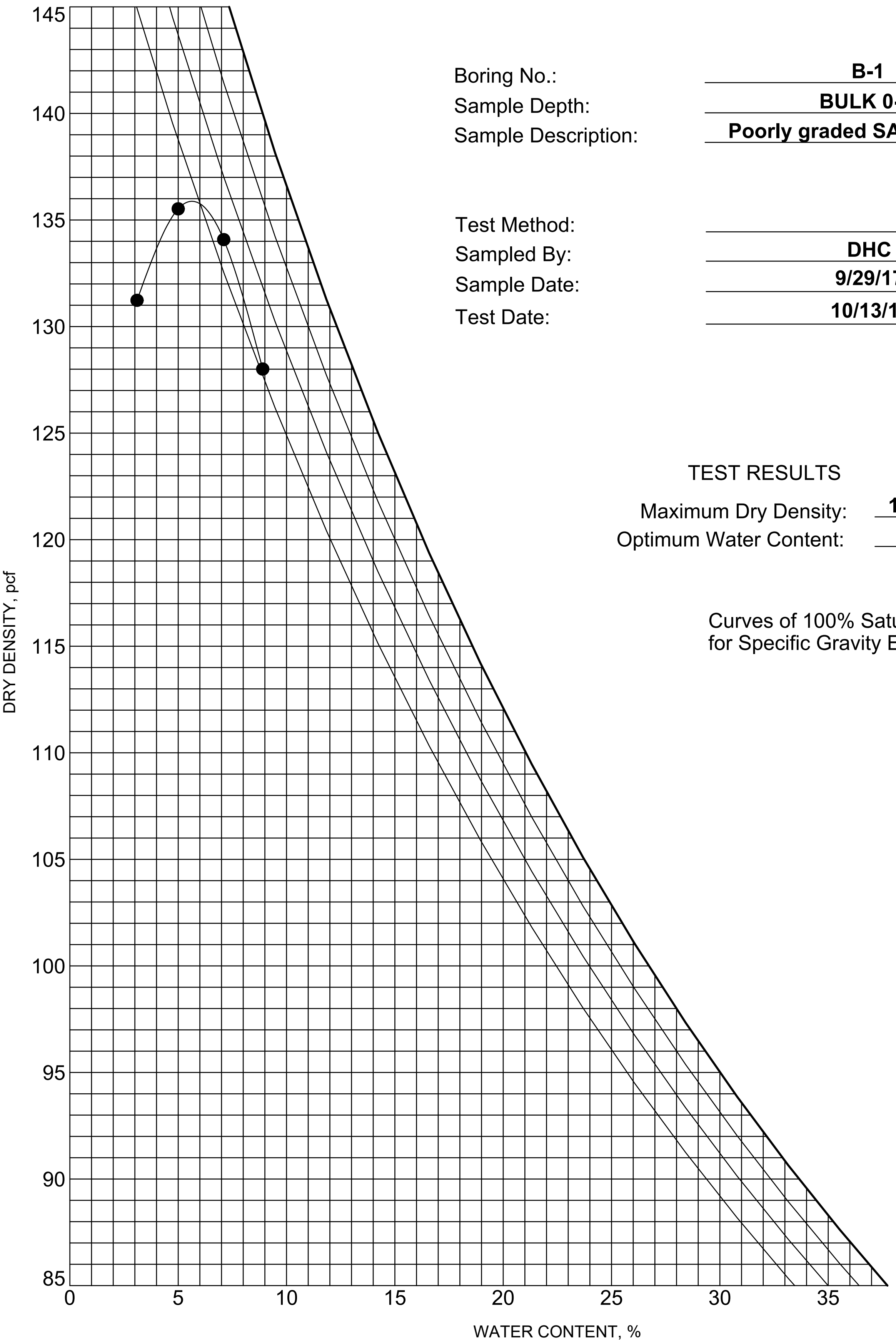
Boring No.	Depth (feet)	Remolded	Peak		Ultimate	
			C (psf)	ϕ (deg)	C (psf)	ϕ (deg)
B-1	15	No	245	38	190	37
B-1	25	No	248	36	190	35
B-3	30	No	275	36	100	36
B-3	40	No	300	36	100	35
B-5	20	No	262	35	50	35
B-6	25	No	840	31	505	32

Table B-6
Soil Corrosivity Test Results

Boring No.	Depth (feet)	pH	Water Soluble Sulfate (ppm)	Water Soluble Chloride (ppm)	Minimum Resistivity (ohm-cm)
B-1	0-5	6.9	161	73	2,800

Table B-7
R-Value Test Results

Boring No.	Depth (feet)	R-Value
B-4	0 – 5	41



Boring No.: **B-1**
Sample Depth: **BULK 0-5'**
Sample Description: **Poorly graded SAND with silt**

Test Method:
Sampled By: **DHC**
Sample Date: **9/29/17**
Test Date: **10/13/17**

TEST RESULTS

Maximum Dry Density: **136.0 pcf**
Optimum Water Content: **5.5 %**

Curves of 100% Saturation
for Specific Gravity Equal to:

2.80

2.70

2.60

2.50

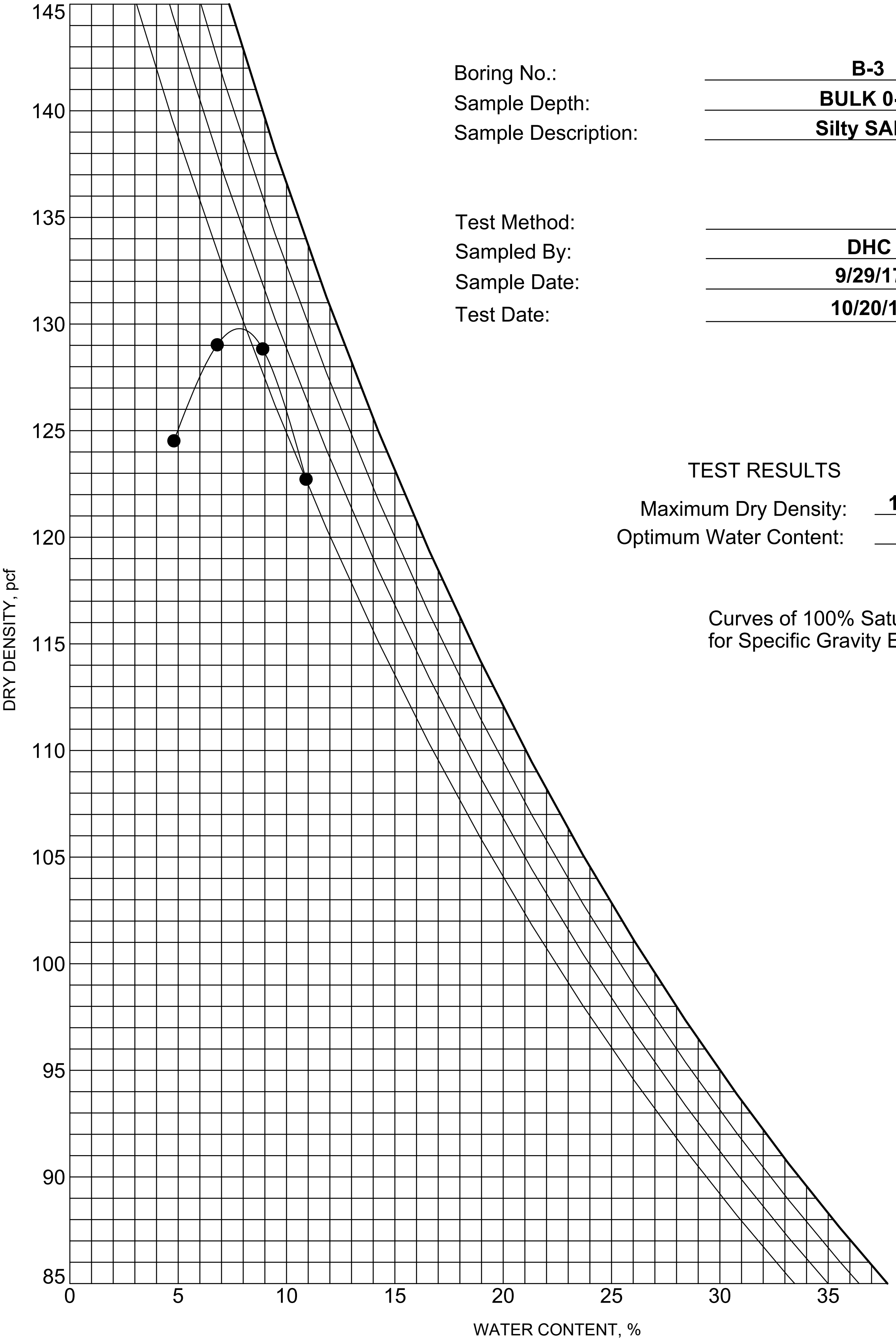
COMPACTION (MODIFIED BY PAUL) 170875.3 - UCR OUTPATIENT PAVILLION.GPJ TWINING LABS.GDT 10/25/17

TWINING

MOISTURE-DENSITY RELATIONSHIP

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	FIGURE B-1
170875.3	October 2017	



Boring No.: **B-3**
Sample Depth: **BULK 0-5'**
Sample Description: **Silty SAND**

Test Method:
Sampled By: **DHC**
Sample Date: **9/29/17**
Test Date: **10/20/13**

TEST RESULTS

Maximum Dry Density: **130.0 pcf**
Optimum Water Content: **8.0 %**

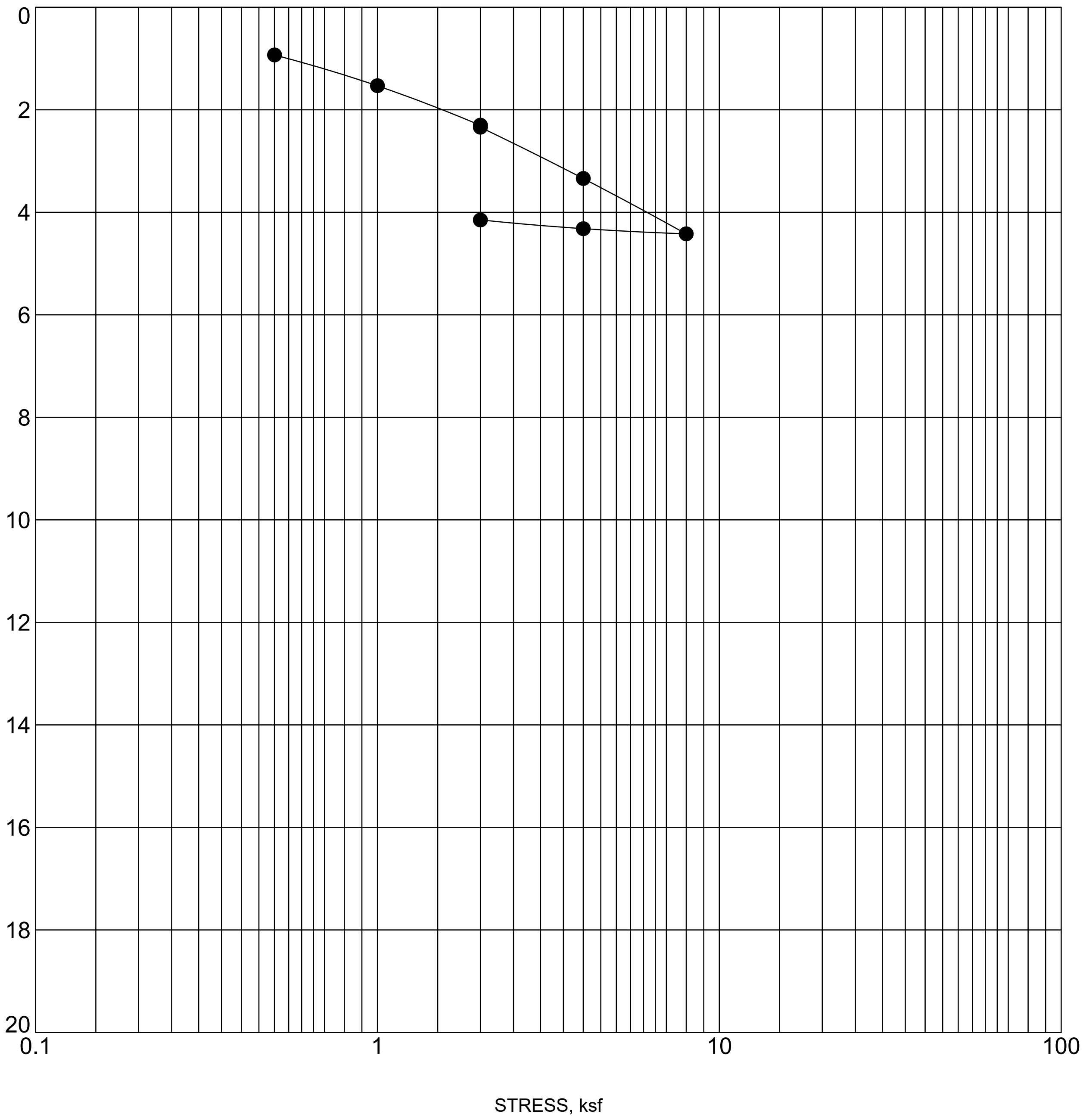
Curves of 100% Saturation
for Specific Gravity Equal to:
2.80
2.70
2.60
2.50

TWINING

MOISTURE-DENSITY RELATIONSHIP

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-2

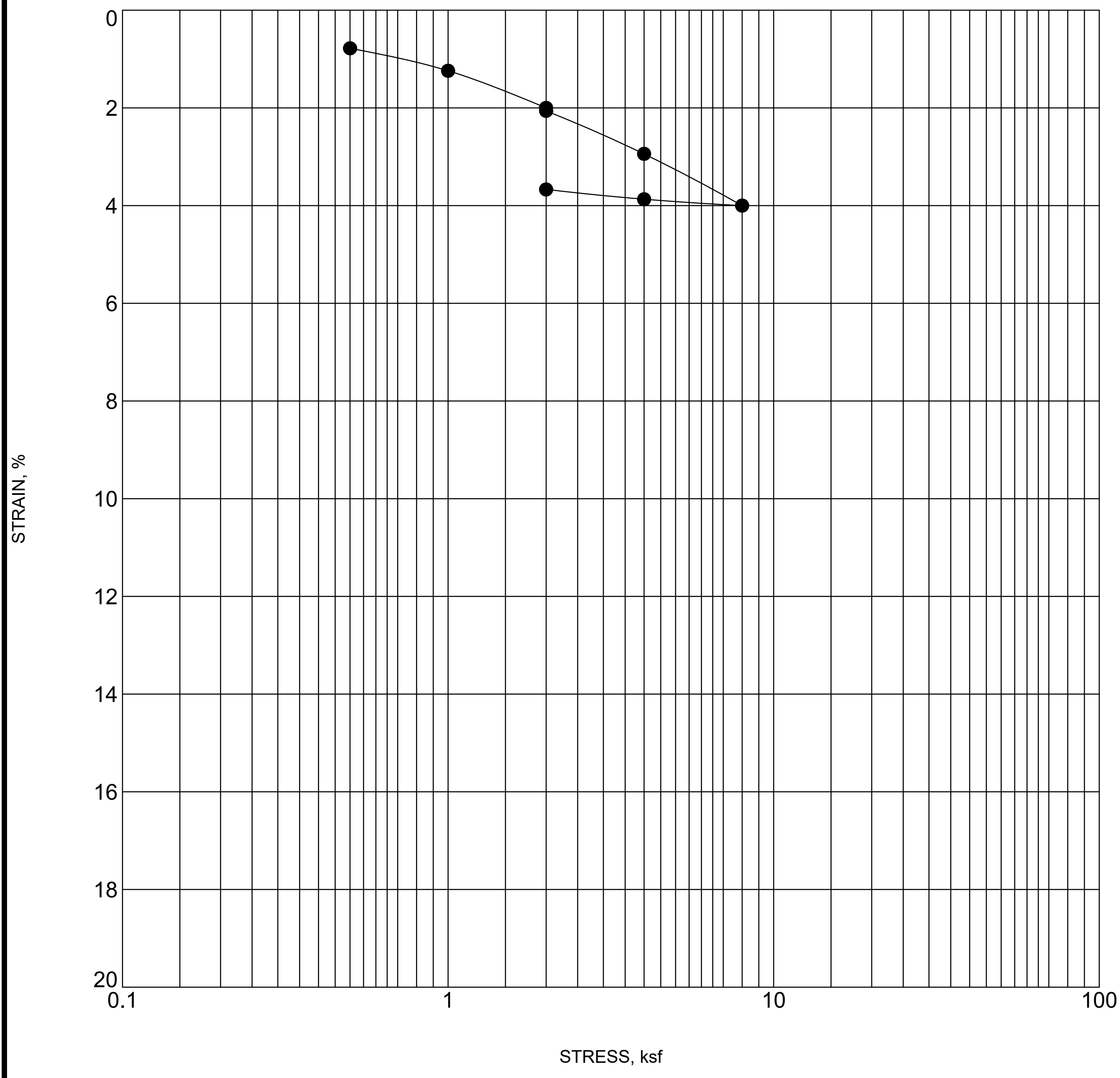


	Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-1 at 35 ft**	**Silty SAND**	**109.4**	**6.2**

CONSOLIDATION TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-3

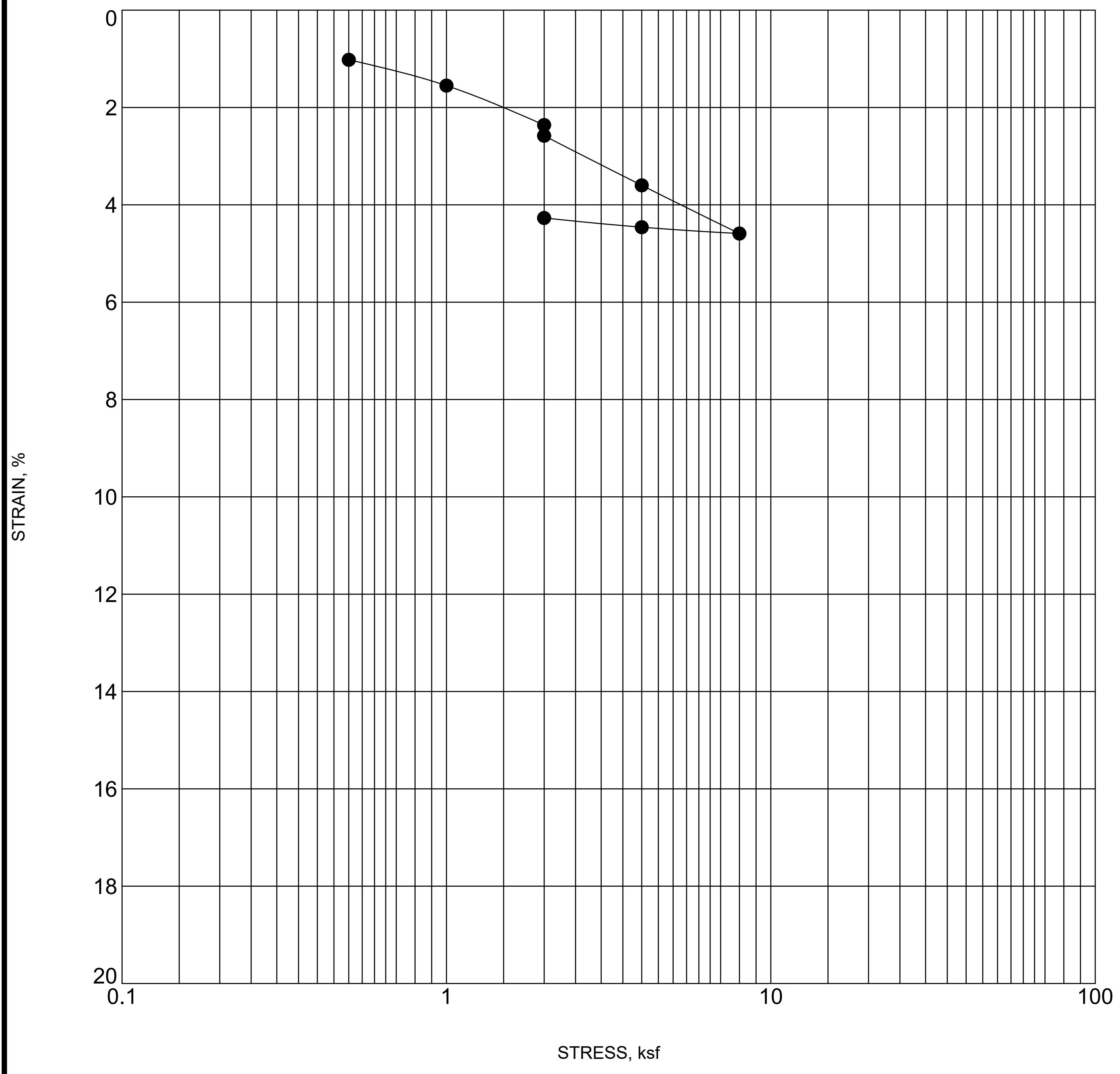


	Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-2 at 10 ft**	**Silty SAND**	**9.0**	**121.0**

CONSOLIDATION TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-4

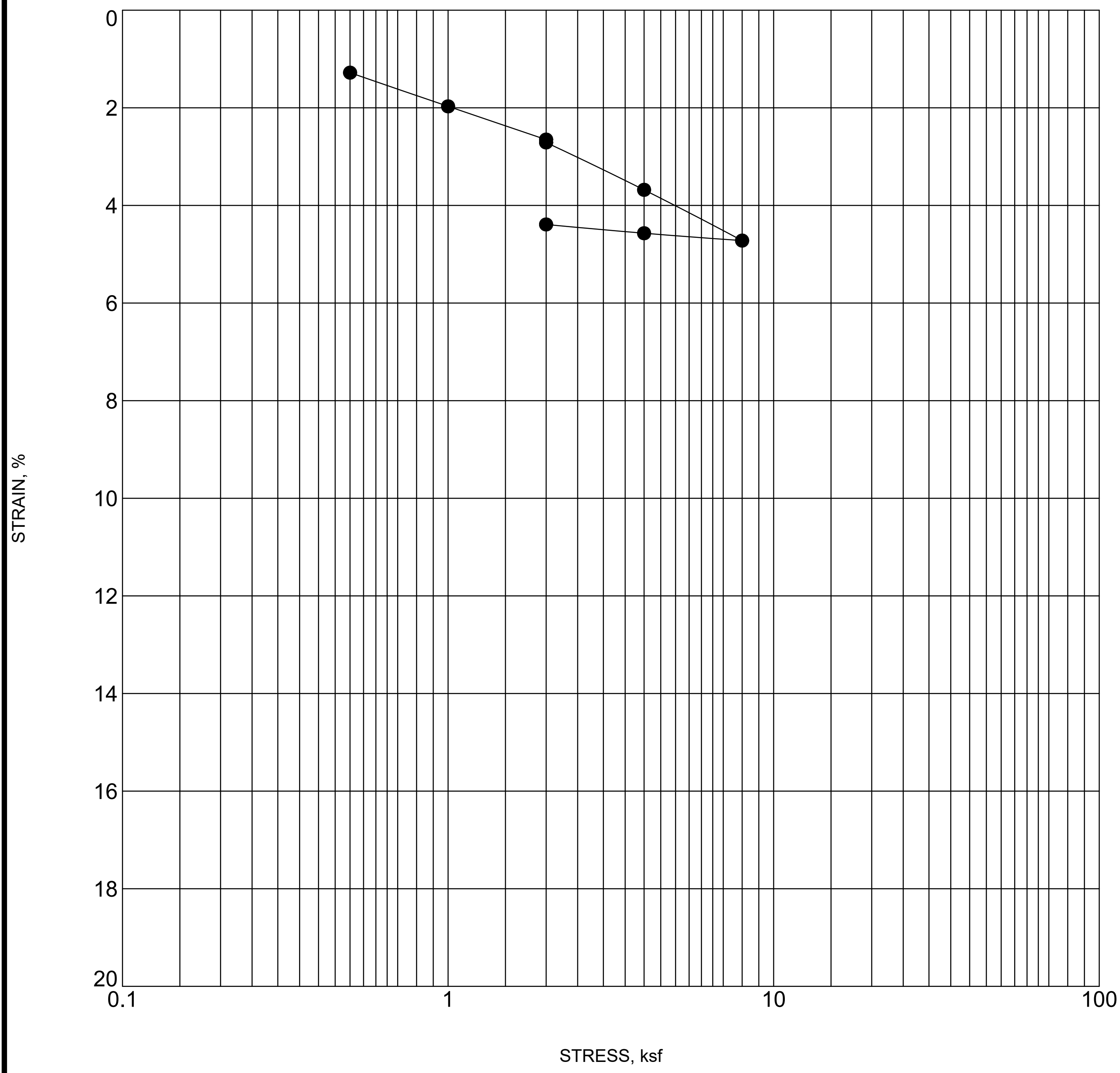


	Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-3 at 10 ft**	**Silty SAND**	**119.0**	**3.6**

CONSOLIDATION TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-5



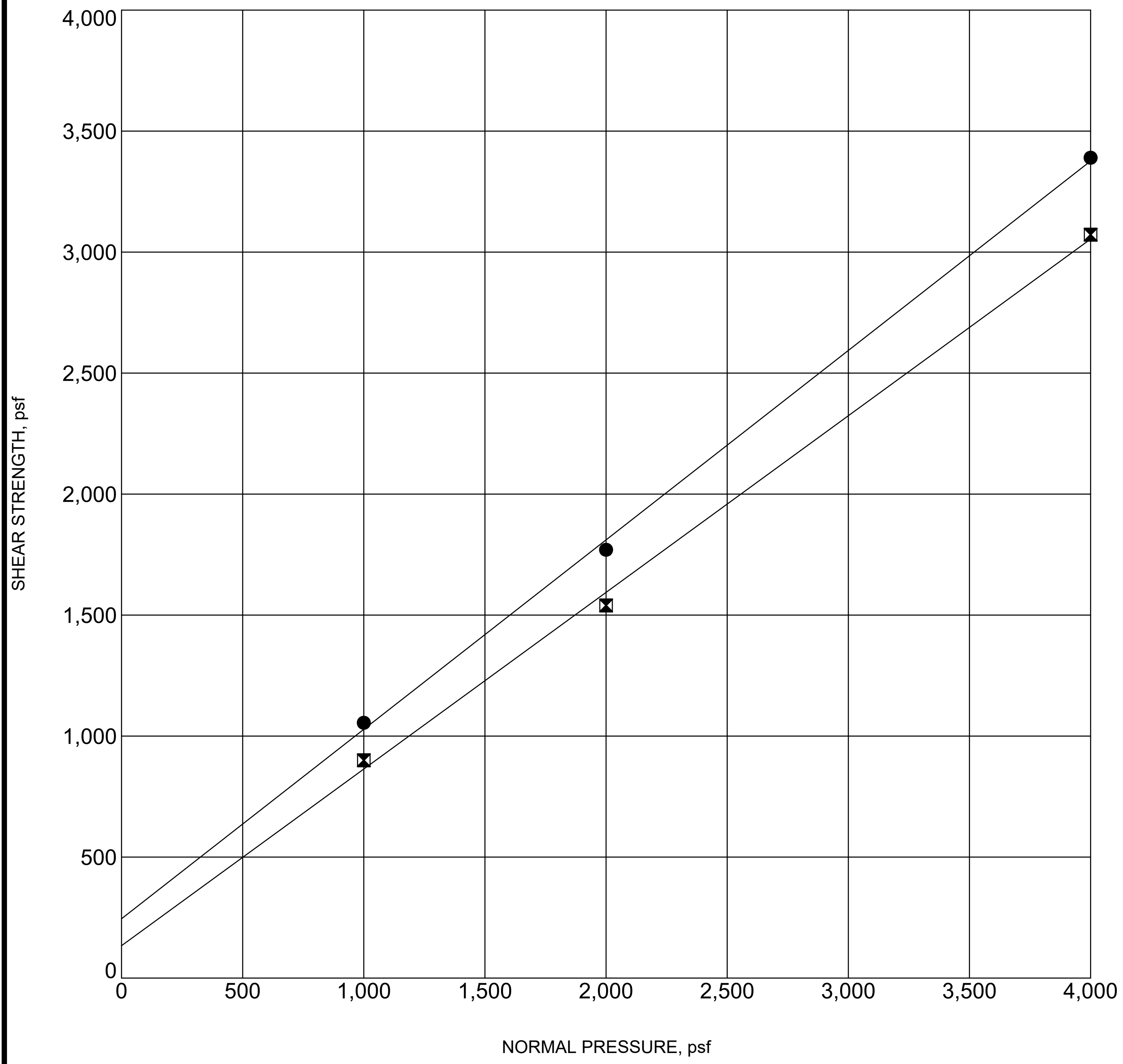
Sample Location		Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-3 at 20 ft**	**Silty SAND**		

TWINING

CONSOLIDATION TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	FIGURE B-6
170875.3	October 2017	



Shear Strength Parameters

	Peak —●—	**Ultimate** —⧗—
Cohesion, C (psf):	245	190
Friction Angle, Ø (deg):	38	37

Initial Moisture (%): 9.2
Final Moisture (%): 17.0

Boring No.: B-1
Sample Depth (ft): 15
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 117.7

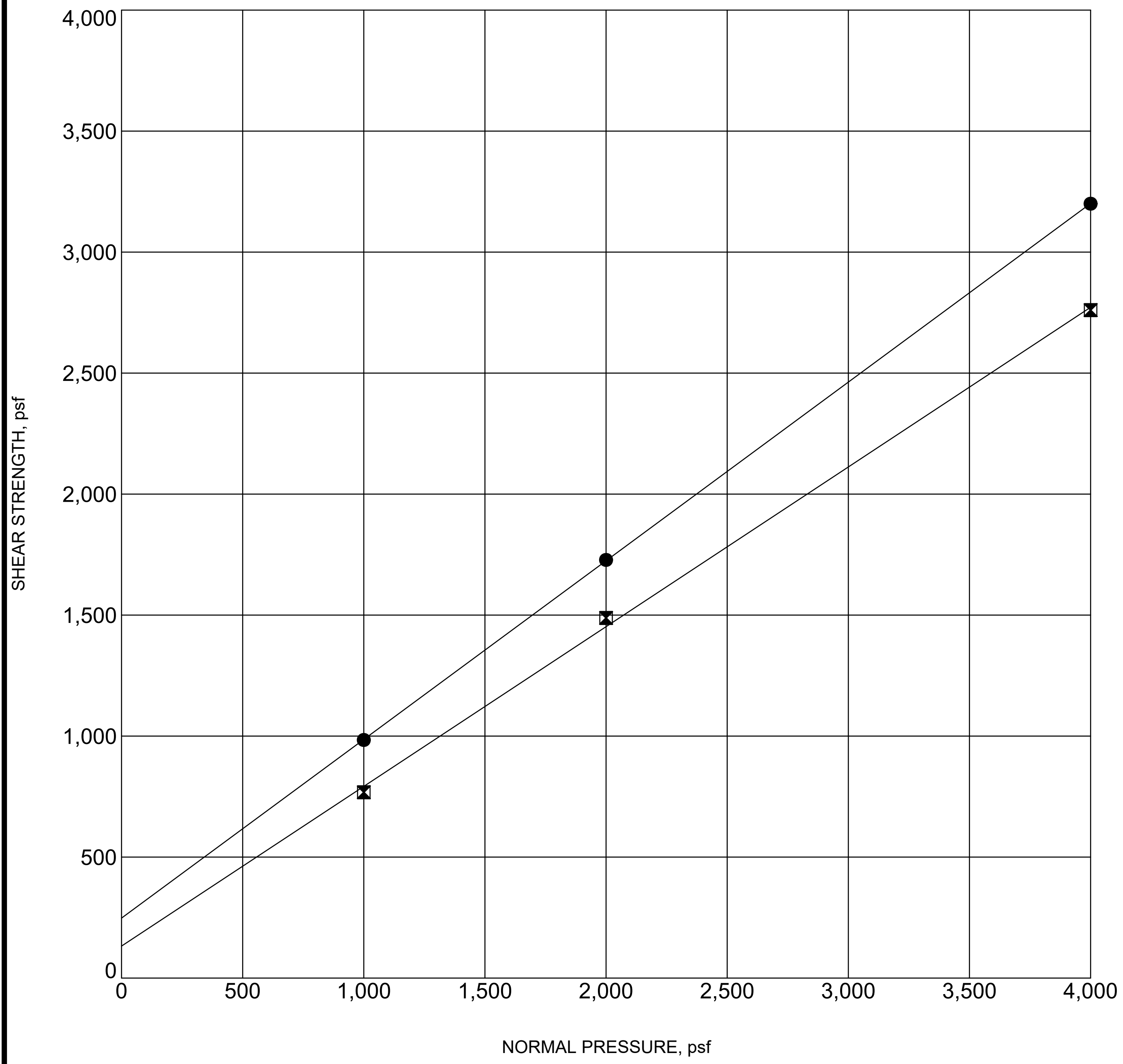
DIRECT SHEAR 170875.3 - UCR OUTPATIENT PAVILLION.GPJ TWINING LABS.GDT 10/27/17

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-7



Boring No.:	B-1
Sample Depth (ft):	25
Sample Description:	Silty SAND
Strain Rate (in./min):	0.005
Dry Density (pcf):	107.4

Shear Strength Parameters

	Peak —●—	**Ultimate** —⊠—
Cohesion, C (psf):	248	190
Friction Angle, Ø (deg):	36	35

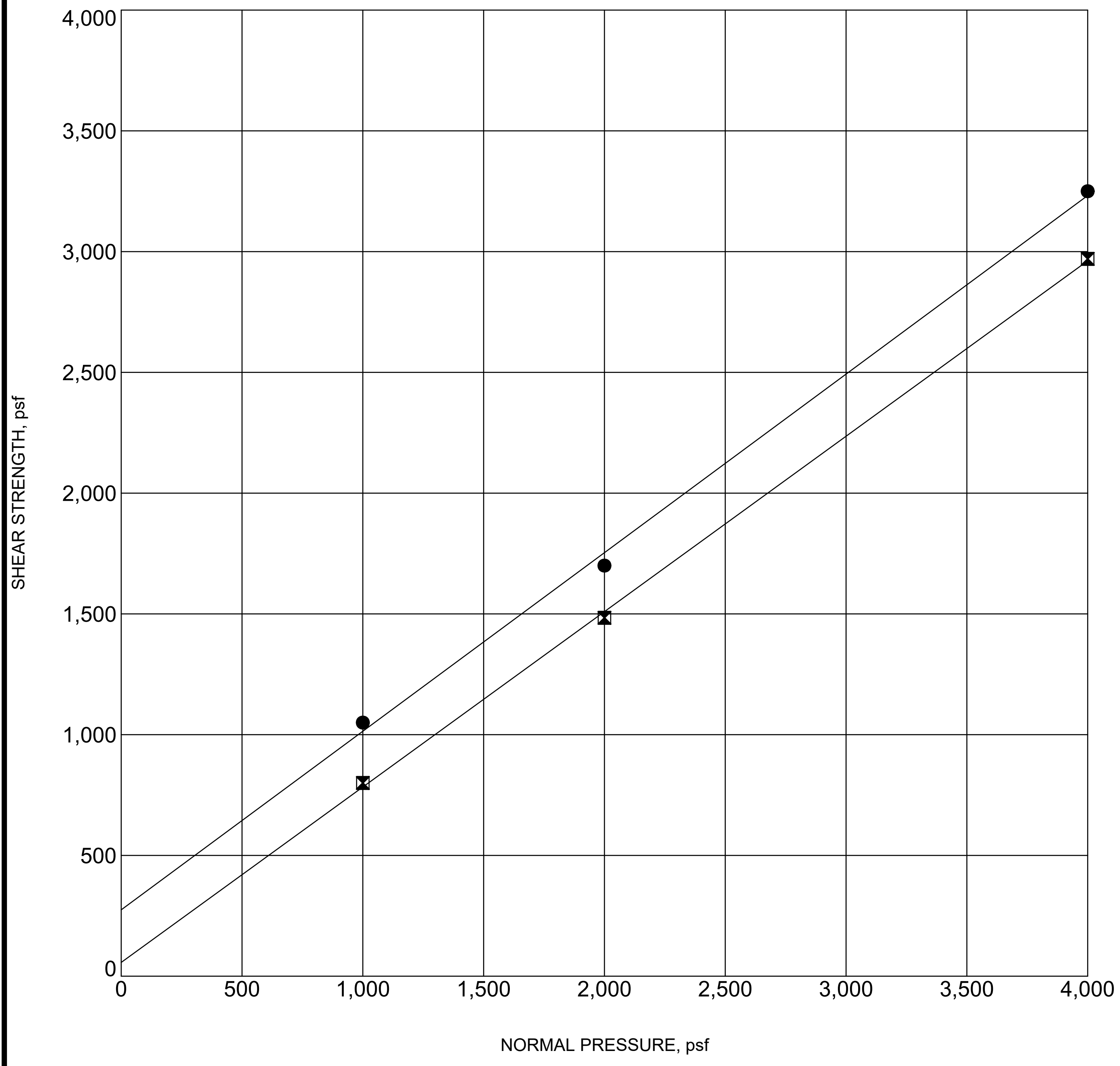
Initial Moisture (%): 14.3
Final Moisture (%): 14.9

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-8



Boring No.: B-3
Sample Depth (ft): 30
Sample Description:
Strain Rate (in./min): 0.005
Dry Density (pcf): 121.7

Shear Strength Parameters

	Peak —●—	**Ultimate** –☒–
Cohesion, C (psf):	275	100
Friction Angle, Ø (deg):	36	36

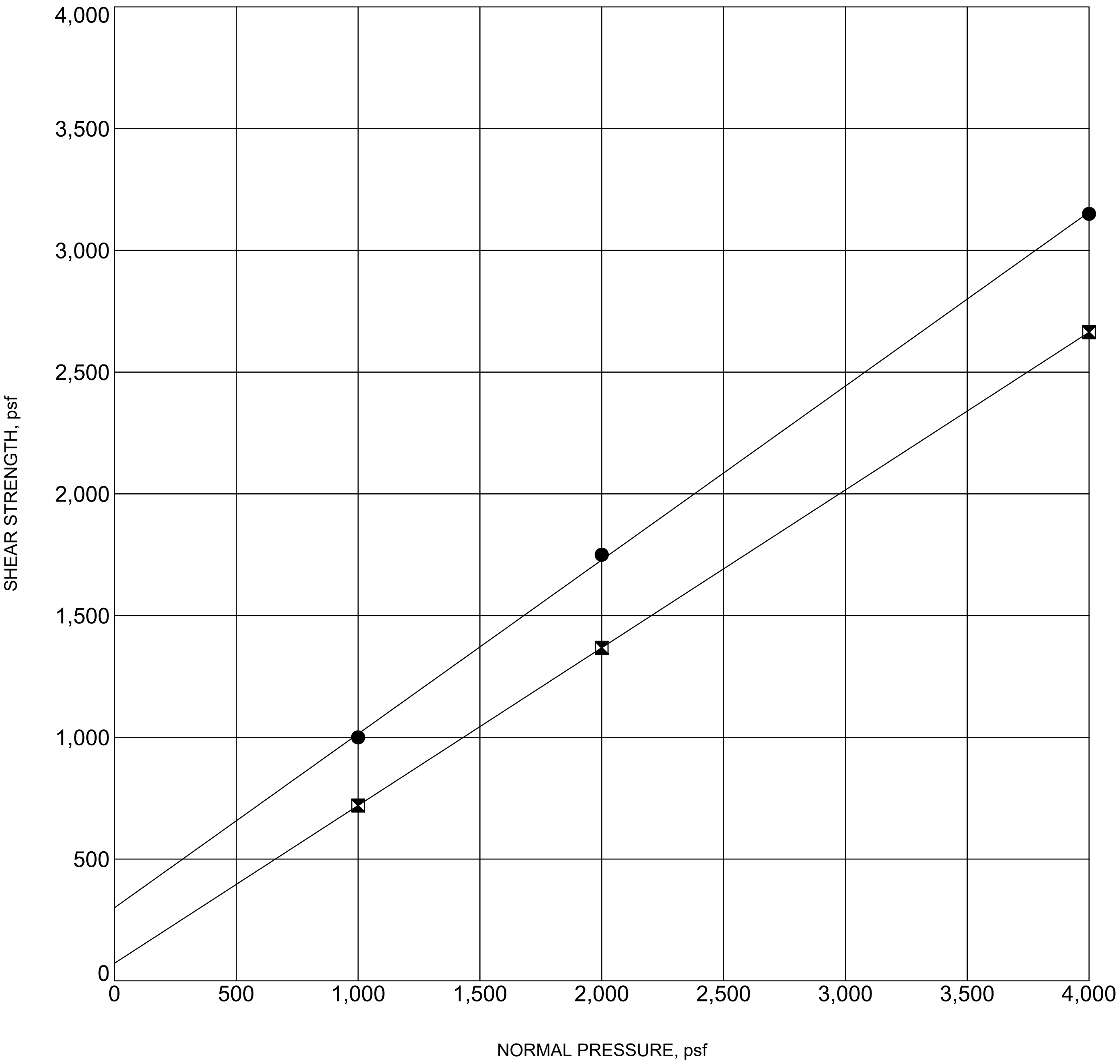
Initial Moisture (%): 7.0
Final Moisture (%): 11.8

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-9



Boring No.: B-3
Sample Depth (ft): 40
Sample Description:
Strain Rate (in./min): 0.005
Dry Density (pcf): 127.6

Shear Strength Parameters

	Peak —●—	Ultimate —⧗—
Cohesion, C (psf):	300	100
Friction Angle, Ø (deg):	36	35

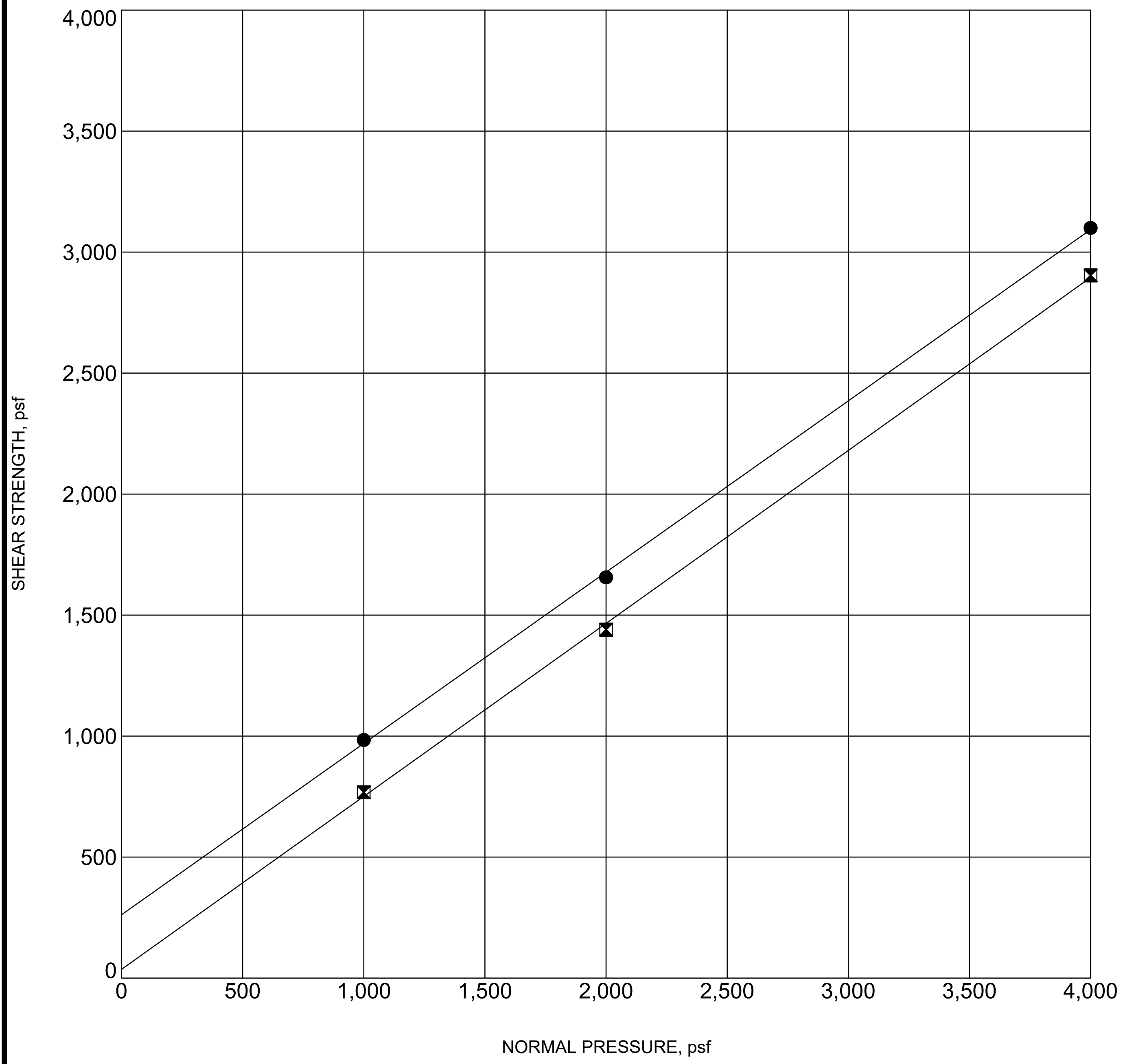
Initial Moisture (%): 8.9
Final Moisture (%): 12.7

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO. 170875.3	REPORT DATE October 2017	FIGURE B-10



Boring No.: B-5
Sample Depth (ft): 20
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf):

Shear Strength Parameters

	Peak —●—	**Ultimate** —⧗—
Cohesion, C (psf):	262	50
Friction Angle, Ø (deg):	35	35

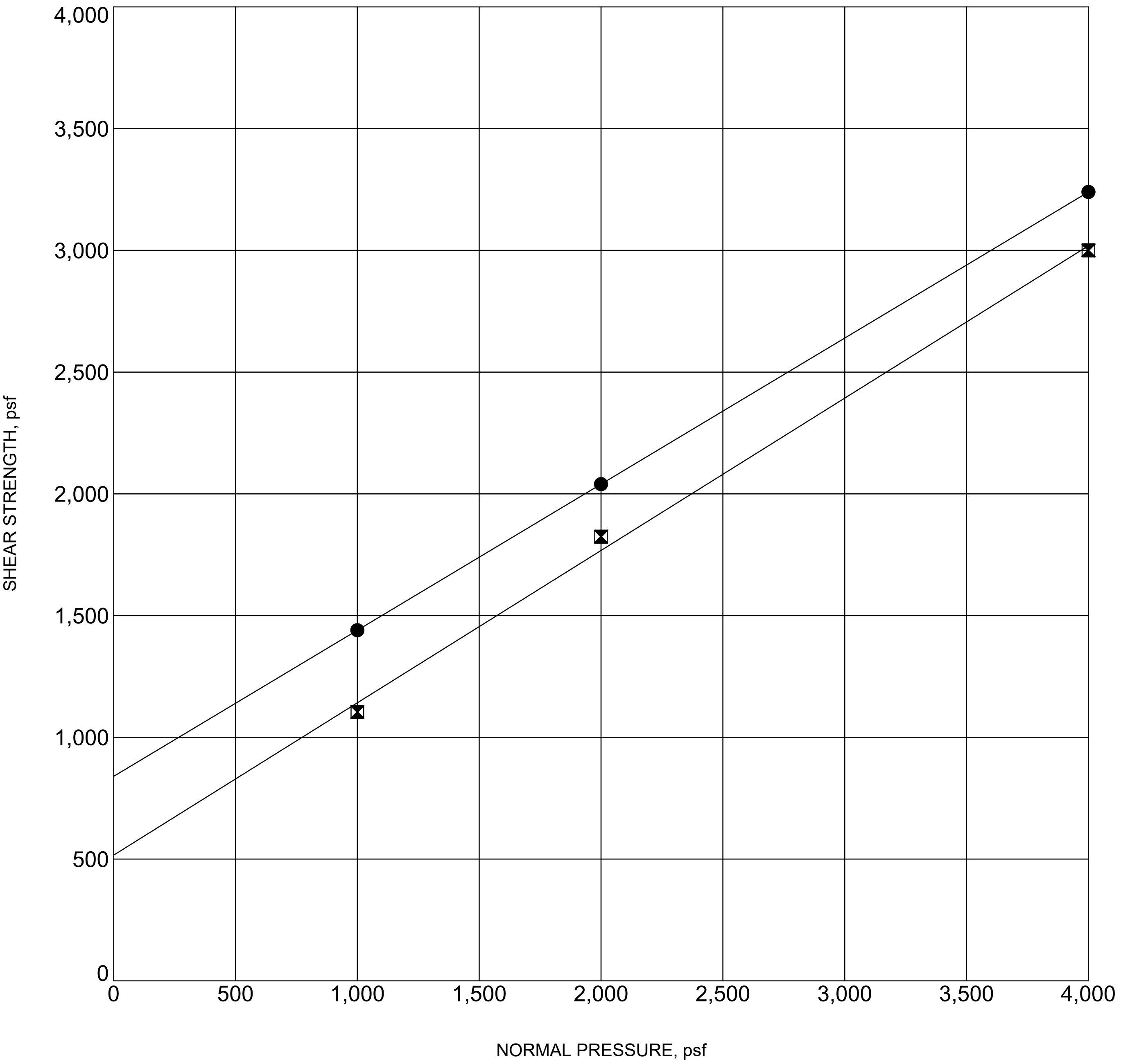
Initial Moisture (%):
Final Moisture (%): 19.0

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-11



Shear Strength Parameters

	Peak ●	Ultimate ⧗
Cohesion, C (psf):	840	505
Friction Angle, Ø (deg):	31	32

Initial Moisture (%): 8.7
Final Moisture (%): 13.4

Boring No.:	B-6
Sample Depth (ft):	25
Sample Description:	Silty SAND
Strain Rate (in./min):	0.005
Dry Density (pcf):	130.4

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-12

TWINING

2883 East Spring Street
Suite 300
Long Beach CA 90806

Tel 562.426.3355
Fax 562.426.6424

APPENDIX D
PERCOLATION TESTING

Infiltration Rate Calculation Sheet

Project :	UCR Oasis Hub	Project No. :	220759.3	Date :	12/2/2022
Test Hole No.:	P-1	Tested by :	AB/CDD		
Depth of Test Hole, D_T (in):	60	USCS Soil Classification :	Silty SAND		

Test Hole Dimension (inches)			Length	Width	
Diameter (if round) (inches) =	8.00	Sides (if rectangular) =			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" ? (Y/N)
1	7:38 AM	8:03 AM	25	15.8	22.2	6.4	Y
2	9:19 AM	9:44 AM	25	18.6	22.2	3.6	N

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

			Δt	H_o	H_f	ΔH	
Trial No.	**Start Time**	**Stop Time**	**Time Interval (min.)**	**Initial Water Height (inches)**	**Final Water Height (inches)**	**Change in Water Level (inches)**	**Tested Infiltration Rate**
1	9:53 AM	10:23 AM	30	42.96	38.40	4.56	0.43
2	10:23 AM	10:53 AM	30	44.40	39.36	5.04	0.46
3	10:53 AM	11:23 AM	30	44.16	39.60	4.56	0.42
4	11:23 AM	11:53 AM	30	43.20	38.64	4.56	0.42
5	11:53 AM	12:23 PM	30	43.80	39.48	4.32	0.40
6	12:24 PM	12:54 PM	30	43.08	38.76	4.32	0.40
7	12:54 PM	1:24 PM	30	43.20	38.64	4.56	0.42

Infiltration Rate with a factor of safety of 3 = 0.1 inch /hr

Infiltration Rate Calculation Sheet

Project :	UCR Clean Technology Park	Project No. :	220759.3	Date :	12/2/2022
Test Hole No.:	P-2	Tested by :	AB/CDD		
Depth of Test Hole, D_T (in):	60	USCS Soil Classification :	Silty SAND		

Test Hole Dimension (inches)			Length	Width	
Diameter (if round) (inches) =	8.00	Sides (if rectangular) =			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" ? (Y/N)
1	7:38 AM	8:03 AM	25	30.0	38.4	8.4	Y
2	8:10 AM	8:35 PM	745	25.2	36.2	11.0	Y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

			Δt	H_o	H_f	ΔH	
Trial No.	**Start Time**	**Stop Time**	**Time Interval (min.)**	**Initial Water Height (inches)**	**Final Water Height (inches)**	**Change in Water Level (inches)**	**Tested Infiltration Rate**
1	8:37 AM	8:47 AM	10	40.20	33.36	6.84	2.12
2	8:48 AM	8:58 AM	10	36.48	32.40	4.08	1.34
3	9:09 AM	9:19 AM	10	36.84	32.28	4.56	1.50
4	9:21 AM	9:31 AM	10	36.00	32.04	3.96	1.32
5	9:32 AM	9:42 AM	10	36.24	32.52	3.72	1.23
6	1:18 PM	1:28 PM	10	38.40	34.44	3.96	1.24

Infiltration Rate with a factor of safety of 3 = 0.4 inch /hr

TWINING

2883 East Spring Street
Suite 300
Long Beach CA 90806

Tel 562.426.3355
Fax 562.426.6424

APPENDIX E
PREVIOUS PERCOLATION TESTING

2883 East Spring
Street
Suite 300
Long Beach CA
90806

Tel 562.426.3355
Fax 562.426.6424

TWINING

Appendix C
Percolation Testing

Two percolation tests were performed at the project site as shown on Figure 2 – Site Location and Exploration Location Map. Percolation testing was on September 29, 2017 in general conformance with the County of Riverside requirements.

The purpose of the tests was to evaluate the infiltration rates of subgrade soils. At the completion of the boring excavation, a 3-inch diameter slotted PVC pipe was inserted in the borehole. The borehole was presoaked prior to testing. After the completion of presoaking, the borings were filled with water to a minimum depth of 12 inches above the bottom of excavation. Upon completion of the borings and testing, the boreholes were backfilled with soil from the cuttings as noted in the Log of Borings.

The lowest reading was used to determine the infiltration rate. A summary of test results is presented in Table C-1 and the detailed test data is attached to this appendix.

Table C-1 - Summary of Percolation Test Results

Test Location	Depth of Test Hole (ft.)	Design Infiltration Rate (in/hr)
B-7	+/- 30	0.1
B-8	+/- 10	0.9

It is our opinion that an infiltration BMP facility may be feasible at this site. Once the location and depth of the proposed system is determined by the civil engineer, we will review and provide our updated recommendations. At the minimum, any infiltration system should be located at least 15 feet away from any existing and proposed building foundations.

Infiltration Rate Calculation Sheet

Project :	UCR - Outpatient Pavillion	Project No. :	170875.3	Date :	9/29/2017
Test Hole No.:	B-7	Tested by :	SL		
Depth of Test Hole, D_T (in):	360	USCS Soil Classification :	SM		

Test Hole Dimension (inches)			Length	Width	
Diameter (if round) (inches) =	8	Sides (if rectangular) =			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" ? (Y/N)
1	7:51 AM	8:51 AM	60	248.4	360.0	111.6	Y
2	8:51 AM	9:51 AM	60	252.0	360.0	108.0	Y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

			Δt	H_o	H_f	ΔH	
Trial No.	**Start Time**	**Stop Time**	**Time Interval (min.)**	**Initial Water Height (inches)**	**Final Water Height (inches)**	**Change in Water Level (inches)**	**Tested Infiltration Rate**
1	9:48 AM	9:58 AM	10	123.60	121.20	2.40	0.2
2	9:58 AM	10:08 AM	10	121.20	114.00	7.20	0.7
3	10:08 AM	10:18 AM	10	114.00	109.20	4.80	0.5
4	10:18 AM	10:28 AM	10	109.20	105.60	3.60	0.4
5	10:28 AM	10:38 AM	10	105.60	104.28	1.32	0.1
6	10:38 AM	10:48 AM	10	104.28	102.12	2.16	0.2
7	10:48 AM	10:58 AM	10	102.12	100.32	1.80	0.2
8	10:58 AM	11:08 AM	10	109.20	106.32	2.88	0.3
9							
10							
11							
12							
13							
14							
15							

Recommended Infiltration Rate = Min. Tested Rate/2 = 0.1 inch /hr

Infiltration Rate Calculation Sheet

Project :	UCR - Outpatient Pavillion	Project No. :	170875.3	Date :	9/29/2017
Test Hole No.:	B-8	Tested by :	SL		
Depth of Test Hole, D_T (in):	120	USCS Soil Classification :	SM		
Test Hole Dimension (inches)			Length	Width	
Diameter (if round) (inches) =	8	Sides (if rectangular) =			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" ? (Y/N)
1	9:04 AM	10:04 AM	60	48.6	105.6	57.0	Y
2	10:05 AM	11:05 AM	60	96.0	105.6	9.6	Y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

			Δt	H_o	H_f	ΔH	
Trial No.	**Start Time**	**Stop Time**	**Time Interval (min.)**	**Initial Water Height (inches)**	**Final Water Height (inches)**	**Change in Water Level (inches)**	**Tested Infiltration Rate**
1	11:07 AM	11:47 AM	40	24.00	8.16	15.84	2.6
2	11:50 AM	12:20 PM	30	24.60	15.00	9.60	1.8
3	12:22 PM	12:52 PM	30	28.20	16.68	11.52	1.9
4	12:54 PM	1:24 PM	30	31.80	19.20	12.60	1.8
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Recommended Infiltration Rate = Min. Tested Rate/2 = 0.9 inch /hr

Attachment 13

Supporting Noise Documentation

Freeway Distance

Ruler

Line | Path | Polygon | Circle | 3D path | 3D poly

Measure the distance between two points on the ground

Map Length: 0.08 Miles

Ground Length: 0.08

Heading: 89.64 degrees

☑ Mouse Navigation

Legend

- 1200 University Ave
- Parking Lot 50
- Univ of California Riverside Official?

BNSF Railroad Distance

Legend

- 📍 1200 University Ave
- 📍 Parking Lot 50
- 📍 Univ of California Riverside Official?

Ruler

Line | Path | Polygon | Circle | 3D path | 3D poly

Measure the distance between two points on the ground

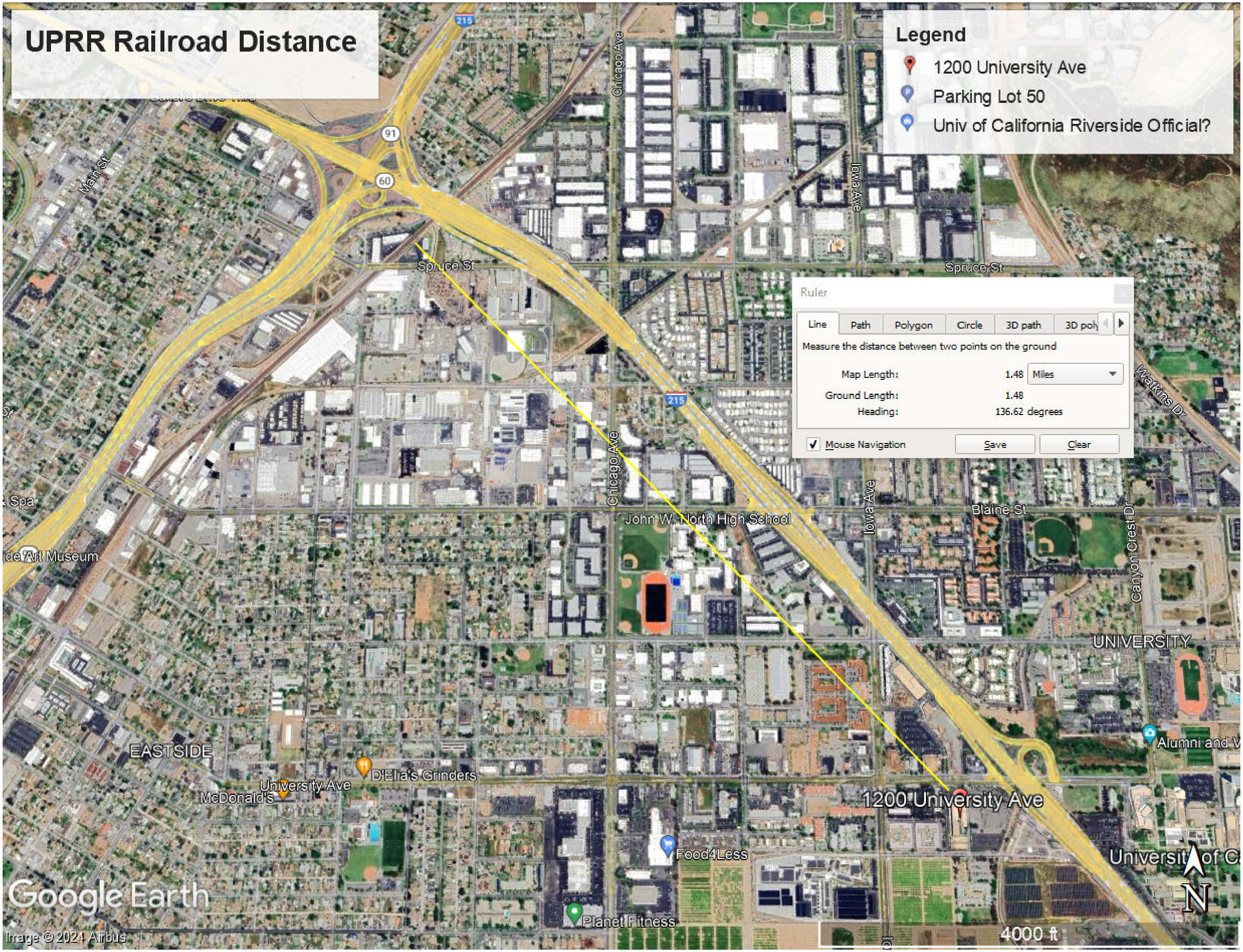
Map Length: 0.83 Miles

Ground Length: 0.83

Heading: 51.87 degrees

☑ Mouse Navigation | Save | Clear

UPRR Railroad Distance



Legend

- 📍 1200 University Ave
- 📍 Parking Lot 50
- 📍 Univ of California Riverside Official?

Ruler

Measure the distance between two points on the ground

Map Length: 1.48 Miles

Ground Length: 1.48

Heading: 136.62 degrees

☑ Mouse Navigation

Source: Aerial (City of Riverside, 2020)

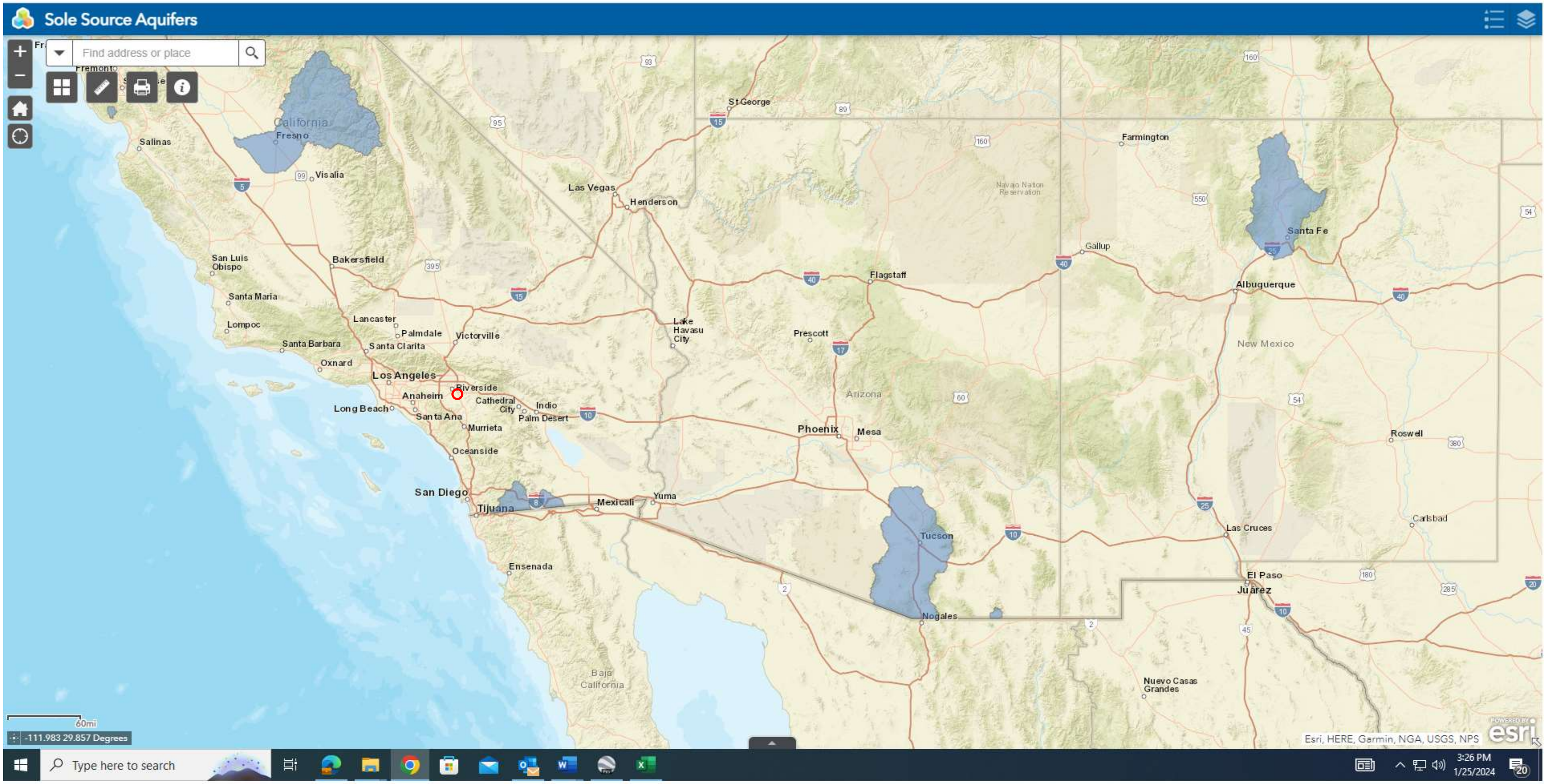
I:\PROJECTS\U\UCRiverside_00886\00004_OasisPark\Map\Add\Addendum.aprx Fig4.1.13-1_NoiseMeas : 00886.4.1 : 1/9/2024 - SAB

HELIX
Environmental Planning

Noise Measurement Locations

Attachment 14

Sole Source Aquifers Map



○ Approximate Project Site Location

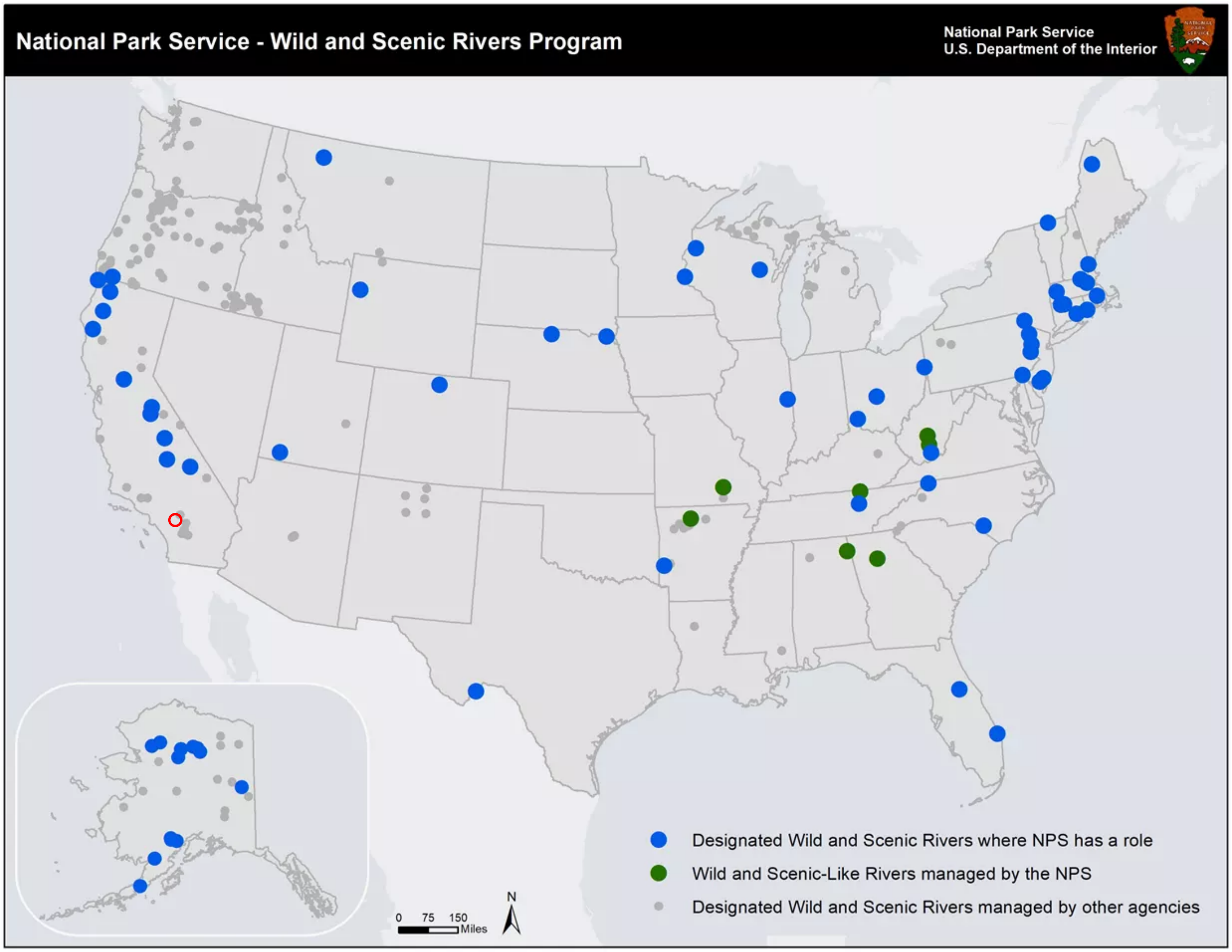
Source: https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=9ebb047ba3ec41ada1877155fe31356b

Attachment 15

Wild and Scenic Rivers Map

Wild and Scenic Rivers Program

Interactive Map of NPS Wild and Scenic Rivers



○ Approximate Project Site Location

(https://nps.maps.arcgis.com/apps/View/index.html?appid=ff42a57d0aae43c49a88daee0e353142)

Attachment 16

Preliminary Hydrology Study

September 5, 2023

UCR OASIS Park
Psomas Project No. 5MIL130100

PRELIMINARY HYDROLOGY STUDY

For
University of California, Riverside – OASIS Park
APN 253-050-005, 006, 007, & 008

PREPARED FOR:
University of California, Riverside
Planning, Design & Construction
1223 University Avenue Suite 240
Riverside, CA 92507

PREPARED BY:
Psomas
401 B Street, Suite 1600
San Diego, CA 92101

DATE:
September 5, 2023

REGISTERED PROFESSIONAL ENGINEER
SARAH K. CURRAN
No. C69620
CIVIL
STATE OF CALIFORNIA

9/5/2023

Sarah Curran, RCE C69620 Date

TABLE OF CONTENTS

APPENDICES

1.0 Project Background

The University of California, Riverside (“UCR” or “University”) is developing an Opportunities to Advance Sustainability, Innovation and Social Inclusion (OASIS) Park (“Project”) on the University property located at 1200 University Avenue and a portion of 1150 and 1160 University Avenue (Assessor Parcel Number [APN] 253-050-005 and a portion of APNs 253-050-006, 253-050-007, and 253-050-008), south of University Avenue, north of Everton Place, and west of the Gage Canal, a Caltrans yard and Interstate 215/State Route 60 (I-215/SR 60) freeway, in the City of Riverside, California. The property comprises approximately 8 acres, approximately 4 of which will be improved as part of the Project (“Project site”). The scope of the Project includes the design and construction of one to two new buildings, a gathering space, open spaces, a work yard, and stormwater treatment facilities. The eastern portion of the site may also be improved with surface-level adjustments to parking spaces/restriping and new landscaping.

Vicinity Map

This study has been prepared to determine the peak runoff rates and velocities for the pre-development and post-development conditions in support of determining concept level drainage improvement needs to support the development of the Project site. This study will also serve to support the California Environmental Quality Act (CEQA) permitting process. The future Design Build Team will ultimately be responsible for the detailed design of stormwater improvements for the Project.

2.0 Design Criteria and Methodology

The drainage design criteria used for this Project are per the Riverside County Flood Control and Water Conservation District Hydrology Manual (1978).

2.1 Design Runoff Method

Per the Riverside County Flood Control and Water Conservation District Hydrology Manual (RCFC & WCDHM), the rational method is used for tributary areas less than 300 acres, given as:

Q = C x I x A

Where:
Q = Flow rate in cubic feet per second (cfs)
C = Coefficient of runoff (C)
I = Rainfall intensity in inches per hour (in/hr)
A = Drainage area in acres (ac)

Hydraulic characteristics are as follows:

- Soil Type: Group B per Plate C-1.16, see Appendix A.
- Land Use: Pervious and Impervious
- Coefficient of Runoff (C) are calculated using Plate D-5.2, see Appendix A.

3.0 Existing Conditions

3.1 Existing Conditions Description

The 8.3 acre property is currently developed with a University Extension (UNEX) building, parking structure, surface parking lots, and hardscape/landscape. Approximately 85% of the property is impervious and approximately 15% of the property is pervious. Property stormwater runoff is collected and discharged through overland flow, basins, above-ground drainage, and underground storm drains. Three (3) existing storm drain inlet structures, located at the north side of the property, capture the combined flows and convey them through an existing 18-inch reinforced concrete pipe (RCP) storm drain line that ultimately discharges to an existing City-owned 24-inch storm drain main line within University Avenue.

Runoff from adjacent properties contribute to the stormwater collected on the property. Offsite stormwater runoff from the neighboring I-215/SR 60 freeway, the Caltrans site, and the Gage Canal area is collected and conveyed by a concrete swale through the Gage Canal area and discharged to the northeast corner of the property. A portion of the freeway runoff is captured by a storm drain inlet that is piped to the I-215/SR 60 freeway on-ramp retaining wall, which then outlets onto the Caltrans site, see Appendix B for record information. Runoff from the Caltrans site flows to a concrete headwall structure located in the northwest corner of the Caltrans site, which directs it to the concrete swale that crosses the Gage Canal area. Additional surface flows are collected within the Gage Canal area by a dirt swale that carries flows north into the concrete swale. The concrete swale collectively carries the runoff from these three sites onto the property, where it is conveyed along the northern portion of the property by concrete ribbon gutters to the three storm drain inlets described above.

Parking Lot 50 is a recently improved (2017) surface parking lot that has implemented stormwater management facilities. Stormwater sheet flows on impervious pavement and is channeled through curb cuts into an existing bioretention basin network where flows are captured by inlets within the basins before connecting to the existing 18-inch storm drain lateral.

Parking Lot 51 stormwater sheet flows on impervious pavement north and west to concrete ribbon gutters, which carry flows north to the three storm drain inlets described above.

3.2 Existing Inlet and Lateral Capacities

Depending on the condition of the existing lateral, the Mannings coefficient will vary. The capacity of the existing 18-inch storm drain lateral was calculated based on varied Mannings runoff coefficients (n) and is summarized below:

Existing 18-inch Lateral Capacity			
Pipe	**Assumed Slope (ft/ft)**	**Manning's (n)**	**Capacity (cfs)**
Existing 18-inch RCP SD	0.0100	0.01	13.69
Existing 18-inch RCP SD	0.0100	0.015	9.13
Existing 18-inch RCP SD	0.0100	0.021	6.52

See Appendix A for calculations.

The capacity of the three existing storm drain inlets was calculated and is summarized below:

Existing Inlet Capacity				
Pipe	**Effective Perimeter (ft)**	**Effective Area (SF)**	**Depth of Ponding (ft)**	**Capacity (cfs)**
Existing 24-inch x 48-inch inlets	6	2	0.5	6.36
Existing 24-inch x 48-inch inlets	6	2	0.5	6.36
Existing 36-inch x 36-inch inlet	6	2.25	0.5	6.36
Total Capacity of Existing Three Inlets				**19.09**

See Appendix A for calculations.

Overflow paths should be provided as part of the design to convey stormwater via the surface to University Avenue should a given storm event exceed the capacity of the existing 18-inch storm drain lateral.

The property is located within the Santa Ana River Watershed. According to the Federal Emergency Management Agency ("FEMA") Special Flood Hazard Area / Flood Insurance Rate Map (FIRM), this area is located outside of the 100-year flood plain.

Drainage basin areas, flow paths, and concentration points are shown on the Existing Hydrology Map, see Appendix C. Calculations for the existing condition can be found in Appendix A.

4.0 Proposed Conditions

4.1 Hydrology Analysis

Approximately four acres of the larger 8.3-acre property will be demolished, graded, and improved as part of the Project. As part of that improvement, the overall perviousness of the property will increase and imperviousness will, in turn, decrease. The Project site limits of improvements are outlined on the Proposed Hydrology Map, see Appendix C.

The property's pervious and impervious areas are summarized as follows:

Property Pervious Increase	
	Percentage
Existing	15%
Proposed	26%
Delta	11%

Property Impervious Decrease	
	Percentage
Existing	85%
Proposed	74%
Delta	11%

The proposed conditions will increase the property's perviousness by implementing bioretention basins and landscaping as part of the Project improvements, where each proposed basin treats and detains stormwater runoff. Each basin will connect to the existing 18-inch storm drain lateral on the Project site.

The quantity of stormwater runoff from the Project site will decrease from the existing to the proposed condition since the perviousness of the property is increasing. Therefore, the total quantity of runoff for the 8.3-acre property will also decrease.

The RCFC and WCDHM indicate a 100-year level of flood protection required for the Project.

The 8.3-acre property has been broken down into drainage subareas as indicated on the Preliminary Hydrology Exhibit in Appendix C. Subareas identified as "1" represent areas of the property that will not be improved as part of the Project. Subareas identified as "2" represent portions of the property to be improved as part of the Project (approximately 4 acres). Subareas identified as "3" represent areas that are tributary to the 8.3-acre property. Proposed sub-areas are summarized below:

Subarea 1-A (Parking Lot 51 area): Stormwater sheet flows west on impervious pavement and is conveyed via an existing concrete gutter to downstream inlets. Drainage from Subarea 1-A will be bypassed around the Project site, however, will ultimately continue to connect to the existing 18-inch storm drain lateral, similar to the current condition.

Subarea 1-B (Parking Lot 50 area): Stormwater sheet flows on impervious pavement and is channeled through curb cuts into existing bioretention basins and collected at inlets located within the basins before connecting to the existing 18-inch storm drain lateral. The condition will be maintained and not impacted by Project improvements.

Subarea 2-A (OASIS Park Project site): Stormwater from the westerly portion of the improved Project site will be conveyed to a new bioretention basin and then via underground storm drain to the existing 18-inch storm drain lateral.

Subarea 2-B (OASIS Park Project site): Stormwater from the easterly portion of the improved Project site will be conveyed to new bioretention basins and then via underground storm drain to the existing 18-inch storm drain lateral.

Subareas 3-A, 3-B, and 3-C (I-215/SR 60 freeway, Caltrans site and Gage Canal area): Stormwater from these Subareas consists of offsite drainage from the I-215/SR 60 freeway, the adjacent Caltrans site and the Gage Canal area. Drainage from these subareas will continue to be collected at the northeast corner of the property and conveyed via existing concrete ribbon gutters to the east edge of the improved project site. Drainage will then be collected and conveyed to the existing 18-inch storm drain lateral. The condition of these subareas will be maintained and not impacted by the Project improvements.

Proposed Peak Flow

Subarea ID	Area to Design Point (AC)	Peak Flow, 100-year (cfs)
1-A	2.15	2.01
1-B	1.64	1.54
2-A	1.65	1.54
2-B	2.97	2.78
3-A	4.72	4.42
3-B	0.37	0.35
3-C	0.13	0.12
Total	**13.6**	**12.8**

A summary of the peak flow for the 100-year storm event is summarized below:

Summary of Peak Flow

	Q_{100} (cfs)
Existing	13.1
Proposed	12.8
Delta	0.3

Overflow paths should be provided as part of the design to convey stormwater via the surface to University Avenue should a given storm event exceed the capacity of the existing 18-inch storm drain lateral.

4.2 Hydromodification

Hydromodification is required for the site. The post-construction stormwater management for the Project shall follow the University's Phase II Small MS4 Post-Construction Stormwater Management Requirements documents and Phase II Small MS4 Post-Construction Stormwater Management Checklist. See the Project specific Preliminary Water Quality Management Plan for analysis and design and Appendix C for the Preliminary Hydrology Exhibit.

4.3 Best Management Practices (BMPs)

Bioretention basins are proposed to treat and store the Project site runoff. These bioretention BMP’s will consist of a vegetated area that will collect flows and discharge to the existing 18-inch storm drain lateral. These non-infiltrating bioretention basin BMP’s provide necessary flow based treatment to meet UCR’s pollution control requirements. See the Preliminary Water Quality Management Plan for analysis and design of long-term post construction BMPs per the University Municipal Separate Storm Sewer System (MS4) Permit and Appendix C for the Preliminary Hydrology Exhibit.

5.0 Summary

The Project will result in an increased perviousness and decreased imperviousness of the 8.3-acre property, and therefore reduce the overall runoff quantity. Bioretention basins will be implemented with the Project improvements to comply with the University MS4 Permit. The existing 18-inch storm drain lateral will continue to convey runoff from the 8.3-acre property, including the Project site, and adjacent tributary areas. Overflow paths should be provided as part of the design to convey stormwater via the surface to University Avenue should a given storm event exceed the capacity of the existing 18-inch storm drain lateral. The Project will not substantially alter the existing drainage patterns nor increase stormwater runoff from the property.

APPENDIX A

Calculations

PSOMAS
401 B STREET, SUITE 1600
SAN DIEGO, CA 92101

UCR OASIS Park
PSOMAS#:5MIL130100
CALCULATED BY: AMP
6/7/2023

2 YEAR - EXISTING CONDITION

DRAINAGE AREA	DEVELOPMENT	A (ACRES)	% OF TOTAL ACREAGE	C*	I** (IN/HR)	Q*** (CFS)	REMARKS
THE FOLLOWING HYDROLOGIC CALCULATIONS DONE PER METHODS DESCRIBED IN THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER DISTRICT HYDROLOGY MANUAL							
SUB-AREA							
1-A	Commercial (Parking Lot 51)	4.28	32.97%	0.81	0.5	1.73	
1-B	Commercial (Parking Lot 50)	1.75	13.48%	0.81	0.5	0.71	
2	Commercial (Discharges offsite onto University Ave)	1.73	N/A	0.81	0.5	0.70	
3-A	Commercial (Caltrans Site)	4.72	36.36%	0.81	0.5	1.91	
3-B	Commercial (I-215 Freeway)	0.37	2.85%	0.81	0.5	0.15	
3-C	Commercial (Gage Canal)	0.13	#DIV/0!	0.81	0.5	0.05	
	TOTAL	12.98		0.81	0.5	**5.3**	

100 YEAR - EXISTING CONDITION

DRAINAGE AREA	DEVELOPMENT	A (ACRES)	% OF TOTAL ACREAGE	C*	I** (IN/HR)	Q*** (CFS)	REMARKS
THE FOLLOWING HYDROLOGIC CALCULATIONS DONE PER METHODS DESCRIBED IN THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER DISTRICT HYDROLOGY MANUAL							
SUB-AREA							
1-A	Commercial (Parking Lot 51)	4.28	32.97%	0.84	1.2	4.31	
1-B	Commercial (Parking Lot 50)	1.75	13.48%	0.84	1.2	1.76	
2	Commercial (Discharges offsite onto University Ave)	1.73	N/A	0.84	1.2	1.74	
3-A	Commercial (Caltrans Site)	4.72	36.36%	0.84	1.2	4.76	
3-B	Commercial (I-215 Freeway)	0.37	2.85%	0.84	1.2	0.37	
3-C	Commercial (Gage Canal)	0.13	#DIV/0!	0.84	1.2	0.13	
	TOTAL	12.98		0.84	1.2	**13.1**	

* C based on coefficient of runnoff from NOAA Atlas 14
** Intensities are based on the tablr from Plate D-4.1, RCFC & WCD Hydrology Manual
***Q based on the rational method equation from Plate D-1, RCFC & WCD Hydrology Manual

$$Q = C * I * A$$

Existing 18" Storm Drain Capacity Calculations

Pipe	Slope (Assumed) (ft/ft)	Diameter (in)	Diameter (ft)	k	Manning's n	Pipe Area (sf)	100% or 75% or 50%	Flow Area (sf)	Wetted Perimeter (ft)	Hydraulic Radius A/P	Velocity fps	Capacity cfs
Exist 18" RCP SD	**0.0100**	**18**	1.5	1.49	0.01	1.7671	100	1.767	4.712	0.375	7.748	13.692

Pipe	Slope (Assumed) (ft/ft)	Diameter (in)	Diameter (ft)	k	Manning's n	Pipe Area (sf)	100% or 75% or 50%	Flow Area (sf)	Wetted Perimeter (ft)	Hydraulic Radius A/P	Velocity fps	Capacity cfs
Exist 18" RCP SD	**0.0100**	**18**	1.5	1.49	0.015	1.7671	100	1.767	4.712	0.375	5.166	9.128

Pipe	Slope (Assumed) (ft/ft)	Diameter (in)	Diameter (ft)	k	Manning's n	Pipe Area (sf)	100% or 75% or 50%	Flow Area (sf)	Wetted Perimeter (ft)	Hydraulic Radius A/P	Velocity fps	Capacity cfs
Exist 18" RCP SD	**0.0100**	**18**	1.5	1.49	0.021	1.7671	100	1.767	4.712	0.375	3.690	6.520

Existing Catch Basin Capacity Calculations

GRATE SIZE	***24"x48"***	***36"x36"***
LENGTH / DIAMETER	*4.0*	*3.0*
WIDTH	*2.0*	*3.0*
EFFECTIVE PERIMETER (50% CLOGGING) (FT.)	6.00	6.00
EFFECTIVE AREA (50% CLOGGING) (SF)	2.000	2.250
DEPTH OF PONDING (FT.)	0.50	0.50
FLOW CAPACITY (CFS)	6.36	6.36
TOTAL FLOW CAPACITY (CFS)	19.09	

NOAA Atlas 14, Volume 6, Version 2
Location name: Riverside, California, USA*
Latitude: 33.9747°, Longitude: -117.3369°
Elevation: 1016.27 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.091** (0.076-0.110)	**0.117** (0.098-0.142)	**0.152** (0.126-0.185)	**0.181** (0.149-0.222)	**0.222** (0.176-0.281)	**0.254** (0.198-0.329)	**0.287** (0.218-0.382)	**0.322** (0.237-0.441)	**0.371** (0.262-0.530)	**0.409** (0.279-0.607)
10-min	**0.130** (0.109-0.158)	**0.168** (0.140-0.204)	**0.218** (0.181-0.265)	**0.260** (0.214-0.318)	**0.318** (0.253-0.403)	**0.364** (0.283-0.472)	**0.411** (0.312-0.547)	**0.461** (0.340-0.632)	**0.531** (0.375-0.760)	**0.587** (0.400-0.870)
15-min	**0.158** (0.132-0.191)	**0.203** (0.169-0.246)	**0.264** (0.219-0.320)	**0.314** (0.259-0.385)	**0.384** (0.306-0.488)	**0.440** (0.342-0.571)	**0.497** (0.378-0.662)	**0.558** (0.411-0.765)	**0.642** (0.454-0.919)	**0.710** (0.484-1.05)
30-min	**0.232** (0.194-0.281)	**0.299** (0.249-0.362)	**0.388** (0.322-0.471)	**0.462** (0.381-0.567)	**0.565** (0.450-0.718)	**0.647** (0.504-0.839)	**0.732** (0.555-0.974)	**0.821** (0.605-1.13)	**0.945** (0.668-1.35)	**1.04** (0.712-1.55)
60-min	**0.336** (0.280-0.406)	**0.432** (0.360-0.523)	**0.560** (0.466-0.681)	**0.668** (0.550-0.819)	**0.817** (0.650-1.04)	**0.935** (0.728-1.21)	**1.06** (0.803-1.41)	**1.19** (0.875-1.63)	**1.37** (0.965-1.95)	**1.51** (1.03-2.24)
2-hr	**0.476** (0.397-0.577)	**0.610** (0.508-0.739)	**0.787** (0.654-0.957)	**0.933** (0.769-1.15)	**1.14** (0.904-1.44)	**1.29** (1.01-1.68)	**1.46** (1.11-1.94)	**1.63** (1.20-2.23)	**1.86** (1.31-2.66)	**2.04** (1.39-3.03)
3-hr	**0.576** (0.481-0.697)	**0.736** (0.614-0.893)	**0.949** (0.788-1.15)	**1.12** (0.926-1.38)	**1.36** (1.09-1.73)	**1.55** (1.21-2.01)	**1.74** (1.32-2.32)	**1.94** (1.43-2.66)	**2.22** (1.57-3.17)	**2.43** (1.66-3.61)
6-hr	**0.793** (0.662-0.960)	**1.01** (0.846-1.23)	**1.31** (1.09-1.59)	**1.55** (1.27-1.90)	**1.88** (1.49-2.38)	**2.13** (1.66-2.76)	**2.39** (1.81-3.18)	**2.65** (1.96-3.64)	**3.02** (2.13-4.32)	**3.30** (2.25-4.90)
12-hr	**1.05** (0.872-1.27)	**1.35** (1.12-1.63)	**1.74** (1.45-2.12)	**2.06** (1.70-2.53)	**2.50** (1.99-3.18)	**2.84** (2.21-3.68)	**3.18** (2.42-4.24)	**3.54** (2.61-4.84)	**4.02** (2.84-5.74)	**4.39** (2.99-6.51)
24-hr	**1.39** (1.23-1.61)	**1.81** (1.60-2.09)	**2.36** (2.08-2.73)	**2.81** (2.45-3.27)	**3.41** (2.89-4.11)	**3.88** (3.22-4.77)	**4.35** (3.52-5.48)	**4.84** (3.81-6.26)	**5.49** (4.16-7.40)	**6.00** (4.39-8.37)
2-day	**1.71** (1.51-1.97)	**2.26** (1.99-2.60)	**2.97** (2.62-3.44)	**3.56** (3.11-4.15)	**4.36** (3.69-5.25)	**4.97** (4.13-6.12)	**5.60** (4.54-7.06)	**6.25** (4.93-8.09)	**7.12** (5.39-9.60)	**7.80** (5.71-10.9)
3-day	**1.84** (1.63-2.12)	**2.46** (2.18-2.84)	**3.29** (2.90-3.80)	**3.96** (3.47-4.63)	**4.89** (4.14-5.89)	**5.61** (4.65-6.90)	**6.34** (5.14-7.99)	**7.10** (5.60-9.19)	**8.13** (6.16-11.0)	**8.94** (6.54-12.5)
4-day	**1.98** (1.76-2.29)	**2.68** (2.37-3.10)	**3.61** (3.18-4.17)	**4.37** (3.82-5.10)	**5.41** (4.58-6.52)	**6.22** (5.16-7.66)	**7.06** (5.72-8.89)	**7.92** (6.24-10.2)	**9.10** (6.89-12.3)	**10.0** (7.33-14.0)
7-day	**2.29** (2.02-2.64)	**3.11** (2.75-3.59)	**4.21** (3.71-4.87)	**5.11** (4.47-5.97)	**6.36** (5.39-7.67)	**7.33** (6.08-9.02)	**8.33** (6.75-10.5)	**9.36** (7.38-12.1)	**10.8** (8.16-14.5)	**11.9** (8.71-16.6)
10-day	**2.48** (2.20-2.86)	**3.39** (3.00-3.92)	**4.61** (4.06-5.33)	**5.61** (4.91-6.55)	**7.00** (5.93-8.43)	**8.08** (6.70-9.94)	**9.20** (7.45-11.6)	**10.4** (8.16-13.4)	**12.0** (9.05-16.1)	**13.2** (9.68-18.4)
20-day	**3.01** (2.67-3.47)	**4.15** (3.67-4.79)	**5.68** (5.00-6.57)	**6.95** (6.08-8.11)	**8.73** (7.39-10.5)	**10.1** (8.41-12.5)	**11.6** (9.39-14.6)	**13.1** (10.3-17.0)	**15.3** (11.5-20.6)	**16.9** (12.4-23.6)
30-day	**3.58** (3.17-4.13)	**4.93** (4.36-5.70)	**6.77** (5.97-7.84)	**8.32** (7.27-9.70)	**10.5** (8.88-12.6)	**12.2** (10.1-15.0)	**14.0** (11.4-17.7)	**15.9** (12.6-20.6)	**18.6** (14.1-25.1)	**20.7** (15.2-28.9)
45-day	**4.25** (3.76-4.90)	**5.85** (5.17-6.75)	**8.03** (7.08-9.29)	**9.87** (8.64-11.5)	**12.5** (10.6-15.0)	**14.6** (12.1-17.9)	**16.8** (13.6-21.1)	**19.1** (15.1-24.7)	**22.4** (17.0-30.2)	**25.1** (18.4-35.0)
60-day	**4.95** (4.38-5.71)	**6.77** (5.99-7.82)	**9.27** (8.18-10.7)	**11.4** (9.97-13.3)	**14.4** (12.2-17.4)	**16.8** (14.0-20.7)	**19.4** (15.7-24.4)	**22.1** (17.4-28.6)	**26.0** (19.7-35.0)	**29.1** (21.3-40.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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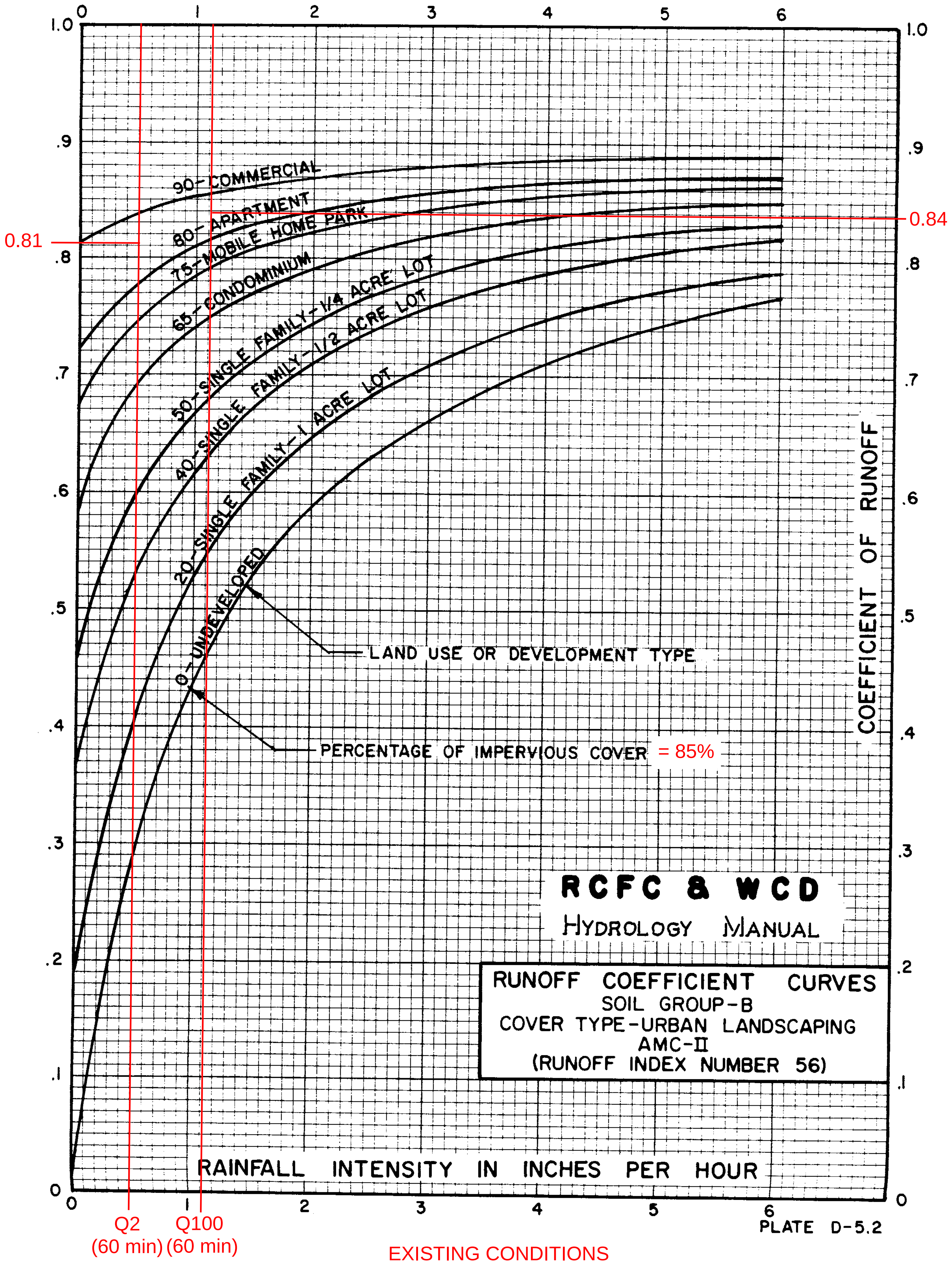
PF graphical



RCFC & WCD

HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP-B
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 56)

PLATE D-5.2

EXISTING CONDITIONS

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	215,60, 91	60.7/70.6, 22.0/18.5, 32.7/34.7		2838

7-12-04
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
Alan R. Bisi
No. C-62808
Exp. 6/30/06
CIVIL
STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Cal-Trans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

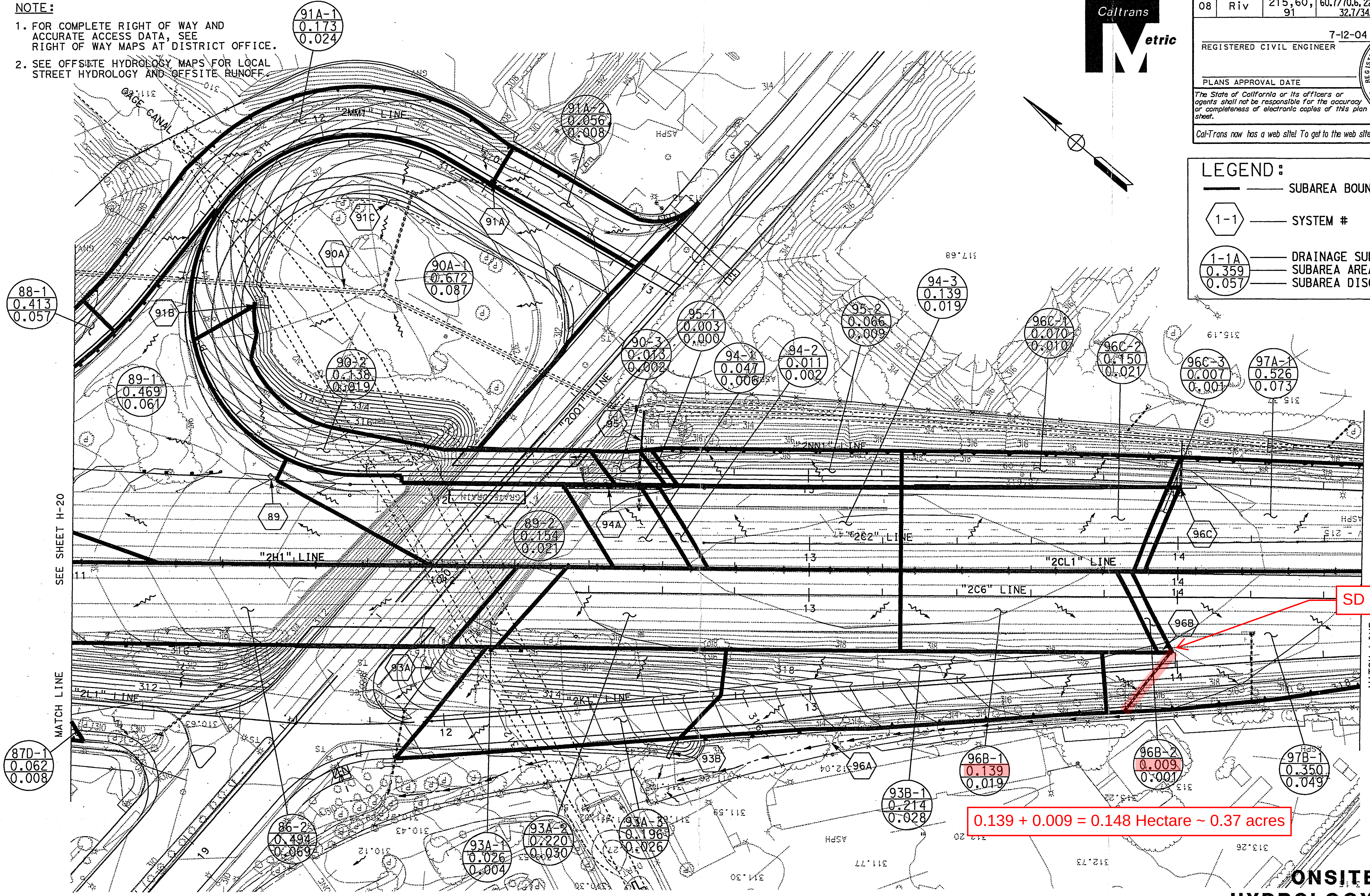
Caltrans Metric

NOTE:

1. FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY MAPS AT DISTRICT OFFICE.
2. SEE OFFSITE HYDROLOGY MAPS FOR LOCAL STREET HYDROLOGY AND OFFSITE RUNOFF.

LEGEND:

▬ ──	SUBAREA BOUNDARY
⬡ 1-1	SYSTEM #
1-1A	DRAINAGE SUBAREA #
0.359	SUBAREA AREA (HA)
0.057	SUBAREA DISCHARGE (CMS)



SD inlet

0.139 + 0.009 = 0.148 Hectare ~ 0.37 acres

THIS PLAN ACCURATE FOR DRAINAGE WORK ONLY.

ALL DIMENSIONS ARE
METERS UNLESS OTHERWISE SHOWN

FOR BIDDING PURPOSES ONLY

ONSITE HYDROLOGY MAP

SCALE 1:500

H-21

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS

0 20 40 60 80

USERNAME => bpatschu
DGN FILE => 833484h021.dgn

CU 08227

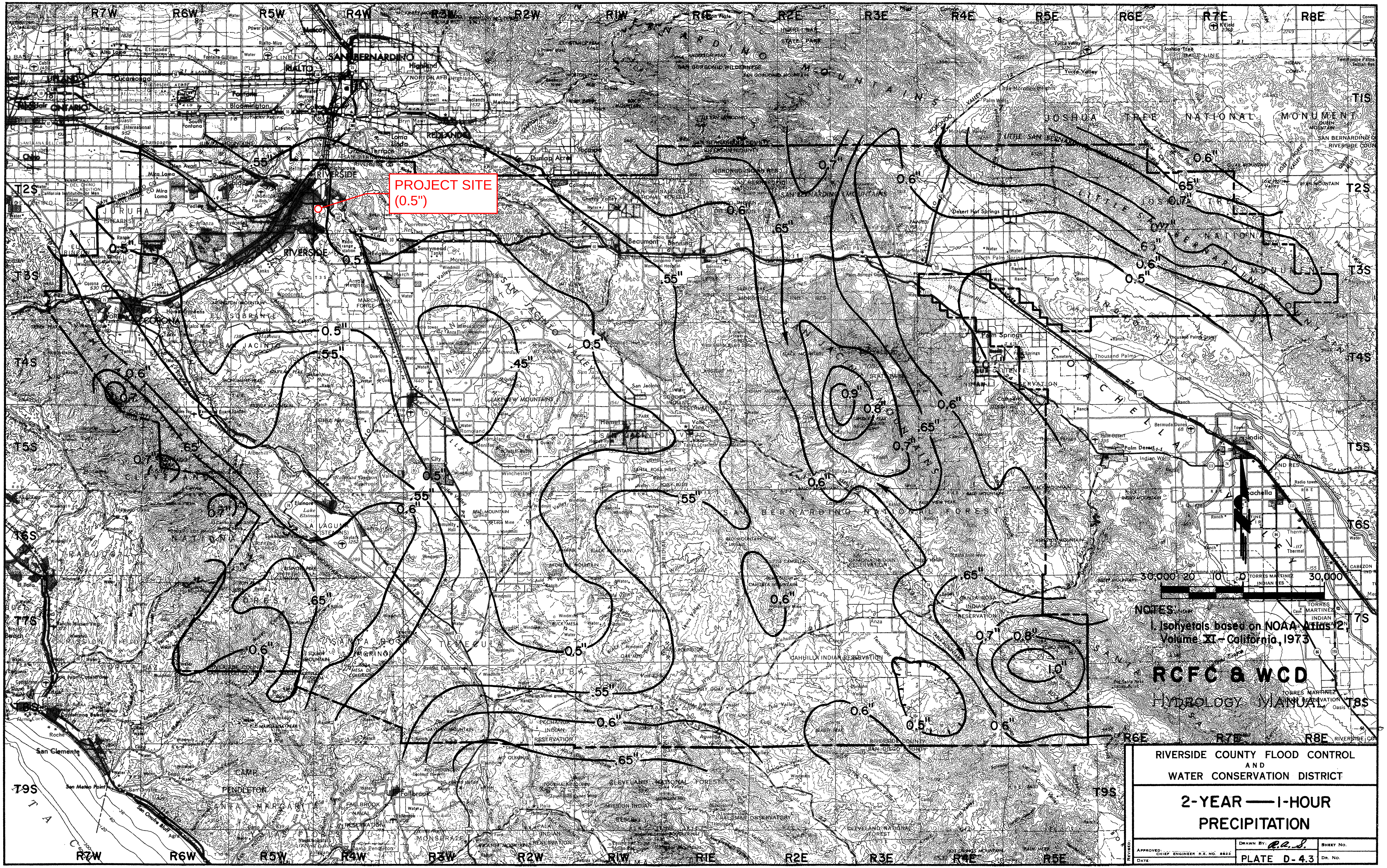
EA 334841

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT

PROJECT ENGINEER
ALAN R. BISI

CALCULATED/DESIGNED BY
CHECKED BY
REVISED BY
DATE REVISED
DATE

DATE PLOTTED => 26-NOV-2008
TIME PLOTTED => 09:11
LAST REVISION



NOTES
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

2-YEAR —— 1-HOUR PRECIPITATION

REVISED:

APPROVED: ______
CHIEF ENGINEER R.E. NO. 8822

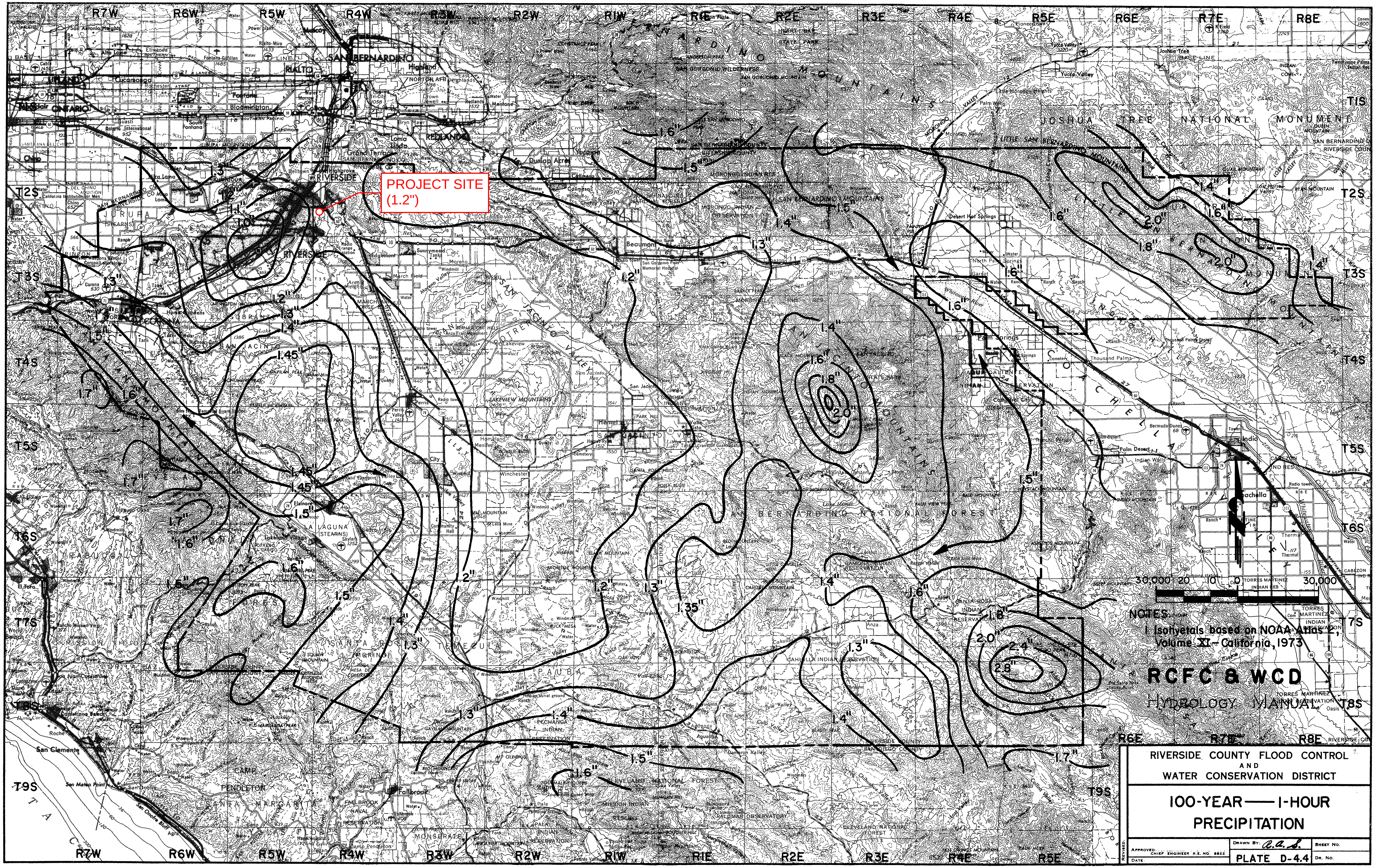
DATE:

DRAWN BY: R.A.S.

SHEET NO.

PLATE D-4.3

DR. NO.



PROJECT SITE
(1.2")

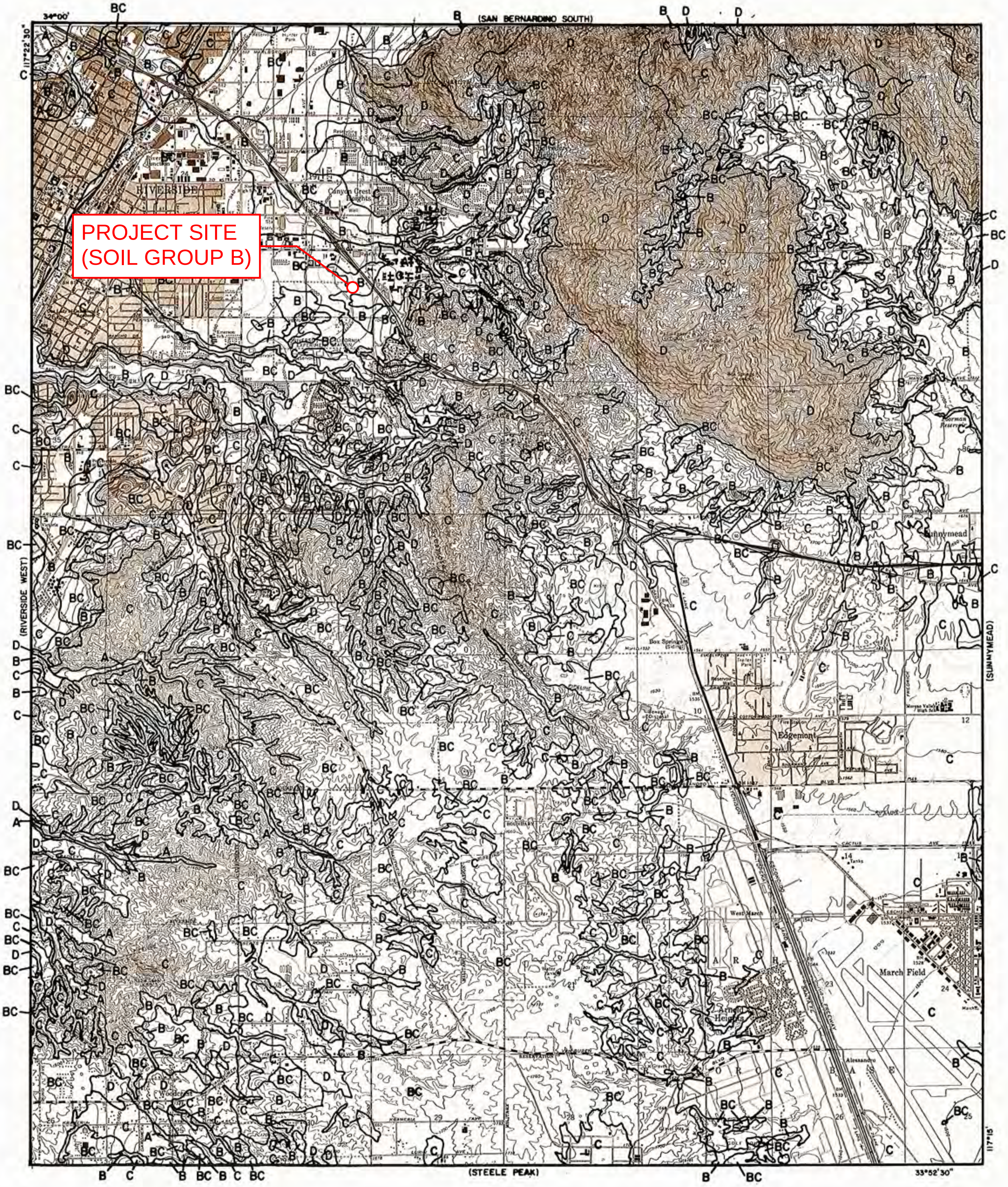
NOTES
1 Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

100-YEAR —— 1-HOUR PRECIPITATION

APPROVED: CHIEF ENGINEER R.E. NO. 8822
DATE
REVISED
DRAWN BY: R.A.S.
SHEET NO.
PLATE D-4.4
DR. NO.



LEGEND

- SOILS GROUP BOUNDARY
- A SOILS GROUP DESIGNATION

RCFC & WCD
HYDROLOGY MANUAL

HYDROLOGIC SOILS GROUP MAP FOR RIVERSIDE-EAST

PLATE C-1.16

PSOMAS
401 B STREET, SUITE 1600
SAN DIEGO, CA 92101

UCR OASIS Park
PSOMAS#:5MIL130100
CALCULATED BY: AMP
6/7/2023

2 YEAR - PROPOSED CONDITION

DRAINAGE AREA	DEVELOPMENT	A (ACRES)	% OF TOTAL ACREAGE	C*	I** (IN/HR)	Q*** (CFS)	REMARKS
THE FOLLOWING HYDROLOGIC CALCULATIONS DONE PER METHODS DESCRIBED IN THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER DISTRICT HYDROLOGY MANUAL							
SUB-AREA							
1-A	Commercial (Parking Lot 51)	2.15	15.77%	0.73	0.5	0.78	
1-B	Commercial (Parking Lot 50)	1.64	12.03%	0.73	0.5	0.60	
2-A	Commercial (West Proposed Site)	1.65	12.11%	0.73	0.5	0.60	
2-B	Commercial (East Proposed Site)	2.97	21.79%	0.73	0.5	1.08	
3-A	Commercial (Caltrans Site)	4.72	N/A	0.73	0.5	1.72	
3-B	Commercial (I-215 Freeway)	0.37	N/A	0.73	0.5	0.14	
3-C	Commercial (Gage Canal)	0.13	N/A	0.73	0.5	0.05	
TOTAL		13.63		0.73	0.5	**5.0**	

100 YEAR - PROPOSED CONDITION

DRAINAGE AREA	DEVELOPMENT	A (ACRES)	% OF TOTAL ACREAGE	C*	I** (IN/HR)	Q*** (CFS)	REMARKS
THE FOLLOWING HYDROLOGIC CALCULATIONS DONE PER METHODS DESCRIBED IN THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER DISTRICT HYDROLOGY MANUAL							
SUB-AREA							
1-A	Commercial (Parking Lot 51)	2.15	15.77%	0.78	1.2	2.01	
1-B	Commercial (Parking Lot 50)	1.64	12.03%	0.78	1.2	1.54	
2-A	Commercial (West Proposed Site)	1.65	12.11%	0.78	1.2	1.54	
2-B	Commercial (East Proposed Site)	2.97	21.79%	0.78	1.2	2.78	
3-A	Commercial (Caltrans Site)	4.72	N/A	0.78	1.2	4.42	
3-B	Commercial (I-215 Freeway)	0.37	N/A	0.78	1.2	0.35	
3-C	Commercial (Gage Canal)	0.13	N/A	0.78	1.2	0.12	
TOTAL		13.63		0.78	1.2	**12.8**	

* C based on coefficient of runnoff from NOAA Atlas 14
** Intensities are based on the tablr from Plate D-4.1, RCFC & WCD Hydrology Manual
***Q based on the rational method equation from Plate D-1, RCFC & WCD Hydrology Manual

Q = C * I *A

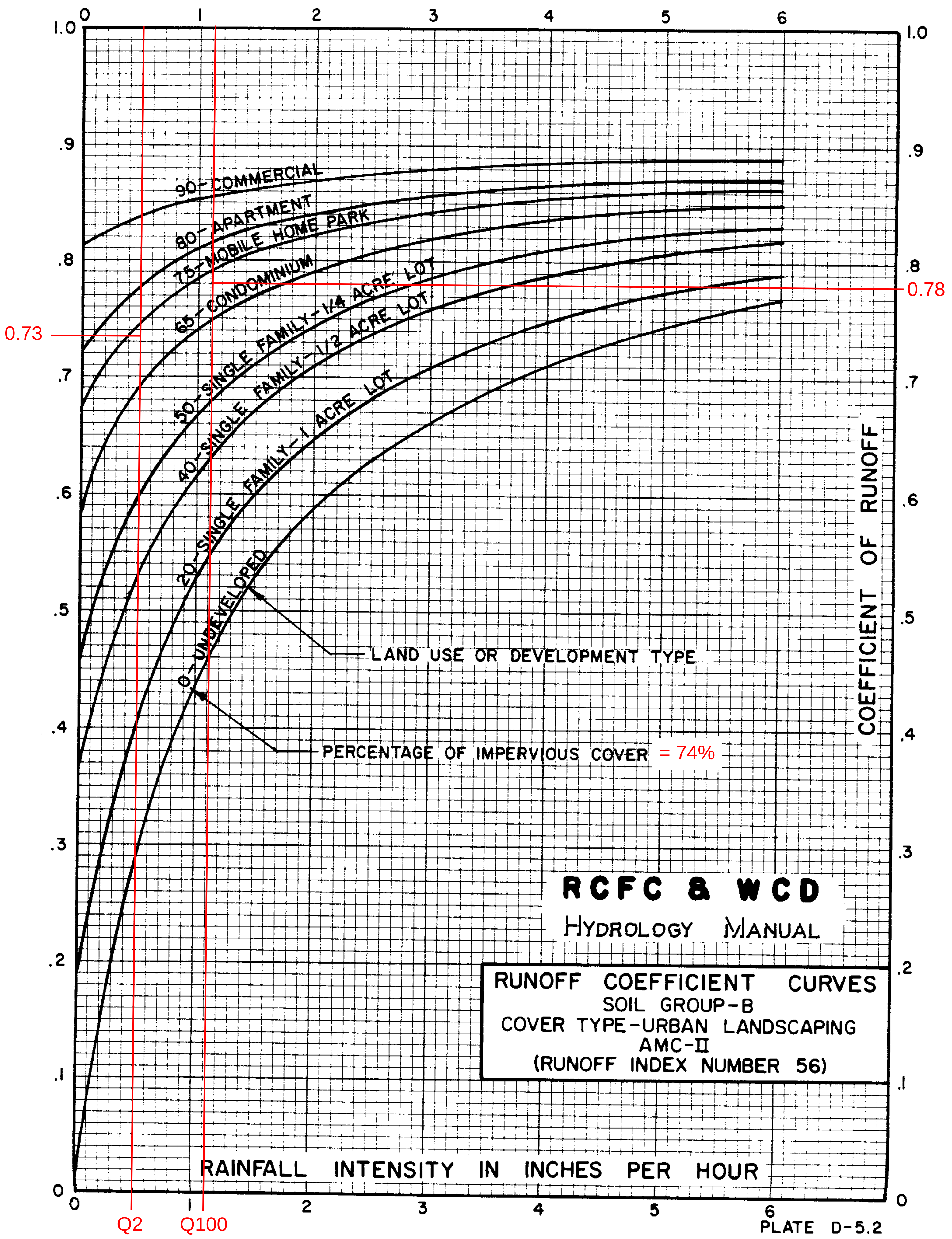


PLATE D-5.2

PROPOSED CONDITIONS

September 5, 2023

UCR OASIS Park
Psomas Project No. 5MIL130100

APPENDIX B

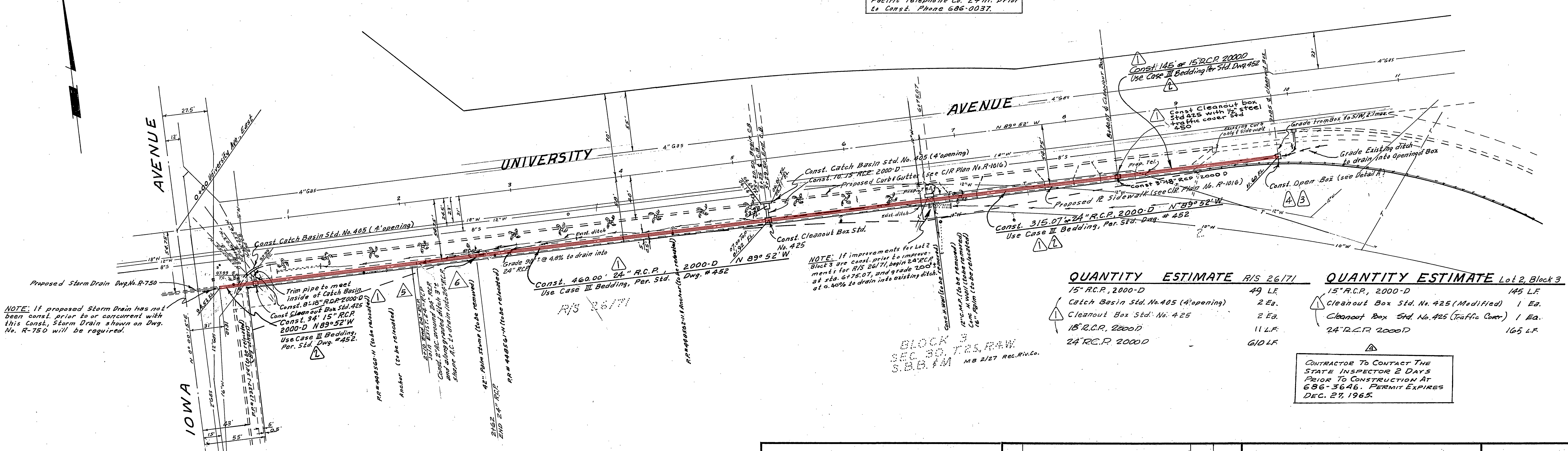
Record Information

BENCH MARKS:

1. Elev. 997.623 C/R F.B. 625 PK in N.W. curb return University Ave & Iowa.
2. Elev. 996.63 F.B. 558 page 45, Top Mon. inside Caped Mon. Int. University & Iowa 4' North of ℄ of R/W Sta. 0+00.

CAUTION

Telephone underground, contact Pacific Telephone Co. 24 hr. prior to Const. Phone 686-0037.



NOTE: If proposed Storm Drain has not been const. prior to or concurrent with this Const., Storm Drain shown on Dwg. No. R-750 will be required.

NOTE: If improvements for Lot 2 Block 3 are const. prior to improvements for R/S 26/71, begin 24" RCP at sta. 6+75.07, and grade 200'± at a 0.40% to drain into existing ditch.

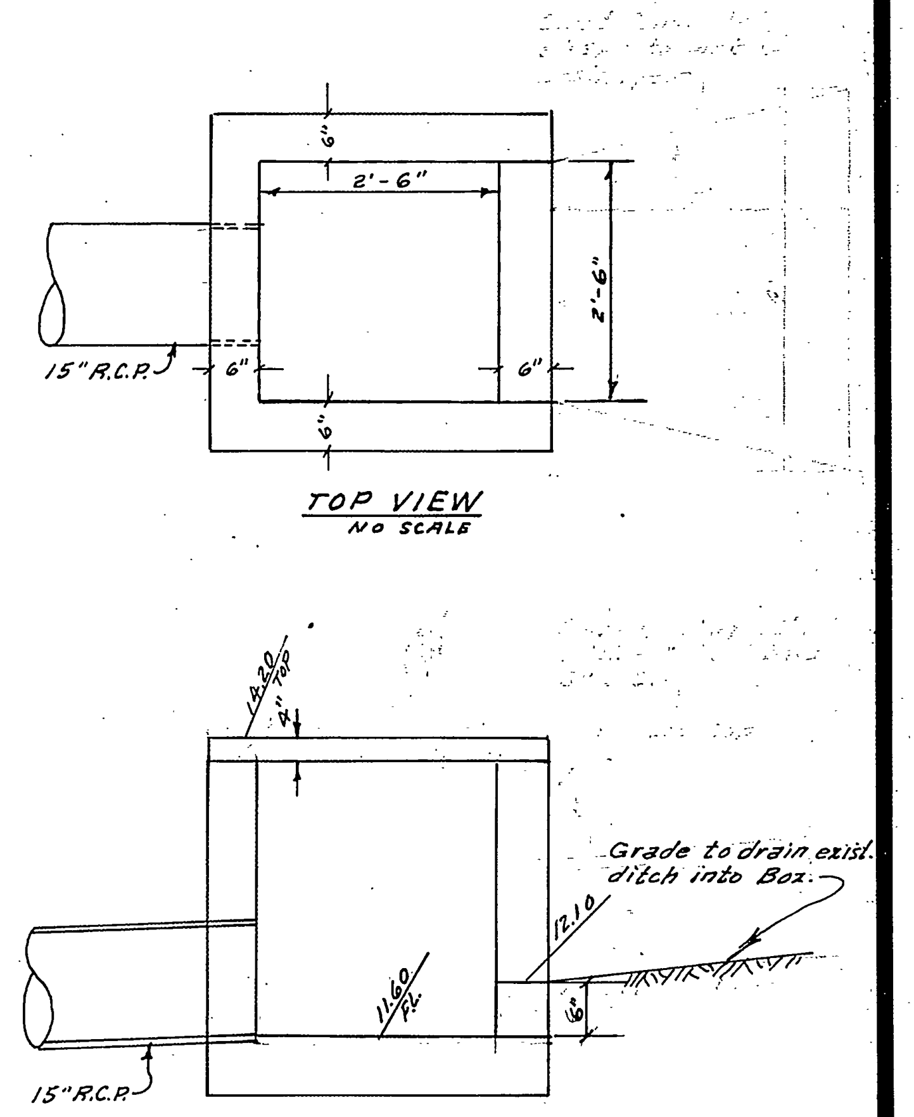
QUANTITY ESTIMATE R/S 26/71

15" R.C.P., 2000-D	49 L.F.
Catch Basin Std. No. 405 (4' opening)	2 Ea.
Cleanout Box Std. No. 425	2 Ea.
18" R.C.P., 2000D	11 L.F.
24" R.C.P. 2000D	610 L.F.

QUANTITY ESTIMATE Lot 2, Block 3

15" R.C.P., 2000-D	145 L.F.
Cleanout Box Std. No. 425 (Modified)	1 Ea.
Cleanout Box Std. No. 425 (Traffic Cover)	1 Ea.
24" R.C.P. 2000D	165 L.F.

CONTRACTOR TO CONTACT THE STATE INSPECTOR 2 DAYS PRIOR TO CONSTRUCTION AT 686-3646. PERMIT EXPIRES DEC. 27, 1965.



DETAIL A
NO SCALE

To be Const. per Standard Dwg. No. 425 without Frame & cover & one side, as shown.

NOTE: The Contractor is to get the necessary encroachment permits, to work on State Right of Way.

INDEXED WR

ALBERT A. WEBB ASSOCIATES
CIVIL ENGINEERS
RIVERSIDE, CALIFORNIA
APPROVED BY Ernest N. Webb DATE 1/19/65
R.E. No. 9876
W.O. 64-402 FOR: JIMMY TOTMAN F.B. 558

MARK	REVISIONS	APPR.	DATE
6	Added End Const. 24" RCP @ 2+62 ENW 10-22-71		10.28.71
5	~~Added End Const. 24" RCP @ 2+10~~ ENW		
4	ADDED NOTE TO CONTACT STATE INSP.		
3	Revised C.O. Box to Open Box / ENW		
2	Changed Case I Bedding to Case III / E.N.W.		5.27
1	Add C.O. Box - Changed Pipe Sizes / E.N.W.		

DESIGNED BY BEL DRAWN BY BEL CHECKED BY

CITY OF RIVERSIDE, CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

APPROVED BY	BY	DATE
OFFICE ENGINEER	wdg	4.16
PARK DEPARTMENT		
TRAFFIC DIVISION		
ASSISTANT CITY ENG.	AKJ	4.16

APPROVED BY
DIRECTOR OF PUBLIC WORKS
DATE 4-19-65

STORM DRAIN PLAN & PROFILE
UNIVERSITY AVENUE
BETWEEN IOWA AVE & F/W
SOUTHERLY SIDE
HORIZ. SCALE: 1" = 50' VERT. SCALE: 1" = 5'

PROJECT NO.
D-130
SHEET 1 OF 1
FILE NO. 64-402-D

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	Riv	215,60, 91	60.7/70.6, 22.0/18.5, 32.7/34.7		2838

7-12-04
REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

Alan R. Bisi
No. C-62808
Exp. 6/30/06
CIVIL

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

Cal-Trans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

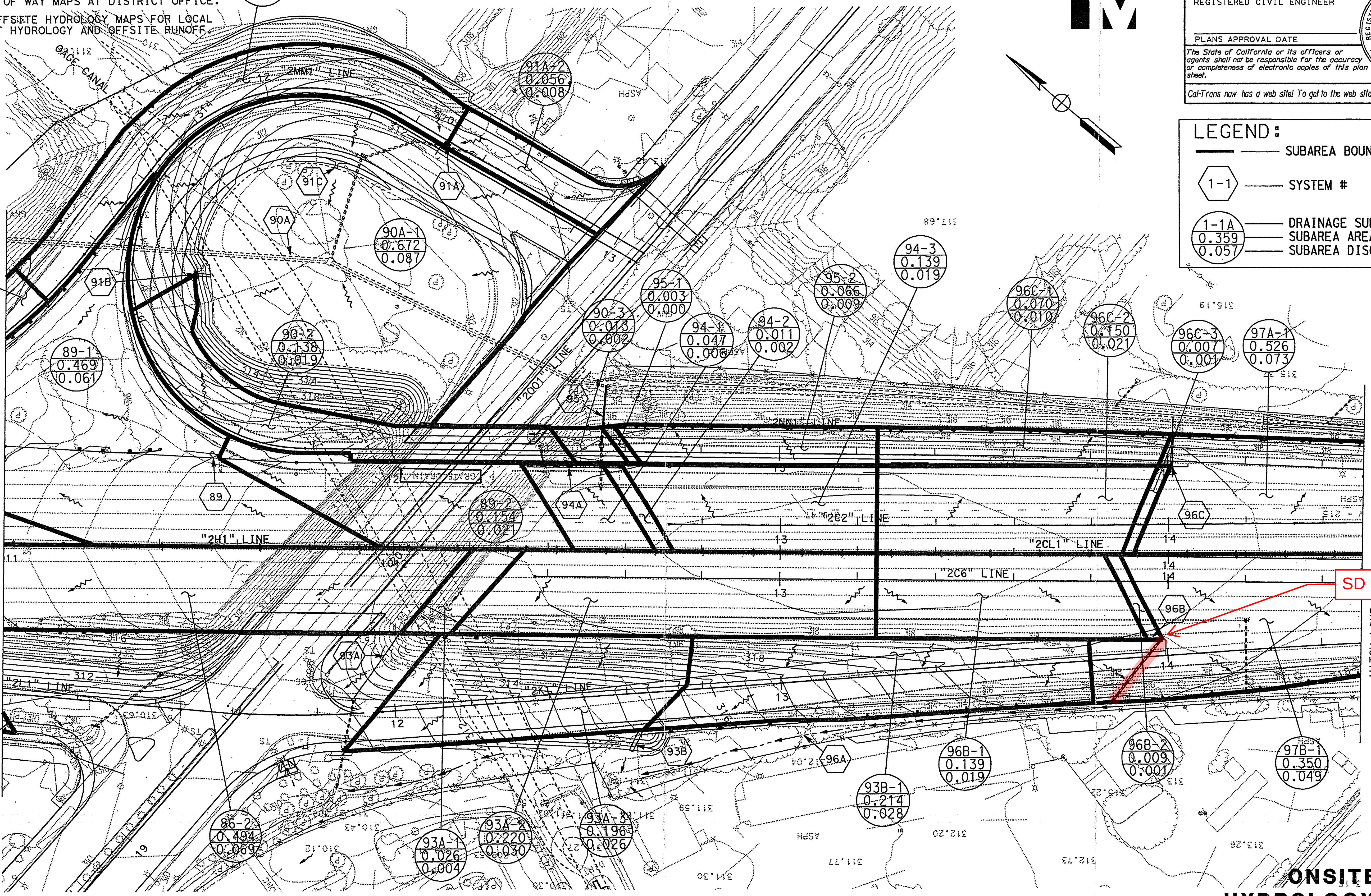
Caltrans Metric

NOTE:

1. FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY MAPS AT DISTRICT OFFICE.
2. SEE OFFSITE HYDROLOGY MAPS FOR LOCAL STREET HYDROLOGY AND OFFSITE RUNOFF.

LEGEND:

▬ ▬	SUBAREA BOUNDARY
⬡ 1-1	SYSTEM #
1-1A	DRAINAGE SUBAREA #
0.359	SUBAREA AREA (HA)
0.057	SUBAREA DISCHARGE (CMS)



THIS PLAN ACCURATE FOR DRAINAGE WORK ONLY.

ALL DIMENSIONS ARE
METERS UNLESS OTHERWISE SHOWN

FOR BIDDING PURPOSES ONLY

ONSITE HYDROLOGY MAP

SCALE 1:500

H-21

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT

PROJECT ENGINEER
ALAN R. BISI

CALCULATED/DESIGNED BY
CHECKED BY

REVISED BY
DATE REVISED
DATE

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS
0 20 40 60 80

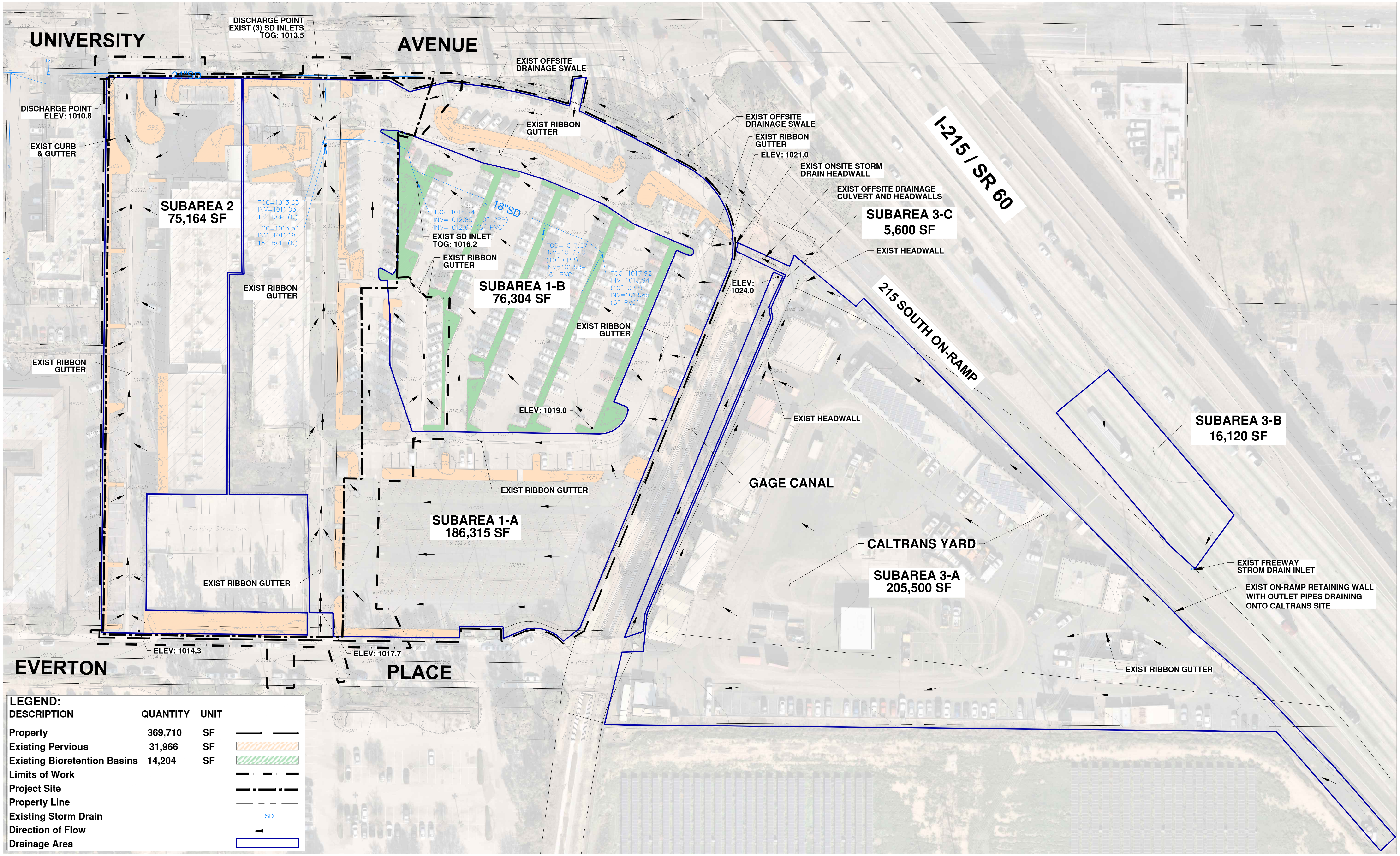
USERNAME => bpatschu
DGN FILE => 833484h021.dgn

CU 08227
EA 334841

LAST REVISION
DATE PLOTTED => 26-NOV-2008
TIME PLOTTED => 09:11

APPENDIX C

Exhibits

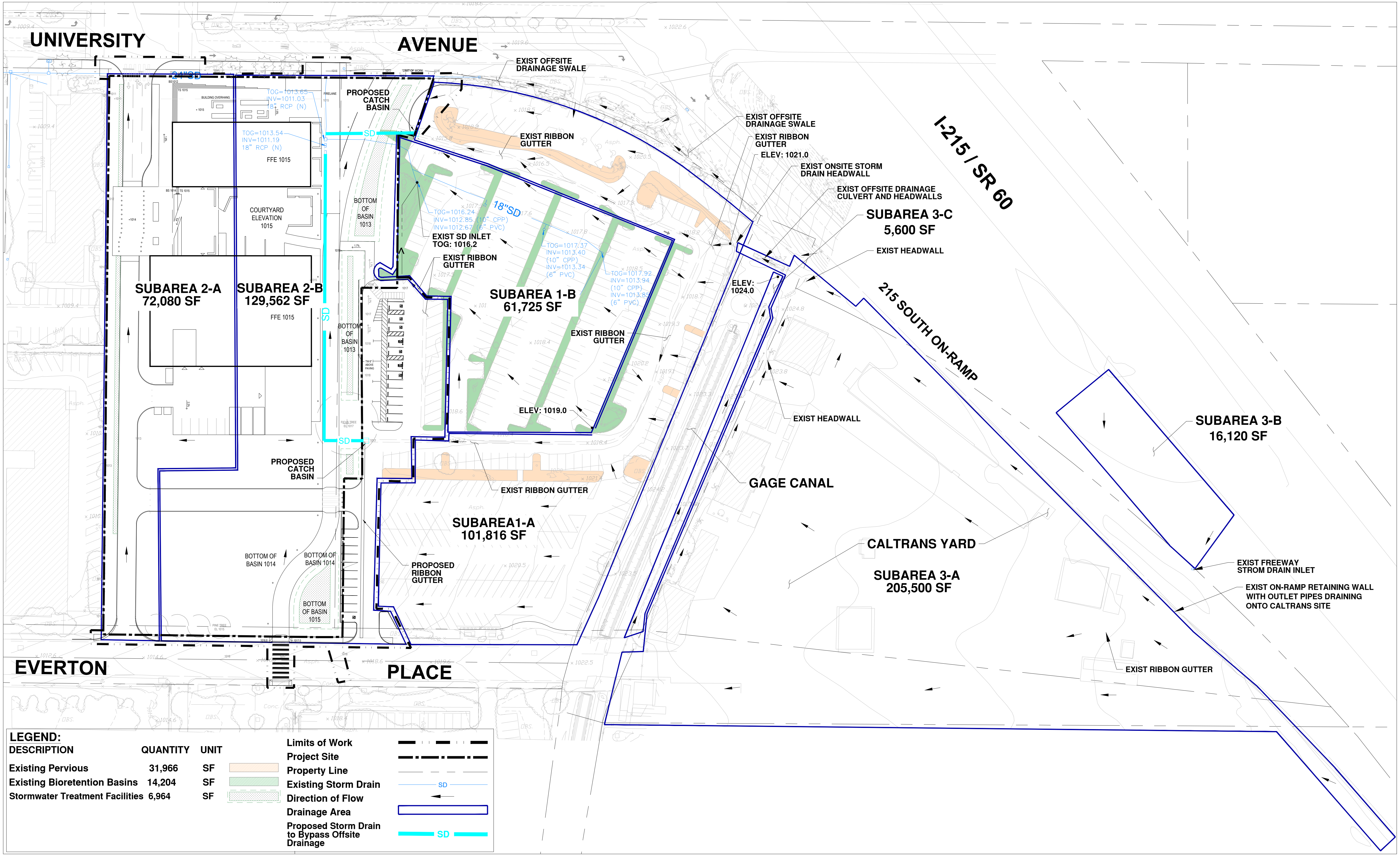


LEGEND:

DESCRIPTION	QUANTITY	UNIT	
Property	369,710	SF	— —
Existing Pervious	31,966	SF	🟧
Existing Bioretention Basins	14,204	SF	🟩
Limits of Work			-·-·-
Project Site			—·—·—
Property Line			— – —
Existing Storm Drain			— SD —
Direction of Flow			←
Drainage Area			▭

EXISTING HYDROLOGY MAP

0' 40' 80' 160'



LEGEND:

DESCRIPTION	QUANTITY	UNIT	
Existing Pervious	31,966	SF	🟧
Existing Bioretention Basins	14,204	SF	🟩
Stormwater Treatment Facilities	6,964	SF	▨

Limits of Work	▬ ▪ ▬ ▪ ▬
Project Site	▬ · ▬ · ▬
Property Line	— — —
Existing Storm Drain	SD
Direction of Flow	←
Drainage Area	▭
Proposed Storm Drain to Bypass Offsite Drainage	SD

PRELIMINARY HYDROLOGY EXHIBIT

0' 40' 80' 160'

Attachment 17

Preliminary Water Quality Management Plan

PRELIMINARY STORMWATER QUALITY MANAGEMENT PLAN

For
University of California, Riverside – OASIS Park
APN 253-050-005, 006, 007, & 008

PREPARED FOR:
University of California, Riverside
Planning, Design & Construction
1223 University Avenue Suite 240
Riverside, CA 92507

PREPARED BY:
Psomas
401 B Street, Suite 1600
San Diego, CA 92101

DATE:
September 5, 2023

REGISTERED PROFESSIONAL ENGINEER
SARAH K. CURRAN
No. C69620
CIVIL
STATE OF CALIFORNIA

9/5/2023

Sarah Curran, RCE C69620 Date

TABLE OF CONTENTS

APPENDICES

1.0 Project Background

The University of California, Riverside (“UCR” or “University”) is developing an Opportunities to Advance Sustainability, Innovation and Social Inclusion (OASIS) Park (“Project”) at 1200 University Avenue and a portion of 1150 and 1160 University Avenue (Accessor Parcel Number [APN] 253-050-005 and a portion of APNs 253-050-006, 253-050-007, and 253-050-008), south of University Avenue, north of Everton Place, and west of Gage Canal, a Caltrans yard and Interstate 215/State Route 60 (I-215/SR-60)freeway, in the City of Riverside, California. The property comprises approximately 8 acres,approximately 4 of which will be improved as part of the Project (“Project site”). The scope of the Project includes the design and construction of one to two new buildings, a gathering space,open spaces, a work yard, and stormwater treatment facilities. The eastern portion of the site may also be improved with surface-level adjustments to parking spaces/restriping and new landscaping.

Vicinity Map

The Project will be required to comply with University's Phase II Small Municipal Separate Storm Sewer System (MS4) Permit. Since it will create/replace more than 5,000 square feet of impervious surface, it will be defined as a Regulated Project and therefore required to implement measures for site design, runoff reduction, stormwater treatment, and baseline hydromodification management. This report has been prepared to support the programming of the Project site and the California Environmental Quality Act (CEQA) permitting process. The future Design Build Team will ultimately be responsible for the detailed design of stormwater improvements for the Project.

2.0 Water Quality and Management Overview

2.1 Phase II Small MS4 Post-Construction Management Requirements

The post-construction stormwater management for the Project shall follow the University's Phase II Small MS4 Post-Construction Stormwater Management Requirements documents and Phase II Small MS4 Post-Construction Stormwater Management Checklist, provided in Appendix A.

3.0 Existing Conditions

The property, including the Project site, is located within the Santa Ana River Watershed. Onsite and offsite stormwater is collected and discharged by overland flow, basins, above-ground drainage, and underground storm drain systems. Three (3) existing storm drain inlet structures, located at the north side of the property, capture the combined flows and conveys them through an existing 18-inch reinforced concrete pipe (RCP) storm drain line that ultimately discharges to an existing City-owned 24-inch storm drain main line within University Avenue. Runoff from adjacent properties (e.g. I-215/SR 60, Caltrans, Gage Canal) contributes to the stormwater collected on the property and is conveyed by concrete ribbon gutters to the three storm drain inlets.

Parking Lot 50 is a recently improved (2017) surface parking lot that has implemented stormwater management facilities. Sheet flow stormwater is channelized though curb cuts to existing bioretention basins and collected at inlets located within the basins before connecting to the existing 18-inch storm drain lateral.

Parking Lot 51 stormwater sheet flows on impervious pavement north and west to the concrete ribbon gutters, which carry flows north to the three storm drain inlets described above.

Infiltration rates around the property vary between 0.1 to 0.9 in/hour per the geotechnical report, dated 1/25/2023. The geotechnical report is provided in Appendix B.

According to the Federal Emergency Management Agency ("FEMA") Special Flood Hazard Area / Flood Insurance Rate Map (FIRM), the Project site is located outside of the 100-year flood plain.

4.0 Proposed Conditions

Approximately four acres of the larger 8.3-acre property will be demolished, graded, and improved as part of the Project. Landscaping, pavers and other permeable materials will be incorporated into the 4 +/- acre improved site which, as a result, will increase the perviousness from the existing condition.

As a baseline condition, bioretention Stormwater Best Management Practices (BMPs) will be implemented to treat and detain stormwater runoff from the improved Project site before ultimately connecting to the existing 18-inch storm drain lateral which, in turn, connects to the City of Riverside 24-inch main, similar to the existing conditions. See the Preliminary Hydrology Study for the *Existing Hydrology Map* and *Preliminary Hydrology Exhibit* for existing and proposed drainage conditions. As an enhancement, infiltration BMPs can be incorporated to also achieve LEED Rainwater Management credits.

Runoff from Parking Lot 51 and the adjacent properties (e.g. I-215/SR 60 freeway, Caltrans yard, Gage Canal) will be collected via new catch basins before entering the improved Project site and conveyed via new storm drain, or similar, to the existing 18-inch lateral, without any new treatment, detention or retention. Similarly, drainage from Parking Lot 50 will continue to be bypassed around the improved project site and connected to the 18-inch lateral, as it is in the existing condition. See the Preliminary Hydrology Study for the *Preliminary Hydrology Exhibit* for the proposed drainage conditions.

5.0 Pollutants of Concern

The property, including the Project site, is tributary to the Santa Ana River Reach 3. This waterway is listed as impaired under the 303(d) list for the following listed pollutants of concern:

- Copper
- Lead
- Pathogens

The BMP's selected for the Project site should prioritize treatment of the listed pollutants.

Potential pollutant source areas in the Project site include a network of vegetated landscaping, surface parking stalls, paved vehicular and pedestrian pathways, building roofs, and service yards.

6.0 Best Management Practices

6.1 Best Management Practices (BMP) Recommendations

The preliminary Water Quality Management Plan (pWQMP) exhibit in Appendix C represents conceptual BMPs for the Project. Associated design fact sheets are provided in Appendix D.

Approximately 6,965 square feet of bioretention basins are proposed to treat and store Project site runoff. Runoff will be collected and discharged to the basins before connecting to the existing 18-inch storm drain lateral. These bioretention BMP's will consist of a vegetated area with a mulch layer (2 to 3 inches), engineered soil media (18 to 36 inches), and a gravel layer (12 inches) with perforated pipes. The non-infiltrating bioretention basin BMP's provide necessary flow based treatment to meet UCR's pollution control requirements.

Permeable pavers may be used to both treat and reduce the stormwater runoff at the entrance at University Avenue. Permeable pavers will be placed on top of a reservoir layer (12 inches) so that drainage will infiltrate into the native subsoil. Overflow drainage will be connected to the existing 18-inch storm drain lateral.

As an enhancement, and to achieve LEED Rainwater Management credits, an infiltration basin may be used to capture and infiltrate onsite runoff and drainage. The basin will consist of vegetation of native grasses and should not exceed 5 feet maximum in depth. Any flows that exceed the basin's volume will be directed to the downstream conveyance system.

7.0 Treatment Volume and Flow Rate Calculations

7.1 Stormwater Treatment Recommendations

The Riverside County Design Handbook for Low Impact Development Best Management Practices (2011) was used to calculate the runoff volume (V_{BMP}) and peak design discharge (Q_{BMP}) for the 85th Percentile 24-hour storm event of each drainage area as indicated in the pWQMP Exhibit and summarized in the following table:

Stormwater Treatment Summary			
Subarea	Area (AC)	V_{BMP} (cubic feet)	Q_{BMP} (cfs)
2-A	1.65	1,681	0.2
2-B	2.97	3,734	0.3
Total			**0.5**

Based on the calculated V_{BMP}, the Bioretention Facilities BMP worksheet was used to develop the conceptual sizing of this BMP presented in this report and is summarized as follows:

Stormwater Treatment Facilities			
BMP	Tributary Subareas (AC)	V_{BMP} (cubic feet)	Minimum Surface Area (ft^2)
Biofiltration Basin	2-B	3,734	5,787

Reference Appendix E for concept V_{BMP}, Q_{BMP} and BMP sizing worksheet and Appendix F for Isohyetal Map for the 85th Percentile 24-hour storm event.

APPENDIX A

University’s Phase II Small MS4 Post-Construction Stormwater Management Documents and Checklist

UC RIVERSIDE | Environmental Health & Safety

Phase II Small MS4 Post-Construction Stormwater Management Requirements

11/10/2021

Applicability

Site Design Measures are required for all projects that **create and/or replace** (including projects with no net increase in impervious footprint) **between 2,500 square feet and 5,000 feet of impervious surface**.

Low Impact Development (LID) Design Standards are required for all development projects that **create and/or replace 5,000 square feet or more of impervious surface** (Regulated Projects).

Requirements

1) **Projects that create and/or replace between 2,500 square feet and 5,000 feet of impervious surface** shall implement one or more of the following **site design measures** to reduce project site runoff:
    a) Stream Setbacks and Buffers – a vegetated area including trees, shrubs, and herbaceous vegetation that exists or is established to protect a stream system;
    b) Soil Quality Improvement and Maintenance – improvement and maintenance of soil through soil amendments and creation of microbial community;
    c) Tree planting and preservation – planting and preservation of health, established threes that include both evergreens and deciduous , as applicable;
    d) Rooftop and Impervious Area Disconnection – rerouting of rooftop drainage pipes to drain rainwater to rain barrels, cisterns, or permeable areas instead of the storm sewer;
    e) Porous Pavement – pavement that allows runoff to pass through it, thereby reducing the runoff from a site and surrounding areas and filtering pollutants;
    f) Green Roofs – a vegetative layer grown on a roof (rooftop garden);
    g) Vegetated Swales – a vegetated, open-channel management practice designed specifically to treat and attenuate stormwater runoff;
    h) Rain Barrels and Cisterns – system that collects and stores stormwater runoff from a roof or other impervious surface
2) Project proponents shall use the **State Water Board Post-Construction Water Balance Calculator or equivalent to quantify the runoff reduction** resulting from implementation of **site design measures**.[1]
3) **Site Design Measures** shall be based on the objective of achieving infiltration, evapotranspiration and/or harvesting/reuse of the 85th percentile rainfall event, to the extent feasible, to meet **6) Numeric Sizing Criteria for Stormwater Retention and Treatment**. Site design measures shall be used to reduce the amount of runoff, to the extent technically feasible, for which retention and runoff is required. Any remaining runoff from impervious drainage management areas (DMAs) may then be directed to one or more bioretention facilities as specified in **7) Stormwater Treatment Measures and Baseline Hydromodification Management Measures**.

---

[1] The State Water Board Post-Construction Water Balance Calculator referenced in the Phase II Small MS4 permit can be found at https://www.waterboards.ca.gov/water_issues/programs/stormwater/phase_ii_municipal.html

4) **Projects that create and/or replace 5,000 square feet or more of impervious surface (Regulated Projects)** shall implement measures for **site design, runoff reduction, stormwater treatment,** and **baseline hydromodification management.**
    a) Where a redevelopment project results in an increase of more than 50 percent of the impervious surface of a previously existing development, runoff from the entire project, consisting of all existing, new, and/or replaced impervious surfaces, must be included to the extent feasible.
    b) Where a redevelopment project results in an increase of less than 50 percent of the impervious surface of a previously existing development, only runoff from the new and/or replaced impervious surface of the project must be included.

5) **Source Control Measures** – Regulated Projects with pollutatant-generating activities and sources are required to implement standard permanent and/or operational source control measures as applicable. Measures for the following pollutant-generating activities and sources shall be designed consistent with recommendations from the CASQA Stormwater BMP Handbook for New Development and Redevelopment or equivalent manual, and include:
    a) Accidental spills or leaks
    b) Interior floor drains
    c) Parking/Storage area maintenance
    d) Indoor and structural pest control
    e) Landscape/outdoor pesticide use
    f) Pools, spas, ponds, decorative fountains, and other water features
    g) Restaurants, grocery stores, and other food service operations
    h) Storage and handling of solid waste
    i) Outdoor storage of equipment or materials
    j) Vehicle and equipment cleaning
    k) Vehicle and equipment repair and maintenance
    l) Fuel dispensing areas
    m) Loading docks
    n) Fire sprinkler test water
    o) Drain or wash water from boiler drain lines, condensate drain lines, rooftopequipment, drainage sumps, and other sources
    p) Unauthorized non-storm water discharges
    q) Building and grounds maintenance

6) **Numeric Sizing Criteria for Stormwater Retention and Treatment** – Facilities designed to evapotranspire, infiltrate, harvest/use, and biotreat stormwater must meet at least one of the following **hydraulic sizing design criteria**:
    a) **Volumetric Criteria**

i) The maximized capture stormwater volume for the tributary area, on the basis of historical rainfall records, determined using the formula and volume capture coefficients in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87 (1998) pages 175-178 (that is, approximately the 85th percentile 24-hour storm runoff event); or

ii) The volume of annual runoff required to achieve 80 percent or more capture, determined in accordance with the methodology in Section 5 of CASQA's Stormwater Best Management Practice Handbook, New Development and Redevelopment (2003), using local rainfall data.

b) **Flow-based Criteria**

i) The flow of runoff produced from a rain event equal to at least 0.2 inches per hour intensity; or

ii) The flow of runoff produced from a rain event equal to at least 2 times the 85th percentile hourly rainfall intensity as determined from local rainfall records

7) **Stormwater Treatment Measures and Baseline Hydromodification Management Measures** – After implementation of Site Design Measures, runoff from remaining impervious DMAs must be directed to one or more facilities designed to infiltrate, evapotranspire, and/or biotreat the amount of runoff specified in **6) Numeric Sizing Criteria for Stormwater Retention and Treatment**. The facilities must be demonstrated to be at least as effective as a bioretention system with the following design parameters:

1) Maximum surface loading rate of 5 inches per hour, based on the flow rates calculated. A sizing factor of 4% of tributary impervious area may be used.

2) Minimum surface reservoir volume equal to surface area times a depth of 6 inches.

3) Minimum planting medium depth of 18 inches. The planting medium must sustain a minimum infiltration rate of 5 inches per hour throughout the life of the project and must maximize runoff retention and pollutant removal. A mixture of sand (60%-70%) meeting the specifications of American Society for Testing and Materials (ASTM) C33 and compost (30%-40%) may be used.

4) Subsurface drainage/storage (gravel) layer with an area equal to the surface area and having a minimum depth of 12 inches.

5) Underdrain with discharge elevation at top of gravel layer.

6) No compaction of soils beneath the facility, or ripping/loosening of soils if compacted.

7) No liners or other barriers interfering with infiltration.

8) Appropriate plant palette for the specified soil mix and maximum available water use.

a) **Alternative Designs for Bioretention Facilities** — Facilities, or a combination of facilities, of a different design than **Stormwater Treatment Measures and Baseline Hydromodification Management Measures** may be permitted if the following measures of equivalent effectiveness are demonstrated:

1) Equal or greater amount of runoff infiltrated or evapotranspired.
2) Equal or lower pollutant concentrations in runoff that is discharged after bioretention.
3) Equal or greater protection against shock loadings and spills.
4) Equal or greater accessibility and ease of inspection and maintenance.

b) **Allowed Adjustments for Bioretention Facilities for Special Site Conditions** – The bioretention design parameters as specified in **Stormwater Treatment Measures and Baseline Hydromodification Management Measures** may be adjusted for the following special site conditions:

1) Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.
2) Facilities in areas with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a “flow-through planter”).
3) Facilities located in areas of highly infiltrative soils or high groundwater, or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.

c) **Exceptions to Requirements for Bioretention Facilities** – Contingent on a demonstration that use of bioretention or a facility of equivalent effectiveness is infeasible, other types of biotreatment or media filters (such as tree-box-type biofilters or in-vault media filters) may be used for the following:

1) Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;
2) Facilities receiving runoff solely from existing (pre-project) impervious areas;
3) Historic sites, structures, or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

Phase II Small MS4 Post-Construction Stormwater Management Checklist

Projects That Create/Replace >2,500 sf of impervious surface

11/29/2022

Applicability

Site Design Measures to reduce project site stormwater runoff are required for all projects that create and/or replace **between 2,500 square feet and 5,000 square feet** of impervious surface.

Low Impact Development (LID) Design Standards to effectively reduce stormwater runoff and pollutants are required for all development and redevelopment projects that create and/or replace **5,000 square feet or more** of impervious surface.

Instructions

Complete this checklist to facilitate and document project stormwater management planning, and forward to EH&S Environmental Programs for compliance review.

Project Information

Project Name:

Project #:

Project Location:

Description of Project:

Project Type: New Development ☐ Redevelopment[1] ☐ Retrofit ☐ Landscaping ☐ Road ☐ Utility ☐ Other ☐____________________________

Total Project Site Area (sq ft):____________ Disturbed (sq ft):___________

New Impervious (sq ft):___________ Replaced Impervious (sq ft):[1]____________

Will redevelopment result in an increase of more than 50% of existing impervious surface? Yes ☐ No ☐

[1] Where a redevelopment project results in an increase of more than 50% of the impervious surface of a previously existing development, runoff from the entire project consisting of all existing, new, and/or replaced impervious surfaces, must be included in the stormwater management design to the extent feasible

Surface Areas for Redevelopment or Road Projects (square feet):

Total Pre-project Impervious:___________ Total Post-project Impervious:___________

Stormwater Management Design Checklist

PART A – Projects that create and/or replace between 2,500 and 5,000 square feet of impervious surface.

Select one or more of the following site design measures to reduce project site runoff: (check all that apply):

☐ Stream Setbacks and Buffers – a vegetated area including trees, shrubs, and herbaceous vegetation that exists or is established to protect a stream system

☐ Soil Quality Improvement and Maintenance – improvement and maintenance of soil through soil amendments and creation of microbial community

☐ Tree planting and preservation – planting and preservation of health, established threes that include both evergreens and deciduous , as applicable

☐ Rooftop and Impervious Area Disconnection – rerouting of rooftop drainage pipes to drain rainwater to rain barrels, cisterns, or permeable areas instead of the storm sewer

☐ Porous Pavement – pavement that allows runoff to pass through it, thereby reducing the runoff from a site and surrounding areas and filtering pollutants

☐ Green Roofs – a vegetative layer grown on a roof (rooftop garden)

☐ Vegetated Swales – a vegetated, open-channel management practice designed specifically to treat and attenuate stormwater runoff

☐ Rain Barrels and Cisterns – system that collects and stores stormwater runoff from a roof or other impervious surface

The State Water Resources Control Board Post-Construction Water Balance Calculator (or equivalent) must be used to quantify the runoff reduction resulting from implementation of site design measures, and the calculations may be attached to, or accompany this checklist.

Describe the site design measures selected (attach additional sheets if necessary):

Size of area that will drain to each BMP (sq ft):__________

Volume of runoff that will be managed by each BMP (cu ft):__________

Pollutants that will be managed by each BMP (check each that apply):

☐ Trash ☐ Sediment ☐ Dry weather flow ☐ Other:__________

Pre-project runoff volume (cu ft):__________ Project-related runoff volume increase (cu ft):__________

Project-related runoff volume increase with reduction credits (cu ft):__________

If post-construction stormwater runoff volume cannot be balanced with site design measures only, additional measures for runoff reduction, stormwater treatment, and baseline hydromodification management must be designed for the project as described in PART B.

PART B – Projects that create and/or replace 5,000 square feet or more of impervious surface.

Projects that create and/or replace 5,000 square feet or more of impervious surface shall implement measures for site design, runoff reduction, stormwater treatment, and baseline hydromodification management.

Source Control Measures: Projects with pollutant-generating activities and sources shall be required to implement standard permanent and/or operational source control measures as applicable.

Please check the pollutant generating activities or sources below that apply to this project (check all that apply):

☐ Accidental spills or leaks
☐ Building and grounds maintenance
☐ Drain or wash water from boiler drain lines, condensate drain lines, rooftop equipment, drainage sumps, and other sources
☐ Fire sprinkler test water
☐ Fuel dispensing areas
☐ Indoor and structural pest control
☐ Interior floor drains
☐ Landscape/outdoor pesticide use
☐ Loading docks
☐ Outdoor storage of equipment or materials
☐ Parking/storage area maintenance
☐ Pools, spas, ponds, decorative fountains, and other water features
☐ Restaurants, grocery stores, and other food service operations
☐ Storage and handling of solid waste
☐ Unauthorized non-stormwater discharges
☐ Vehicle and equipment cleaning
☐ Vehicle and equipment repair and maintenance

Source control measures shall be designed consistent with recommendations from the CASQA Development BMP Online Handbook (June 2021).

Describe the source control BMPs that will be implemented for the project for all pollutant generating activities checked above (attached additional sheets if necessary):

Numeric Sizing Criteria for Stormwater Retention and Treatment

Facilities designed to evapotranspire, infiltrate, harvest/use, and biotreat storm water to meet at least one of the following hydraulic sizing design criteria:

1) Volumetric Criteria:	2) Flow-based Criteria
a) The maximized capture storm water volume for the tributary area, on the basis of historical rainfall records, determined using the formula and volume capture coefficients in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87 (1998) pages 175-178 (that is, approximately the 85th percentile 24-hour storm runoff event); or	a) The flow of runoff produced from a rain event equal to at least 0.2 inches per hour intensity; or b) The flow of runoff produced from a rain event equal to at least 2 times the

b) The volume of annual runoff required to achieve 80 percent or more capture, determined in accordance with the methodology in Section 5 of CASQA's Stormwater Best Management Practice Handbook, New Development and Redevelopment (2003), using local rainfall data.	85th percentile hourly rainfall intensity as determined from local rainfall records.

Site design measures shall be based on the objective of achieving infiltration, evapotranspiration and/or harvesting/reuse of the 85th percentile rainfall event, to the extent feasible, to meet numeric sizing criteria for stormwater retention and treatment. Site design measures shall be used to reduce the amount of runoff, to the extent technically feasible, for which retention and runoff is required. Remaining runoff from impervious drainage management areas may then be directed to one or more bioretention facilities.

The State Water Resources Control Board SMARTS Post-Construction Calculator (or equivalent) must be used to quantify the runoff reduction, and the calculations may be attached to, or accompany this checklist.

For BMP selection, please refer to the Riverside County Design Handbook for Low Impact Development Best Management Practices for the Santa Ana watershed, accessible at: http://www.floodcontrol.co.riverside.ca.us/NPDES/LIDBMP.aspx.

Describe the BMP(s) selected for this project to achieve infiltration, evapotranspiration, and/or harvesting/reuse of the 85th percentile rainfall event, to the extent feasible, and meet at least one of the hydraulic sizing design criteria (attach additional sheets if necessary):

Size of area that will drain to each BMP (sq ft):__________

Volume of runoff that will be managed by each BMP (cu ft):__________

Pollutants that will be managed by each BMP (check each that apply):

☐ Trash ☐ Sediment ☐ Dry weather flow ☐ Other:__________

Pre-project runoff volume (cu ft):__________ Project-related runoff volume increase (cu ft):__________

Project-related runoff volume increase with reduction credits (cu ft):__________

Stormwater Treatment Measures and Baseline Hydromodification Management Measures

After implementation of site design measures and one or more facilities designed to infiltrate, evapotranspirate, and/or biotreat runoff specified by numeric sizing criteria, any remaining runoff from impervious drainage management areas may then be directed to one or more bioretention facilities designed to infiltrate, evapotranspire, and/or biotreat runoff and meet numeric sizing criteria for stormwater retention and treatment so long as the facilities are demonstrated to be at least as effective as a bioretention system with the following design parameters (check all that apply):

☐ Maximum surface loading rate of 5 inches per hour, based on the flow rates calculated. A sizing factor of 4% of tributary impervious area may be used.

☐ Minimum surface reservoir volume equal to surface area times a depth of 6 inches.

☐ Minimum planting medium depth of 18 inches. The planting medium must sustain a minimum infiltration rate of 5 inches per hour throughout the life of the project and must maximize runoff retention and pollutant removal. A mixture of sand (60%-70%) meeting the specifications of American Society for Testing and Materials (ASTM) C33 and compost (30%-40%) may be used.

☐ Subsurface drainage/storage (gravel) layer with an area equal to the surface area and having a minimum depth of 12 inches.

☐ Underdrain with discharge elevation at top of gravel layer.

☐ No compaction of soils beneath the facility, or ripping/loosening of soils if compacted.

☐ No liners or other barriers interfering with infiltration.

☐ Appropriate plant palette for the specified soil mix and maximum available water use.

Allowed Adjustments for Bioretention Facilities for Special Site Conditions

Do any of the following special site conditions apply?

☐ Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.

☐ Facilities in areas with documented high concentrations of pollutants n underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a “flow-through planter”).

☐ Facilities located in areas of highly infiltrative soils or high groundwater, or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.

Exceptions to Requirements for Bioretention Facilities

Is the use of bioretention or a facility of equivalent effectiveness infeasible? Contingent on a demonstration of infeasibility, other types of biotreatment or media filters (such as tree-box-type biofilters or in-vault media filters may be used for the following (check any that apply):

☐ Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;

☐ Facilities receiving runoff solely from existing (pre-project) impervious areas;

☐ Facilities located in areas of highly infiltrative soils or high groundwater, or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.

APPENDIX B

Geotechnical Report

TWINING
Engineering a Better Tomorrow

Geotechnical Investigation Report

Proposed OASIS Park
University of California, Riverside
Riverside, California

Prepared for:

University of California, Riverside
1223 University Avenue, Suite 240
Riverside, CA 92507

June 29, 2023
Project No.: 220759.3

TWINING

2883 East Spring Street
Suite 300
Long Beach CA 90806

Tel 562.426.3355
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June 29, 2023
Project No.: 220759.3

Ms. Daneca Stevens
Project Manager
Planning, Design, and Construction
University of California, Riverside
1223 University Avenue, Suite 240
Riverside, CA 92507

Subject: **Geotechnical Investigation Report**
Proposed OASIS Park
University of California, Riverside
Riverside, California

Dear Ms. Stevens,

In accordance with your request and authorization, we are presenting the results of our geotechnical investigation for the proposed OASIS Park project located at the University of California, Riverside in Riverside, California. The purpose of our investigation is to characterize subsurface conditions of the site and evaluate seismic and geologic hazards at the site.

This report was prepared in accordance with the requirements of the 2022 California Building Code (2022 CBC) and ASCE 7-16 (ASCE, 2017). The geotechnical engineer of record from the Design/Build team shall utilize this report and provide geotechnical recommendations for the construction and design of the proposed project.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding this report or if we can be of further service, please do not hesitate to contact the undersigned.

Respectfully submitted,
TWINING, INC.

PAUL C. SOLTIS
G-2606
Ex. 12/31/24

Doug Crayton
Staff Engineer

Paul Soltis, PE 56140, GE 2606
Vice President, Geotechnical Engineering

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Appendices

1. INTRODUCTION

This report presents the results of the geotechnical investigation performed by Twining, Inc. (Twining) for the proposed OASIS Park project located at University of California, Riverside in Riverside, California. A description of the site and the proposed improvements is provided in the following section. The objectives of this investigation have been to characterize subsurface conditions of the site and evaluate seismic and geologic hazards at the site. Our investigation was performed in conformance with the 2022 California Building Code (2022 CBC) and ASCE 7-16 (ASCE, 2017).

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The overall OASIS site is located at the existing Parking Lot 50 and 1200 University Avenue on University of California, Riverside campus in Riverside, California, as shown on Figure 1 – Site Location Map. The approximate site coordinates are latitude 33.974715°N and longitude 117.336899°W, on the Riverside East, California 7½-Minute Quadrangle, according to the United States Geological Survey (USGS) topographic maps (USGS 2022). The overall OASIS site is bound by University Avenue on the north, the Gage Canal on the east, Everton Place on the south, and commercial properties on the west. The western third of the site is currently occupied by the University Extension building, a four-story parking garage, and surface parking lots. The eastern portion of the site is covered by Parking Lots 50 and 51. Three buildings previously occupied the site of Lot 50 and were demolished around 2017. The site covers approximately 8.25 acres. The site is relatively flat with a surface elevation that varies from approximately 1011 feet mean sea level (msl) in the northwest corner, to 1024 feet msl in the northeast corner, to 1022 feet msl in the southeast corner, to 1013 feet msl in the southwest corner. Twining previously conducted borings in September of 2017 for an abandoned Outpatient Pavilion project that was planned for Parking Lot 50. The borings from that investigation and this current investigation are used in the preparation of this report.

The proposed project will consist of the construction of a new technology park consisting of research laboratories, technology incubator, training facilities, hybrid-learning room, offices, community spaces, other supporting uses, and parking on the western portion of the OASIS Site. Associated improvements such as new flatwork, landscape areas, and utilities are also expected. We note that a conceptual plan layout of the proposed development is not available at the time of preparation of this report. The scope of our report is to provide a comprehensive evaluation of the site; we note that additional borings/investigation may be required depending on the actual locations of the new structures relative to completed boring locations. A site plan and the locations of our borings are depicted on Figure 2 – Site Plan and Boring Location Map.

3. SCOPE OF WORK

Our scope of work included review of background information, pre-field activities and field exploration, laboratory testing, and report preparation. These tasks are described in the following subsections.

3.1. Literature Review

We reviewed readily available background data including published geologic maps, topographic maps, aerial photographs, seismic hazard maps and literature, and flood hazard maps relevant to the subject site. Relevant information has been incorporated into this report. A partial list of literature reviewed is presented in the “Selected References” section of this report.

3.2. Pre-Field Activities

Before starting our exploration program, we performed a geotechnical site reconnaissance to observe the general surficial conditions at the site and to select field exploration locations. After exploration locations were delineated, Underground Service Alert was notified of the planned locations a minimum of 72 hours prior to excavation. Additionally, existing as-built utility plans were reviewed by Twining and the University to determine if the proposed boring locations conflicted with existing underground utilities.

3.3. Field Exploration

The field exploration consisted of drilling, testing, sampling, and logging of 8 exploratory borings (B-9 through B-14, P-1, and P-2) and percolation testing in 2 of the borings (P-1 and P-2) conducted at the site on December 1 and 2, 2022. The approximate exploration locations are shown on Figure 2 – Site Plan and Boring Location Map. Additionally, Twining previously conducted 8 borings at the site in September and October of 2017. The locations of those borings are also shown on Figure 2.

The borings were advanced to approximate depths of 5 to 51.5 feet below ground surface (bgs) using a CME-75 truck-mounted drill rig equipped with 8-inch-diameter hollow-stem-auger (HSA). All borings were first excavated to 5 feet bgs using a hand-auger to clear potential underground utilities.

Drive samples of the soils were obtained from the borings using a Standard Penetration Test (SPT) sampler without room for liner and a modified California split-spoon sampler. The samplers were driven using a 140-pound automatic hammer falling approximately 30 inches. The blow counts to drive the samplers were recorded, and subsurface conditions encountered in the borings were logged by a Twining field engineer under the supervision of a California Registered Geotechnical Engineer. Bulk samples were collected from the upper 5-foot soil cuttings. The samples were transported to Twining's geotechnical engineering laboratory in Long Beach, California for examination and testing.

In-situ percolation testing was performed in borings P-1 and P-2, which were advanced to 5 feet bgs, to provide estimates of infiltration rate of the site soils. In 2017 Twining conducted percolation tests at borings B-7 and B-8 at depths of 30 feet and 10 feet, respectively. The results of the infiltration testing are discussed in Appendix A – Field Exploration.

Upon completion of exploration, the borings deeper than 5 feet were backfilled with lean concrete grout. The 5-foot-deep borings were backfilled with soil cuttings. The surface was repaired to match existing conditions.

Detailed descriptions of the field exploration and the soils encountered during the current and previous drilling are presented in Appendix A – Field Exploration.

3.4. Geotechnical Laboratory Testing

Laboratory tests were performed on selected samples obtained from the borings to aid in the soil classification and to evaluate the engineering properties of site soils. The following tests were performed in general accordance with ASTM and Caltrans standards:

- In-situ moisture and density (ASTM D2937),
- #200 Wash (ASTM D1140),
- Atterberg Limits (ASTM D4318),
- Expansion Index (ASTM D4829),

- Consolidation (ASTM D2435),
- Direct shear (ASTM D3080),
- Maximum dry density and optimum moisture content (ASTM D1557),
- Resistance value (R-value) (ASTM D2844), and
- Corrosivity (Caltrans test methods CT417, CT422, and CT 643).

Detailed laboratory test procedures and results are presented in Appendix B – Laboratory Testing.

3.5. Report Preparation

We compiled and analyzed the data collected from our field exploration and laboratory testing. We performed engineering analyses based on our literature review and data from field exploration and laboratory testing programs. Our analyses included the following:

- Site geology, and subsurface conditions,
- Groundwater conditions,
- Geologic hazards and seismic design parameters, and
- Liquefaction potential and seismic settlement.

We prepared this report to present our conclusions from this investigation.

4. GEOLOGY AND SUBSURFACE CONDITIONS

The regional and site geology and subsurface conditions are described in this section, based on our data review and field investigation. A portion of the geologic map is reproduced as Figure 3 – Geologic Map. Detailed subsurface conditions are presented in Appendix A – Field Exploration.

4.1. Regional Geology

The project site is located within the central portion of the Perris Block, a relatively stable terrain which is bounded on the north by the Cucamonga fault zone, on the east by the San Jacinto fault zone, on the south by the San Felipe fault zone, and on the west by the Elsinore fault zone. The Perris Block, in turn, is situated within the northern portion of the Peninsular Ranges geomorphic province. The Peninsular Range province occupies the southwestern portion of the state, south of the Transverse Ranges and west of the Colorado geomorphic provinces.

The Peninsular Ranges province is characterized generally by northwest-trending mountains and valleys, traversed by northwest-trending faults. Within the Perris Block, the predominant rock exposures comprise a multitude of Cretaceous-age plutonic emplacements known collectively as the southern California batholith. Locally these plutons intruded Jurassic-age metavolcanic and metasedimentary rocks and Paleozoic-age limestone, schist, and gneiss. Valleys are mantled by Quaternary-age alluvial fan deposits and recent alluvium derived from erosion of the adjacent mountains.

According to geologic mapping published by the Dibblee Geological Foundation (Dibblee, 2003), the project site is underlain by Pleistocene alluvial fan deposits (map symbol: Qoa). These deposits are described as “deposits of sand, minor gravel, tan to light reddish brown.” A portion of this geologic map is reproduced as Figure 3, Regional Geologic Map.

4.2. Surface and Subsurface Conditions

Earth materials encountered during our subsurface investigation generally consist of a thin layer of undocumented fill underlain by alluvial fan deposits which extend to the total depth of exploration. Based on our field observations, the undocumented fill consists of silty sand on the order of 1 to 8 feet in thickness, with the average depth of approximately 3.5 feet. It should be noted that the undocumented fill thickness may vary across the site. The alluvial deposits consist predominantly of medium dense to very dense sand with varying amounts of fines.

Detailed information regarding the exploratory excavations is presented in Appendix A - Field Exploration.

4.3. Groundwater

Groundwater was not encountered within our exploratory borings drilled to a maximum depth of approximately 51½ feet below the existing grade. Based on our review of the California Water Resource website, the groundwater level is reportedly situated at a depth greater than 150 feet below the ground surface. Groundwater conditions may vary across the site due to stratigraphic and hydrologic conditions and may change over time because of seasonal and meteorological fluctuations, or of activities by humans at this and nearby site.

5. GEOLOGIC HAZARDS AND SEISMIC DESIGN CONSIDERATIONS

The site is in a seismically active area, as is the majority of southern California, and the potential for strong ground motion in the project area is considered high during the design life of the proposed development. The hazards associated with seismic activity in the vicinity of the site area discussed in the following sections.

5.1. Active Faulting and Surface Fault Rupture

The subject site is not located within a State of California Alquist-Priolo Earthquake Fault Zone (Alquist-Priolo EFZ, formerly known as a Special Studies Zone) (Hart and Bryant, 1997). The closest know active fault to the site is the San Jacinto fault, located approximately 6.21 miles to the northeast from the project site. It is our opinion that the likelihood of fault rupture occurring at the site during the design life of the proposed improvements is low.

5.2. Liquefaction Potential

Liquefaction is the phenomenon in which loosely deposited granular soils with silt and clay contents of less than approximately 35 percent, and non-plastic silts located below the water table undergo rapid loss of shear strength when subjected to strong earthquake-induced ground shaking. Ground shaking of sufficient duration results in the loss of grain-to-grain contact due to a rapid rise in pore water pressure and causes the soil to behave as a fluid for a short period of time.

Liquefaction is generally known to occur in loose, saturated, relatively clean, fine-grained cohesionless soils at depths shallower than approximately 50 feet. Factors to consider in the evaluation of soil liquefaction potential include groundwater conditions, soil type, grain size distribution, relative density, degree of saturation, and both the intensity and duration of ground motion. Other phenomena associated with soil liquefaction include sand boils, ground oscillation, and loss of foundation bearing capacity.

The California Geological Survey (CGS) has not published literature or maps within the project site that would indicate a state-designated Zone of Required Investigation for Liquefaction. However, Riverside County has mapped the site in an area of “Low” concern for liquefaction. Based on the depth of groundwater approximately 150 feet bgs, and site subsurface conditions, it is our opinion that liquefaction potential at the site is low.

5.3. Seismic Settlement Potential

Seismic settlement can occur when loose to medium dense granular materials densify during seismic shaking and liquefaction. Seismic settlement may occur in dry, unsaturated, as well as saturated soils. Based on the results of our field exploration, we believe that seismic settlement is possible at the site. The geotechnical engineer of record for the Design/Build team should evaluate the possibility of seismic settlement at the site.

5.4. Landslides

The area of the project site is not within an area with the potential for earthquake-induced landslides. Considering the site is flat and not close to significant slopes, the potential for earthquake-induced landslides to occur at the site is considered negligible.

5.5. Tsunamis and Seiches

Tsunamis are waves generated by massive landslides near or under sea water. Based on California Official Tsunami Inundation Maps, the site is not located on any State of California Tsunami Inundation Map for Emergency Planning. The potential for the site to be adversely impacted by earthquake-induced tsunamis is negligible.

Seiches are standing wave oscillations of an enclosed water body after the original driving force has dissipated. The potential for the site to be adversely impacted by earthquake-induced seiches is considered negligible due to the lack of any significant enclosed bodies of water located in the vicinity of the site.

5.6. Flooding

The Federal Emergency Management Agency (FEMA) has prepared flood insurance rate maps (FIRMs) for use in administering the National Flood Insurance Program, effective September 26, 2008. Based on our review of online FEMA flood mapping, the site is located within Zone X with minimal flood hazard.

5.7. Deaggregated Seismic Source Parameters

We performed a seismic hazard de-aggregation analysis for the peak ground acceleration with a probability of exceedance of 2% in 50 years. The analysis used the USGS Unified Hazard Tool based on the 2014 USGS seismic source model. The results of the analysis indicate the controlling modal moment magnitude and fault distance are 8.1 Mw and 6.3 miles (10.1 km), respectively.

5.8. Site Class for Seismic Design

Based on the SPT resistance, it is our opinion that Site Class D may be used for the project seismic design according to Chapter 20 of ASCE 7-16.

5.9. Seismic Design Parameters

Seismic design for new buildings should be based on the 2022 CBC and ASCE 7-16. As the site is classified as seismic Site Class D and the mapped spectral acceleration parameter at period 1-second, S_1, is greater than 0.2 g, the 2022 CBC requires a site-specific ground motion hazard analysis following Section 11.4.7 of ASCE 7-16 for new buildings.

Alternatively, Exception 2 in Section 11.4.8 of ASCE 7-16 may be used for the project new buildings in lieu of the site-specific ground motion hazard analysis. For seismic design of new buildings based on this exception, seismic design parameters in Table 1 may be used, based on site coordinates of latitude 33.974715°N and longitude 117.336899°W.

Table 1 – Seismic Design Parameters Based on 2022 CBC and ASCE 7-16 for Design Based on Exception 2 in Section 11.4.8 of ASCE 7-16

Design Parameters	Value
Site Class	D
Mapped Spectral Acceleration Parameter at Period of 0.2-Second, S_s (g)	1.5
Mapped Spectral Acceleration Parameter at Period 1-Second, S_1 (g)	0.6
Site Coefficient, F_a	1
Site Coefficient, F_v	1.7
Adjusted MCE_R[1] Spectral Response Acceleration Parameter, S_{MS} (g)	1.5
Adjusted MCE_R[1] Spectral Response Acceleration Parameter, S_{M1} (g)	1.02
Design Spectral Response Acceleration Parameter, S_{DS} (g)	1
Design Spectral Response Acceleration Parameter, S_{D1} (g)	0.68
Risk Coefficient, C_{RS}	0.934
Risk Coefficient, C_{R1}	0.909
Peak Ground Acceleration, PGA_M[2] (g)	0.656
Seismic Design Category[3]	D
Long-Period Transition Period, T_L (seconds)	8
$T_S = S_{D1} / S_{DS}$	0.68

When using the above parameters for seismic design, the seismic design coefficient C_s should be calculated as follows:

For $T \le 1.5T_S$, $C_S = S_{DS}/(R/I_e)$

For $T_L \ge T > 1.5T_S$, $C_S = 1.5\ S_{D1}/(T\ R/I_e)$

For $T > T_L$, $C_S = 1.5\ (S_{D1}\ T_L)/(T^2\ R/I_e)$

where

T = the fundamental period of the structure(s) determined in Section 12.8.2 of ASCE 7-16;

R = the response modification factor determined in Table 12.2-1 of ASCE 7-16; and

I_e = the importance factor determined in accordance with Section 11.5.1 of ASCE 7-16.

Notes:

[1] Risk-Targeted Maximum Considered Earthquake.

[2] Peak Ground Acceleration adjusted for site effects.

[3] For S_1 greater than or equal to 0.75g, the Seismic Design Category is E for risk category I, II, and III structures and F for risk category IV structures.

6. LIMITATIONS

This report presents geotechnical data and seismic design criteria for the proposed project site. The information may be used by the project design team to develop recommendations based on the information provided. The designer should supplement this data with additional data as the deem necessary to provide thorough geotechnical design recommendations.

Due to the limited nature of our field explorations, conditions not observed and described in this report may be present on the site. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. It should be understood that conditions different from those anticipated in this report may be encountered during grading operations.

Site conditions, including groundwater elevation, can change with time as a result of natural processes or the activities of man at the subject site or at nearby sites. Changes to the applicable laws, regulations, codes, and standards of practice may occur as a result of government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Twining, Inc. has no control.

Twining performed its evaluation using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil conditions. No other warranty, either express or implied, is made as to the conclusions and recommendations contained in this report.

7. SELECTED REFERENCES

American Society of Civil Engineers, 2017, Minimum Design Loads and Associated Criteria for Buildings and Other Structures: ASCE Standard ASCE/SEI 7-16, 800 pp, ISBN 9780784414248.

ASTM, current latest version, “Soil and Rock: American Society for Testing and Materials,” vol. 4.08 for ASTM test methods D-420 to D-4914; and vol. 4.09 for ASTM test methods D-4943 to highest number.

California Buildings Standards Commission, 2022, 2022 California Building Code, California Code of Regulations, Title 24, Volume 2 of Part 2, Effective January 1, 2023.

California Geological Survey (CGS), 2008, Guidelines for Evaluating and Mitigating Seismic Hazards in California.

City of Riverside, 2018, “Figure PS-2 Liquefaction Zones, Public Safety Element, Riverside General Plan, 2025”, amended February.

Dibblee, T.W., and Minch, J.A., 2003, “Geologic map of the Riverside East/South ½ of San Bernardino South quadrangles, San Bernardino and Riverside County, California,” 1:24,000 scale, Dibblee Geological Foundation, Map DF-109.

National Association of Corrosion Engineers (NACE), 1984, Corrosion Basics, an Introduction.

Pradel, D., 1998, Procedure to Evaluate Earthquake-Induced Settlements in Dry Sandy Soils, ASCE, Journal of Geotechnical & Geoenvironmental Engineering, Vol. 124, No. 4, 364-368.

Romanoff, Melvin, 1989, Underground Corrosion, NBS Circular 579. Reprinted by NACE. Houston, TX, pp. 166–167.

U.S. Geological Survey (USGS), 2022, USGS 1:24000-scale Riverside East Quadrangle, California, 7.5-Minute Series.

TWINING

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Fax 562.426.6424

FIGURES

REFERENCE: USGS (2022)

TWINING

SITE LOCATION MAP

OASIS PARK
UNIVERSITY OF CALIFORNIA
RIVERSIDE, CA

PROJECT NO.	REPORT DATE	FIGURE 1
220759.3	June 2023	

NOTE: ALL DIMENSIONS AND LOCATIONS ARE APPROXIMATE

LEGEND

B-1 TD=51.5' ✚	APPROXIMATE LOCATION OF BORING BY TWINING (2022) TOTAL DEPTH IN FEET
P-1 TD=5' ▲	APPROXIMATE LOCATION OF BORING BY TWINING (2017) TOTAL DEPTH IN FEET

N

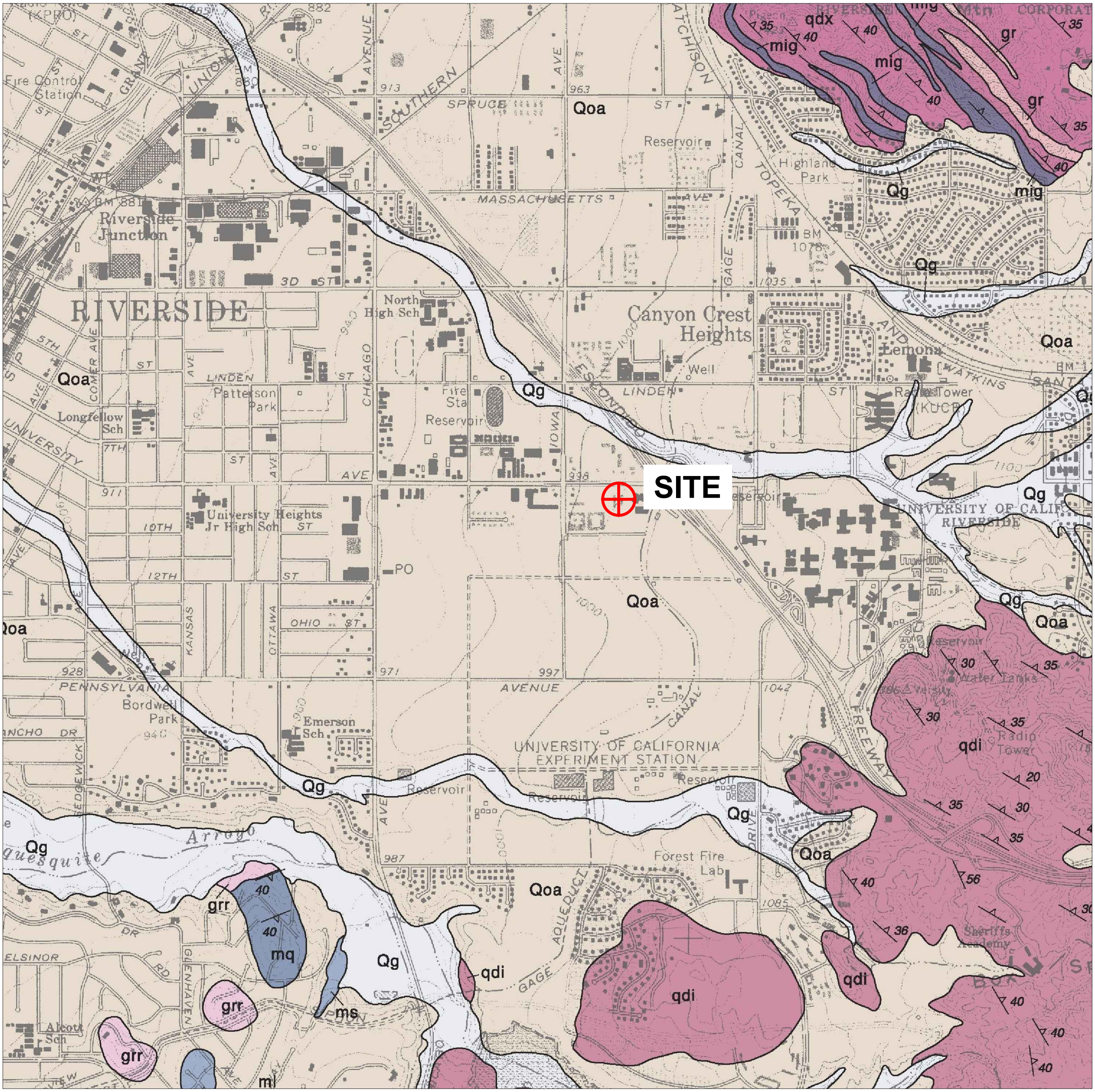
REFERENCE: GOOGLE EARTH (2022)

TWINING

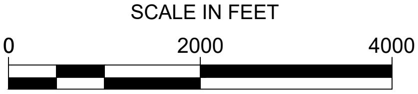
SITE PLAN AND BORING LOCATION MAP

OASIS PARK
UNIVERSITY OF CALIFORNIA, RIVERSIDE
RIVERSIDE, CA

PROJECT No.	REPORT DATE	
220759.3	June 2023	FIGURE 2



Qoa Alluvial fan deposits of sand, minor gravel
Qg Alluvial gravel and sand of stream channels
qdi Quartz diorite (tonalite)
qdx Quartz diorite, xenolith rich



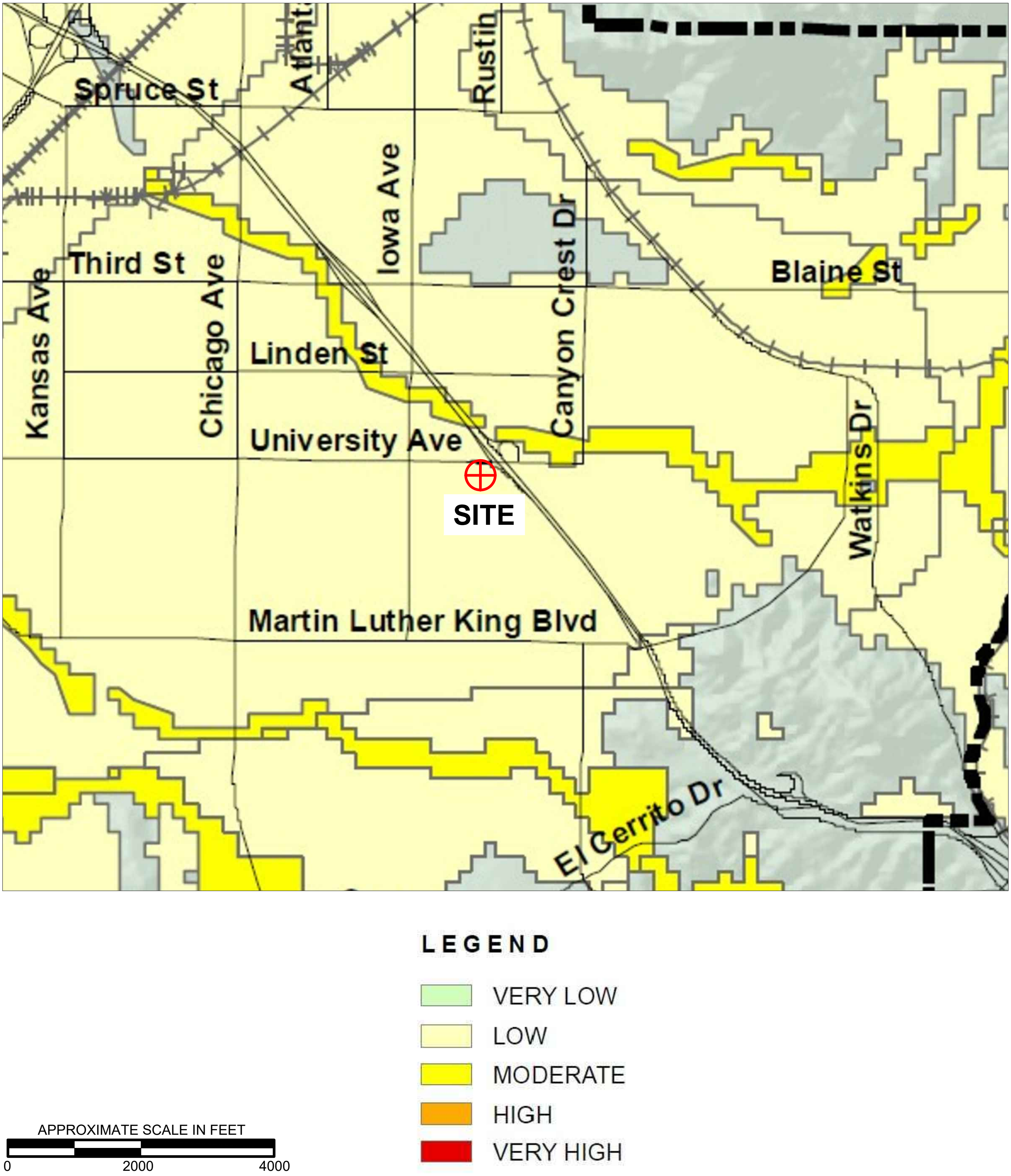
REFERENCE: DIBBLEE (2003)

TWINING

GEOLOGIC MAP

OASIS PARK
UNIVERSITY OF CALIFORNIA
RIVERSIDE, CA

PROJECT NO.	REPORT DATE	FIGURE 4
220759.3	June 2023	



REFERENCE: CITY OF RIVERSIDE COUNTY (2018)

TWINING

LIQUEFACTION ZONES MAP

OASIS PARK
UNIVERSITY OF CALIFORNIA, RIVERSIDE
RIVERSIDE, CALIFORNIA

PROJECT NO.	REPORT DATE	FIGURE 4
220759.3	June 2023	

TWINING

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APPENDIX A
FIELD EXPLORATION

Appendix A
Field Exploration

General

The field exploration for the proposed project consisted of drilling, testing, sampling, and logging of eight exploratory borings (B-9 through B-14, P-1, and P-2) and performing percolation testing in two of the borings (P-1 and P-2). The approximate locations of the exploration are shown on Figure 2 – Site Plan and Boring Location Map.

The borings were first excavated to 5 feet below ground surface (bgs) using a hand-auger to clear potential underground utilities. Upon completion of exploration, borings B-9 through B-14 were backfilled with neat cement and the others with soil cuttings. The surface of all locations was repaired to match existing conditions, and the paved locations were patched with Portland cement concrete to match existing conditions.

Exploratory Borings

Drilling operation for the borings was performed by Baja Exploration of Escondido, California using a CME-75 truck-mounted drill rig equipped with 8-inch diameter hollow-stem-auger (HSA). The borings were advanced to a maximum depth of 5.0 to 51.5 feet bgs on December 1 and 2, 2022.

Twining previously performed eight exploratory borings at the site in 2017. Those borings are included below.

An explanation of the boring logs is presented as Figure A-1. The boring logs from the current drilling are presented on Figures A-10 through A-17. The boring logs from 2017 are presented as Figures A-2 through A-9. The boring logs describe the earth materials encountered, samples obtained, and show the field and laboratory tests performed. The logs also show the boring number, drilling date, and the name of the logger and drilling subcontractor. The borings were logged by a Twining engineer using the Unified Soil Classification System under the supervision of a registered California Geotechnical Engineer. The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual. Drive and bulk samples of representative earth materials were obtained from the borings.

Disturbed samples were obtained from select depths using a Standard Penetration Test (SPT) sampler. This sampler consists of a 2-inch O.D., 1.4-inch I.D. split barrel shaft without room for liner. Soil samples obtained by the SPT sampler were retained in plastic bags. A California modified sampler was also used to obtain drive samples of the soils from select depths. This sampler consists of a 3-inch outside diameter (O.D.), 2.4-inch inside diameter (I.D.) split barrel shaft. The samples were retained in brass rings for laboratory testing.

When the boring was drilled to a select depth, the sampler was lowered to the bottom of the boring and then driven a total of 18 inches into the soil using an automatic hammer weighing 140 pounds dropped from a height of 30 inches. The number of blows required to drive the samplers the final 12 inches is presented on the boring logs. Where sampler refusal is encountered and the sampler does not advance 18 inches, the total number of blows per number of inches advanced is presented. The blow counts given are field raw blow counts that have not been modified to account for field and/or depth conditions.

Percolation Testing

Percolation testing were performed in borings P-1 and P-2. After being advanced to 5 feet bgs using a hand-auger, the borings were drilled to 5 feet bgs again using an 8 inch-diameter, truck-mounted, hollow-stem auger. The borings were drilled under the observation of a field engineer who logged the subsurface conditions encountered and collected samples of the subsurface materials encountered.

The percolation test holes were prepared by placing approximately 1 inch of gravel at the bottom of the hole. A 3-inch diameter perforated PVC pipe wrapped in filter sock was placed at the bottom of the hole and the annular space around the pipe was backfilled with gravel.

After preparing the percolation test holes, the percolation was performed in accordance with the requirements of Riverside County. After presoaking, the test holes were filled with water to at least 12 inches above the bottom of the excavation. Measurements were recorded at 10-minute or 30-minute intervals depending on the results of the "sandy soil criteria test." A minimum of 6 intervals were measured. The average drop that occurred over the last 3 readings was used to determine the percolation rate at each test location. Detailed test data is attached to this appendix.

A reduction factor of 3 was applied to the final measured infiltration rate to obtain the design infiltration rate. A summary of test results is presented in Table A-1, and the detailed test data is attached as Appendix D. Additionally, data from previous percolation testing performed at the site are attached as Appendix E.

Table A-1 – Infiltration Rate with a Reduction Factor of 3

Location	Depth (feet)	Infiltration Rate (in/hour)
P-1	5	0.1
P-2	5	0.4

UNIFIED SOIL CLASSIFICATION CHART

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

COARSE-GRAINED SOILS			FINE-GRAINED SOILS	
Relative Density	**SPT (blows/ft)**	**Relative Density (%)**	**Consistency**	**SPT (blows/ft)**
Very Loose	<4	0 - 15	Very Soft	<2
Loose	4 - 10	15 - 35	Soft	2 - 4
Medium Dense	10 - 30	35 - 65	Medium Stiff	4 - 8
Dense	30 - 50	65 - 85	Stiff	8 - 15
Very Dense	>50	85 - 100	Very Stiff	15 - 30
			Hard	>30

NOTE: SPT blow counts based on 140 lb. hammer falling 30 inches

Sample Symbol	Sample Type	Description
◫	SPT	1.4 in I.D., 2.0 in. O.D. driven sampler
☒	California Modified	2.4 in. I.D., 3.0 in. O.D. driven sampler
⧄	Bulk	Retrieved from soil cuttings
▥	Thin-Walled Tube	Pitcher or Shelby Tube

LABORATORY TESTING ABBREVIATIONS

ATT	Atterberg Limits
C	Consolidation
CORR	Corrosivity Series
DS	Direct Shear
EI	Expansion Index
GS	Grain Size Distribution
K	Permeability
MAX	Moisture/Density (Modified Proctor)
O	Organic Content
RV	Resistance Value
SE	Sand Equivalent
SG	Specific Gravity
TX	Triaxial Compression
UC	Unconfined Compression

TWINING

EXPLANATION FOR LOG OF BORINGS

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A-1

DATE DRILLED 9/29/17
LOGGED BY DHC
BORING NO. B-1
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
						MAX		SM	Silty SAND with about 5% gravel, reddish brown to brown, dense, moist
5			33						-- same
10			39						-- same
15			38/50 for 2"	9.2	117.7	DS			-- same
20			39					SM	Silty SAND, brown, dense, moist
25			45/50 for 6"	14.3	107.4	DS			-- same
30			28			C		SP	Poorly graded SAND, light to dark brown to white to black, medium dense, moist
35									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 2

DATE DRILLED 9/29/17
LOGGED BY DHC
BORING NO. B-1
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		☒	44	6.2	109.4			SM	Silty SAND, brown, dense, moist
40		▯	29			#200			-- medium dense
45		☒	51	7.5	113.5			SP	Poorly graded SAND, brown to yellow to white, dense, moist
								SM	Silty SAND, light brown, dense, moist
50		▯	39						Total Depth = 51.5 feet Backfilled on 9/29/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings.
55									
60									
65									
70									

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 2

DATE DRILLED 10/9/17 LOGGED BY DHC **BORING NO. B-2**
DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA DRILLER 2R Drilling SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
	Bulk	Driven							
								SM	Silty SAND, reddish brown, moist
5			22						-- same, medium dense
10			42	9.0	121.0	C			-- same, dense
15			50 for 6"						-- same, very dense, only partial recovery
20			69	6.9	116.8				-- same, very dense
25			30						-- same, dense
30			74	3.2	121.4			SW	Well graded SAND, very dense, brown to black to red to white, moist
									Total Depth = 31.5 feet Backfilled on 10/9/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings.
35									

BORING LOG 170875.3 - UCR OUTPATIENT PAVILLION.GPJ TWINING LABS.GDT 10/25/17

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 3

DATE DRILLED 9/29/17
LOGGED BY DHC
BORING NO. B-3
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
									3 inches of AC with no base
						MAX			
5			23					SM	Silty SAND with 5% gravel, reddish brown, medium dense, moist
10			38	3.6	119.0	C		SM	Silty SAND with 10% large grain sand, reddish brown to brown, dense, moist
15			20			#200		SM	Silty SAND, brown to reddish to light brown, medium dense, moist
20			55					SM	-- same, dense, with approximately 5% gravel, reddish brown, moist
25			15			#200		SM	-- same without gravel, medium dense
30			54	7.0	121.7	DS		SP	Poorly graded SAND, reddish brown, very dense, moist
35									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 4

DATE DRILLED 9/29/17
LOGGED BY DHC
BORING NO. B-3
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
			25						-- yellow to brown to red, medium dense
40			40/50 for 5"	8.9	127.6	DS		SM	Silty SAND, reddish brown, very dense, moist
45			40						-- same, dense
50			82	2.8	118.4			SP	Poorly graded SAND, light brown to white to black, very dense, moist
									Total Depth = 51.5 feet Backfilled on 9/29/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings. Surface patched with cold-patch.
55									
60									
65									
70									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO. 170875.3
REPORT DATE October 2017
FIGURE A - 4

DATE DRILLED 10/9/17
LOGGED BY DHC
BORING NO. B-4
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
							▒	SM	Silty SAND, reddish brown, moist
5		☒	48	2.7	133.6		▒		-- same, dense, few organics
10		▯	11			#200	▒		-- same, medium dense, light brown
15		☒	27			#200	⁘	SW	Well graded SAND, medium dense, light brown to black to white to red, moist
									Total Depth = 16.5 feet Backfilled on 10/9/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings.
20									
25									
30									
35									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 5

DATE DRILLED 10/9/17 LOGGED BY DHC **BORING NO. B-5**
DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA DRILLER 2R Drilling SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
								SM	Silty SAND, reddish brown, moist
5			28						-- same, medium dense
10			85					SW	Well graded SAND, very dense, light brown with white spots, moist
15			45/50 for 5"					SM	Silty SAND, very dense, light brown, moist
20			24/50 for 6"	19.0					-- same
25			50						-- same, dense, some white spots
30			43					SW	Well graded SAND, dense, brown to orange to white to red, moist
35									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 6

DATE DRILLED 10/9/17 LOGGED BY DHC **BORING NO. B-5**

DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) NE

DRILLING METHOD 8" HSA DRILLER 2R Drilling SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
			26			#200			-- same, more silt
40			54					SM	Silty SAND, very dense, olive brown to brown, moist, trace gravel
45			22			#200		ML	Sandy SILT, very stiff; brown, slightly moist
50			54					ML	-- same, hard, dark brown
55									Total Depth = 51.5 feet Backfilled on 10/9/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings.
60									
65									
70									

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 6

DATE DRILLED	10/9/17	LOGGED BY	DHC	**BORING NO.**	**B-6**
DRIVE WEIGHT	140 lbs.	DROP	30 inches	DEPTH TO GROUNDWATER (ft.)	NE
DRILLING METHOD	8" HSA	DRILLER	2R Drilling	SURFACE ELEVATION (ft.)	N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
5			37					SM	Silty SAND, dense, reddish brown, moist
10			11			#200		SW	Well graded SAND, medium dense, reddish brown, moist
15			34	2.6	105.4				-- same, dense
20			48					SM	Silty SAND, dense, brown with white spots, moist
25			88	8.7	130.4				-- same, very dense
30			15			#200			-- same, medium dense, reddish to olive brown
35									

BORING LOG 170875.3 - UCR OUTPATIENT PAVILLION.GPJ TWINING LABS.GDT 10/25/17

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 7

DATE DRILLED 10/9/17
LOGGED BY DHC
BORING NO. B-6
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		☒	58	6.5	109.9				-- same, very dense
40		☐	29						-- same, medium dense, brown with white spots
45		☒	82	12.0	117.1				-- same, very dense, olive brown
50		☐	31						-- same, dense, reddish brown
									Total Depth = 51.5 feet Backfilled on 10/9/2017 Groundwater not encountered. Borehole backfilled at the completion of testing with soil cuttings.
55									
60									
65									
70									

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO. 170875.3
REPORT DATE October 2017
FIGURE A - 7

DATE DRILLED 9/29/17
LOGGED BY SL
BORING NO. B-7
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
								SM	Silty SAND with mostly fine sand, brown, medium dense, dry
5			35						-- same
10			9						-- moist
15			24	9.5	125.3				-- mostly fine-medium sand, light brown, dry
20			29					ML	Sandy SILT, brown, dense, moist
25			34					SM	Silty SAND with few clay, reddish brown, medium dense, moist
30			19			#200			-- same
									Total Depth = 31.5 feet Backfilled on 9/29/2017 Groundwater not encountered. Pipe inserted for percolation testing. Borehole backfilled at the completion of testing with soil cuttings.
35									

BORING LOG 170875.3 - UCR OUTPATIENT PAVILLION.GPJ TWINING LABS.GDT 1/20/23

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 8

DATE DRILLED 9/29/17
LOGGED BY DHC
BORING NO. B-8
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) NE
DRILLING METHOD 8" HSA
DRILLER 2R Drilling
SURFACE ELEVATION (ft.) N/A ±(MSL)

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
						■		2.5 inches of AC with no base
5		☒	53				SM	Silty SAND with about 5% gravel, reddish brown, dense, moist
10			27					-- more silt and no gravel, medium dense
								Total Depth = 11.5 feet Backfilled on 9/29/2017 Groundwater not encountered. Pipe inserted for percolation testing. Borehole backfilled at the completion of testing with soil cuttings. Surface patched with cold-patch.
15								
20								
25								
30								
35								

TWINING

LOG OF BORING

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE A - 9

DATE DRILLED 12/1/2022
LOGGED BY CDD
BORING NO. B-9
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1020 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
								SM	3 inches of asphalt with no base
								SM	ARTIFICIAL FILL: Silty SAND; dark reddish brown; moist; fine grain sand; fine to coarse gravel; trace mica
									ALLUVIUM: Silty SAND; dark reddish brown; moist; fine grain sand; fine to coarse gravel; trace mica
1015	5		▯	35				SM	-- same; dense; reddish brown; trace fine gravel; fine to medium grain sand
1010	10		☒	42	6.8	112.2		SM	-- same; medium dense; moist; very fine grain sand; fine gravel
1005	15		▯	21				SM	-- same; medium dense; moist; very fine grain sand; fine gravel
1000	20		☒	49	6.6	126.5		SM	-- same; dense; fine to medium grain sand
995	25		▯	35				SM	-- same; dense; light reddish brown; moist; fine to medium grain sand; fine gravel
990	30		☒	50 for 6"	7.5	111.5		SM	-- same; very dense; reddish brown with orange and black laminations; moist; fine to medium grain sand; mostly medium gravel with some fine
									Total Depth = 31.0 feet Backfilled on 12/1/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
985	35								

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 10

DATE DRILLED 12/1/2022
LOGGED BY CDD
BORING NO. B-10
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1021 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
										4 inches of asphalt concrete over 10 inches of base over 3 inches of old asphalt concrete
									SM	ARTIFICIAL FILL:
									SM	Silty SAND; reddish brown; slightly moist; mostly fine grain sand with some medium
1016	5			25	6.2	112.6	C		SM	ALLUVIUM: Silty SAND; reddish brown; moist; mostly fine grain sand with some medium -- same; medium dense
1011	10			13					SM	-- same; medium dense; brown; slightly moist; mostly fine sand with some medium
1006	15			39	4.6	109.9	#200, DS		SM	-- same; medium dense; brown; slightly moist; fine to medium grain sand with less silt
1001	20			26					SM	--same; medium dense
996	25			47	2.8	109.2	#200		SW-SM	Well graded SAND with silt; dense; reddish yellow; slightly moist; fine to coarse grain sand; some organics/rootlets
991	30			30					SM	Silty SAND; dense; dark brown; moist; very fine sand; trace mica
986	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO. 220759.3
REPORT DATE June 2023
FIGURE A - 11

DATE DRILLED 12/1/2022
DRIVE WEIGHT 140 lbs.
DRILLING METHOD 8" HSA

LOGGED BY CDD
DROP 30 inches
DRILLER Baja Exploration

BORING NO. B-10
DEPTH TO GROUNDWATER (ft.) N/E
SURFACE ELEVATION (ft.) 1021 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	U.S.C.S. CLASSIFICATION	DESCRIPTION
				50 for 5"	11.0	123.0		SM SM	Silty SAND; dense; dark brown; moist; very fine sand; trace mica *(continued)* -- same; very dense; reddish brown
981	40			57				SM	-- same; very dense; fine to medium grain sand
976	45			22/50 for 6"	9.3	124.1		SP-SM	Poorly graded SAND with silt; very dense; reddish brown; moist; fine to medium grain sand; micaceous
971	50			40				SM	Silty SAND; dense; reddish brown; moist; fine to medium grain sand
									Total Depth = 51.5 feet Backfilled on 12/1/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
966	55								
961	60								
956	65								
951	70								

BORING LOG 220759.3 - UCR OASIS GEOTECH.GPJ TWINING LABS.GDT 6/24/23

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 11

DATE DRILLED 12/1/2022
LOGGED BY CDD
BORING NO. B-11
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1019 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES		BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
		Bulk	Driven							
										5 inches of asphalt concrete with no base
									SM	ARTIFICIAL FILL: Silty SAND; reddish brown; slightly moist; fine to medium grain sand; fine gravel
									SM	ALLUVIUM: Silty SAND; reddish brown; slightly moist; fine to medium grain sand; fine gravel
1014	5		☒	24	5.3	119.2	DS		SM	-- same; medium dense
1009	10		▯	20					SM	-- same; medium dense; brown; fine grain sand
1004	15		☒	29	10.4	105.9	C		SM	-- same; medium dense; reddish brown to yellowish brown; slightly moist; fine to medium grain sand
999	20		▯	27					SM	-- same; medium dense; brown; fine grain sand
994	25		☒	38	1.9	105.6			SP-SM	Poorly graded SAND with silt; medium dense; light yellowish brown; dry
989	30		▯	27					SM	Silty SAND; medium dense; yellowish brown; slightly moist; fine grain sand
										Total Depth = 31.0 feet Backfilled on 12/1/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
984	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 12

DATE DRILLED 12/1/2022
LOGGED BY CDD
BORING NO. **B-12**
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1014 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
										4 inches of asphalt over 6 inches of base
							CORR, EI, RV		SM	ARTIFICIAL FILL: Silty SAND; reddish brown; dry; fine grain sand; fine to medium gravel
									SM	ALLUVIUM: Silty SAND; reddish brown; dry; fine grain sand; fine to medium gravel
1009	5			31	3.0	114.8	C		SM	-- same; medium dense; slightly moist; fine grain sand
1004	10			25			#200		SP-SM	Poorly graded SAND with silt; medium dense; light yellowish brown; slightly moist; fine to medium grain sand
999	15			48	4.5	106.7	DS		SP-SM	-- same; dense
994	20			35			#200		SM	Silty SAND; dense; light yellowish brown; slightly moist; some silt layers
989	25			56	2.4	116.7	C		SP-SM	Poorly graded SAND with silt; dense; reddish brown; slightly moist; fine to medium grain sand
984	30			45					SM	Silty SAND; dense; reddish brown; slightly moist; mostly fine sand with some medium
979	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 13

DATE DRILLED 12/1/2022
LOGGED BY CDD
BORING NO. B-12
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1014 +(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
				77	5.3	112.9	DS		SM SM	Silty SAND; dense; reddish brown; slightly moist; mostly fine sand with some medium *(continued)* -- same; very dense
974	40			64					SM	-- same; very dense; light reddish brown; slightly moist; mostly fine grain sand
969	45			50 for 6"	5.1	110.9			SM	-- same; very dense; fine to medium sand
964	50			55					SM	-- same; very dense
										Total Depth = 51.5 feet Backfilled on 12/1/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
959	55									
954	60									
949	65									
944	70									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 13

DATE DRILLED 12/2/2022 LOGGED BY CDD **BORING NO. B-13**
DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA DRILLER Baja Exploration SURFACE ELEVATION (ft.) 1013 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
										5 inches of asphalt concrete with no base
					10.8		DS, MAX		SM	ARTIFICIAL FILL: Silty SAND; brown; moist; fine grain sand; fine gravel -- gets looser; yellowish brown
1008	5			20					SM	ALLUVIUM: Silty SAND; medium dense; yellowish brown; slightly moist; fine grain sand; fine gravel
1003	10			33	0.7	95.5	#200		SP	Poorly graded SAND; medium dense; yellowish brown; dry; fine to coarse grain sand; sample disturbed
998	15			40					SP	-- same; dense; light yellowish brown; fine to medium grain sand
993	20			52	1.6	109.5			SM	Silty SAND; dense; light yellowish brown; dry; mostly fine sand; fine gravel
988	25			34					SP-SM	Poorly graded SAND with silt; dense; light yellowish brown; slightly moist; fine to medium grain sand
983	30			40/50 for 6"	0.9	112.5	#200		SP-SM	Poorly graded SAND with silt; very dense; brown; dry; fine grain sand; fine gravel
										Total Depth = 31.0 feet Backfilled on 12/2/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
978	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 14

DATE DRILLED 12/2/2022 LOGGED BY CDD **BORING NO. B-14**
DRIVE WEIGHT 140 lbs. DROP 30 inches DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA DRILLER Baja Exploration SURFACE ELEVATION (ft.) 1013 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
										5 inches of asphalt concrete with no base
		☐					CORR, EI		SM	ARTIFICIAL FILL: Silty SAND; brown; slightly moist; fine grain sand; fine gravel -- @1' some debris and brick pieces
1008	5		☒	38	6.5	116.2	DS			-- same; medium dense; very dark brown; slightly moist; medium to coarse grain sand; fine gravel
									SP-SM	ALLUVIUM: Poorly graded SAND with silt; reddish brown; slightly moist; fine grain sand
1003	10		☐	19			#200		SP-SM	-- same; medium dense; yellowish brown; slightly moist; fine to medium grain sand
998	15		☒	37	2.2	106.2	C		SP-SM	-- same; medium dense
993	20		☐	47			#200		SM	Silty SAND; dense; brown; slightly moist; fine to medium sand
988	25		☒	62	2.6	108.4	DS		SP-SM	Poorly graded SAND with silt; dense; yellowish brown; slightly moist; fine to medium grain sand
983	30		☐	29			#200		SM	Silty SAND; medium dense; yellowish brown; slightly moist
978	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 15

DATE DRILLED 12/2/2022
LOGGED BY CDD
BORING NO. B-14
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1013 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
			☒	52	8.3	124.5		▨	SM SM	Silty SAND; medium dense; yellowish brown; slightly moist *(continued)* -- same; dense; reddish brown; moist; fine to medium grain sand
973	40		▯	34			#200	▨	SM	-- same; dense; brown; moist; fine grain sand
968	45		☒	46	12.2	112.1		▨	SM	-- same; medium dense; some mica
963	50		▯	19				▨	SM	-- same; medium dense; reddish brown; moist; fine to medium grain sand; trace fine gravel; some mica
										Total Depth = 51.5 feet Backfilled on 12/2/2022 Backfilled with neat cement. Groundwater not encountered. Surface patched with PCC.
958	55									
953	60									
948	65									
943	70									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 15

DATE DRILLED 12/2/2022
LOGGED BY CDD
BORING NO. P-1
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1012 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
								■		7 inches of asphalt concrete with no base
							#200	░	SM	ARTIFICIAL FILL: Silty SAND; brown; slightly moist; fine grain sand; trace fine gravel -- @ 1' changes to light reddish brown; trace subangular medium to coarse gravel
		▨						░	SM	ALLUVIUM: Silty SAND; reddish brown; slightly moist; fine grain sand; trace fine gravel -- @3' some caliche veins -- @4' becomes denser
1007	5									Total Depth = 5.0 feet Backfilled on 12/2/2022 Backfilled with cuttings. Groundwater not encountered. Surface patched with PCC.
1002	10									
997	15									
992	20									
987	25									
982	30									
977	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 16

DATE DRILLED 12/2/2022
LOGGED BY CDD
BORING NO. P-2
DRIVE WEIGHT 140 lbs.
DROP 30 inches
DEPTH TO GROUNDWATER (ft.) N/E
DRILLING METHOD 8" HSA
DRILLER Baja Exploration
SURFACE ELEVATION (ft.) 1015 ±(MSL)

ELEVATION (feet)	DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS / FOOT	MOISTURE (%)	DRY DENSITY (pcf)	ADDITIONAL TESTS	GRAPHIC LOG	U.S.C.S. CLASSIFICATION	DESCRIPTION
										5 inches of asphalt with no base
									SM	ARTIFICIAL FILL: Silty SAND; brown; slightly moist; medium grain sand; fine gravel -- @1.5' asphalt and brick debris -- @2' layer of 5" thick asphalt
							#200		SM	ALLUVIUM: Silty SAND; reddish brown; slightly moist; fine grain sand; some fine gravel; some organics/rootlets
1010	5									Total Depth = 5.0 feet Backfilled on 12/2/2022 Backfilled with cuttings. Groundwater not encountered. Surface patched with PCC.
1005	10									
1000	15									
995	20									
990	25									
985	30									
980	35									

TWINING

LOG OF BORING

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE A - 17

TWINING

2883 East Spring Street
Suite 300
Long Beach CA 90806

Tel 562.426.3355
Fax 562.426.6424

APPENDIX B
LABORATORY TESTING

TWINING

2883 East Spring Street
Suite 300
Long Beach CA 90806

Tel 562.426.3355
Fax 562.426.6424

Appendix B
Laboratory Testing

Laboratory Moisture Content and Density Tests

The moisture content and dry densities of selected driven samples obtained from the exploratory borings were evaluated in general accordance with the latest version of ASTM D2937. The results are shown on the boring logs in Appendix A and summarized in Table B-1.

No. 200 Wash Sieve

The amount of fines passing the No. 200 sieve was evaluated in accordance with ASTM D1140. The results are presented in Table B-2.

Resistance Value (R-value)

R-value testing was performed on a select bulk sample of the near-surface soils encountered at the site. The test was performed in general accordance with ASTM D2844. The result is summarized in Table B-3.

Maximum Dry Density-Optimum Moisture Content

One selected bulk sample was tested to evaluate the maximum dry density and its optimum moisture content. The test was performed in general accordance with ASTM test method D1557. The result is presented on Figure B-1.

Expansion Index

The expansion index of a select soil sample was evaluated in general accordance with ASTM D4829. The specimen was molded under a specified compactive energy at approximately 50 percent saturation. The prepared 1-inch thick by 4-inch diameter specimen was loaded with a surcharge of 144 pounds per square foot and was inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The result of expansion index test is presented in Table B-4.

Consolidation

Consolidation tests were performed on selected modified-California soil samples in general accordance with the latest version of ASTM D2435. The samples were inundated during testing to represent adverse field conditions. The percent consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample. Test results are presented on Figures B-2 through B-3 and the results from Hushmand are attached below.

Direct Shear

Direct shear tests were performed on a remolded sample and representative modified-California soil samples in general accordance with the latest version of ASTM D3080 to evaluate the shear strength characteristics of the selected materials. The samples were inundated during shearing to represent adverse field conditions. Test results are presented on Figures B-4 through B-10.

Corrosivity

Soil pH and resistivity tests were performed by Anaheim Test Lab, Inc. (ATLI) of Anaheim, California on a representative soil sample. The resistivity of the soil assumes saturated soil conditions. The chloride and sulfate contents of the selected samples were evaluated in general accordance with the latest versions of Caltrans test methods CT417, CT422, and CT 643. The test results are presented on Table B-6 and the ATLI report included in this appendix.

Table B-1 - Moisture Content and Dry Density

Boring No.	Depth (feet)	Moisture Content (%)	Dry Density (pcf)
B-9	10	6.8	112.2
B-9	20	6.6	126.5
B-9	30	7.5	111.5
B-10	5	6.2	112.6
B-10	15	4.6	109.9
B-10	25	2.8	109.2
B-10	35	11.0	123.0
B-10	45	9.3	124.1
B-11	5	5.3	119.2
B-11	15	10.4	105.9
B-11	25	1.9	105.6
B-12	5	3.0	114.8
B-12	15	4.5	106.7
B-12	25	2.4	116.7
B-12	35	5.3	112.9
B-12	45	5.1	110.9
B-13	10	0.7	95.5
B-13	20	1.6	109.5
B-13	30	0.9	112.5
B-14	5	6.5	116.2
B-14	15	2.2	106.2
B-14	25	2.6	108.4
B-14	35	8.3	124.5
B-14	45	12.2	112.1

Table B-2 - No. 200 Wash Sieve

Boring No.	Depth (feet)	Percent Passing No. 200 Sieve
B-10	15	14.2
B-10	25	8.0
B-12	10	12.0
B-12	20	31.8
B-13	10	4.3
B-13	30	10.2
B-14	10	10.4
B-14	20	30.1
B-14	30	15.7
B-14	40	46.7
P-1	1-5’ BULK	42.4
P-2	3-5’ BULK	44.4

Table B-3 Resistance Value (R-value)

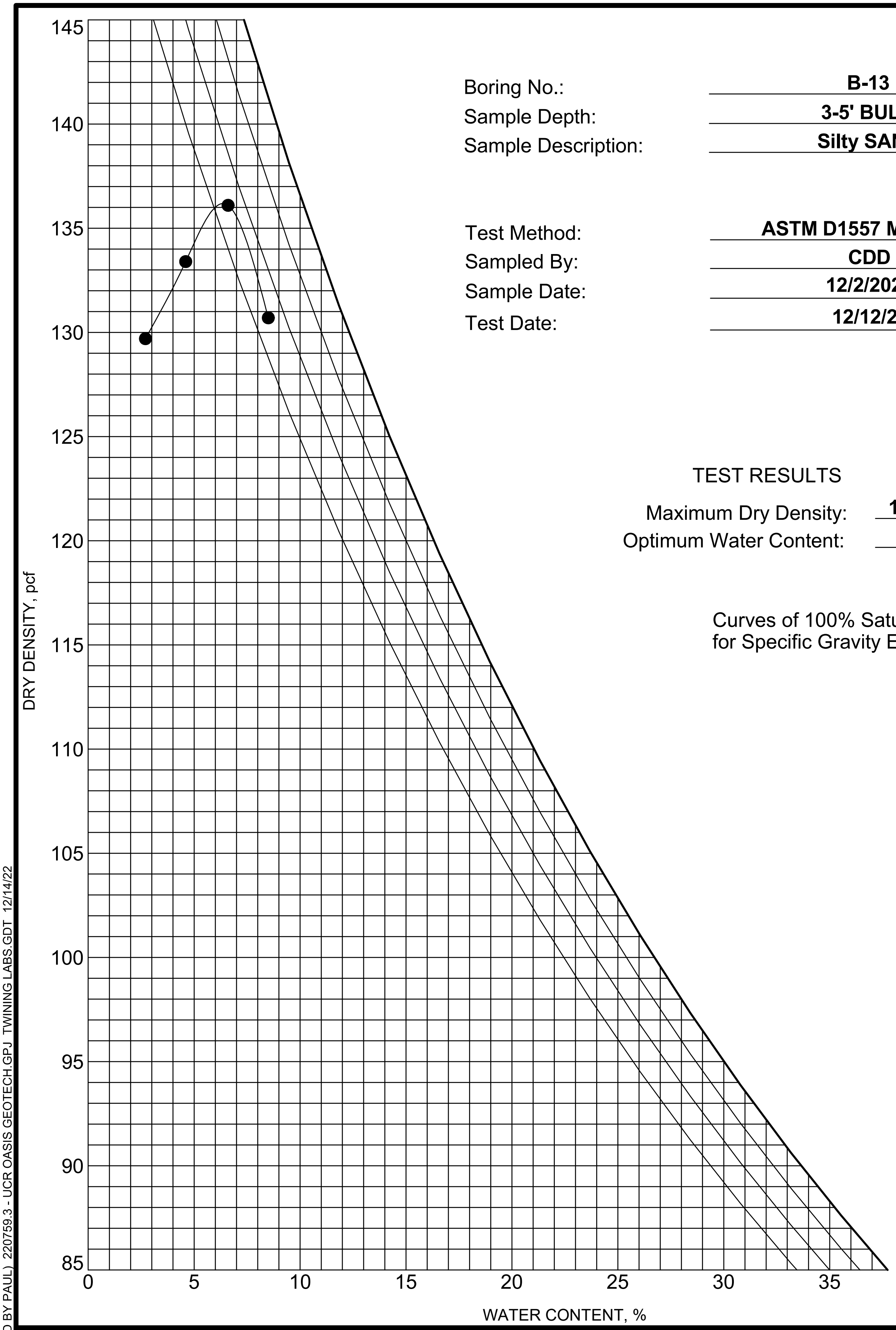
Boring No.	Depth (feet)	R Value
B-12	1 - 5	40

Table B-4 - Expansion Index

Boring No.	Depth (feet)	Expansion Index	Expansion Potential
B-12	1 - 5	0	Very low
B-14	1 - 5	4	Very low

Table B-5 - Corrosivity Test Results

Boring No.	Depth (feet)	pH	Minimum Resistivity (ohm-cm)	Water Soluble Sulfate (ppm)	Water Soluble Chloride (ppm)
B-12	1-5	7.4	6,500	86	18
B-14	1-5	7.2	4,300	139	28



Boring No.: **B-13**
Sample Depth: **3-5' BULK**
Sample Description: **Silty SAND**

Test Method: **ASTM D1557 Method A**
Sampled By: **CDD**
Sample Date: **12/2/2022**
Test Date: **12/12/22**

TEST RESULTS

Maximum Dry Density: **136.0** **pcf**
Optimum Water Content: **6.5** **%**

Curves of 100% Saturation
for Specific Gravity Equal to:

2.80

2.70

2.60

2.50

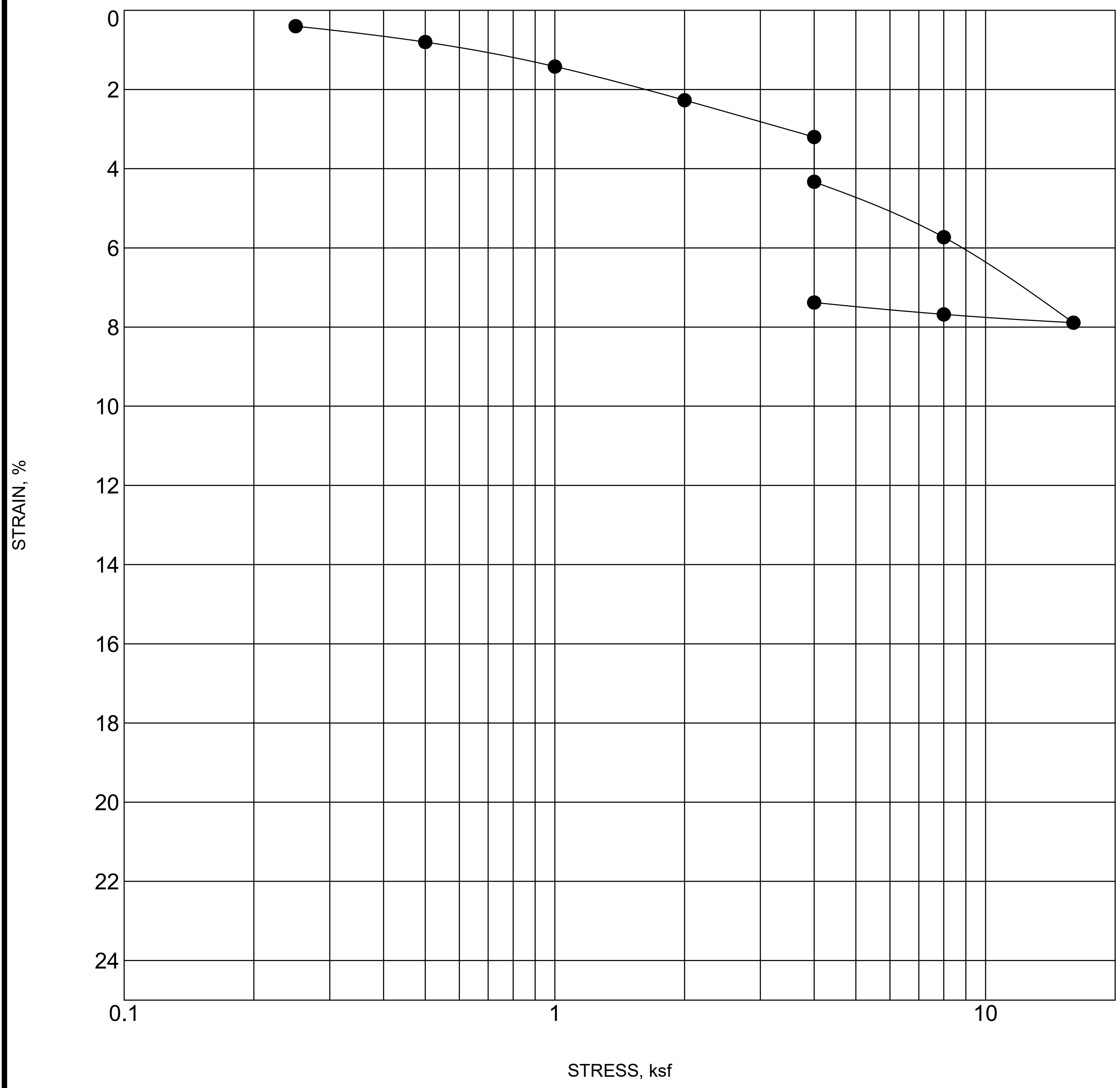
COMPACTION (MODIFIED BY PAUL) 220759.3 - UCR OASIS GEOTECH.GPJ TWINING LABS.GDT 12/14/22

TWINING

MOISTURE-DENSITY RELATIONSHIP

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-1



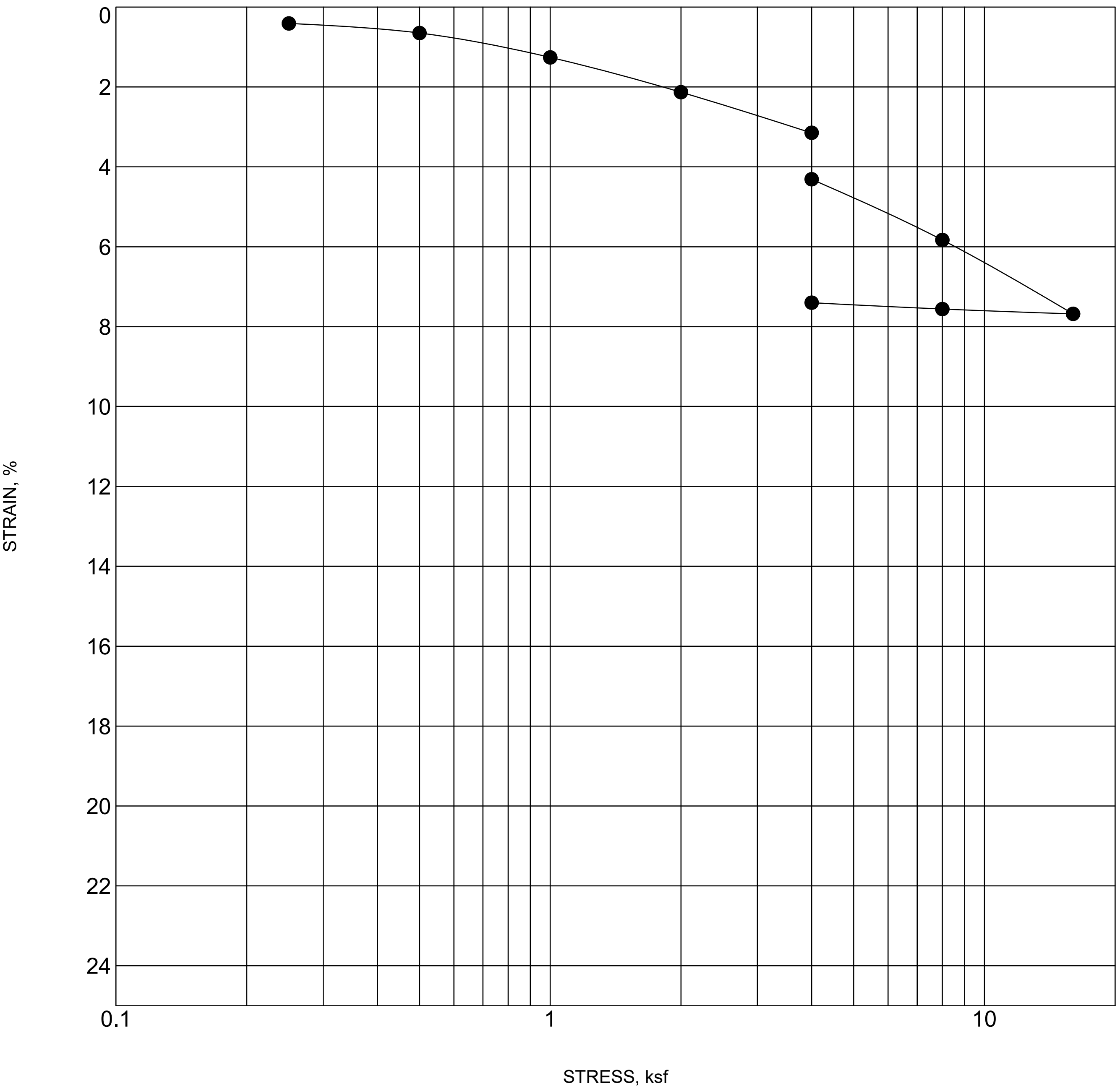
	Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-11 at 15 ft**	**Silty SAND**	**105.9**	**10.4**

TWINING

CONSOLIDATION TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-2



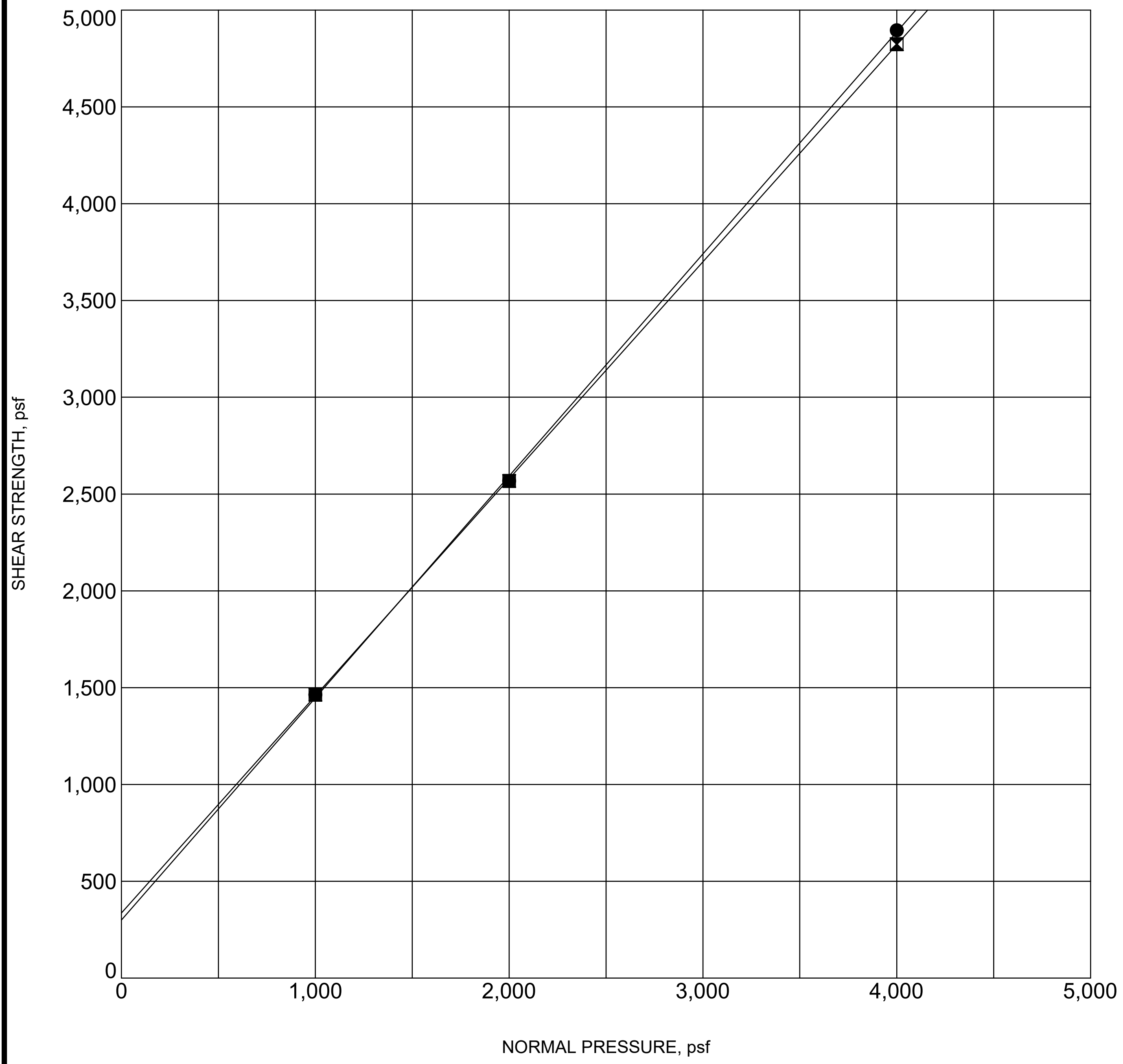
	Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-14 at 15 ft**	**Poorly graded SAND with silt**	**106.2**	**2.2**

TWINING

CONSOLIDATION TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-3



Boring No.: B-10
Sample Depth (ft): 15
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 109.9

Shear Strength Parameters

	Peak —●—	**Ultimate** —☒—
Cohesion, C (psf):	300	336
Friction Angle, Ø (deg):	49	48

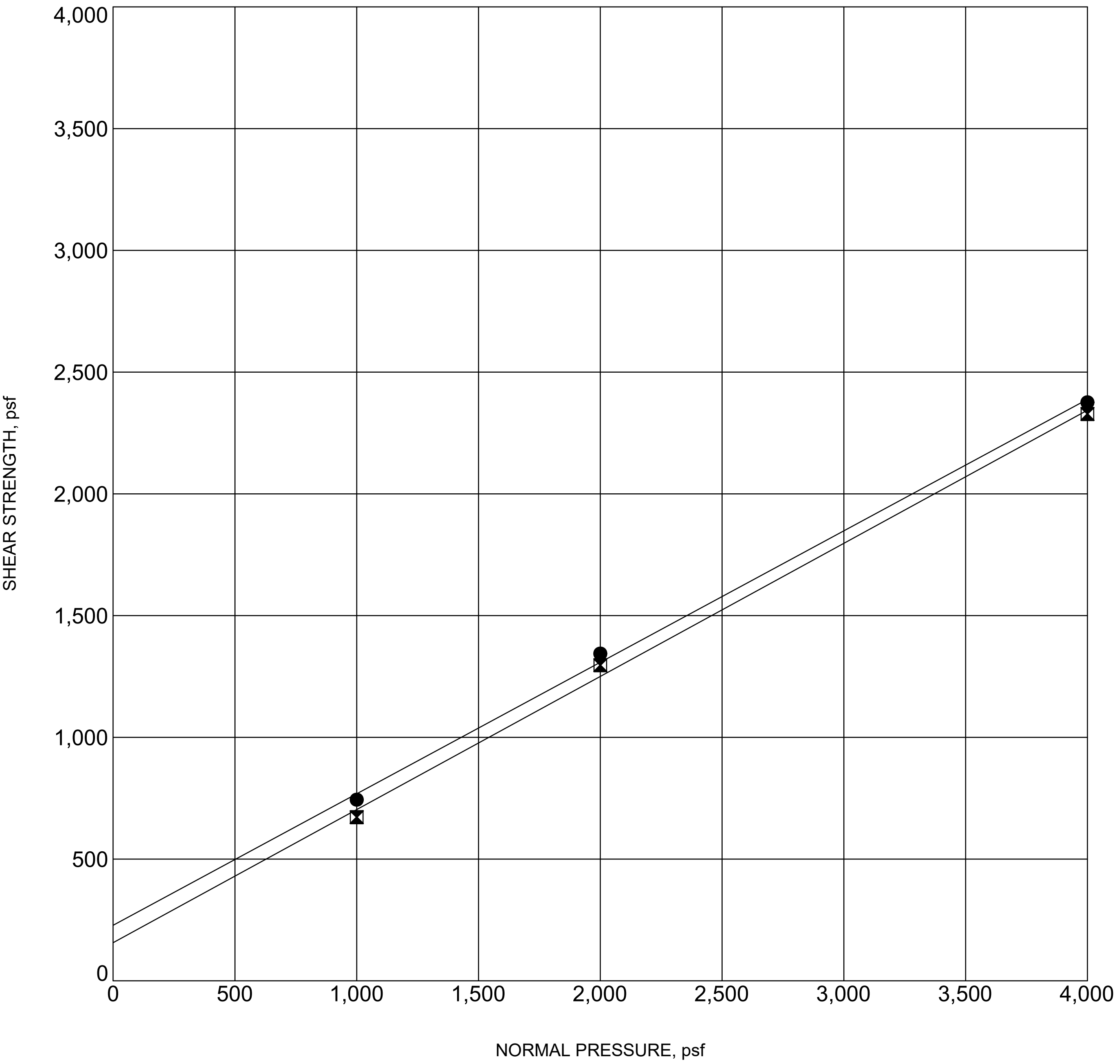
Initial Moisture (%): 4.6
Final Moisture (%): 12.7

TWINING

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	FIGURE B-4
220759.3	June 2023	



Boring No.: B-11
Sample Depth (ft): 5
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 119.2

Shear Strength Parameters

	Peak —●—	Ultimate —⧗—
Cohesion, C (psf):	228	156
Friction Angle, Ø (deg):	28	29

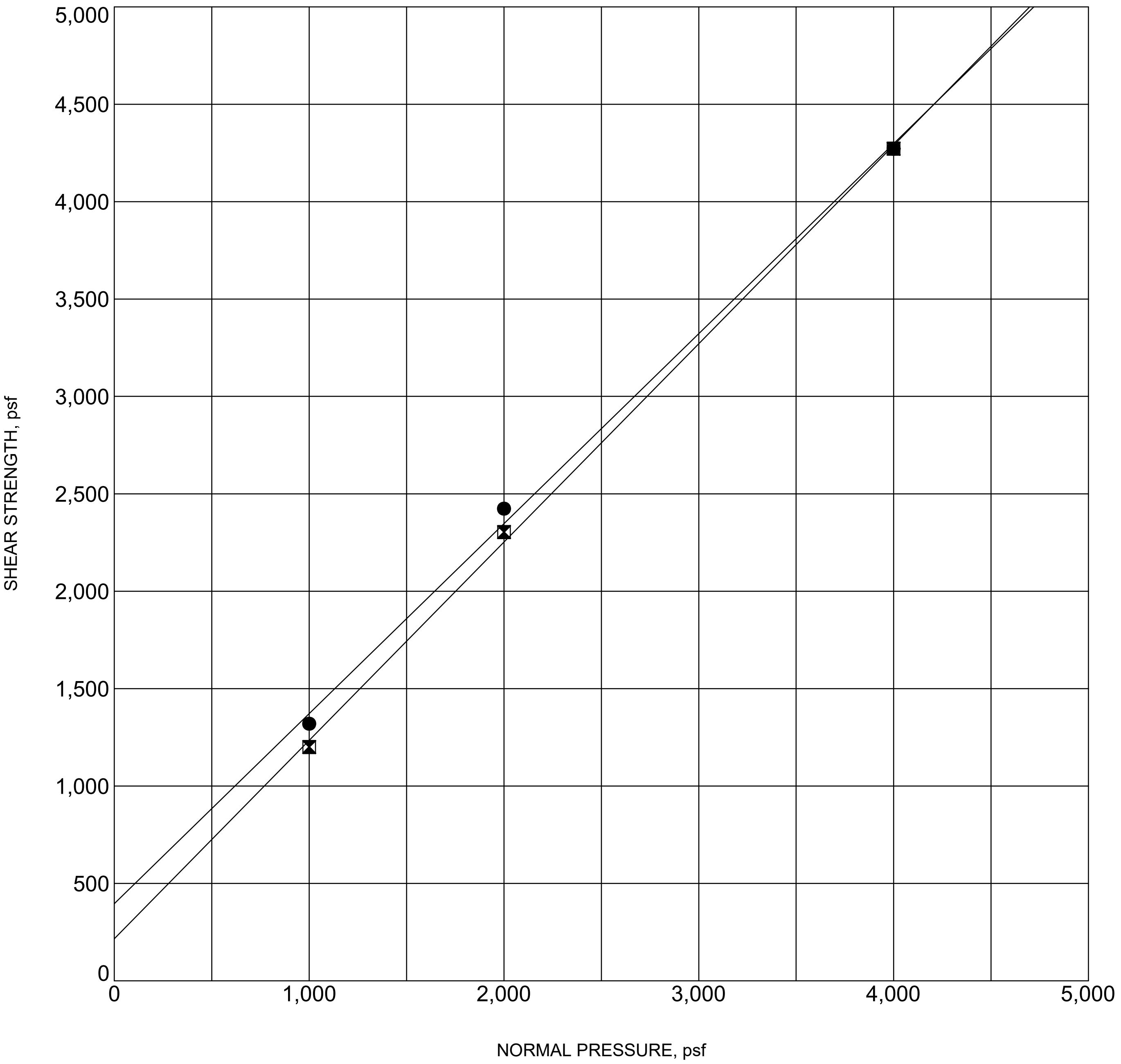
Initial Moisture (%): 5.3
Final Moisture (%): 10.1

TWINING

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-5



Boring No.: B-12
Sample Depth (ft): 15
Sample Description: Poorly graded SAND with silt
Strain Rate (in./min): 0.005
Dry Density (pcf): 106.7

Shear Strength Parameters

	Peak —●—	Ultimate —⧗—
Cohesion, C (psf):	396	216
Friction Angle, Ø (deg):	44	46

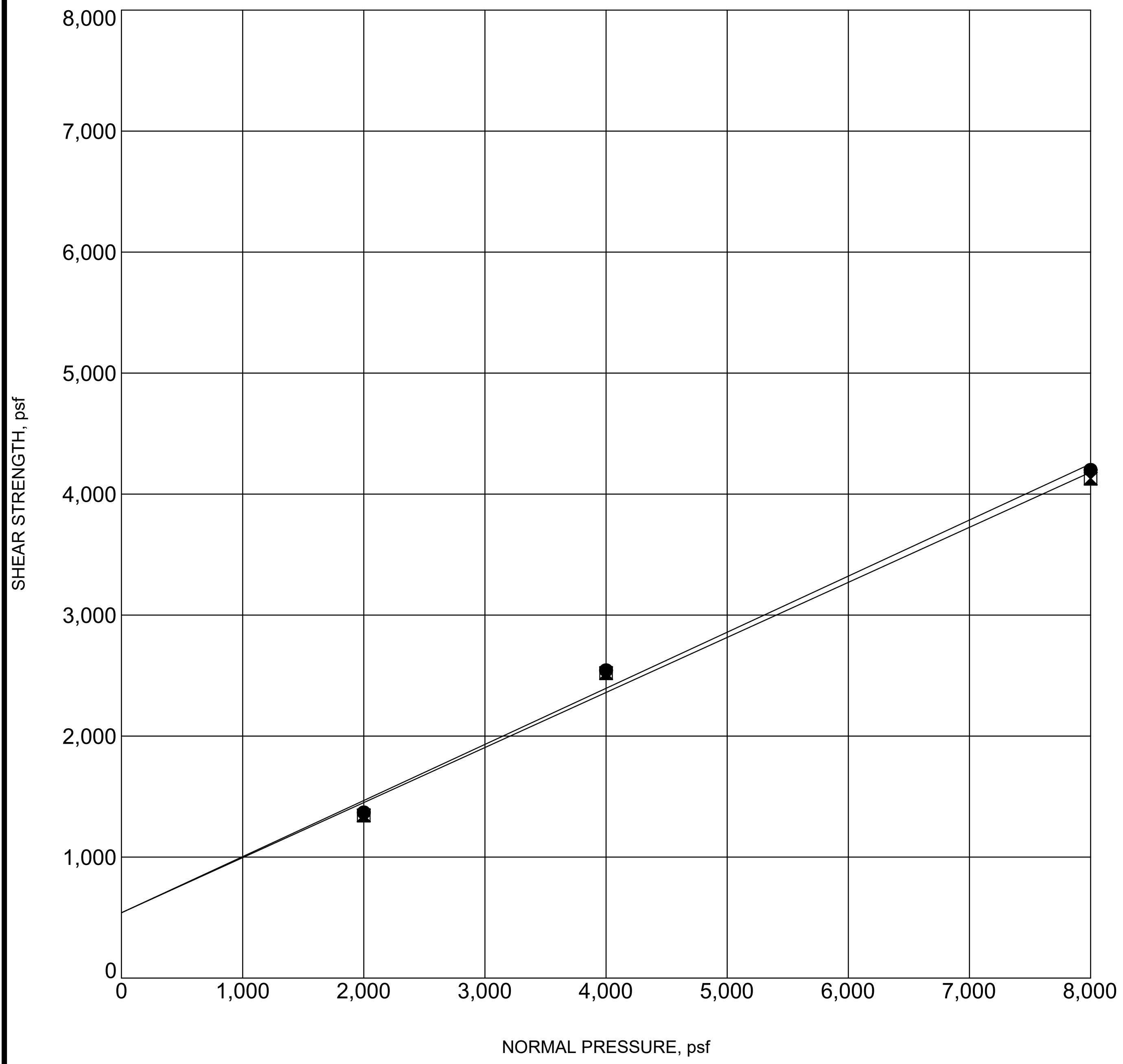
Initial Moisture (%): 4.5
Final Moisture (%): 15.7

TWINING

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-6



Boring No.: B-12
Sample Depth (ft): 35
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 112.9

Shear Strength Parameters

	Peak —●—	Ultimate —⧗—
Cohesion, C (psf):	540	540
Friction Angle, Ø (deg):	25	24

Initial Moisture (%): 5.3
Final Moisture (%): 11.4

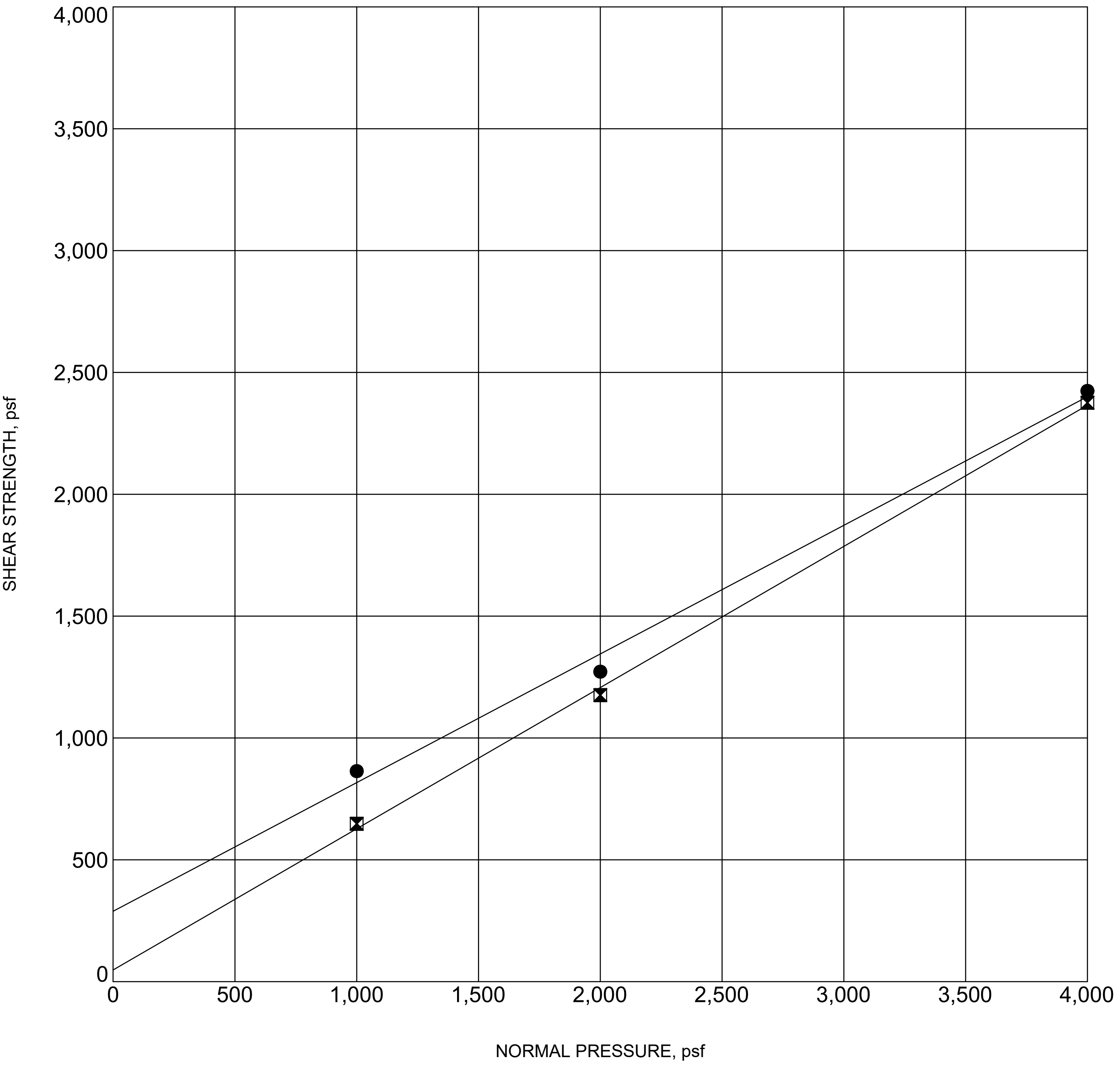
DIRECT SHEAR 220759.3 - UCR OASIS GEOTECH.GPJ TWINING LABS.GDT 12/14/22

TWINING

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-7



Boring No.: B-13
Sample Depth (ft): 3-5' BULK
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 122.6

Shear Strength Parameters

	Peak —●—	**Ultimate** —⧗—
Cohesion, C (psf):	288	48
Friction Angle, Ø (deg):	28	30

Initial Moisture (%): 6.4
Final Moisture (%): 10.8

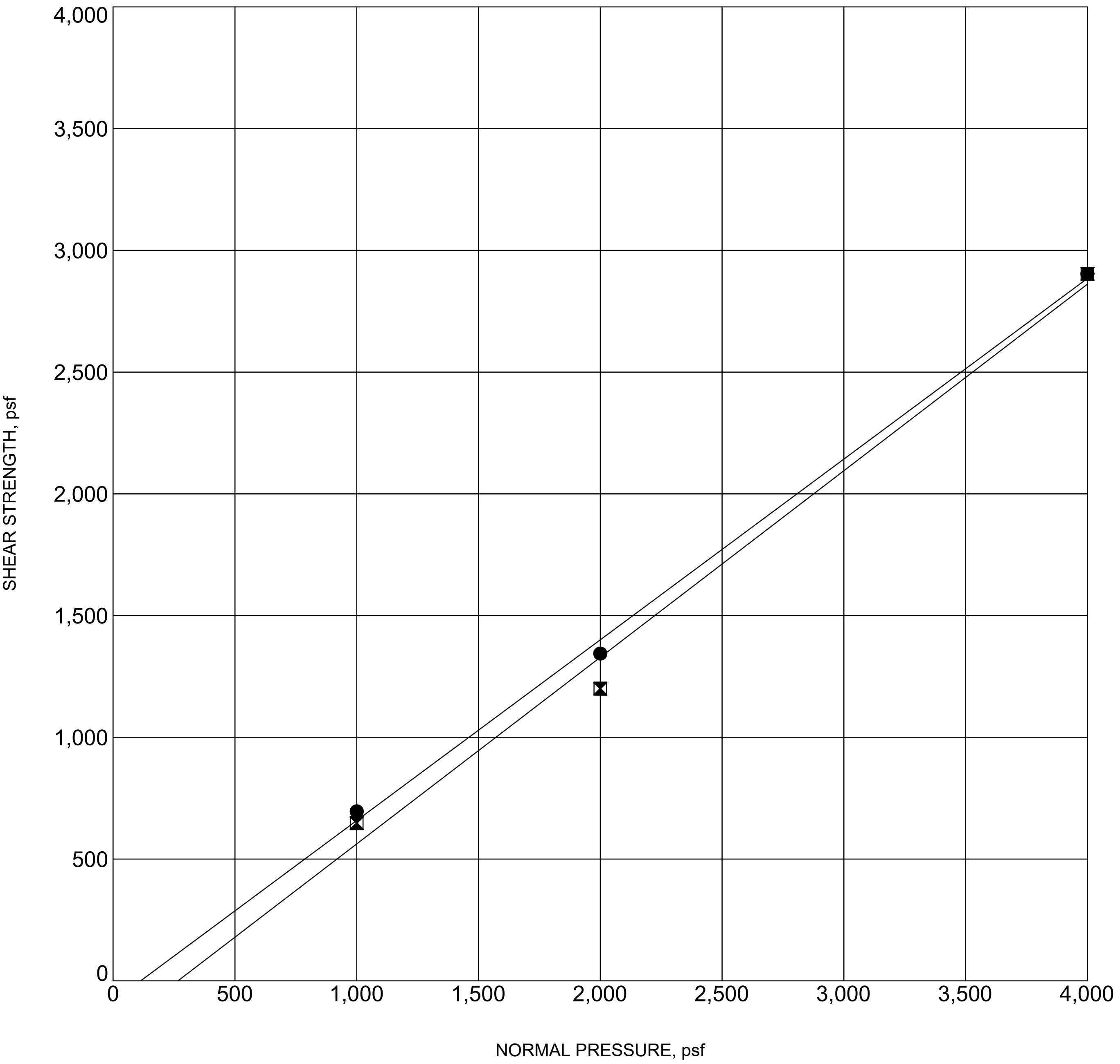
Remolded to 90% relative compaction

TWINING

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-8



Boring No.: B-14
Sample Depth (ft): 5
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 116.2

Shear Strength Parameters

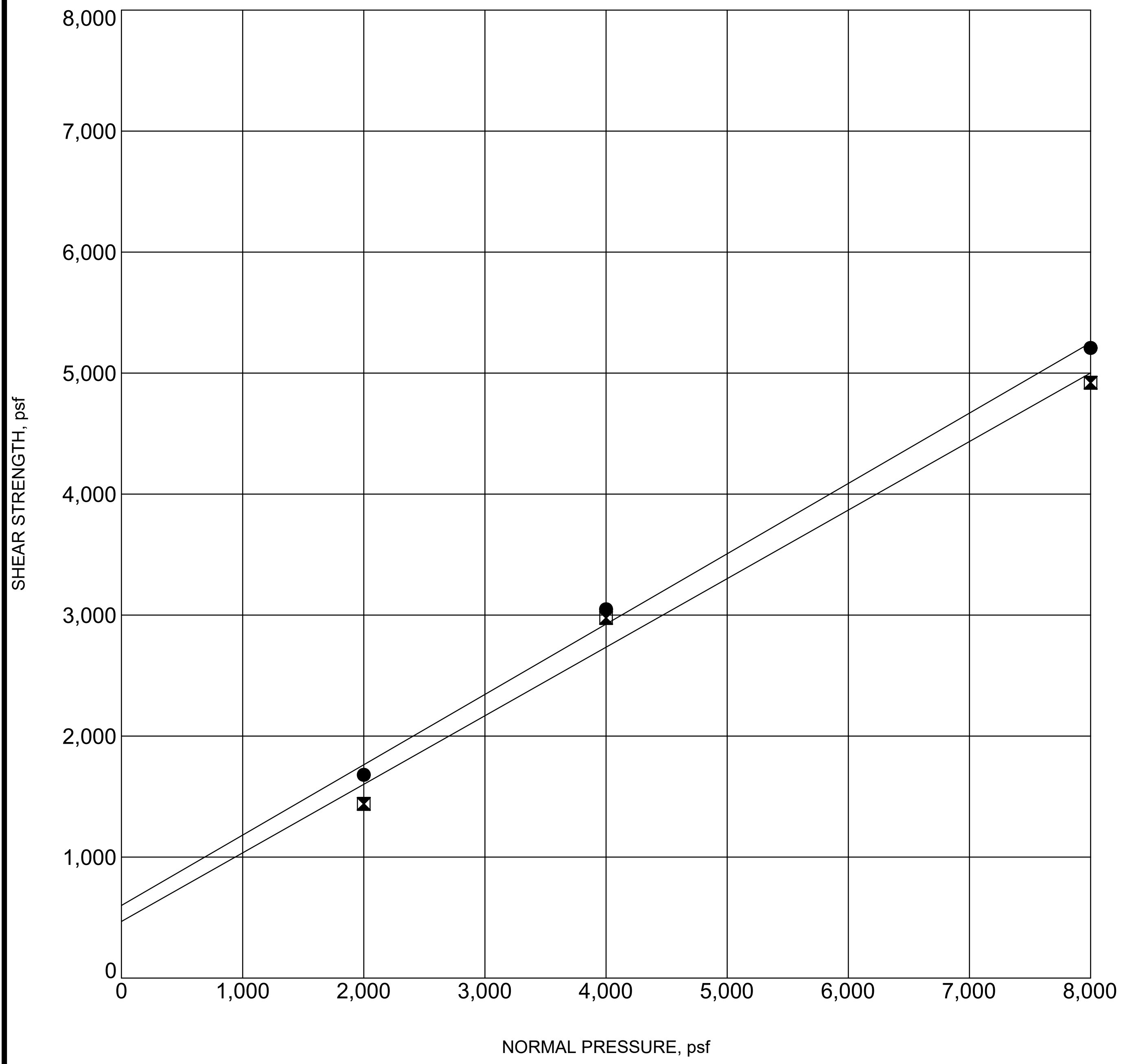
	Peak —●—	Ultimate —⧗—
Cohesion, C (psf):	0	0
Friction Angle, Ø (deg):	36	37

Initial Moisture (%): 6.5
Final Moisture (%): 11.6

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-9



Shear Strength Parameters

	Peak ●	**Ultimate** ⧗
Cohesion, C (psf):	600	468
Friction Angle, Ø (deg):	30	30

Boring No.: B-14
Sample Depth (ft): 25
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 108.4

Initial Moisture (%): 2.6
Final Moisture (%): 14.8

TWINING

DIRECT SHEAR TEST

OASIS Park
University of California, Riverside
Riverside, California

PROJECT NO.	REPORT DATE	
220759.3	June 2023	FIGURE B-10

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Hushmand Associates, Inc.
250 Goddard, Irvine,
CA 92618

p. (949) 777-1274
w. haieng.com
e. hai@haieng.com

January 16, 2023

Twining Inc.
2883 East Spring Street,
Long Beach, CA 90805

Attention: Mr. Doug Crayton

SUBJECT: Laboratory Test Result
Project Name: UCR Oasis
Project No.: 220759.3
HAI Project No.: TWI-23-001

Dear Mr. Crayton:

Enclosed is the result of the laboratory testing program conducted on samples from the above referenced project. The testing performed for this program was conducted in general accordance with the following test procedure:

Type of Test	Test Procedure
Consolidation	ASTM D2435

Attached are: three (3) Consolidation test results.

We appreciate the opportunity to provide our testing services to Twining Inc. If you have any questions regarding the test results, please contact us.

Sincerely,

M. Varsei

Kang C. Lin, BS, EIT
Laboratory Manager

Maryam Varsei, M.Sc.
Senior Staff Engineer

CONSOLIDATION TEST

ASTM D2435

Client :	Twining Inc.	*HAI Project No.:*	TWI-23-001
Project Name:	UCR Oasis	*Tested by:*	KL
Project Number:	220579.3	*Checked by:*	SD
Boring No.:	B-10	*Date:*	01/26/23
Sample No.:	R		
Type of Sample:	Undisturbed Ring		
Depth (ft):	5		
Soil Description:	Brown, Silty Sand (SM)		

Initial Total Weight (g)	Final Total Weight (g)	Final Dry Weight (g)
150.48	159.18	141.11

			Initial Conditions	Final Conditions
Height	H	(in)	1.024	0.935
Height of Solids	H_s	(in)	0.693	0.693
Height of Water	H_w	(in)	0.125	0.241
Height of Air	H_a	(in)	0.206	0.001
Dry Density		**(pcf)**	**114.5**	**134.0**
Water Content		**(%)**	**6.6**	**12.8**
Saturation		**(%)**	**37.7**	**99.4**

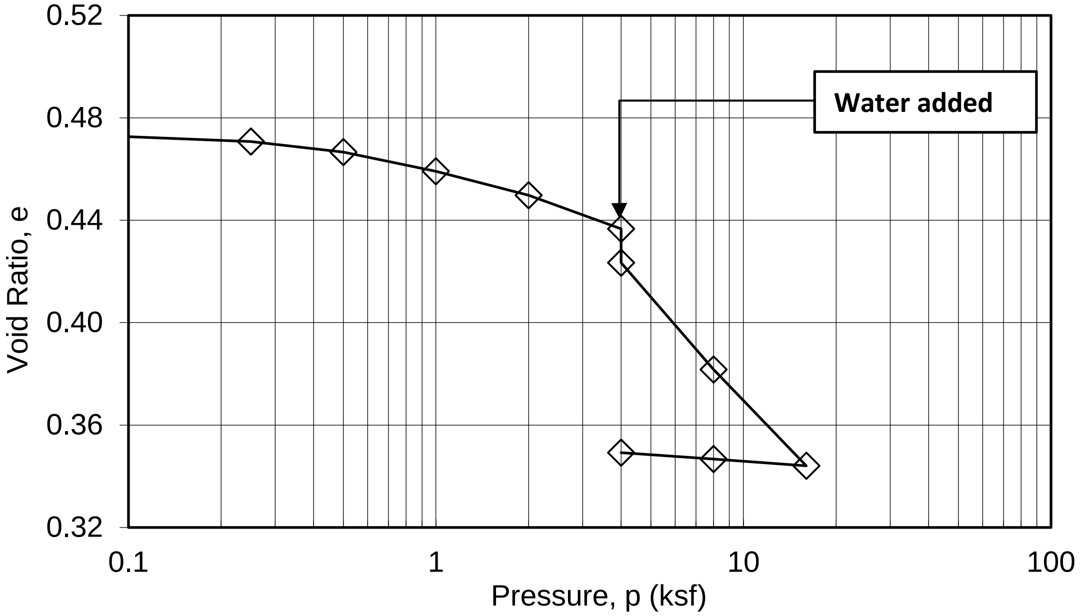
* Saturation is calcualted based on Gs= 2.71

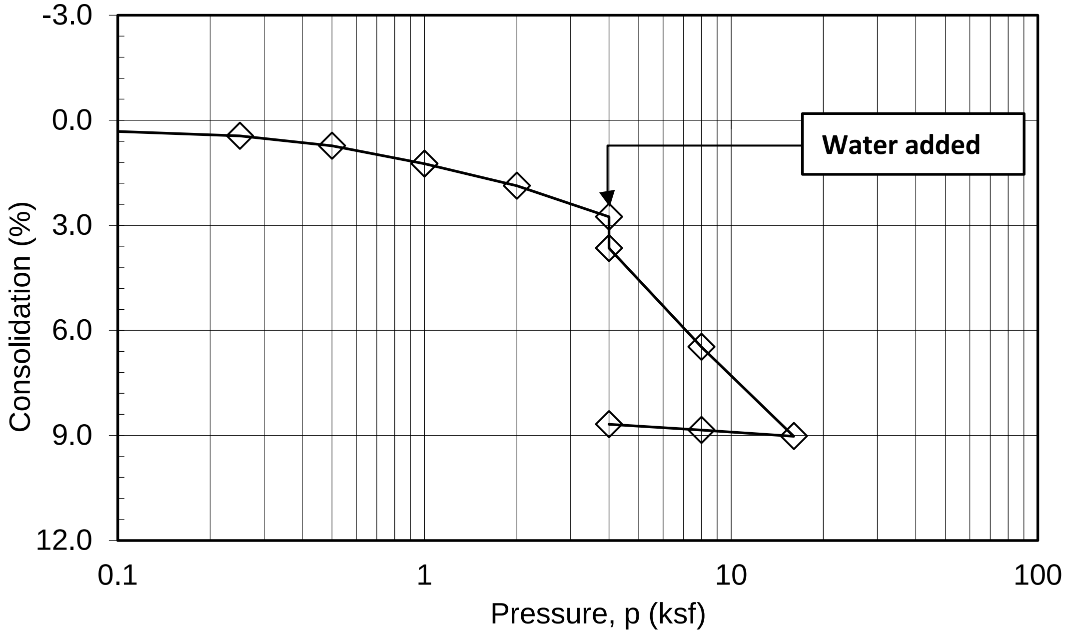
Load (ksf)	**δH (in)**	**H (in)**	**Voids (in)**	**e**	**Consol. (%)**	**a_v (ksf^{-1})**	**M_v (ksf^{-1})**	**Comment**
0.01	-------	1.0240	0.331	0.477	0			
0.25	0.0046	1.0194	0.326	0.471	0.4	2.8E-02	1.9E-02	
0.5	0.0075	1.0165	0.323	0.467	0.7	1.7E-02	1.1E-02	
1	0.0127	1.0113	0.318	0.459	1.2	1.5E-02	1.0E-02	
2	0.0191	1.0049	0.312	0.450	1.9	9.3E-03	6.4E-03	
4	0.0283	0.9957	0.303	0.437	2.8	6.6E-03	4.6E-03	
4	0.0374	0.9866	0.293	0.423	3.7	Water Added		
8	0.0663	0.9577	0.265	0.382	6.5	1.0E-02	7.5E-03	
16	0.0924	0.9316	0.238	0.344	9.0	4.7E-03	3.5E-03	
8	0.0906	0.9334	0.240	0.347	8.8	Unloaded		
4	0.0889	0.9351	0.242	0.349	8.7			

CONSOLIDATION TEST

ASTM D2435

Client :	Twining Inc.	*HAI Project No.:*	TWI-23-001
Project Name:	UCR Oasis	*Tested by:*	KL
Project Number:	220579.3	*Checked by:*	SD
Boring No.:	B-10	*Date:*	01/26/23
Sample No.:	R		
Type of Sample:	Undisturbed Ring		
Depth (ft):	5		
Soil Description:	Brown, Silty Sand (SM)		





CONSOLIDATION TEST

ASTM D2435

Client : Twining Inc.
Project Name: UCR Oasis
Project Number: 220579.3
Boring No.: B-12
Sample No.: R
Type of Sample: Undisturbed Ring
Depth (ft): 5
Soil Description: Brown, Silty Sand (SM)

HAI Project No.: TWI-23-001
Tested by: KL
Checked by: SD
Date: 01/26/23

Initial Total Weight	Final Total Weight	Final Dry Weight
(g)	(g)	(g)
140.69	153.04	136.92

		Initial Conditions	Final Conditions
Height H	(in)	1.000	0.925
Height of Solids H_s	(in)	0.673	0.673
Height of Water H_w	(in)	0.050	0.215
Height of Air H_a	(in)	0.277	0.038
Dry Density	**(pcf)**	**113.7**	**132.8**
Water Content	**(%)**	**2.8**	**11.8**
Saturation	**(%)**	**15.3**	**84.9**

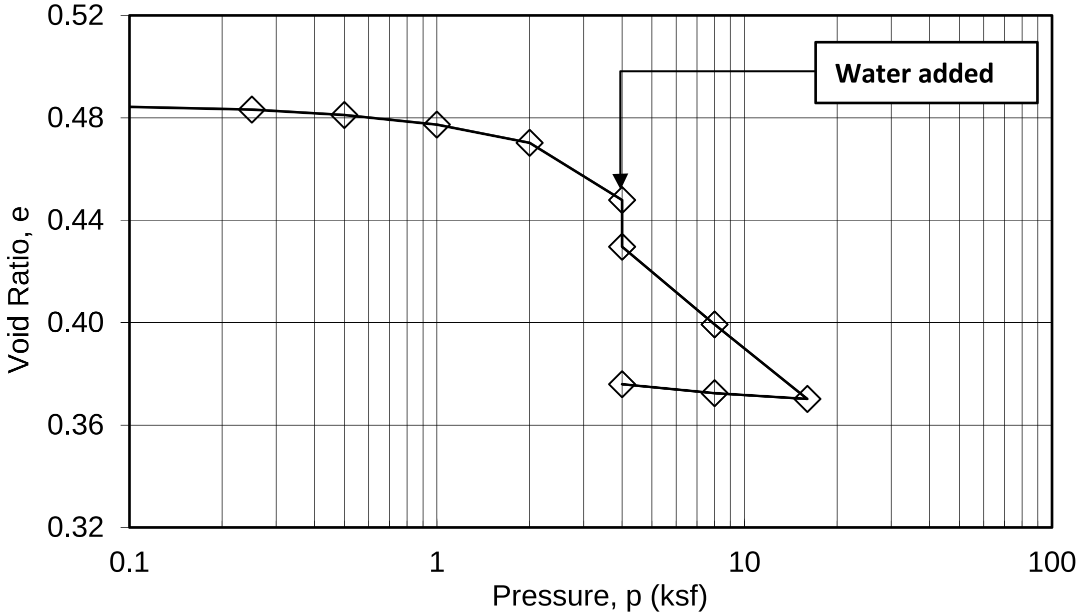
* Saturation is calcualted based on Gs= 2.71

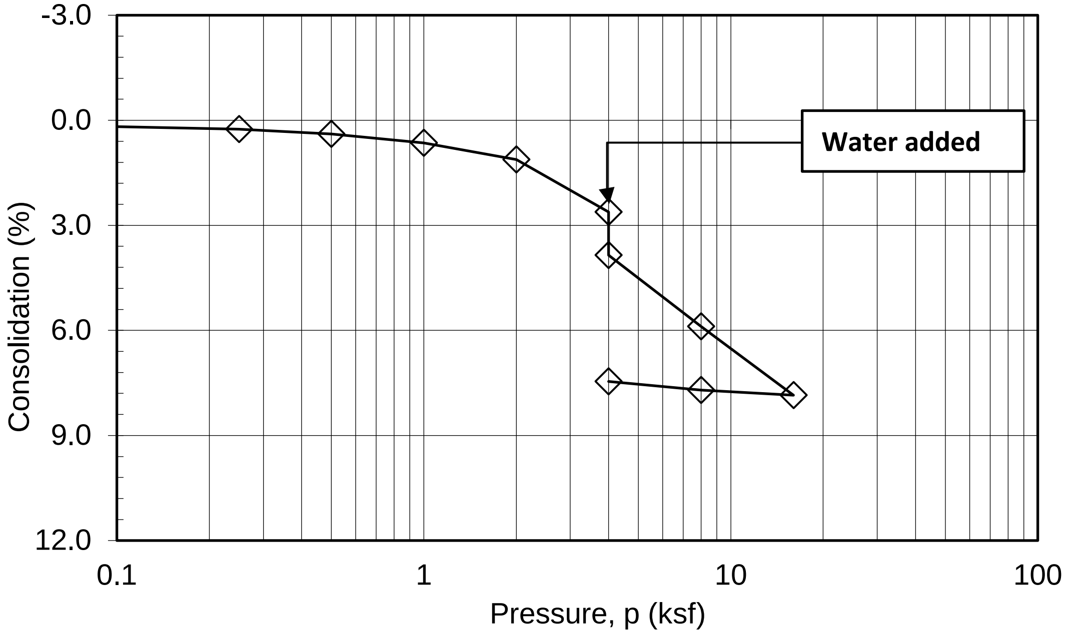
Load (ksf)	**δH (in)**	**H (in)**	**Voids (in)**	**e**	**Consol. (%)**	**a_v (ksf^{-1})**	**M_v (ksf^{-1})**	**Comment**
0.01	-------	1.0000	0.327	0.487	0			
0.25	0.0025	0.9975	0.325	0.483	0.3	1.5E-02	1.0E-02	
0.5	0.0039	0.9961	0.324	0.481	0.4	8.3E-03	5.6E-03	
1	0.0065	0.9935	0.321	0.477	0.6	7.6E-03	5.2E-03	
2	0.0112	0.9888	0.316	0.470	1.1	7.0E-03	4.8E-03	
4	0.0262	0.9738	0.301	0.448	2.6	1.1E-02	7.7E-03	
4	0.0385	0.9615	0.289	0.430	3.8	Water Added		
8	0.0589	0.9411	0.269	0.399	5.9	7.6E-03	5.4E-03	
16	0.0785	0.9215	0.249	0.370	7.8	3.6E-03	2.7E-03	
8	0.0770	0.9230	0.250	0.372	7.7	Unloaded		
4	0.0746	0.9254	0.253	0.376	7.5			

CONSOLIDATION TEST

ASTM D2435

Client :	Twining Inc.	*HAI Project No.:*	TWI-23-001
Project Name:	UCR Oasis	*Tested by:*	KL
Project Number:	220579.3	*Checked by:*	SD
Boring No.:	B-12	*Date:*	01/26/23
Sample No.:	R		
Type of Sample:	Undisturbed Ring		
Depth (ft):	5		
Soil Description:	Brown, Silty Sand (SM)		





HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

CONSOLIDATION TEST

ASTM D2435

Client : Twining Inc.
Project Name: UCR Oasis
Project Number: 220579.3
Boring No.: B-12
Sample No.: R
Type of Sample: Undisturbed Ring
Depth (ft): 25
Soil Description: Brown, Silty Sand (SM)

HAI Project No.: TWI-23-001
Tested by: KL
Checked by: SD
Date: 01/26/23

Initial Total Weight	Final Total Weight	Final Dry Weight
(g)	(g)	(g)
141.21	148.33	130.72

			Initial Conditions	**Final Conditions**
Height	H	(in)	1.000	0.883
Height of Solids	H_s	(in)	0.642	0.642
Height of Water	H_w	(in)	0.140	0.234
Height of Air	H_a	(in)	0.218	0.006
Dry Density		**(pcf)**	**108.6**	**139.4**
Water Content		**(%)**	**8.0**	**13.5**
Saturation		**(%)**	**39.0**	**97.5**

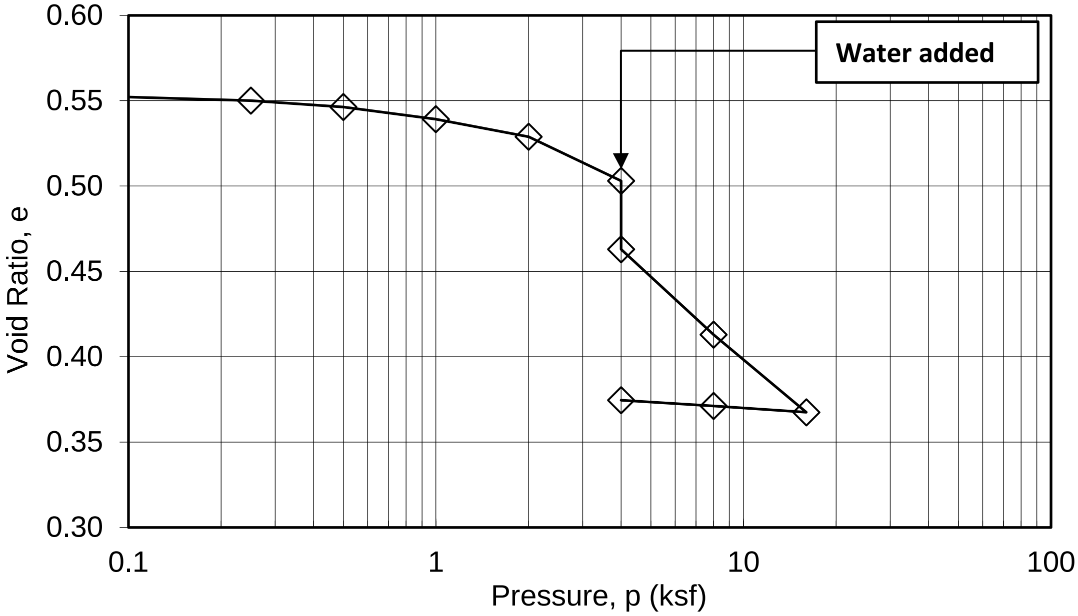
* Saturation is calcualted based on Gs= 2.71

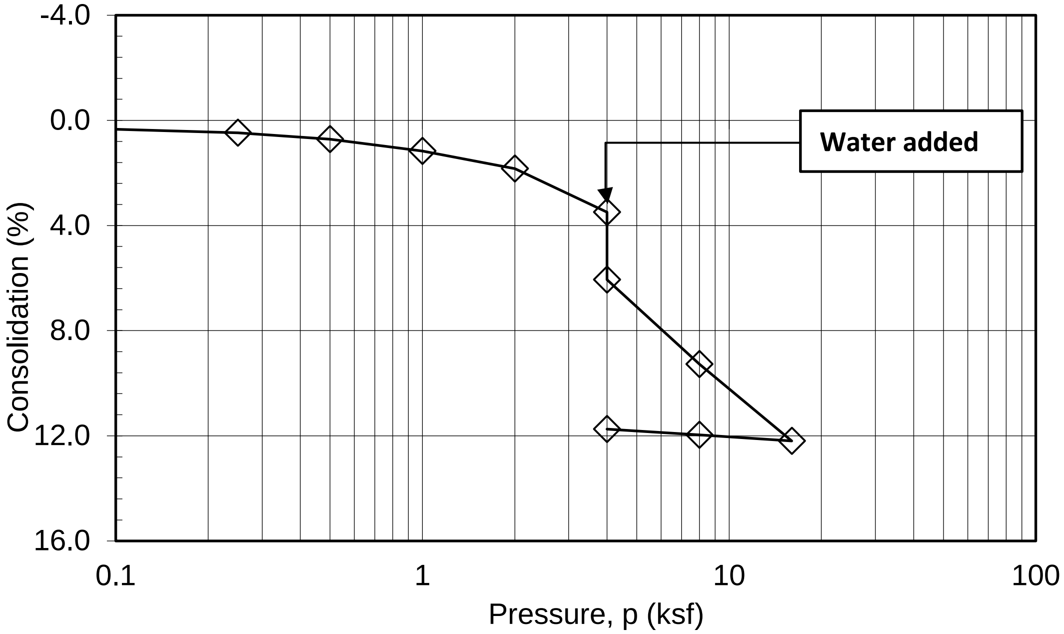
Load (ksf)	**δH (in)**	**H (in)**	**Voids (in)**	**e**	**Consol. (%)**	**a_v (ksf^{-1})**	**M_v (ksf^{-1})**	**Comment**
0.01	-------	1.0000	0.358	0.557	0			
0.25	0.0047	0.9953	0.353	0.550	0.5	3.0E-02	2.0E-02	
0.5	0.0072	0.9928	0.351	0.546	0.7	1.5E-02	1.0E-02	
1	0.0117	0.9883	0.346	0.539	1.2	1.4E-02	9.1E-03	
2	0.0184	0.9817	0.340	0.529	1.8	1.0E-02	6.8E-03	
4	0.0349	0.9651	0.323	0.503	3.5	1.3E-02	8.6E-03	
4	0.0606	0.9394	0.297	0.463	6.1	Water Added		
8	0.0927	0.9073	0.265	0.413	9.3	1.3E-02	8.9E-03	
16	0.1220	0.8781	0.236	0.368	12.2	5.7E-03	4.2E-03	
8	0.1196	0.8804	0.238	0.371	12.0	Unloaded		
4	0.1175	0.8825	0.240	0.374	11.7			

CONSOLIDATION TEST

ASTM D2435

Client :	Twining Inc.	*HAI Project No.:*	TWI-23-001
Project Name:	UCR Oasis	*Tested by:*	KL
Project Number:	220579.3	*Checked by:*	SD
Boring No.:	B-12	*Date:*	01/26/23
Sample No.:	R		
Type of Sample:	Undisturbed Ring		
Depth (ft):	25		
Soil Description:	Brown, Silty Sand (SM)		





ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949) 336-6544

DATE: 12/13/2022

TWINING LABS
3310 AIRPORT WAY
LONG BEACH, CA 90806

P.O. NO.: Soils120722

LAB NO.: C-6627, 1-2

SPECIFICATION: CT-643/417/422

MATERIAL: Soil

Project No.: 220759.3
Project: UCR Oasis
WO No.: W01-22-36016
Sample Date: 12/2/2022

ANALYTICAL REPORT

CORROSION SERIES

SUMMARY OF DATA

	pH	MIN RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
1) B-12 Bulk	7.4	6,500	86	18
2) B-14 Bulk	7.2	4,300	139	28

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

TWINING

2883 East Spring Street
Suite 300
Long Beach CA 90806

Tel 562.426.3355
Fax 562.426.6424

APPENDIX C
PREVIOUS LABORATORY TESTING

2883 East Spring
Street
Suite 300
Long Beach CA
90806

Tel 562.426.3355
Fax 562.426.6424

TWINING

Appendix B
Laboratory Testing

Laboratory Moisture Content and Density Tests

The moisture content and dry densities of selected driven samples obtained from the exploratory borings were evaluated in general accordance with the latest version of ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A. A Modified Proctor test was also performed on near-surface soils to determine the maximum dry density and optimum water content for compaction. The tests were performed in accordance with ASTM D 1557 Method A. The results are summarized below in Table B-1 and a copy of the curve is attached to this appendix as Figures B-1 and B-2.

Wash Sieve

The amount of fines passing the No. 200 sieve was evaluated by the wash sieve. The test procedure was in general accordance with ASTM D 1140. The results are presented in Table B-2.

Expansion Index Test

The expansion index was evaluated in general accordance with ASTM D 4829. The specimen was molded under a specified compactive energy at approximately 50 percent saturation. The prepared 1-inch thick by 4-inch diameter specimen was loaded with a surcharge of 144 pounds per square foot and was inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The result of the Expansion Index test is presented on Table B-4.

Consolidation Test

Consolidation tests were performed on a selected driven soil sample by in general accordance with the latest version of ASTM D2435. The sample was inundated during testing to represent adverse field conditions. The percent consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample. The results of the test are attached to this appendix as Figures B-3 through B-6.

Direct Shear Tests

Direct shear tests were performed on selected remolded and relatively undisturbed soil samples in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of the materials. The samples were inundated during shearing to represent adverse field conditions. The results are summarized in Table B-5. Plots can be found in Figures B-7 through B-12.

Corrosivity

Soil pH and resistivity tests were performed by Anaheim Test Lab on a representative soil sample in general accordance with the latest version of California Test Method 643. The chloride content of the selected sample was evaluated in general accordance with the latest version of California Test Method 422. The sulfate content of the selected samples was evaluated in general accordance with the latest version of California Test Method 417. The test results are presented on Table B-6.

Resistance Value (R-Value)

R-value testing was performed on a select bulk sample of the near-surface soils encountered at the site. The test was performed in general accordance with ASTM D 28444. The results are summarized in Table B-7.

Table B-1
Moisture-Density Relationship Testing

ASTM D 1557 Method A

Boring No.	Depth (feet)	Maximum Dry Density (pcf)	Optimum Water Content (%)
B-1	0 – 5	136.0	5.5
B-3	0 – 5	130.0	8.0

Table B-2
No. 200 Wash Sieve Results

Boring No.	Depth (feet)	Percent Passing #200
B-1	40	19.1
B-3	15	27.5
B-3	25	38.4
B-4	10	10.6
B-4	15	11.4
B-5	35	7.1
B-5	45	54
B-6	10	9.7
B-6	30	21.7
B-7	30	38.8

Table B-4
Expansion Index Test Result

Boring No.	Depth (feet)	Expansion Index
B-8	0 – 5	9

Table B-5
Direct Shear Tests

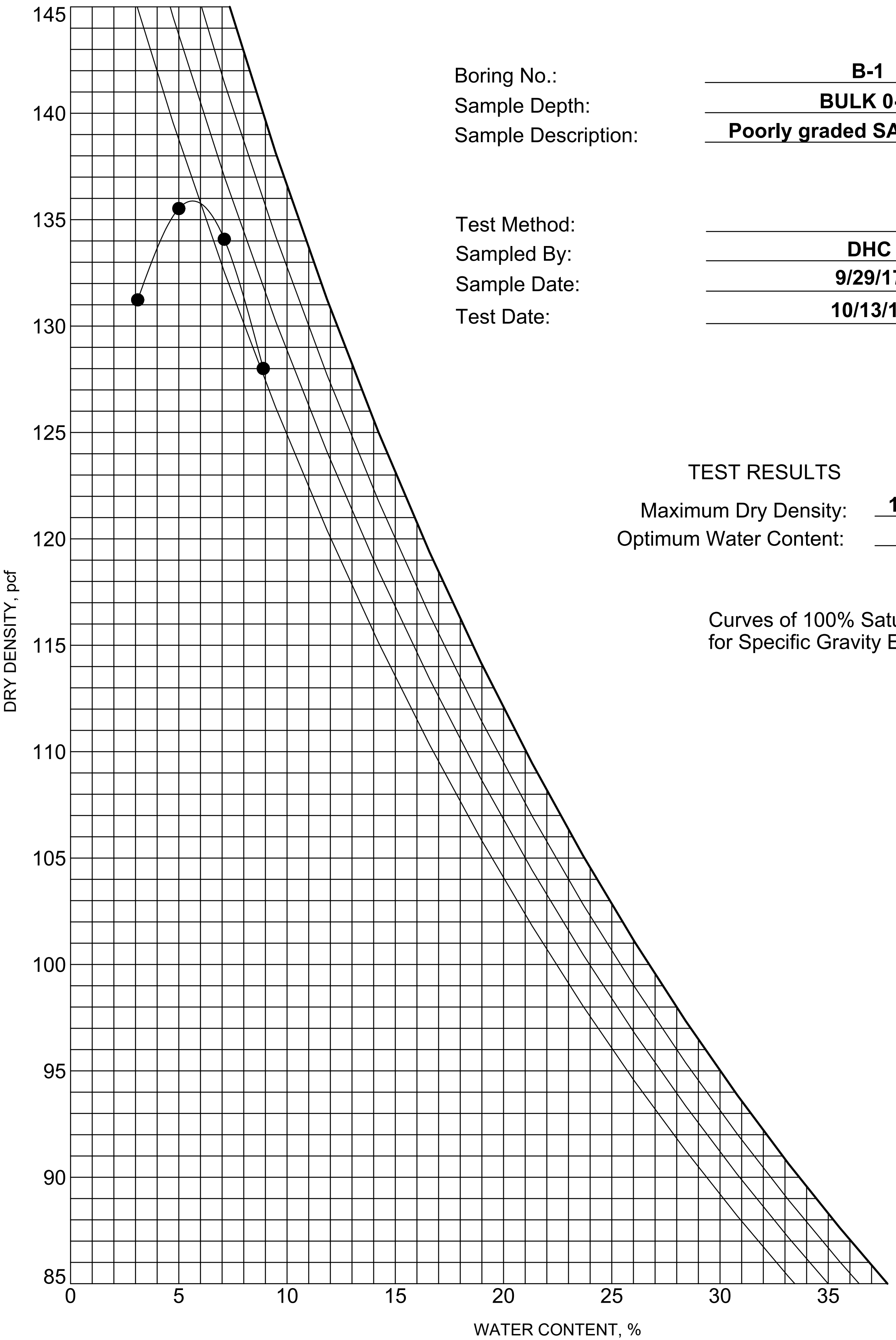
Boring No.	Depth (feet)	Remolded	Peak		Ultimate	
			C (psf)	ϕ (deg)	C (psf)	ϕ (deg)
B-1	15	No	245	38	190	37
B-1	25	No	248	36	190	35
B-3	30	No	275	36	100	36
B-3	40	No	300	36	100	35
B-5	20	No	262	35	50	35
B-6	25	No	840	31	505	32

Table B-6
Soil Corrosivity Test Results

Boring No.	Depth (feet)	pH	Water Soluble Sulfate (ppm)	Water Soluble Chloride (ppm)	Minimum Resistivity (ohm-cm)
B-1	0-5	6.9	161	73	2,800

Table B-7
R-Value Test Results

Boring No.	Depth (feet)	R-Value
B-4	0 – 5	41



Boring No.: B-1
Sample Depth: BULK 0-5'
Sample Description: Poorly graded SAND with silt

Test Method:
Sampled By: DHC
Sample Date: 9/29/17
Test Date: 10/13/17

TEST RESULTS

Maximum Dry Density: 136.0 pcf
Optimum Water Content: 5.5 %

Curves of 100% Saturation
for Specific Gravity Equal to:

2.80

2.70

2.60

2.50

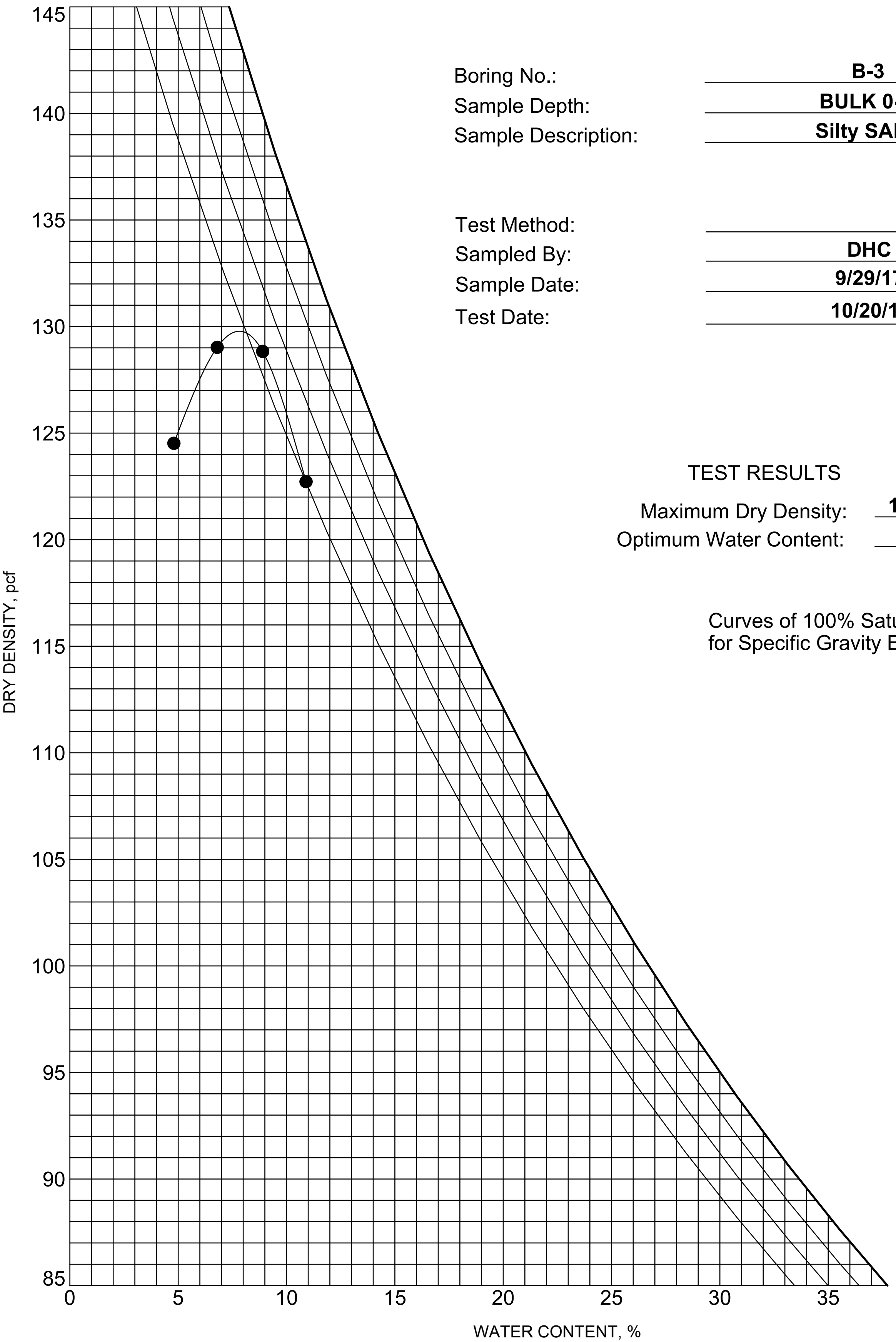
COMPACTION (MODIFIED BY PAUL) 170875.3 - UCR OUTPATIENT PAVILLION.GPJ TWINING LABS.GDT 10/25/17

TWINING

MOISTURE-DENSITY RELATIONSHIP

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-1



Boring No.: **B-3**
Sample Depth: **BULK 0-5'**
Sample Description: **Silty SAND**

Test Method:
Sampled By: **DHC**
Sample Date: **9/29/17**
Test Date: **10/20/13**

TEST RESULTS

Maximum Dry Density: **130.0** **pcf**
Optimum Water Content: **8.0** **%**

Curves of 100% Saturation
for Specific Gravity Equal to:

2.80

2.70

2.60

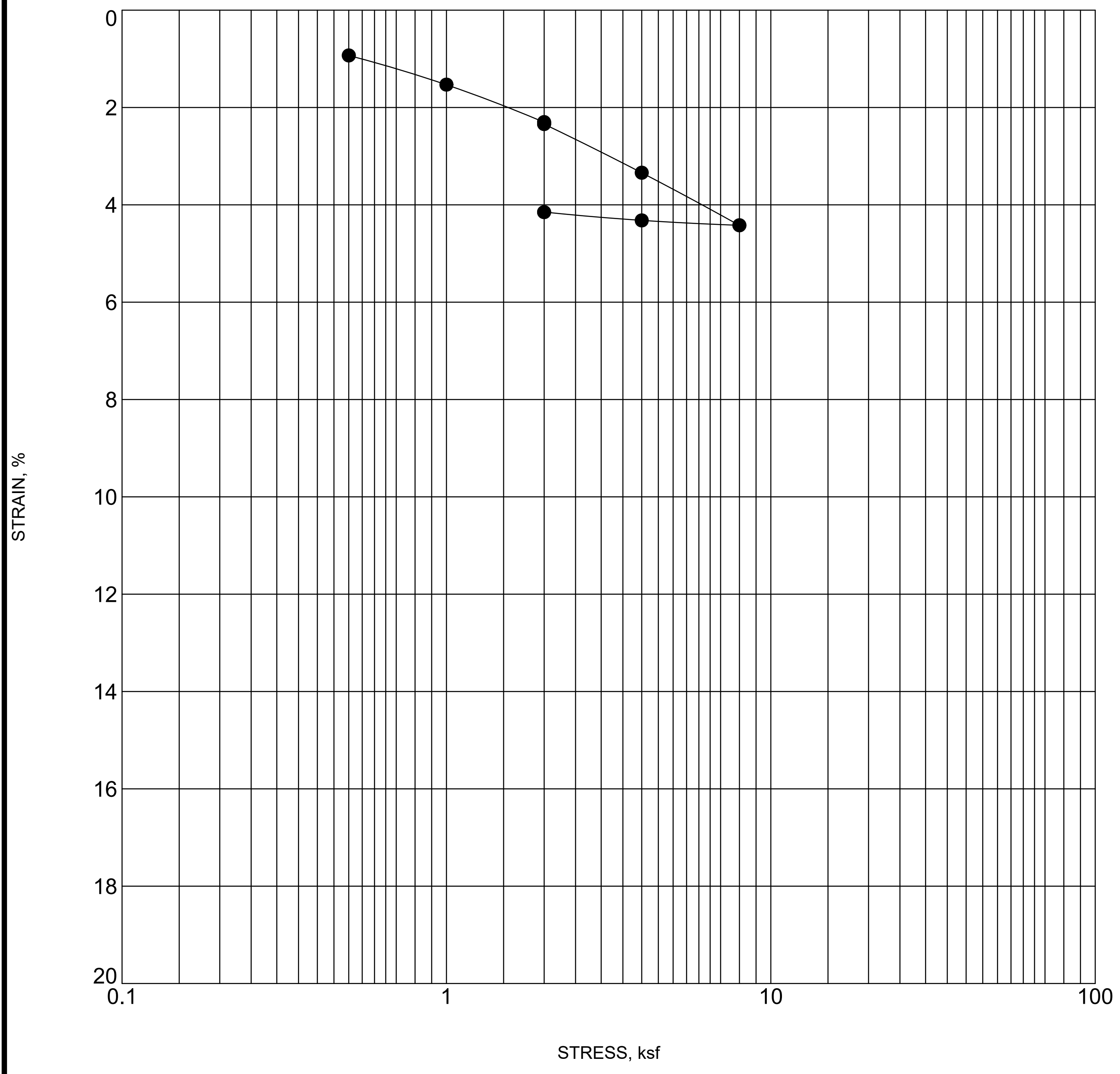
2.50

MOISTURE-DENSITY RELATIONSHIP

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	FIGURE B-2
170875.3	October 2017	

TWINING



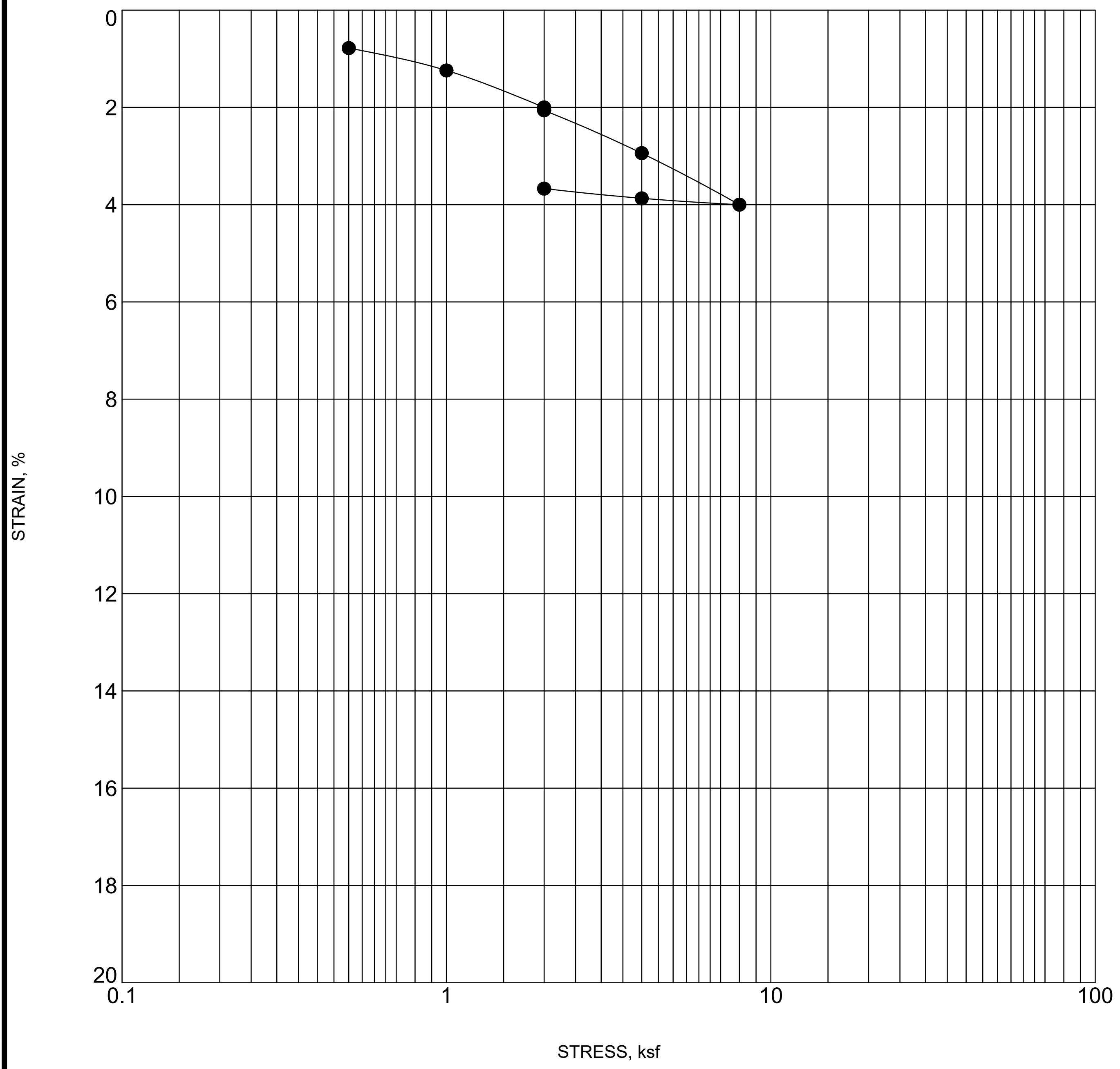
	Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-1 at 35 ft**	**Silty SAND**	**109.4**	**6.2**

TWINING

CONSOLIDATION TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	FIGURE B-3
170875.3	October 2017	



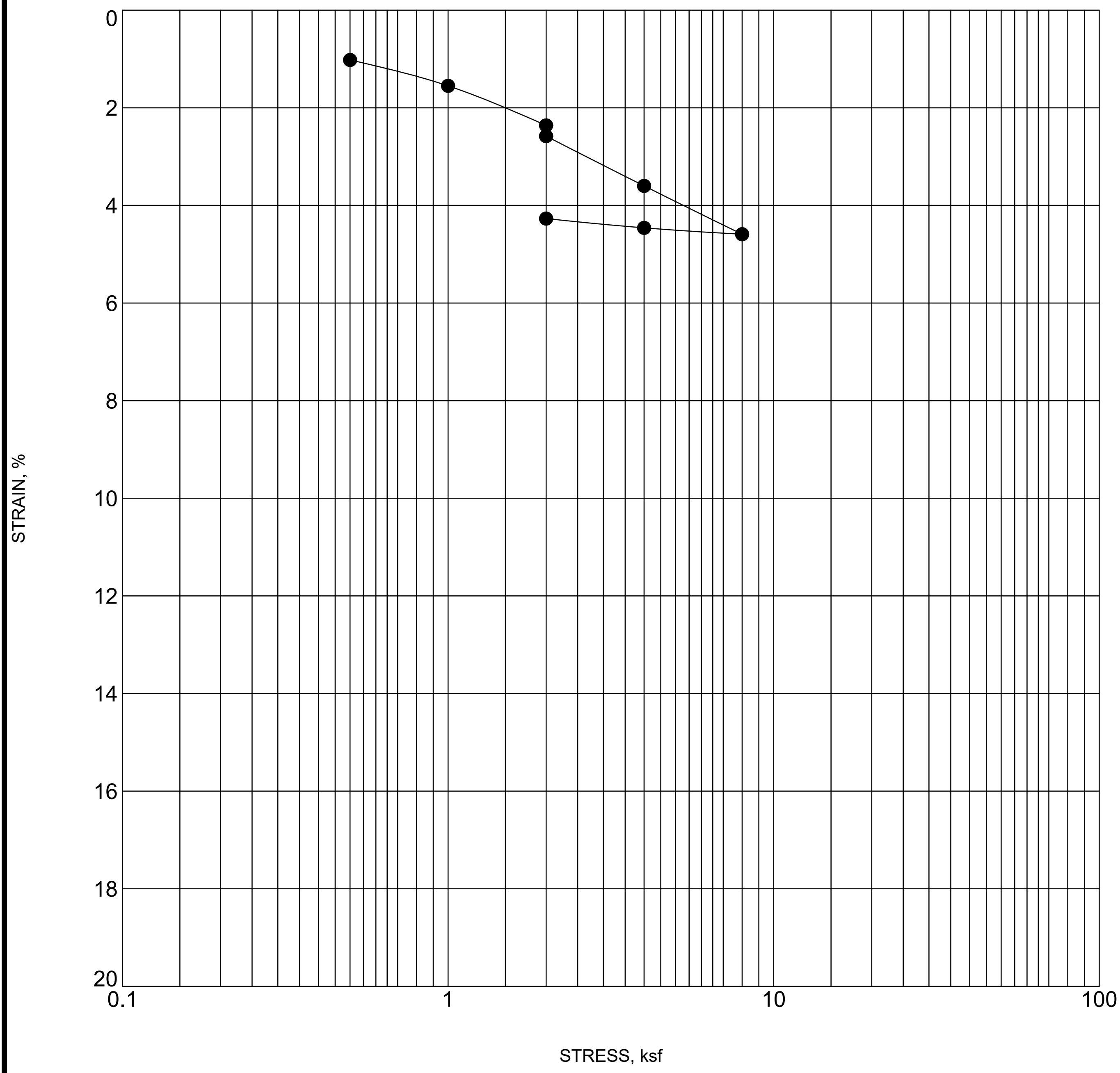
	Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-2 at 10 ft**	**Silty SAND**	**9.0**	**121.0**

TWINING

CONSOLIDATION TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-4



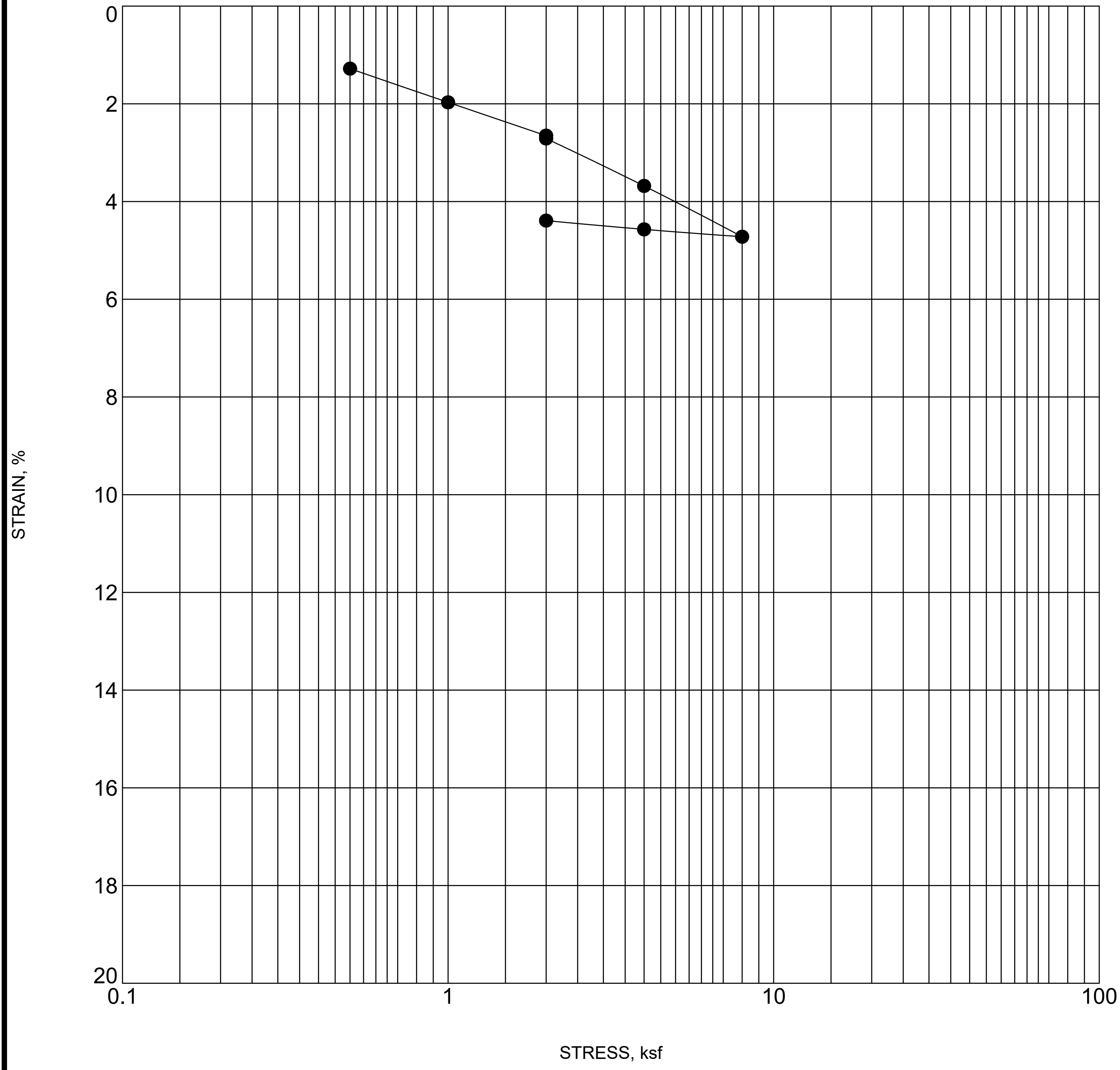
	Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-3 at 10 ft**	**Silty SAND**	**119.0**	**3.6**

TWINING

CONSOLIDATION TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-5



	Sample Location	Soil Description	Dry Density (pcf)	Moisture Content (%)
●	**B-3 at 20 ft**	**Silty SAND**		

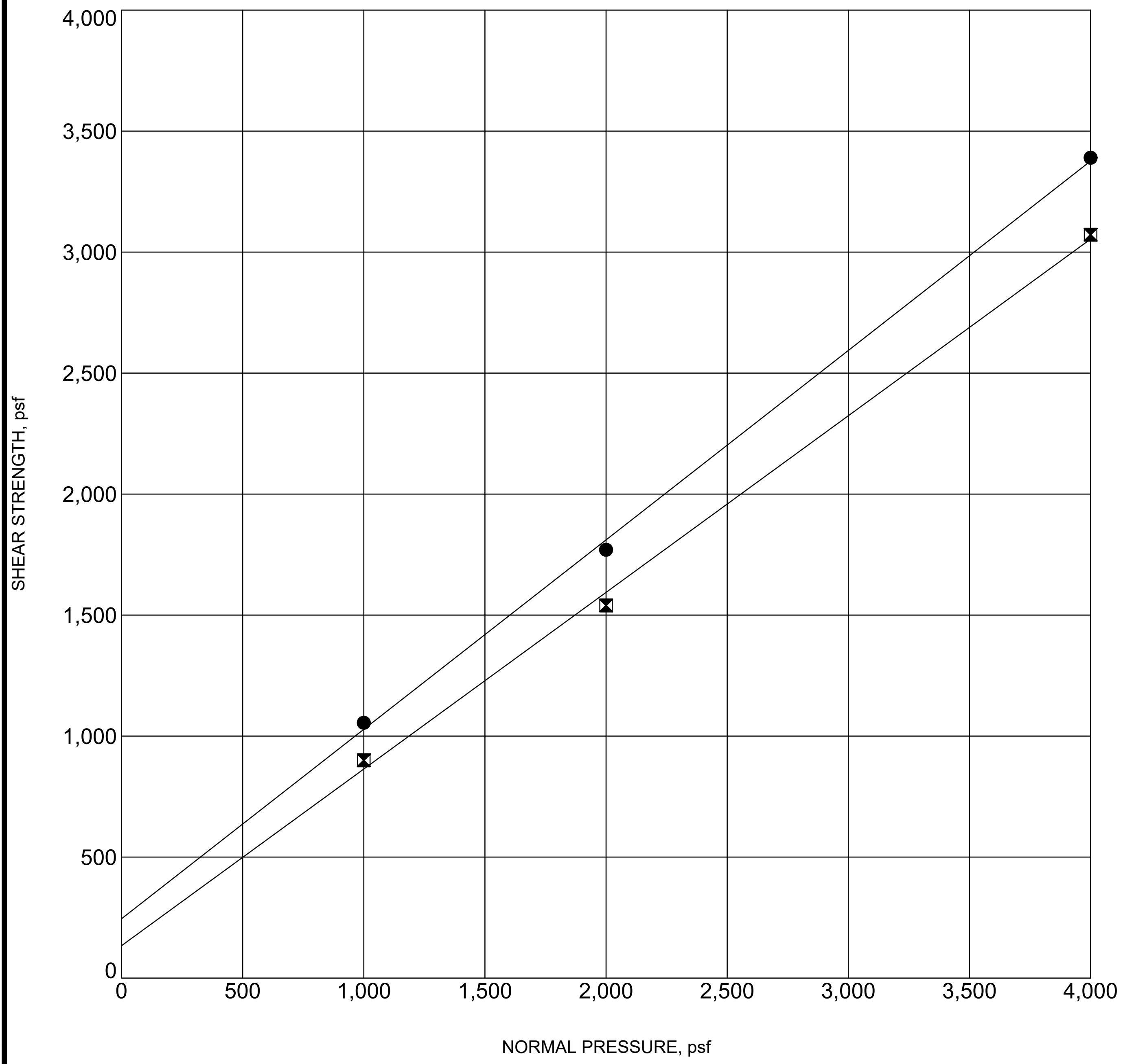
CONSOL STRAIN 170875.3 - UCR OUTPATIENT PAVILLION.GPJ TWINING LABS.GDT 10/27/17

TWINING

CONSOLIDATION TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-6



Boring No.:	B-1
Sample Depth (ft):	15
Sample Description:	Silty SAND
Strain Rate (in./min):	0.005
Dry Density (pcf):	117.7

Shear Strength Parameters

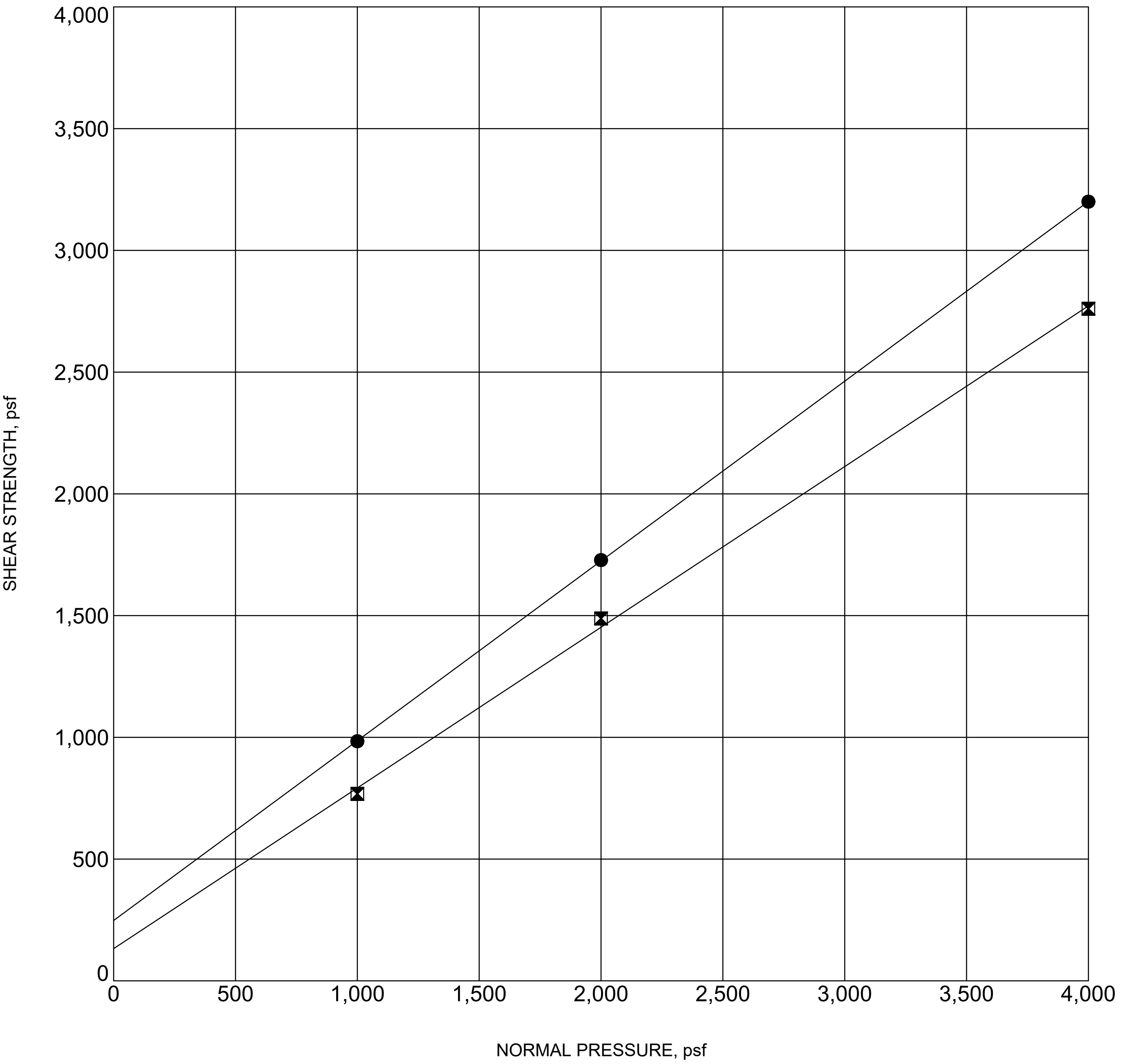
	Peak —●—	**Ultimate** —⧗—
Cohesion, C (psf):	245	190
Friction Angle, Ø (deg):	38	37
Initial Moisture (%):	9.2	
Final Moisture (%):	17.0	

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	FIGURE B-7
170875.3	October 2017	



Boring No.: B-1
Sample Depth (ft): 25
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 107.4

Shear Strength Parameters

	Peak ●	Ultimate ⧗
Cohesion, C (psf):	248	190
Friction Angle, Ø (deg):	36	35

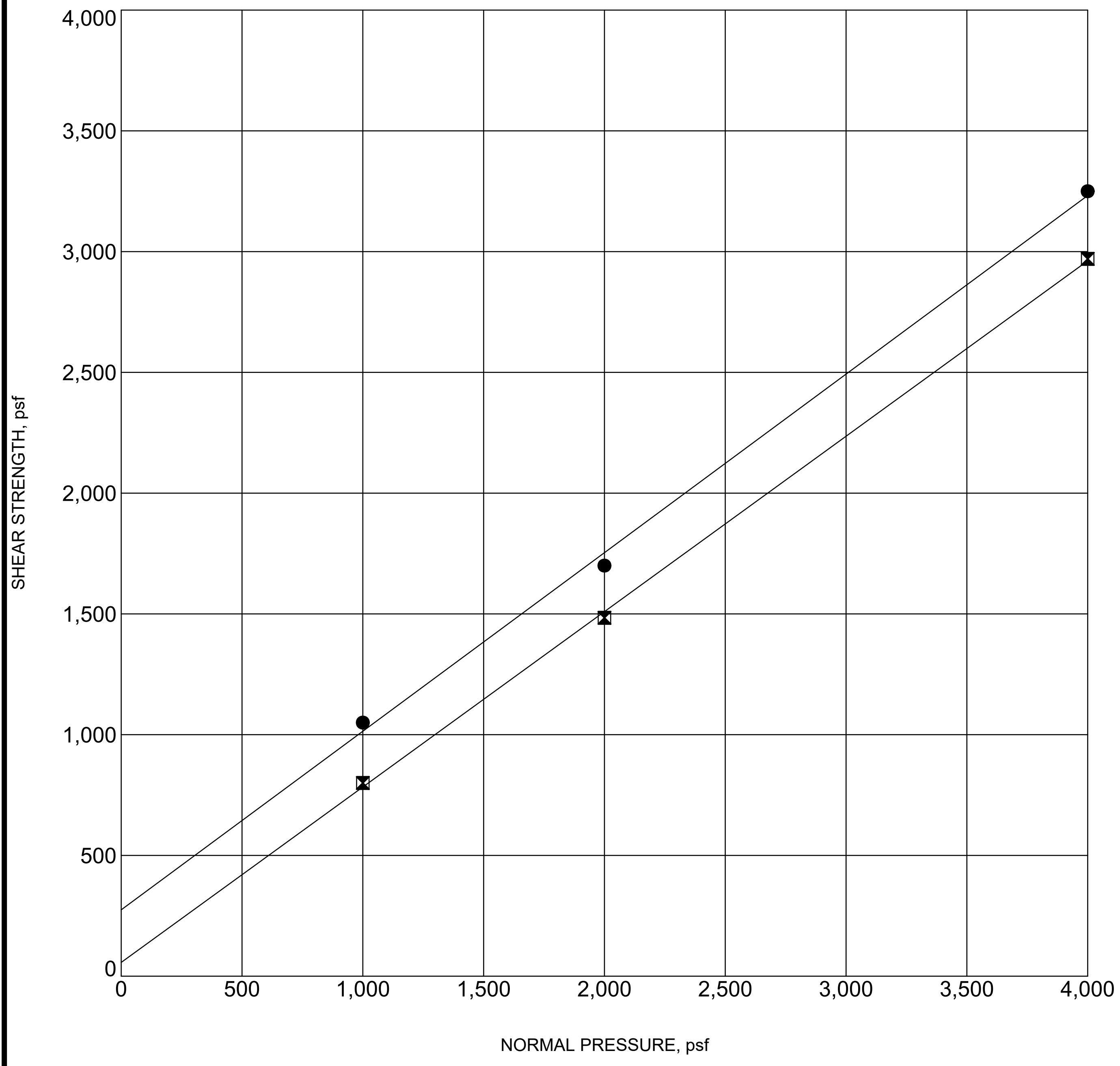
Initial Moisture (%): 14.3
Final Moisture (%): 14.9

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-8



Shear Strength Parameters

	Peak —●—	Ultimate –⧗–
Cohesion, C (psf):	275	100
Friction Angle, Ø (deg):	36	36

Initial Moisture (%): 7.0
Final Moisture (%): 11.8

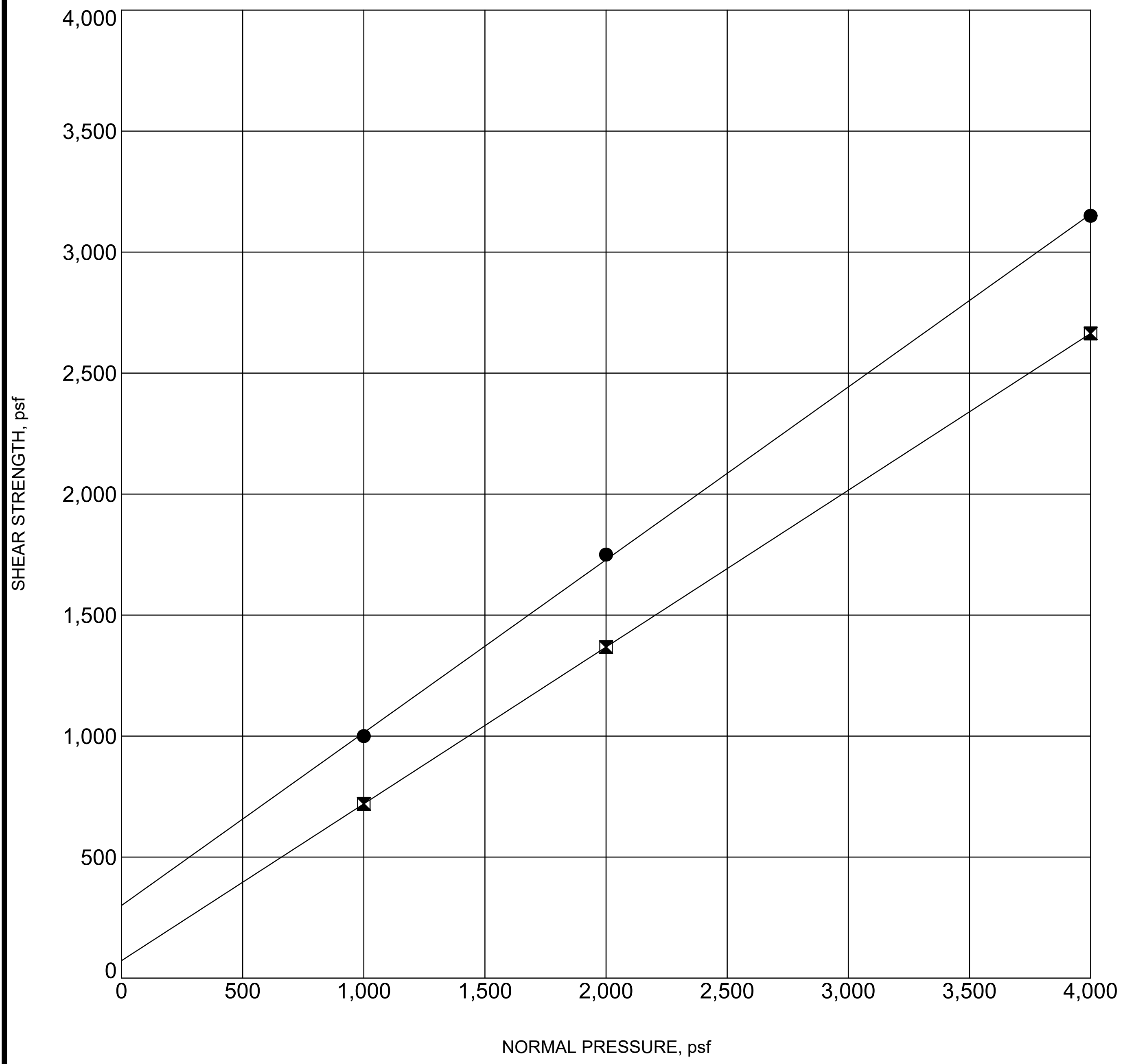
Boring No.: B-3
Sample Depth (ft): 30
Sample Description:
Strain Rate (in./min): 0.005
Dry Density (pcf): 121.7

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-9



Shear Strength Parameters

	Peak ●	**Ultimate** ⧗
Cohesion, C (psf):	300	100
Friction Angle, Ø (deg):	36	35

Boring No.: B-3
Sample Depth (ft): 40
Sample Description:
Strain Rate (in./min): 0.005
Dry Density (pcf): 127.6

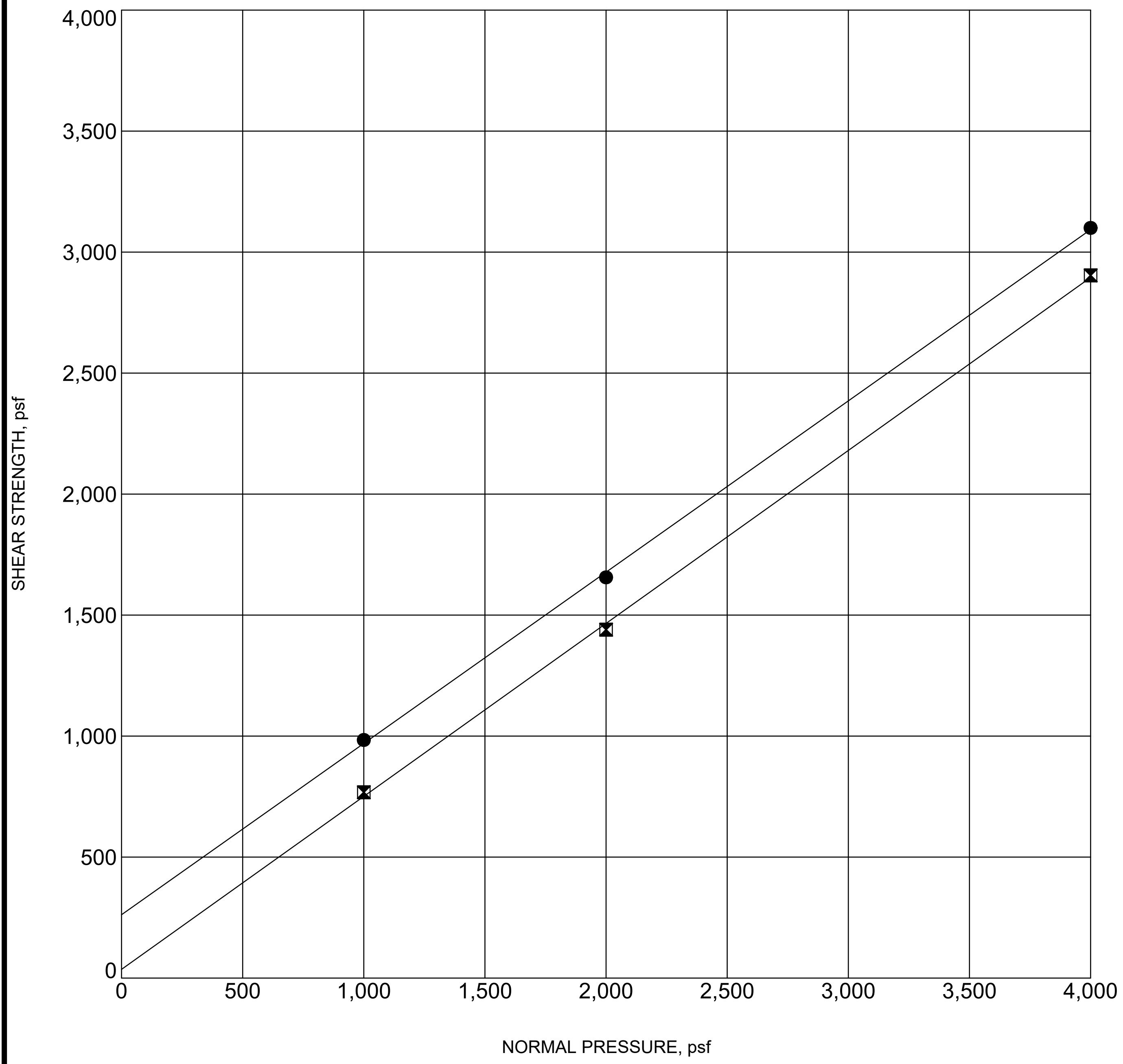
Initial Moisture (%): 8.9
Final Moisture (%): 12.7

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-10



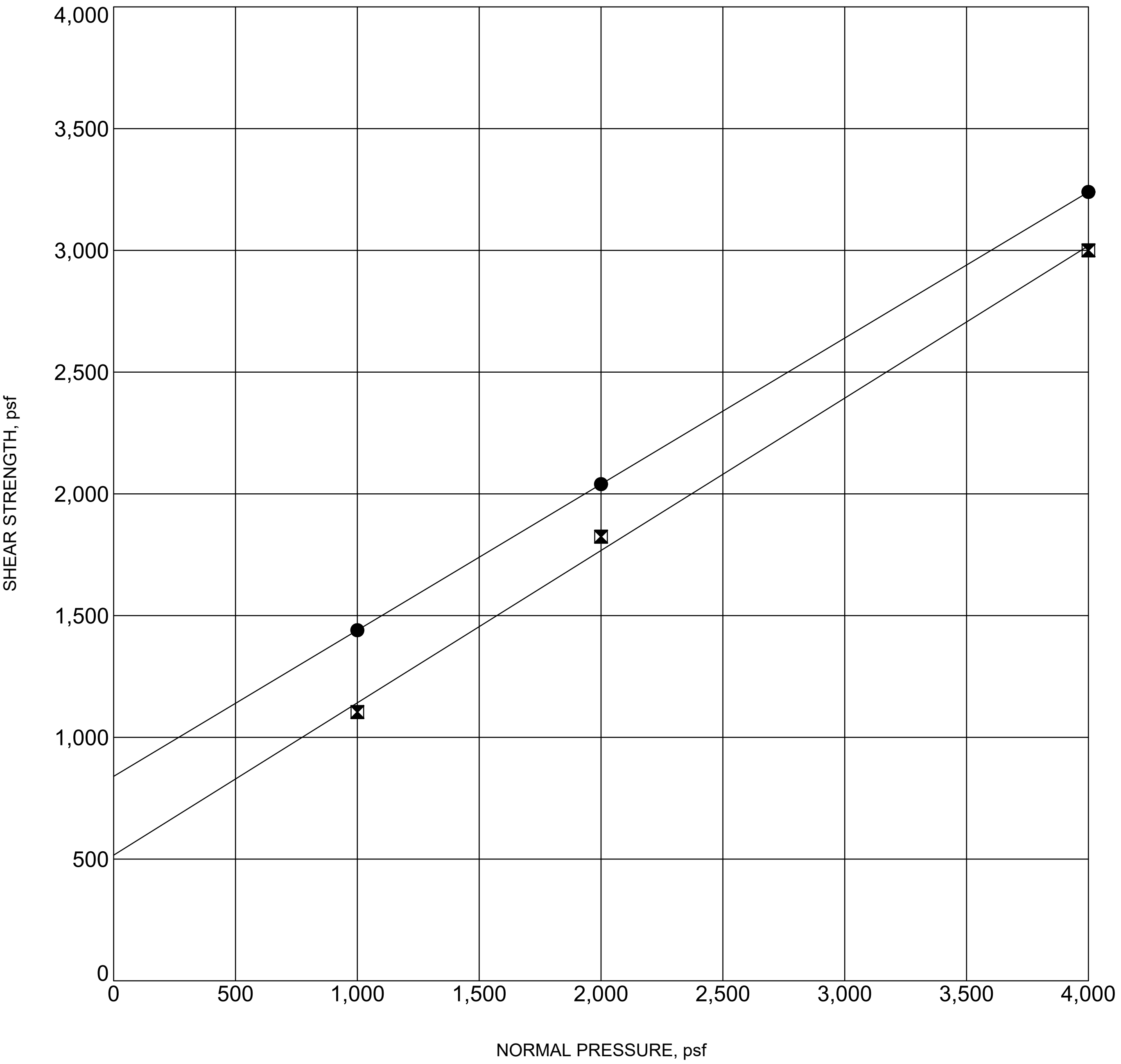
Boring No.:	B-5		**Shear Strength Parameters**	
			Peak —●—	**Ultimate** —☒—
Sample Depth (ft):	20	**Cohesion, C (psf):**	262	50
Sample Description:	Silty SAND	**Friction Angle, Ø (deg):**	35	35
Strain Rate (in./min):	0.005			
Dry Density (pcf):		**Initial Moisture (%):**		
		Final Moisture (%):	19.0	

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	
170875.3	October 2017	FIGURE B-11



Boring No.: B-6
Sample Depth (ft): 25
Sample Description: Silty SAND
Strain Rate (in./min): 0.005
Dry Density (pcf): 130.4

Shear Strength Parameters

	Peak —●—	**Ultimate** —☒—
Cohesion, C (psf):	840	505
Friction Angle, Ø (deg):	31	32

Initial Moisture (%): 8.7
Final Moisture (%): 13.4

TWINING

DIRECT SHEAR TEST

UC Riverside, Outpatient Pavillion
1150 University Avenue
Riverside, California

PROJECT NO.	REPORT DATE	FIGURE B-12
170875.3	October 2017	

APPENDIX D
PERCOLATION TESTING

Infiltration Rate Calculation Sheet

Project :	UCR Oasis Hub	Project No. :	220759.3	Date :	12/2/2022
Test Hole No.:	P-1	Tested by :	AB/CDD		
Depth of Test Hole, D_T (in):	60	USCS Soil Classification :	Silty SAND		

Test Hole Dimension (inches)		Length	Width	
Diameter (if round) (inches) =	8.00	Sides (if rectangular) =		

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" ? (Y/N)
1	7:38 AM	8:03 AM	25	15.8	22.2	6.4	Y
2	9:19 AM	9:44 AM	25	18.6	22.2	3.6	N

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

			Δt	H_o	H_f	ΔH	
Trial No.	**Start Time**	**Stop Time**	**Time Interval (min.)**	**Initial Water Height (inches)**	**Final Water Height (inches)**	**Change in Water Level (inches)**	**Tested Infiltration Rate**
1	9:53 AM	10:23 AM	30	42.96	38.40	4.56	0.43
2	10:23 AM	10:53 AM	30	44.40	39.36	5.04	0.46
3	10:53 AM	11:23 AM	30	44.16	39.60	4.56	0.42
4	11:23 AM	11:53 AM	30	43.20	38.64	4.56	0.42
5	11:53 AM	12:23 PM	30	43.80	39.48	4.32	0.40
6	12:24 PM	12:54 PM	30	43.08	38.76	4.32	0.40
7	12:54 PM	1:24 PM	30	43.20	38.64	4.56	0.42

Infiltration Rate with a factor of safety of 3 = 0.1 inch /hr

Infiltration Rate Calculation Sheet

Project : UCR Clean Technology Park
Project No. : 220759.3
Date : 12/2/2022
Test Hole No.: P-2
Tested by : AB/CDD
Depth of Test Hole, D_T (in): 60
USCS Soil Classification : Silty SAND

Test Hole Dimension (inches)		Length	Width	
Diameter (if round) (inches) = 8.00	Sides (if rectangular) =			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" ? (Y/N)
1	7:38 AM	8:03 AM	25	30.0	38.4	8.4	Y
2	8:10 AM	8:35 PM	745	25.2	36.2	11.0	Y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

			Δt	H_o	H_f	ΔH	
Trial No.	**Start Time**	**Stop Time**	**Time Interval (min.)**	**Initial Water Height (inches)**	**Final Water Height (inches)**	**Change in Water Level (inches)**	**Tested Infiltration Rate**
1	8:37 AM	8:47 AM	10	40.20	33.36	6.84	2.12
2	8:48 AM	8:58 AM	10	36.48	32.40	4.08	1.34
3	9:09 AM	9:19 AM	10	36.84	32.28	4.56	1.50
4	9:21 AM	9:31 AM	10	36.00	32.04	3.96	1.32
5	9:32 AM	9:42 AM	10	36.24	32.52	3.72	1.23
6	1:18 PM	1:28 PM	10	38.40	34.44	3.96	1.24

Infiltration Rate with a factor of safety of 3 = 0.4 inch /hr

TWINING

2883 East Spring Street
Suite 300
Long Beach CA 90806

Tel 562.426.3355
Fax 562.426.6424

APPENDIX E
PREVIOUS PERCOLATION TESTING

2883 East Spring
Street
Suite 300
Long Beach CA
90806

Tel 562.426.3355
Fax 562.426.6424

TWINING

Appendix C
Percolation Testing

Two percolation tests were performed at the project site as shown on Figure 2 – Site Location and Exploration Location Map. Percolation testing was on September 29, 2017 in general conformance with the County of Riverside requirements.

The purpose of the tests was to evaluate the infiltration rates of subgrade soils. At the completion of the boring excavation, a 3-inch diameter slotted PVC pipe was inserted in the borehole. The borehole was presoaked prior to testing. After the completion of presoaking, the borings were filled with water to a minimum depth of 12 inches above the bottom of excavation. Upon completion of the borings and testing, the boreholes were backfilled with soil from the cuttings as noted in the Log of Borings.

The lowest reading was used to determine the infiltration rate. A summary of test results is presented in Table C-1 and the detailed test data is attached to this appendix.

Table C-1 - Summary of Percolation Test Results

Test Location	Depth of Test Hole (ft.)	Design Infiltration Rate (in/hr)
B-7	+/- 30	0.1
B-8	+/- 10	0.9

It is our opinion that an infiltration BMP facility may be feasible at this site. Once the location and depth of the proposed system is determined by the civil engineer, we will review and provide our updated recommendations. At the minimum, any infiltration system should be located at least 15 feet away from any existing and proposed building foundations.

Infiltration Rate Calculation Sheet

Project :	UCR - Outpatient Pavillion	Project No. :	170875.3	Date :	9/29/2017
Test Hole No.:	B-7	Tested by :	SL		
Depth of Test Hole, D_T (in):	360	USCS Soil Classification :	SM		

Test Hole Dimension (inches)		Length	Width	
Diameter (if round) (inches) =	8			
Sides (if rectangular) =				

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" ? (Y/N)
1	7:51 AM	8:51 AM	60	248.4	360.0	111.6	Y
2	8:51 AM	9:51 AM	60	252.0	360.0	108.0	Y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

			Δt	H_o	H_f	ΔH	
Trial No.	**Start Time**	**Stop Time**	**Time Interval (min.)**	**Initial Water Height (inches)**	**Final Water Height (inches)**	**Change in Water Level (inches)**	**Tested Infiltration Rate**
1	9:48 AM	9:58 AM	10	123.60	121.20	2.40	0.2
2	9:58 AM	10:08 AM	10	121.20	114.00	7.20	0.7
3	10:08 AM	10:18 AM	10	114.00	109.20	4.80	0.5
4	10:18 AM	10:28 AM	10	109.20	105.60	3.60	0.4
5	10:28 AM	10:38 AM	10	105.60	104.28	1.32	0.1
6	10:38 AM	10:48 AM	10	104.28	102.12	2.16	0.2
7	10:48 AM	10:58 AM	10	102.12	100.32	1.80	0.2
8	10:58 AM	11:08 AM	10	109.20	106.32	2.88	0.3
9							
10							
11							
12							
13							
14							
15							

Recommended Infiltration Rate = Min. Tested Rate/2 = 0.1 inch /hr

Infiltration Rate Calculation Sheet

Project :	UCR - Outpatient Pavillion	Project No. :	170875.3	Date :	9/29/2017
Test Hole No.:	B-8	Tested by :	SL		
Depth of Test Hole, D_T (in):	120	USCS Soil Classification :	SM		

Test Hole Dimension (inches)			Length	Width	
Diameter (if round) (inches) =	8	Sides (if rectangular) =			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6" ? (Y/N)
1	9:04 AM	10:04 AM	60	48.6	105.6	57.0	Y
2	10:05 AM	11:05 AM	60	96.0	105.6	9.6	Y

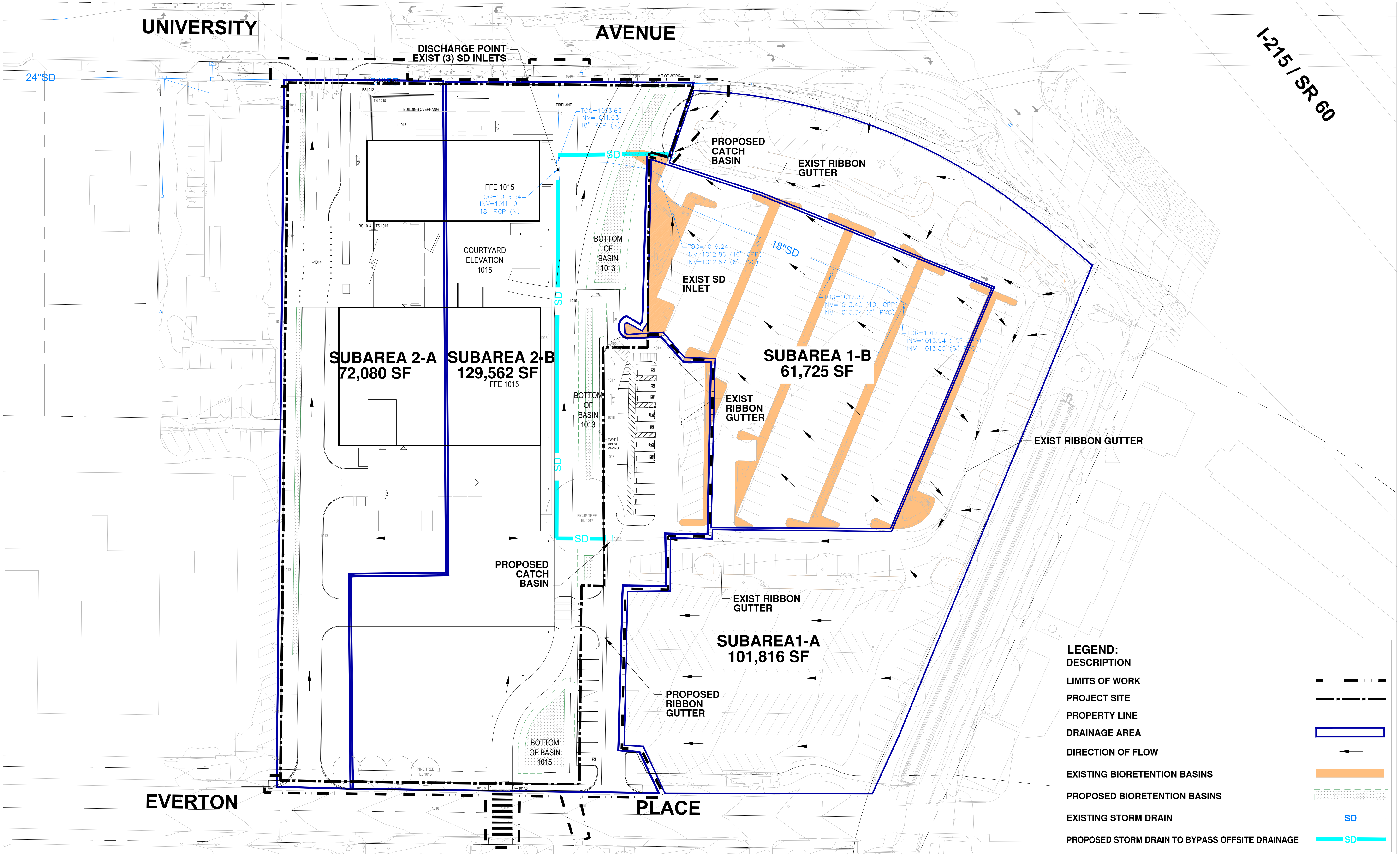
*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

			Δt	H_o	H_f	ΔH	
Trial No.	**Start Time**	**Stop Time**	**Time Interval (min.)**	**Initial Water Height (inches)**	**Final Water Height (inches)**	**Change in Water Level (inches)**	**Tested Infiltration Rate**
1	11:07 AM	11:47 AM	40	24.00	8.16	15.84	2.6
2	11:50 AM	12:20 PM	30	24.60	15.00	9.60	1.8
3	12:22 PM	12:52 PM	30	28.20	16.68	11.52	1.9
4	12:54 PM	1:24 PM	30	31.80	19.20	12.60	1.8
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Recommended Infiltration Rate = Min. Tested Rate/2 = 0.9 inch /hr

APPENDIX C

Exhibits



PWQMP EXHIBIT

0' 40' 80' 160'

APPENDIX D

BMP Design Details

Bioretention Facility - Design Procedure	BMP ID DMA 2-A	Legend:	Required Entries Calculated Cells

Company Name: Psomas

Date: 6/8/2023

Designed by: A.P.

County/City Case No.:

Design Volume

Enter the area tributary to this feature A_T= 1.65 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook V_{BMP}= 1,681 ft^3

Type of Bioretention Facility Design

○ Side slopes required (parallel to parking spaces or adjacent to walkways)

● No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer d_S = 2.0 ft

Top Width of Bioretention Facility, excluding curb w_T = 4.5 ft

Total Effective Depth, d_E

$$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$$

d_E = 1.50 ft

Minimum Surface Area, A_m

$$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$$

A_M = 1,121 ft^2

Proposed Surface Area A= 1,865 ft^2

Minimum Required Length of Bioretention Facility, L L = 249.1 ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility z = :1

Diameter of Underdrain inches

Longitudinal Slope of Site (3% maximum) %

6" Check Dam Spacing feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure

BMP ID: DMA 2-B

Legend: Required Entries 🟦 Calculated Cells ▨

Company Name: Psomas

Date: 6/8/2023

Designed by: A.P.

County/City Case No.:

Design Volume

Enter the area tributary to this feature A_T= 2.97 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook V_{BMP}= 3,734 ft^3

Type of Bioretention Facility Design

● Side slopes required (parallel to parking spaces or adjacent to walkways)

○ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer d_S = 2.0 ft

Top Width of Bioretention Facility, excluding curb w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = (0.3)\ x\ d_S + (0.4)\ x\ 1 - (0.7/w_T) + 0.5$ d_E = 1.43 ft

Minimum Surface Area, A_m

$$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$$

A_M = 2,612 ft^2

Proposed Surface Area A= 5,100 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility z = :1

Diameter of Underdrain inches

Longitudinal Slope of Site (3% maximum) %

6" Check Dam Spacing feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure

BMP ID: DMA 2-B + 1-A

Legend: Required Entries 🟦 Calculated Cells ▨

Company Name: Psomas
Date: 6/8/2023
Designed by: A.P.
County/City Case No.:

Design Volume

Enter the area tributary to this feature A_T= 5.12 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook V_{BMP}= 8,275 ft^3

Type of Bioretention Facility Design

● Side slopes required (parallel to parking spaces or adjacent to walkways)
○ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer d_S = 2.0 ft

Top Width of Bioretention Facility, excluding curb w_T = 10.0 ft

Total Effective Depth, d_E

$$d_E = (0.3) \text{ x } d_S + (0.4) \text{ x } 1 - (0.7/w_T) + 0.5$$

d_E = 1.43 ft

Minimum Surface Area, A_m

$$A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$$

A_M = 5,787 ft^2

Proposed Surface Area A= 6,965 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility z = :1

Diameter of Underdrain inches

Longitudinal Slope of Site (3% maximum) %

6" Check Dam Spacing feet

Describe Vegetation:

Notes:

Permeable Pavement - Design Procedure	BMP ID	Legend:	Required Entries
	DMA 2-A		Calculated Cells

Company Name: Psomas

Designed by: A.P.

Date: 6/13/2023

County/City Case No.:

Design Volume

Enter the area tributary to this feature $A_T =$ 1.65 acres

Enter V_{BMP} determines from Section 2.1 of this Handbook $V_{BMP} =$ 1,681 ft^3

Permeable Pavement Surface Area

Reservoir Layer Depth, b_{TH} $b_{TH} =$ 12 inches

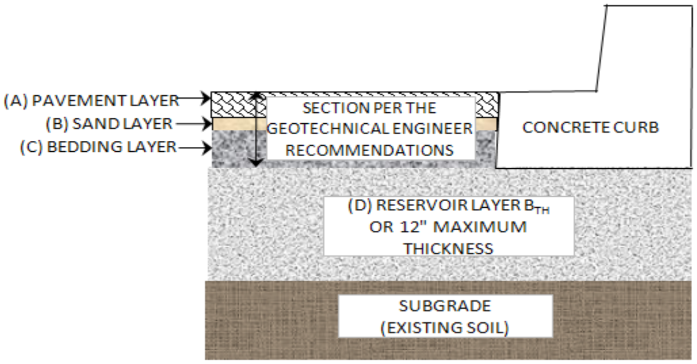
Minimum Surface Area Required, A_S

$$A_{S\,(ft)} = \frac{V_{BMP}\,(ft^3)}{(0.4 \text{ x } b_{TH}\,(in))\,/\,12(in/ft)}$$

$A_S =$ 4,203 ft^2

Proposed Surface Area = 5,814 ft^2

Permeable Pavement Cross Section



Per the Geotechnical	(A)		in
Engineer's	(B)		in
Recommendations	(C)		in

Reservoir Layer (D) 12 in

Total Permeable Pavement Section in

Slope of Permeable Pavement %

Sediment Control Provided? (Use pulldown)

Geotechnical report attached? (Use pulldown)

Describe Surrounding Vegetation:

Notes:

If the permeable pavement has been designed correctly, there should be no error messages on the spreadsheet.

3.3 Permeable Pavement

Type of BMP	LID - Infiltration
Treatment Mechanisms	Infiltration, Evaporation
Maximum Drainage Area	10 acres
Other Names	porous pavement, pervious concrete, pervious asphalt, pervious gravel pavement, cobblestone block, modular block, modular pavement

Description

Permeable pavements can be either pervious asphalt and concrete surfaces, or permeable modular block. Unlike traditional pavements that are impermeable, permeable pavements reduce the volume and peak of stormwater runoff as well as mitigate pollutants from stormwater runoff, provided that the underlying soils can accept infiltration. Permeable pavement surfaces work best when they are designed to be flat or with gentle slopes. This factsheet discusses criteria that apply to infiltration designs.

The permeable surface is placed on top of a reservoir layer that holds the water quality stormwater volume, $V_{BMP.}$ The water infiltrates from the reservoir layer into the native subsoil. Tests must be performed according to the Infiltration Testing Section in Appendix A to be able to use this design procedure.

In some circumstances, permeable pavement may be implemented on a project as a source control feature. Where implemented as a source control feature (sometimes referred to as a 'self-retaining' area), the pavement is not considered a 'BMP' that would be required to be designed and sized per this manual. Where permeable pavement receives runoff from adjacent tributary areas, the permeable pavement *may* be considered a BMP that must be sized according to this manual. Consult the Engineering Authority and the WQMP for any applicable requirements for designing and sizing permeable pavement installations.

Siting Considerations

The WQMP applicable to the project location should be consulted, as it may include criteria for determining the applicability of this and other Infiltration-based BMPs to the project.

Permeable pavements can be used in the same manner as concrete or asphalt in low traffic parking lots, playgrounds, walkways, bike trails, and sports courts. Most types of permeable pavement can be designed to meet Americans with Disabilities Act (ADA) requirements. Permeable pavements **should not** be used in the following conditions:

- ⦸ Downstream of erodible areas
- ⦸ Downstream of areas with a high likelihood of pollutant spills
- ⦸ Industrial or high vehicular traffic areas (25,000 or greater average daily traffic)
- ⦸ Areas where geotechnical concerns, such as soils with low infiltration rates, would preclude the use of this BMP.

Sites with Impermeable Fire Lanes

Oftentimes, Fire Departments do not allow alternative pavement types including permeable pavement. They require traditional impermeable surfaces for fire lanes. In this situation, it is acceptable to use an impermeable surface for the fire lane drive aisles and permeable pavement for the remainder of the parking lot.

Where impermeable fire lanes are used in the design, the impermeable surface must slope towards the permeable pavement, and the base layers shall remain continuous underneath the two pavement types, as shown in Figure 1. This continuous reservoir layer helps to maintain infiltration throughout the pervious pavement site, and can still be considered as part of the total required storage area.

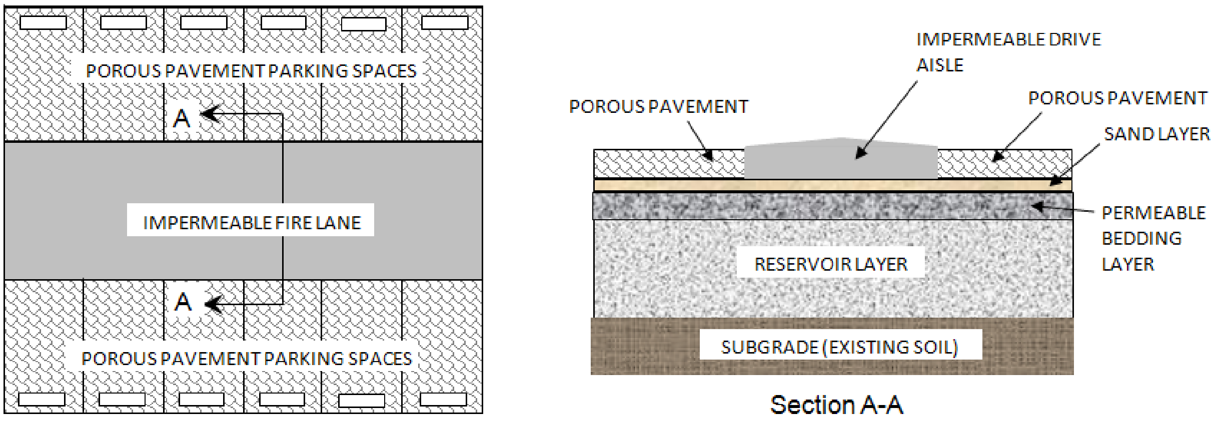


Figure 1: Impermeable Fire Lanes

Also, while a seal coat treatment may be used on the impermeable fire land, traditional seal coat treatments **shall not** be used on permeable pavement.

Setbacks

Always consult your geotechnical engineer for site specific recommendations regarding setbacks for permeable pavement. Recommended setbacks are needed to protect buildings, walls, onsite wells, streams and tanks.

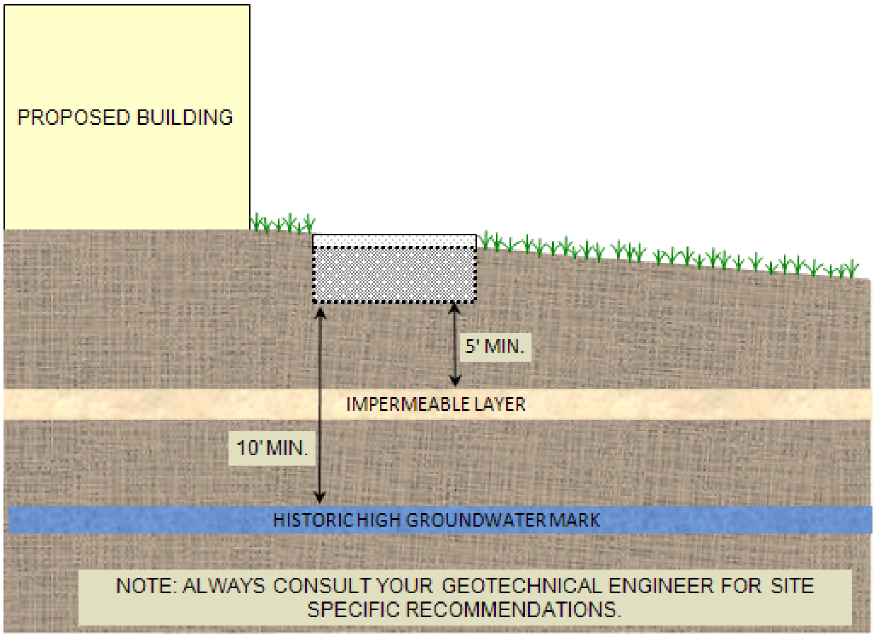


Figure 2: Permeable Pavement Setback Requirements

A minimum vertical separation of 10 feet is required from the bottom of the reservoir layer to the historic high groundwater mark, see Figure 2. A minimum vertical separation of 5 feet is required from the bottom of the reservoir layer to any impermeable layer in the soil. If the historic high groundwater mark is less than 10 feet below the reservoir layer section, or less than 5 feet from an impermeable layer, the infiltration design is not feasible.

Design and Sizing Criteria

To ensure that the pavement structural section is not compromised, a 24-hour drawdown time is utilized for this BMP instead of the longer drawdown time used for most volume based BMPs.

Reservoir Layer Considerations

Even with proper maintenance, sediment will begin to clog the soil below the permeable pavement. Since the soil cannot be scarified or replaced, this will result in slower infiltration rates over the life of the permeable pavement. Therefore, the reservoir layer is limited to a maximum of 12 inches in depth to ensure that over the life of the BMP, the reservoir layer will drain in an adequate time.

***Note**: All permeable pavement BMP installations (not including Permeable Pavement as a source control BMP i.e. a self-retaining area) must be tested by the geotechnical engineer to ensure that the soils drain at a minimum allowable rate to ensure drainage.. See the Infiltration Testing Section of this manual for specific details for the required testing and applied factors of safety.*

Sloping Permeable Pavement

Ideally permeable pavement would be level, however most sites will have a mild slope. If the tributary drainage area is too steep, the water may be flowing too fast when it approaches the permeable pavement, which may cause water to pass over the pavement instead of percolating and entering the reservoir layer. If the maximum slopes shown in Table 1 are complied with, it should address these concerns.

Table 1: Design Parameters for Permeable Pavement

Design Parameter	Permeable Pavement
Maximum slope of permeable pavement	3%
Maximum contributing area slope	5%

Regardless of the slope of the pavement surface design, the bottom of the reservoir layers **shall be flat and level** as shown in Figure 3. The design shown ensures that the water quality volume will be contained in the reservoir layer. A terraced design utilizing non-permeable check dams may be a useful option when the depth of gravel becomes too great as shown in Figure 3.

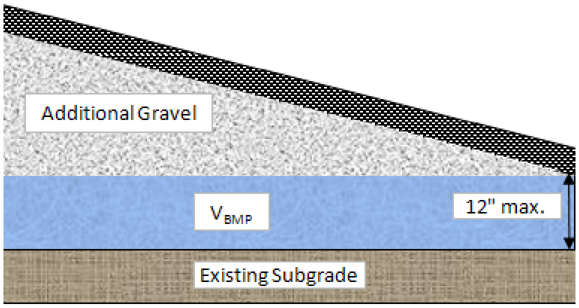


Figure 3: Sloped Cross Sections for Permeable Pavement

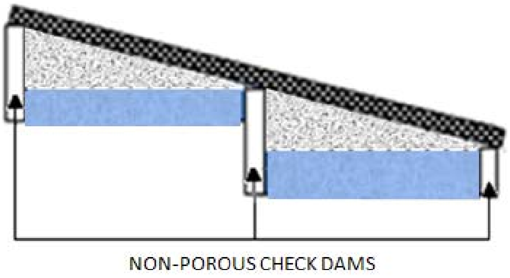


Figure 4: Permeable Pavement with Non-permeable Check Dams

In Figure 4, the bottom of the gravel reservoir layer is incorrectly sloped parallel to the pavement surface. Water would only be allowed to pond up to the lowest point of the BMP. Additional flows would simply discharge from the pavement. Since only a portion of the gravel layer can store water, this design would result in insufficient capacity. This is not acceptable.

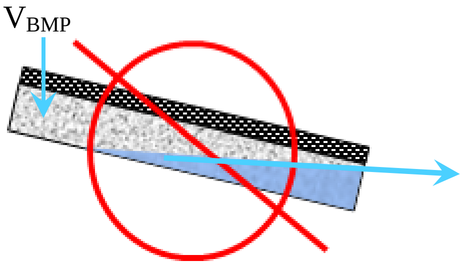


Figure 5: Incorrect Sloping of Permeable Pavement

To assure that the subgrade will empty within the 24 hour drawdown time, it is important that the maximum depth of 12 inches for the reservoir layer discussed in the design procedure is not exceeded. The value should be measured from the lowest elevation of the slope (Figure 4).

Minimum Surface Area

The minimum surface area required, A_S, is calculated by dividing the water quality volume, V_{BMP}, by the depth of water stored in the reservoir layer. The depth of water is found by multiplying the void ratio of the reservoir aggregate by the depth of the layer, b_{TH}. The void ratio of the reservoir aggregate is typically 40%; the maximum reservoir layer depth is 12”.

Sediment Control

A pretreatment BMP should be used for sediment control. This pretreatment BMP will reduce the amount of sediment that enters the system and reduce clogging. The pretreatment BMP will also help to spread runoff flows, which allows the system to infiltrate more evenly. The pretreatment BMP must discharge to the surface of the pavement and not the subgrade. Grass swales may also be used as part of a treatment train with permeable pavements.

Liners and Filter Fabric

Always consult your geotechnical engineer for site specific recommendations regarding liners and filter fabrics. Filter fabric may be used around the edges of the permeable pavement; this will help keep fine sediments from entering the system. Unless recommended for the site, impermeable liners are not to be used below the subdrain gravel layer.

Overflow

An overflow route is needed in the permeable pavement design to bypass storm flows larger than the V_{BMP} or in the event of clogging. Overflow systems must connect to an acceptable discharge point such as a downstream conveyance system.

Roof Runoff

Permeable pavement can be used to treat roof runoff. However, the runoff cannot be discharged beneath the surface of the pavement directly into the subgrade, as shown in Figure 6. Instead the pipe should empty on the surface of the permeable pavement as shown in Figure 7. A filter on the drainpipe should be used to help reduce the amount of sediment that enters the permeable pavement.

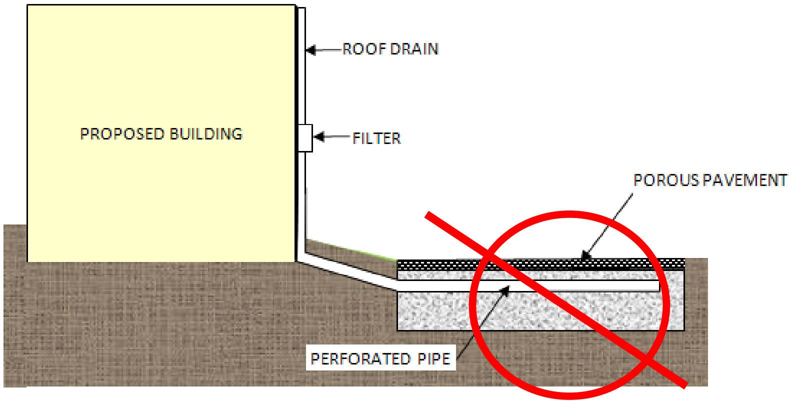


Figure 6: Incorrect Roof Drainage

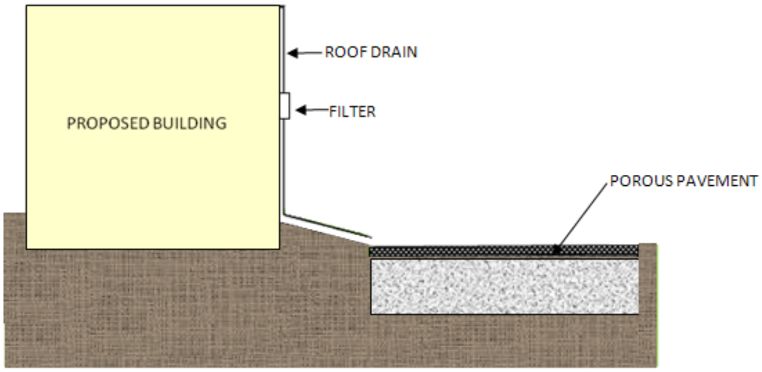


Figure 7: Correct Roof Runoff Drainage

Infiltration

Refer to the Infiltration Testing Section (Appendix A) in this manual for recommendations on testing for this BMP.

Pavement Section

The cross section necessary for infiltration design of permeable pavement includes:

- The thickness of the layers of permeable pavement, sand and bedding layers depends on whether it is permeable modular block or pervious pavement. A licensed geotechnical or civil engineer is required to determine the thickness of these upper layers appropriate for the pavement type and expected traffic loads.
- A 12” maximum reservoir layer consisting of AASHTO #57 gravel vibrated in place or equivalent with a minimum of 40% void ratio.

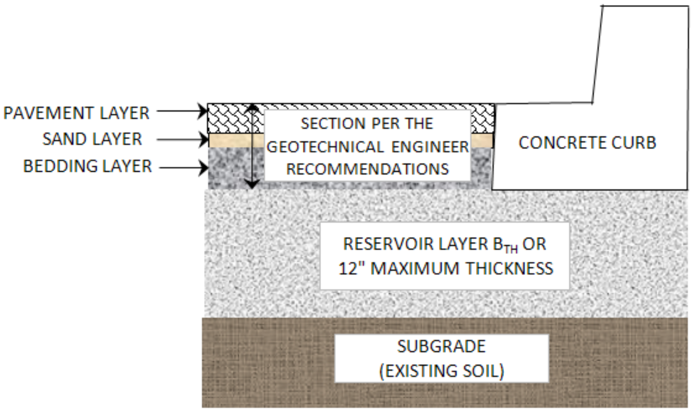


Figure 8: Infiltration Cross Section

Inspection and Maintenance Schedule –Modular Block

Schedule	Activity
Ongoing	• Keep adjacent landscape areas maintained. Remove clippings from landscape maintenance activities. • Remove trash and debris
Utility Trenching and other pavement repairs	• Remove and reset modular blocks, structural section and reservoir layer as needed. Replace damaged blocks in-kind. • Do not pave repaired areas with impermeable surfaces.
After storm events	• Inspect areas for ponding
2-3 times per year	• Sweep to reduce the chance of clogging
As needed	• Sand between pavers may need to be replaced if infiltration capacity is lost

Inspection and Maintenance Schedule –Pervious Concrete/Asphalt

Schedule	Activity
Ongoing	• Keep adjacent landscape areas maintained. Remove clippings from landscape maintenance activities. • Remove trash and debris
Utility Trenching other pavement repairs	• Replace structural section and reservoir layer in kind. • Re-pave using pervious concrete/asphalt. Do not pave repaired areas with impermeable surfaces.
After storm events	• Inspect areas for ponding
2-3 times per year	• Vacuum the permeable pavement to reduce the chance of clogging
As needed	• Remove and replace damaged or destroyed permeable pavement

Design Procedure Permeable Pavement

1. Enter the Tributary Area, A_T.

2. Enter the Design Volume, $V_{BMP,}$ determined from Section 2.1 of this Handbook.

3. Enter the reservoir layer depth, b_{TH} for the proposed permeable pavement. The reservoir layer maximum depth is 12 inches.

4. Calculate the Minimum Surface Area, A_S, required.

$$A_S(\mathrm{ft}) = \frac{V_{BMP}\ (\mathrm{ft}^3)}{(0.4\ \times\ b_{TH}\ (\mathrm{in}))/12(\mathrm{in/ft})}$$

   Where, the porosity of the gravel in the reservoir layer is assumed to be 40%.

5. Enter the proposed surface area and ensure that this is equal to or greater than the minimum surface area required.

6. Enter the dimensions, per the geotechnical engineer's recommendations, for the pavement cross section. The cross section includes a pavement layer, usually a sand layer and a permeable bedding layer. Then add this to the maximum thickness of the reservoir layer to find the total thickness of the BMP.

7. Enter the slope of the top of the permeable pavement. The maximum slope is 3%.

8. Enter whether sediment control was provided.

9. Enter whether the geotechnical approach is attached.

10. Describe the surfaces surrounding the permeable pavement. It is preferred that a vegetation buffer is used around the permeable pavement.
11. Check to ensure that vertical setbacks are met. There should be a minimum of 10 feet between the bottom of the BMP and the top of the high groundwater table, and a minimum of 5 feet between the reservoir layer the top of the impermeable layer.

Reference Materials Used to Develop this Fact Sheet:

Adams, Michelle C. "Porous Asphalt Pavement with Recharge Beds: 20 Years and Still Working." Stormwater Magazine May-June 2003.

Atlanta Regional Commission, et. al. Georgia Stormwater Management Manual. 1st Edition. Vol. 2. Atlanta, 2001. 3 vols.

Bean, E. Z., et al. "Study on the Surface Infiltration Rate of Permeable Pavements." Water and Environment Specialty Conference of the Canadian Society for Civil Engineering. Saskatoon, 2004. 1-10.

California Department of Transportation. CalTrans Standard Plans. 15 September 2005. May 2010 <http://www.dot.ca.gov/hq/esc/oe/project_plans/HTM/stdplns-met-new99.htm>.

Camp Dresser and McKee Inc.; Larry Walker Associates. California Stormwater Best Management Practice Handbook for New Development and Redevelopment. California Stormwater Quality Association (CASQA), 2004.

Colorado Ready Mixed Concrete Association (CRMCA). "Specifier's Guide for Pervious Concrete Pavement Design, Version 1.2." 2010.

County of Los Angeles Public Works. Stormwater Best Management Practice Design and Maintenance Manual. Los Angeles, 2009.

Program, Ventura Countywide Stormwater Quality Management. Technical Guidance Manual for Stormwater Quality Control Measures. Ventura, 2002.

Sacramento Stormwater Quality Partnership and the City of Roseville. Stormwater Quality Design Manual for the Sacramento and South Placer Regions. County of Sacramento, 2007.

Taylor, Chuck. "Advanced Pavement Technology." Riverside, 2008.

Tennis, Paul D., Michael L. Leming and David J. Akers. Pervious Concrete Pavements. Silver Spring: Portland Cement Association and National Ready Mixed Concrete Association, 2004.

Urban Drainage and Flood Control District. Urban Storm Drainage Criteria Manual Volume 3 - Best Management Practices. Vol. 3. Denver, 2008. 3 vols.

Urbonas, Ben R. Stormwater Sand Filter Sizing and Design: A Unit Operations Approach. Denver: Urban Drainage and Flood Control District, 2002.

Permeable Pavement - Design Procedure	BMP ID	Legend:	Required Entries Calculated Cells

Company Name:

Designed by:

Date:

County/City Case No.:

Design Volume

Enter the area tributary to this feature $A_T=$ acres

Enter V_{BMP} determines from Section 2.1 of this Handbook $V_{BMP}=$ ft^3

Permeable Pavement Surface Area

Reservoir Layer Depth, b_{TH} $b_{TH}=$ inches

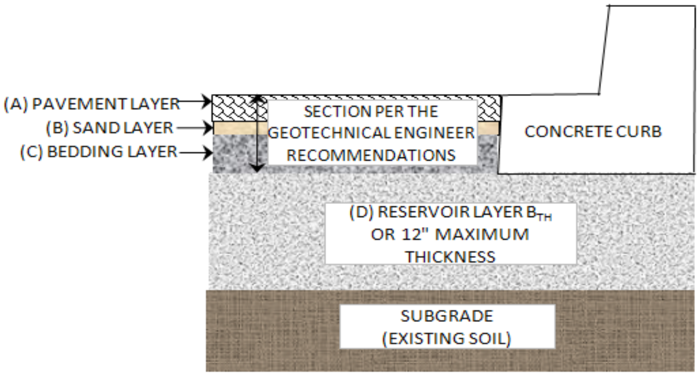
Minimum Surface Area Required, A_S

$$A_{S\,(ft)} = \frac{V_{BMP}\,(ft^3)}{(0.4 \text{ x } b_{TH}\,(in)) / 12(in/ft)}$$

$A_S=$ ft^2

Proposed Surface Area = ft^2

Permeable Pavement Cross Section



Per the Geotechnical Engineer's Recommendations	(A)		in
	(B)		in
	(C)		in

Reservoir Layer (D) in

Total Permeable Pavement Section in

Slope of Permeable Pavement %

Sediment Control Provided? (Use pulldown)

Geotechnical report attached? (Use pulldown)

Describe Surrounding Vegetation:

Notes:

If the permeable pavement has been designed correctly, there should be no error messages on the spreadsheet.

3.5 Bioretention Facility

Type of BMP	LID – Bioretention
Treatment Mechanisms	Infiltration, Evapotranspiration, Evaporation, Biofiltration
Maximum Drainage Area	This BMP is intended to be integrated into a project's landscaped area in a distributed manner. Typically, contributing drainage areas to Bioretention Facilities range from less than 1 acre to a maximum of around 10 acres.
Other Names	Rain Garden, Bioretention Cell, Bioretention Basin, Biofiltration Basin, Landscaped Filter Basin, Porous Landscape Detention

Description

Bioretention Facilities are shallow, vegetated basins underlain by an engineered soil media. Healthy plant and biological activity in the root zone maintain and renew the macro-pore space in the soil and maximize plant uptake of pollutants and runoff. This keeps the Best Management Practice (BMP) from becoming clogged and allows more of the soil column to function as both a sponge (retaining water) and a highly effective and self-maintaining biofilter. In most cases, the bottom of a Bioretention Facility is unlined, which also provides an opportunity for infiltration to the extent the underlying onsite soil can accommodate. When the infiltration rate of the underlying soil is exceeded, fully biotreated flows are discharged via underdrains. Bioretention Facilities therefore will inherently achieve the maximum feasible level of infiltration and evapotranspiration and achieve the minimum feasible (but highly biotreated) discharge to the storm drain system.

Siting Considerations

These facilities work best when they are designed in a relatively level area. Unlike other BMPs, Bioretention Facilities can be used in smaller landscaped spaces on the site, such as:

- ✓ Parking islands
- ✓ Medians
- ✓ Site entrances

Landscaped areas on the site (such as may otherwise be required through minimum landscaping ordinances), can often be designed as Bioretention Facilities. This can be accomplished by:

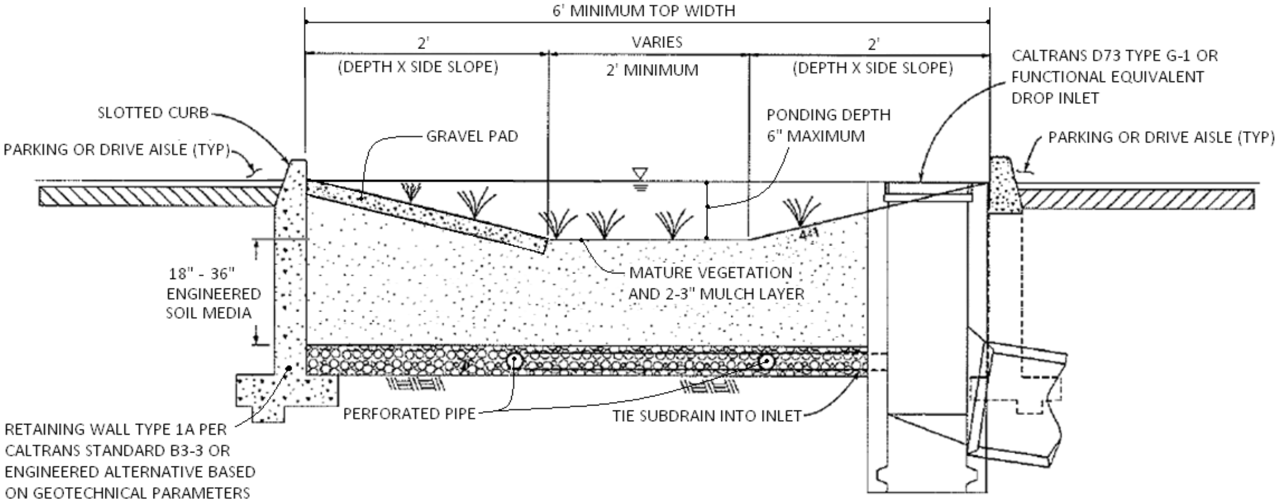
- *Depressing* landscaped areas below adjacent impervious surfaces, rather than elevating those areas
- Grading the site to direct runoff from those impervious surfaces *into* the Bioretention Facility, rather than away from the landscaping
- Sizing and designing the depressed landscaped area as a Bioretention Facility as described in this Fact Sheet

Bioretention Facilities should however not be used downstream of areas where large amounts of sediment can clog the system. Placing a Bioretention Facility at the toe of a steep slope should also be avoided due to the potential for clogging the engineered soil media with erosion from the slope, as well as the potential for damaging the vegetation.

Design and Sizing Criteria

The recommended cross section necessary for a Bioretention Facility includes:

- Vegetated area
- 18' minimum depth of engineered soil media
- 12' minimum gravel layer depth with 6' perforated pipes (added flow control features such as orifice plates may be required to mitigate for HCOC conditions)



While the 18-inch minimum engineered soil media depth can be used in some cases, it is recommended to use 24 inches or a preferred 36 inches to provide an adequate root zone for the chosen plant palate. Such a design also provides for improved removal effectiveness for nutrients. The recommended ponding depth inside of a Bioretention Facility is 6 inches; measured from the flat bottom surface to the top of the water surface as shown in Figure 1.

Because this BMP is filled with an engineered soil media, pore space in the soil and gravel layer is assumed to provide storage volume. However, several considerations must be noted:

- Surcharge storage above the soil surface (6 inches) is important to assure that design flows do not bypass the BMP when runoff exceeds the soil’s absorption rate.
- In cases where the Bioretention Facility contains engineered soil media deeper than 36 inches, the pore space within the engineered soil media can only be counted to the 36-inch depth.
- A maximum of 30 percent pore space can be used for the soil media whereas a maximum of 40 percent pore space can be use for the gravel layer.

Figure 1: Standard Layout for a Bioretention Facility

Engineered Soil Media Requirements

The engineered soil media shall be comprised of 85 percent mineral component and 15 percent organic component, by volume, drum mixed prior to placement. The mineral component shall be a Class A sandy loam topsoil that meets the range specified in Table 1 below. The organic component shall be nitrogen stabilized compost[1], such that nitrogen does not leach from the media.

Table 1: Mineral Component Range Requirements

Percent Range	Component
70-80	Sand
15-20	Silt
5-10	Clay

The trip ticket, or certificate of compliance, shall be made available to the inspector to prove the engineered mix meets this specification.

Vegetation Requirements

Vegetative cover is important to minimize erosion and ensure that treatment occurs in the Bioretention Facility. The area should be designed for at least 70 percent mature coverage throughout the Bioretention Facility. To prevent the BMP from being used as walkways, Bioretention Facilities shall be planted with a combination of small trees, densely planted shrubs, and natural grasses. Grasses shall be native or ornamental; preferably ones that do not need to be mowed. The application of fertilizers and pesticides should be minimal. To maintain oxygen levels for the vegetation and promote biodegradation, it is important that vegetation not be completely submerged for any extended period of time. Therefore, a maximum of 6 inches of ponded water shall be used in the design to ensure that plants within the Bioretention Facility remain healthy.

A 2 to 3-inch layer of standard shredded aged hardwood mulch shall be placed as the top layer inside the Bioretention Facility. The 6-inch ponding depth shown in Figure 1 above shall be measured from the top surface of the 2 to 3-inch mulch layer.

Curb Cuts

To allow water to flow into the Bioretention Facility, 1-foot-wide (minimum) curb cuts should be placed approximately every 10 feet around the perimeter of the Bioretention Facility. Figure 2 shows a curb cut in a Bioretention Facility. Curb cut flow lines must be at or above the V_{BMP} water surface level.

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[1] For more information on compost, visit the US Composting Council website at: http://compostingcouncil.org/

Figure 2: Curb Cut located in a Bioretention Facility

To reduce erosion, a gravel pad shall be placed at each inlet point to the Bioretention Facility. The gravel should be 1- to 1.5-inch diameter in size. The gravel should overlap the curb cut opening a minimum of 6 inches. The gravel pad inside the Bioretention Facility should be flush with the finished surface at the curb cut and extend to the bottom of the slope.

In addition, place an apron of stone or concrete, a foot square or larger, inside each inlet to prevent vegetation from growing up and blocking the inlet. See Figure 3.

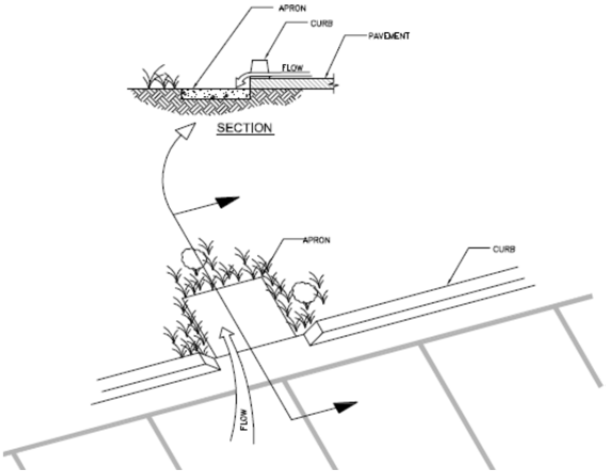


Figure 3: Apron located in a Bioretention Facility

Terracing the Landscaped Filter Basin

It is recommended that Bioretention Facilities be level. In the event the facility site slopes and lacks proper design, water would fill the lowest point of the BMP and then discharge from the basin without being treated. To ensure that the water will be held within the Bioretention Facility on sloped sites, the BMP must be terraced with nonporous check dams to provide the required storage and treatment capacity.

The terraced version of this BMP shall be used on non-flat sites with no more than a 3 percent slope. The surcharge depth cannot exceed 0.5 feet, and side slopes shall not exceed 4:1. Table 2 below shows the spacing of the check dams, and slopes shall be rounded up (i.e., 2.5 percent slope shall use 10' spacing for check dams).

Table 2: Check Dam Spacing

6" Check Dam Spacing	
Slope	**Spacing**
1%	*25'*
2%	*15'*
3%	*10'*

Roof Runoff

Roof downspouts may be directed towards Bioretention Facilities. However, the downspouts must discharge onto a concrete splash block to protect the Bioretention Facility from erosion.

Retaining Walls

It is recommended that Retaining Wall Type 1A, per Caltrans Standard B3-3 or equivalent, be constructed around the entire perimeter of the Bioretention Facility. This practice will protect the sides of the Bioretention Facility from collapsing during construction and maintenance or from high service loads adjacent to the BMP. Where such service loads would not exist adjacent to the BMP, an engineered alternative may be used if signed by a licensed civil engineer.

Side Slope Requirements

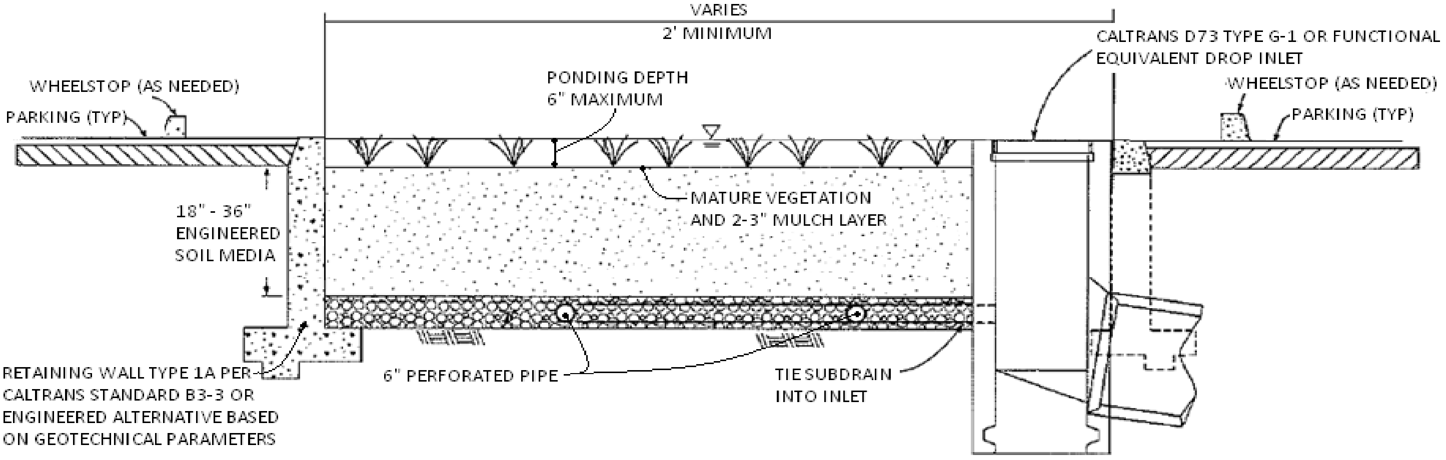
Bioretention Facilities Requiring Side Slopes

The design should assure that the Bioretention Facility does not present a tripping hazard. Bioretention Facilities proposed near pedestrian areas, such as areas parallel to parking spaces or along a walkway, must have a gentle slope to the bottom of the facility. Side slopes inside of a Bioretention Facility shall be 4:1. A typical cross section for the Bioretention Facility is shown in Figure 1.

Bioretention Facilities Not Requiring Side Slopes

Where cars park perpendicular to the Bioretention Facility, side slopes are not required. A 6-inch maximum drop may be used, and the Bioretention Facility must be planted with trees and shrubs to prevent pedestrian access. In this case, a curb is not placed around the Bioretention Facility,

but wheel stops shall be used to prevent vehicles from entering the Bioretention Facility, as shown in Figure 4.



Planter Boxes

Bioretention Facilities can also be placed above ground as planter boxes. Planter boxes must have a minimum width of 2 feet, a maximum surcharge depth of 6 inches, and no side slopes are necessary. Planter boxes must be constructed so as to ensure that the top surface of the engineered soil media will remain level. This option may be constructed of concrete, brick, stone or other stable materials that will not warp or bend. Chemically treated wood or galvanized steel, which has the ability to contaminate stormwater, should not be used. Planter boxes must be lined with an impermeable liner on all sides, including the bottom. Due to the impermeable liner, the inside bottom of the planter box shall be designed and constructed with a cross fall, directing treated flows within the subdrain layer toward the point where subdrain exits the planter box, and subdrains shall be oriented with drain holes oriented down. These provisions will help avoid excessive stagnant water within the gravel underdrain layer. Similar to the in-ground Bioretention Facility versions, this BMP benefits from healthy plants and biological activity in the root zone. Planter boxes should be planted with appropriately selected vegetation.

Figure 5: Planter Box

Source: LA Team Effort

Overflow

An overflow route is needed in the Bioretention Facility design to bypass stored runoff from storm events larger than V_{BMP} or in the event of facility or subdrain clogging. Overflow systems must connect to an acceptable discharge point, such as a downstream conveyance system as shown in Figure 1 and Figure 4. The inlet to the overflow structure shall be elevated inside the Bioretention Facility to be flush with the ponding surface for the design capture volume (V_{BMP}) as shown in Figure 4. This will allow the design capture volume to be fully treated by the Bioretention Facility, and for larger events to safely be conveyed to downstream systems. The overflow inlet shall **<u>not</u>** be located in the entrance of a Bioretention Facility, as shown in Figure 6.

Underdrain Gravel and Pipes

An underdrain gravel layer and pipes shall be provided in accordance with Appendix B – Underdrains.

Figure 6: Incorrect Placement of an Overflow Inlet.

Inspection and Maintenance Schedule

The Bioretention Facility area shall be inspected for erosion, dead vegetation, soggy soils, or standing water. The use of fertilizers and pesticides on the plants inside the Bioretention Facility should be minimized.

Schedule	Activity
Ongoing	• Keep adjacent landscape areas maintained. Remove clippings from landscape maintenance activities. • Remove trash and debris • Replace damaged grass and/or plants • Replace surface mulch layer as needed to maintain a 2-3 inch soil cover.
After storm events	• Inspect areas for ponding
Annually	• Inspect/clean inlets and outlets

Bioretention Facility Design Procedure

1) Enter the area tributary, A_T, to the Bioretention Facility.

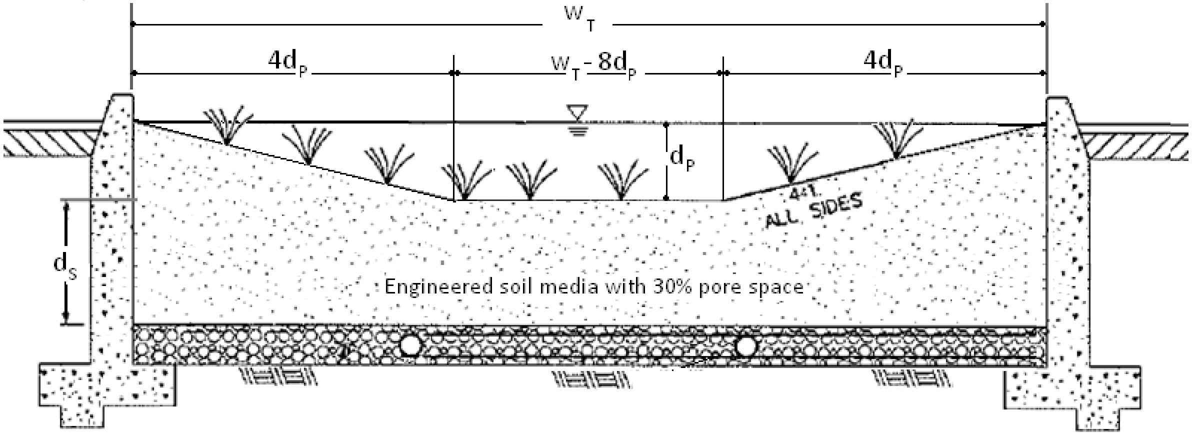
2) Enter the Design Volume, $V_{BMP,}$ determined from Section 2.1 of this Handbook.

3) Select the type of design used. There are two types of Bioretention Facility designs: the standard design used for most project sites that include side slopes, and the modified design used when the BMP is located perpendicular to the parking spaces or with planter boxes that do not use side slopes.

4) Enter the depth of the engineered soil media, d_S. The minimum depth for the engineered soil media can be 18' in limited cases, but it is recommended to use 24' or a preferred 36' to provide an adequate root zone for the chosen plant palette. Engineered soil media deeper than 36' will only get credit for the pore space in the first 36'.

5) Enter the top width of the Bioretention Facility.

6) Calculate the total effective depth, d_E, within the Bioretention Facility. The maximum allowable pore space of the soil media is 30% while the maximum allowable pore space for the gravel layer is 40%. Gravel layer deeper than 12' will only get credit for the pore space in the first 12'.



   a. For the design with side slopes the following equation shall be used to determine the total effective depth. Where, d_P is the depth of ponding within the basin.

$$d_E(\mathrm{ft}) = \frac{0.3 \times \left[\left(w_T(\mathrm{ft}) \times d_S(\mathrm{ft})\right) + 4\left(d_P(\mathrm{ft})\right)^2\right] + 0.4 \ \times \ 1(\mathrm{ft}) + d_P(\mathrm{ft})\left[4d_P(\mathrm{ft}) + \left(w_T(\mathrm{ft}) - 8d_P(\mathrm{ft})\right)\right]}{w_T(\mathrm{ft})}$$

   This above equation can be simplified if the maximum ponding depth of 0.5’ is used. The equation below is used on the worksheet to find the minimum area required for the Bioretention Facility:

$$d_E(\mathrm{ft}) = (0.3 \times d_S(\mathrm{ft}) + \ 0.4 \text{ x } 1(\mathrm{ft})) - \left(\frac{0.7\ (\mathrm{ft}^2)}{w_T(\mathrm{ft})}\right) + 0.5(\mathrm{ft})$$

b. For the design without side slopes the following equation shall be used to determine the total effective depth:

$$\mathrm{d_E(ft) = d_P(ft) + [(0.3) \times d_S(ft) + \ (0.4) \ \times 1(ft)]}$$

The equation below, using the maximum ponding depth of 0.5', is used on the worksheet to find the minimum area required for the Bioretention Facility:

$$\mathrm{d_E(ft) = 0.5\ (ft) + [(0.3) \times d_S(ft) + \ (0.4) \ \times 1(ft)]}$$

7) Calculate the minimum surface area, A_M, required for the Bioretention Facility. This does not include the curb surrounding the Bioretention Facility or side slopes.

$$\mathrm{A_M(ft^2) = \frac{V_{BMP}(ft^3)}{d_E\ (ft)}}$$

8) Enter the proposed surface area. This area shall not be less than the minimum required surface area.

9) Verify that side slopes are no steeper than 4:1 in the standard design, and are not required in the modified design.

10) Provide the diameter, minimum 6 inches, of the perforated underdrain used in the Bioretention Facility. See Appendix B for specific information regarding perforated pipes.

11) Provide the slope of the site around the Bioretention Facility, if used. The maximum slope is 3 percent for a standard design.

12) Provide the check dam spacing, if the site around the Bioretention Facility is sloped.

13) Describe the vegetation used within the Bioretention Facility.

References Used to Develop this Fact Sheet

Anderson, Dale V. "Landscaped Filter Basin Soil Requirements." Riverside, May 2010.

California Department of Transportation. CalTrans Standard Plans. 15 September 2005. May 2010 <http://www.dot.ca.gov/hq/esc/oe/project_plans/HTM/stdplns-met-new99.htm>.

Camp Dresser and McKee Inc.; Larry Walker Associates. California Stormwater Best Management Practice Handbook for New Development and Redevelopment. California Stormwater Quality Association (CASQA), 2004.

Contra Costa Clean Water Program. Stormwater Quality Requirements for Development Applications. 3rd Edition. Contra Costa, 2006.

County of Los Angeles Public Works. Stormwater Best Management Practice Design and Maintenance Manual. Los Angeles, 2009.

Kim, Hunho, Eric A. Seagren and Allen P. Davis. "Engineered Bioretention for Removal of Nitrate from Stormwater Runoff." Water Environment Research 75.4 (2003): 355-366.

LA Team Effort. LA Team Effort: FREE Planter Boxes for Businesses. 2 November 2009. May 2010 <http://lateameffort.blogspot.com/2009/11/free-planter-boxes-for-businesses-est.html>.

Montgomery County Maryland Department of Permitting Services Water Resources Section. Biofiltration (BF). Montgomery County, 2005.

Program, Ventura Countywide Stormwater Quality Management. Technical Guidance Manual for Stormwater Quality Control Measures. Ventura, 2002.

United States Environmental Protection Agency. Storm Water Technology Fact Sheet Bioretention. Washington D.C, 1999.

Urban Drainage and Flood Control District. Urban Storm Drainage Criteria Manual Volume 3 - Best Management Practices. Vol. 3. Denver, 2008. 3 vols.

Urbonas, Ben R. Stormwater Sand Filter Sizing and Design: A Unit Operations Approach. Denver: Urban Drainage and Flood Control District, 2002.

September 5, 2023

UCR OASIS Park
Psomas Project No. 5MIL130100

APPENDIX E

V_{BMP} and Q_{BMP} Worksheets

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend:
Required Entries
Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name Psomas
Date 6/8/2023
Designed by A.P.
Case No
Company Project Number/Name

BMP Identification

BMP NAME / ID DMA 2-A (Proposed Condition - West Drainage Area)

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA 2-A	*72,080*	*Mixed Surface Types*	*0.67*	*0.47*	*33624.8*			
	72080	***Total***			**33624.8**	**0.60**	***1681.2***	***2550***

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: 🟦 Required Entries
▨ Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name Psomas
Date 6/8/2023
Designed by A.P.
Case No
Company Project Number/Name

BMP Identification

BMP NAME / ID DMA 2-B (Proposed Condition - East Draiange Area)

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA 2-B	*129,562*	*Mixed Surface Types*	*0.78*	*0.58*	*74670.9*			
	129562	***Total***			**74670.9**	**0.60**	***3733.5***	***10915***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: 🟦 Required Entries
▨ Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name Psomas
Date 6/8/2023
Designed by A.P.
Case No
Company Project Number/Name

BMP Identification

BMP NAME / ID DMA 2-A (Proposed Condition - West Drainage Area)

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMAs	*DMA 2-A*	*72,080*	*Mixed Surface Types*	*0.67*	*0.47*	*33624.8*			
		72080	***Total***			**33624.8**	**0.20**	***0.2***	***1.54***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: 🟦 Required Entries
▨ Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name Psomas
Date 6/8/2023
Designed by A.P.
Case No
Company Project Number/Name

BMP Identification

BMP NAME / ID DMA 2-B (Proposed Condition - East Draiange Area)

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

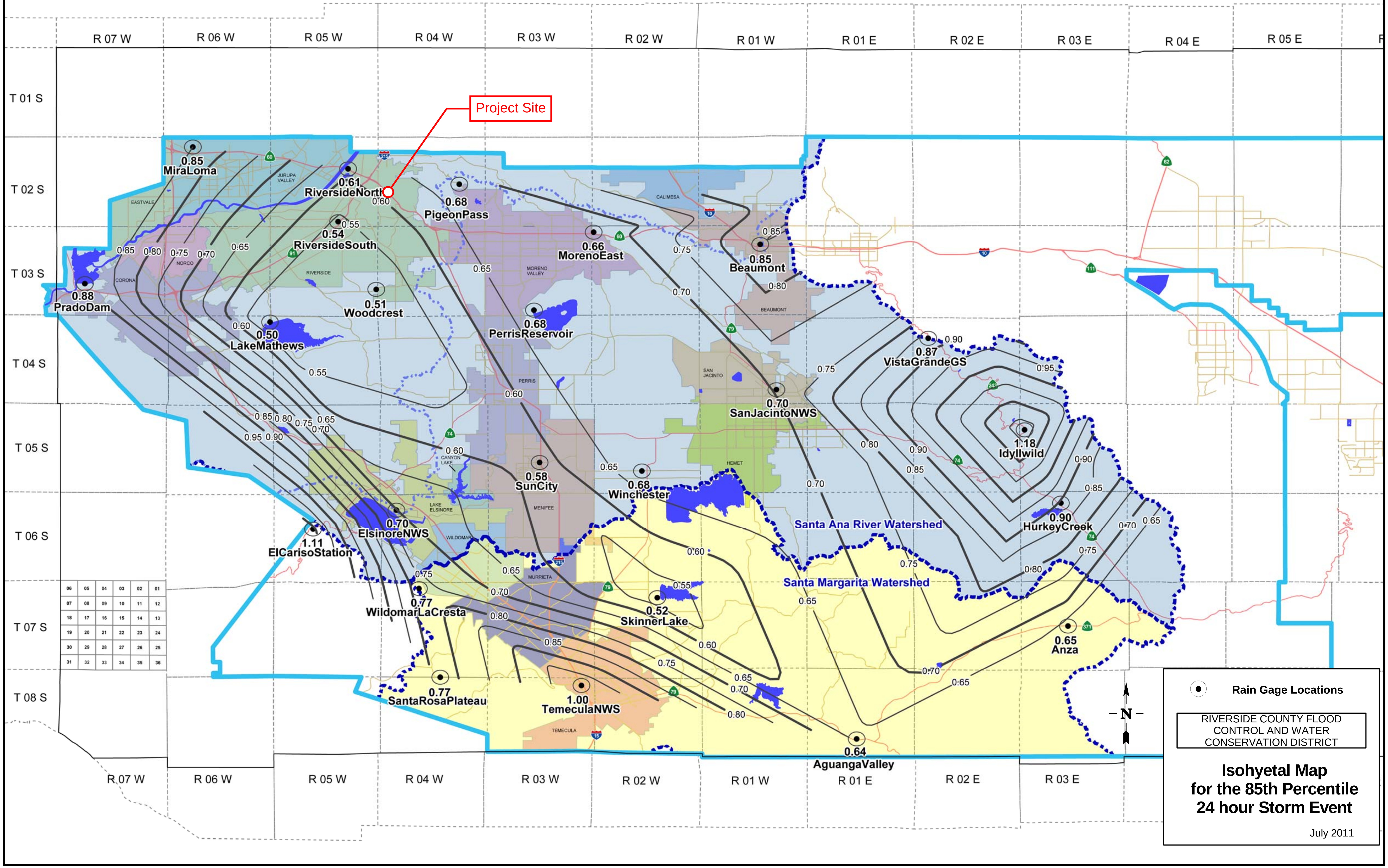
DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMA 2-B	*129,562*	*Mixed Surface Types*	*0.78*	*0.58*	*74670.9*			
	129562	***Total***			**74670.9**	**0.20**	***0.3***	***2.78***

Notes:

APPENDIX F

Isohyetal Map



● Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

July 2011

Attachment 18

Sewer Capacity Study

MEMO

To: Daneca Stevens, Project Manager, University of California, Riverside

From: Jaylee McDowell, Project Engineer, Psomas

Date: September 8, 2023

Subject: UCR OASIS Park – Sewer Capacity Study for CEQA purposes

---

Purpose
The University of California ("UCR" or "University") is developing an Opportunities to Advance Sustainability, Innovation and Social Inclusion (OASIS) Park ("Project") on University property located at 1200 University Avenue and a portion of 1150 and 1160 University Avenue (Assessor Parcel Number [APN] 253-050-005, and a portion of APNs 253-050-006, 253-050-007, and 253-050-008), south of University Avenue, north of Everton Place, and west of the Caltrans yard and Interstate 215/State Route 60 (I-215/SR 60) freeway, in the City of Riverside, California. This memorandum summarizes the existing and proposed sanitary sewer demands for the UCR OASIS Park project, and the resulting will serve letter provided by the City of Riverside. The summary herein has been prepared to support the CEQA permitting for the project.

Existing Conditions

The property comprises approximately 8 acres, approximately 4 of which will be improved as part of the Project ("Project site"). The existing property consists of a University Extension (UNEX) building, parking structure, surrounding surface parking lots, and hardscape/landscape. Based on review of the record drawings, an 8-inch sewer lateral services the existing UNEX building before connecting to an 8-inch City of Riverside Sanitary Sewer main in University Avenue. This 8-inch main connects to an existing City of Riverside 18-inch sanitary sewer main located to the north, also within University Avenue.

An exhibit showing the existing sewer system and lateral connection has been included as Attachment 1.

An analysis prepared by the MEP programming consultant, estimates the sanitary sewer demand for the existing building is approximately **1200 dfu.** See Attachment 2 for related correspondence.

Proposed Conditions

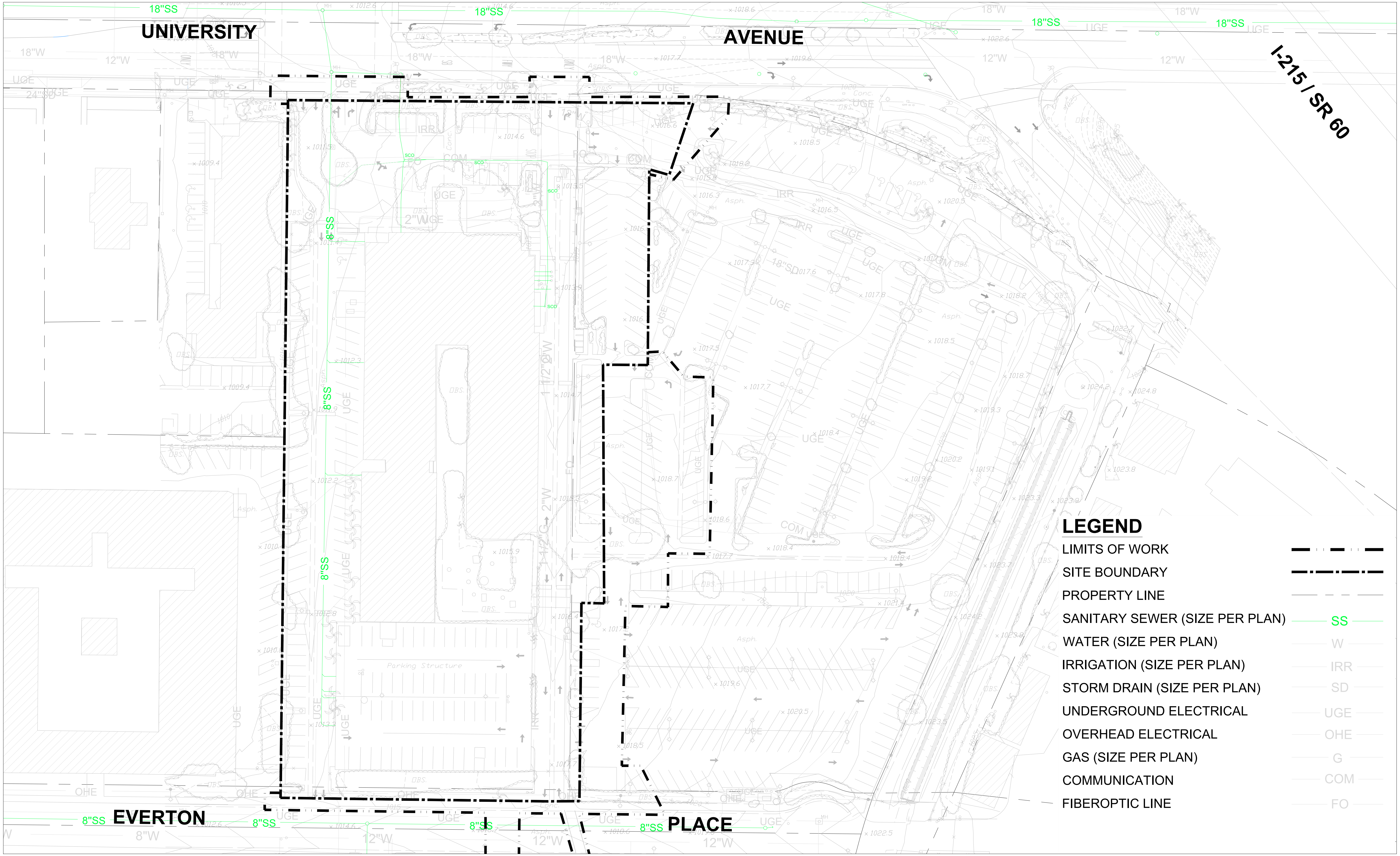
The UCR OASIS Park project proposes the demolition of the existing UNEX building, Parking Structure, and associated hardscape and landscape areas, and for CEQA purposes, construction of a new, approximately 70,000-square-foot (sf) building with a program mix consisting of the following spaces: Research/Laboratory facilities (60% or approximately 42,000 sf), Offices (30% or approximately 21,000 sf), and Academic Instruction facilities/Assembly and Exhibition Spaces (10% or approximately 7,000 sf). This program results in a demand of **252 dfu,** as calculated by the MEP programming consultant (See Attachment 2) therefore reducing the contribution to the public sewer system from the existing condition.

An exhibit showing the proposed sewer system and lateral connection has been included as Attachment 3.

A meeting was held with the City of Riverside on May 1, 2023 to discuss offsite utility impacts. Attachment 4 provides the minutes of that meeting. As stated in the attached Sanitary Sewer Will Serve Letter (Attachment 5) provided by the City of Riverside, no improvements will be required to the municipal sewer system.

Attachment 1

Existing Sanitary Sewer System



EXISTING SEWER EXHIBIT

0' 40' 80' 160'

Attachment 2

Existing and Proposed Sewer Demands

From: Heather Ruszczyk <hruszczyk@MillerHull.com>
Sent: Thursday, March 23, 2023 6:50 PM
To: Beeks, Kameron <kbeeks@glumac.com>; Navarro, Ari <ANavarro@glumac.com>
Cc: Sarah Curran <sarah.curran@psomas.com>
Subject: UCR_CEQA Utility Capacity

Hi Kameron and Ari,

Confirming the following areas/program mix:

- Total Building Area (CEQA): 70,000 sf
- Program: The program mix is actually going to be Lab (60% or 42,000 sf), Office (30% or 21,000 sf), Meeting/Assembly (10% or 7,000 sf)

Sanitary: 252 dfu; **6" sanitary sewer service**

Domestic Water: 150 gpm; **3" domestic water service**

Please provide the following no later than EOD 3/31:

- Update plumbing calcs accordingly to program mix/areas identified above.
- Provide plumbing calcs for existing UNEX Plumbing Calcs. Based on what I could clearly make out as plumbing fixtures on the as-builts from the last known use, I counted:
    - Lavs: 186
    - Toilets: 191
    - Urinals: 5
    - Tub/Showers: 172

We ran the existing fixture unit counts above. Given the large amount of tub showers we assumed that these were living/dormitories, so I ran the numbers using tank type, private water closets. If these are flush valve type water closets than the numbers will change.

Sanitary: 1200 dfu; **8" sanitary sewer service**

Domestic Water: 270 gpm; **4" domestic water service**

Regarding energy, I'll be reaching out to UCR to see if they can provide contact information for a Customer Manager either at UCR or the electrical company and whether we are able to reach out directly or if they'd like to be involved. Objective is to get a meeting with them sometime in the next month.

Please let me know if you need anything else right now for utility capacity related items.

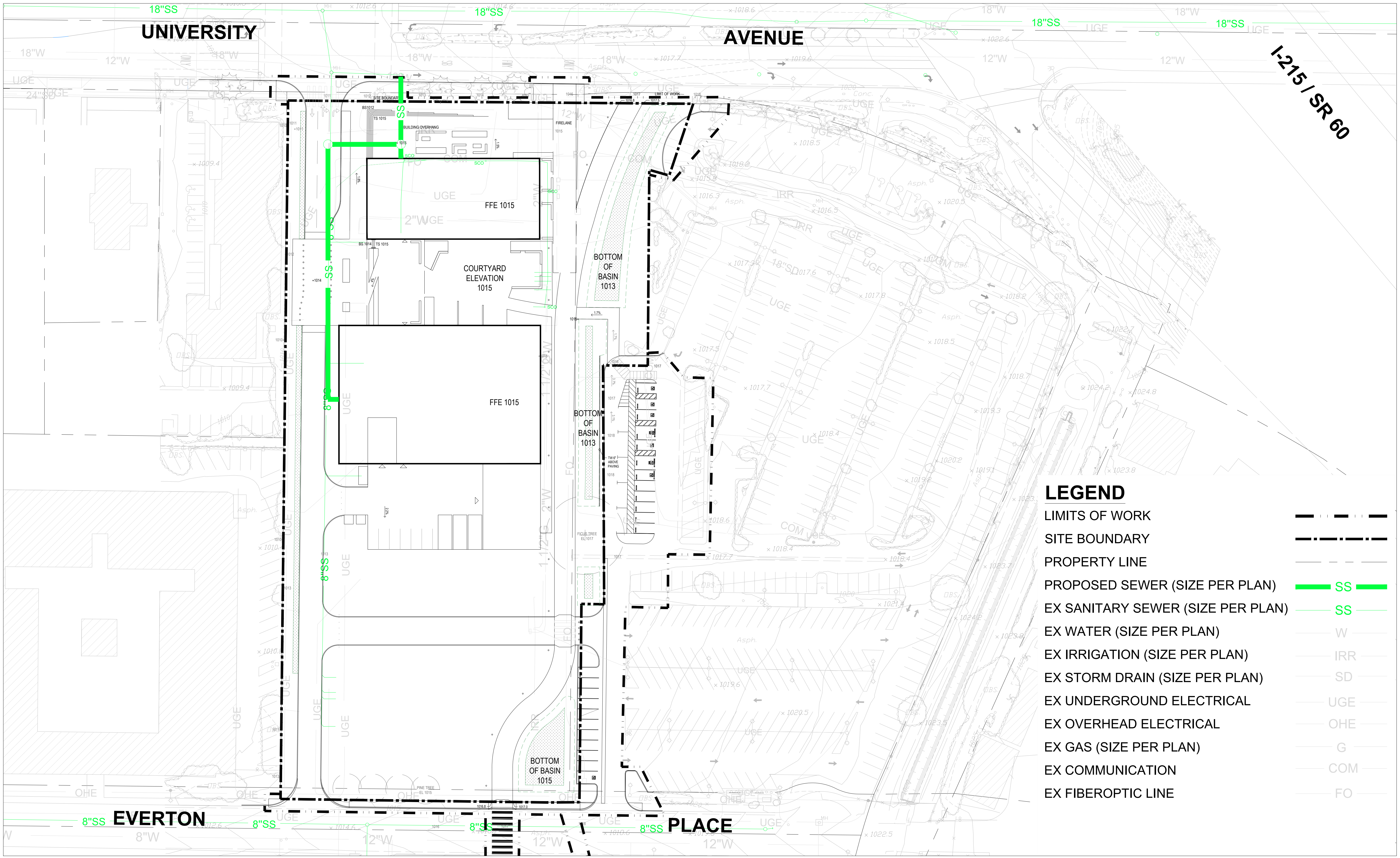
Thanks,
Heather

Heather Ruszczyk, AIA, Associate

The Miller Hull Partnership, LLP
4980 North Harbor Drive, Suite 100
San Diego, CA 92106
Main: 619-220-0984

Attachment 3

Proposed Sanitary Sewer System



PROPOSED SEWER EXHIBIT

0' 40' 80' 160'

PRELIMINARY - NOT FOR CONSTRUCTION

Attachment 4

City of Riverside Meeting Minutes

Meeting Notes
UCR OASIS Park – City of Riverside Utility Discussion
05-01-2023
11:00AM-12:00AM

Attendees:
Psomas – Sarah Curran, Jaylee McDowell, Amy Palowski
Miller Hull – Heather Ruszczyk
UCR – Stephanie Tang, Daneca Stevens
City of Riverside – Chris Scully (Public Works), Chris Gross (Public Utilities Department)

Discussion:

I. Overview:

1. City Overview
    a. Public Works (Chris Scully) – oversees sewer and storm drain
    b. Public Utilities Department (Chris Gross) – oversees water
2. Project Overview
    a. Site study to see how it impacts utilities.
    b. Consultant team is preparing utility study for future development to be implemented via design build bid.
    c. Desire to understand utility needs/impacts to inform CEQA process, cost estimate, and future design build bid.
    d. Proposed building footprint – 70,000 sf.
    e. Existing building footprint – Just under 200,000 sf.

II. Notes:

1. Water
    a. Existing City owned water lines adjacent to project:
        i. 12-inch and 18-inch waterline within University Ave. Reclaimed water is not available at this location.
        ii. Lateral to existing building is from 12-inch main.
            - Psomas to send existing conditions exhibit to Chris Gross to review for their size and location.
        iii. What is the existing meter size?
            - Chris Gross to confirm size of existing meter(s) (Domestic and Irrigation if applicable).
        iv. Domestic water demand will decrease from existing to proposed condition (approximately 270 gpm to 150 gpm).
        v. Proposed Domestic Water Service:
            - No issues with municipal system capacity since demands of site are going down.
            - New connections should be made to 12-inch city main.
            - Use same meter, relocate, or replace
            - If meter is sized down, a connection fee credit will be retained for future meter.
            - Meter could be sized for future connection -OR- Install 2nd meter in different location as part of future project. Either would be okay.

      - Backflow preventer can be reused, relocated or replaced.
      - Confirm required backflow prevention type for Domestic Service.
    vi. Proposed Fire Water service:
      - No existing hydrants located on site. One (1) public in University and two (2) public in Everton.
      - Existing building is not sprinklered. No dedicated fire service on site.
      - New building will be sprinklered and overall fire hydrant demand will likely be around 1500GPM/20PSI.
      - Fire service will require separate lateral.
      - Backflow prevention: Sprinkler system would implicate need for backflow prevention. General backflow guidelines are available from the city website, but it would be dependent on project and designated as part of city review process. Detector Assembly to be part of backflow preventer. RPDA protection is required on City system if sprinkler water is mixed with other chemicals. Otherwise DCDA. Backflow protection. Backflow should be located as close to city system as possible.
    vii. Installation:
      - City will install water service up to and including meter (at or near property line). Fire water will be installed by city up to property line, or near to it. If mainline updates required within the ROW, then plans must be prepared by UCR consultant and submitted to plan check, contractor to install, City to tie-in laterals. Separate meter preferred for landscape irrigation (CG to confirm).
      - Contractor to install backflow preventer and everything downstream of meter or property line (fire).
      - City staff will do initial inspection/certification of backflow device to confirm installed per City standards. UCR is responsible for annual certification. No separate fee for this – included in construction cost all as 1 fee (CG will include this in the letter).
    viii. Will Serve Letter:
      - Based on discussion, city can provide team with fire flow letter for existing hydrants on both University and Everton Place. No additional documentation required.
      - Similarly, city will prepare will serve letter including service costs, without any additional documentation from UCR team. This letter can also provide estimate of capacity for future development at the site in GPM.

2. Sewer
  a. Existing sewer facilities adjacent to and within project limits:
    i. Psomas exhibit indicates one 8-inch and two 12-inch city sewer mains within University. According to the city, the 8-inch sewer is abandoned and two 12-inch sewer lines abandoned and replaced by 18-inch within University. City to send us updated information. Everything drains to the West.

            - City may find record of building plan for the assumed 6-inch lateral coming onto site (appears there is only 1 lateral coming onto the site; not two as shown on Psomas exhibit).
    b. Will Serve Letter:
        i. Demands for sewer service will decrease with future development.
        ii. Psomas to prepare Technical Memo describing existing use and demands of proposed development. Submit to Public Works for use in preparing Will Serve Letter.
    c. Installation/Standards:
        i. City Standard 562 for sewer lateral connection. Minimum size is 6-inches.
        ii. CCTV will need to be performed to confirm exist line can be used to service future development.
    d. Future Capacity:
        i. In order to evaluate capacity for future improvements on site it would be necessary for the city's model to be updated to reflect future demands.

3. Storm Drain
    a. Existing City Storm Drain:
        i. 24-inch city storm drain in University as indicated on Psomas exhibit. There appears to be a 15-inch SD connecting to that not shown on Exhibit. City can provide as builts for existing Storm Drain. Storm Drain mains drain East to West.
    b. Requirements for future connection
        i. Encroachment permit required (private lateral tying into City main). Can also tie into existing private lateral without permit.

Attachment 5

City of Riverside Will Serve Letter

CITY OF
RIVERSIDE
City of Arts & Innovation

July 10, 2023

Stephanie Tang
1223 University Ave, Suite 240
Riverside CA 92507

RE: Sewer Availability – 1200 University Ave & a portion of 1150 & 1160 University Ave
APN's 253-050-005, 253-050-006, 253-050-007, 253-050-008

To Whom It May Concern:

According to our records, sewer facilities are available to serve 1200 University and 1150 and 1160 University Ave Riverside, CA 92507. If you should have any further questions, please feel free to contact Public Works at (951) 826-5341.

Thank you,

Chris Scully, PE
Engineering Manager
Public Works, Land Development

3900 Main Street, Riverside, CA 92522 | Phone: (951) 826-5311 | **RiversideCA.gov**

Attachment 19

Water Capacity Study

PSOMAS

MEMO

To: Daneca Stevens, Project Manager, University of California, Riverside

From: Jaylee McDowell, Project Engineer, Psomas

Date: September 8, 2023

Subject: UCR OASIS Park – Water Capacity Study for CEQA Purposes

Purpose

The University of California ("UCR" or "University") is developing an Opportunities to Advance Sustainability, Innovation and Social Inclusion (OASIS) Park ("Project") on University property located at 1200 University Avenue and a portion of 1150 and 1160 University Avenue (Assessor Parcel Number [APN] 253-050-005, and a portion of APNs 253-050-006, 253-050-007, and 253-050-008), south of University Avenue, north of Everton Place, and west of the Caltrans yard and Interstate 215/State Route 60 (I-215/SR 60) freeway, in the City of Riverside, California. This memorandum summarizes the existing and proposed water demands for the UCR OASIS Park project, and the resulting will serve letter and fire flow test provided by the City of Riverside.

Existing Conditions

The property comprises approximately 8 acres, approximately 4 of which will be improved as part of the Project ("Project site"). The existing property consists of a University Extension (UNEX) building, parking structure, surrounding surface parking lots, and hardscape/landscape. There are two existing City of Riverside water mains located adjacent to the site: an 18-inch transmission main and a 12-inch distribution main. The project site is currently serviced by two (2) 3-inch domestic water meters and one (1) 1-inch irrigation meter, fed from the existing 12-inch City of Riverside water main. One of the existing 3-inch service laterals connects to the existing UNEX building. The existing building does not include a fire sprinkler system and there is no dedicated fire service to the site. Three (3) existing public fire hydrants are located near the site, one (1) on University Avenue and two (2) on Everton Place.

An exhibit showing the existing water system and lateral connections has been included as Attachment 1.

An analysis prepared by the MEP programming consultant, estimates the existing site to have a domestic water demand of 270 gallons per minute (gpm). See Attachment 2 for related correspondence.

Proposed Conditions

The UCR OASIS Park project proposes the demolition of the existing UNEX building, Parking Structure, and associated hardscape and landscape areas, and for CEQA purposes, construction of a new, approximately 70,000-square-foot (sf) building with a program mix consisting of the following spaces: Research/Laboratory facilities (60% or approximately 42,000 sf), Offices (30% or approximately 21,000 sf), and Academic Instruction facilities/Assembly and Exhibition Spaces (10% or approximately 7,000 sf). This program results in a domestic water demand of 150 gpm, as calculated by the MEP programming consultant (See Attachment 2), therefore reducing the demand from the public water main from the existing condition.

An exhibit showing the proposed water system and lateral connections has been included as Attachment 2.

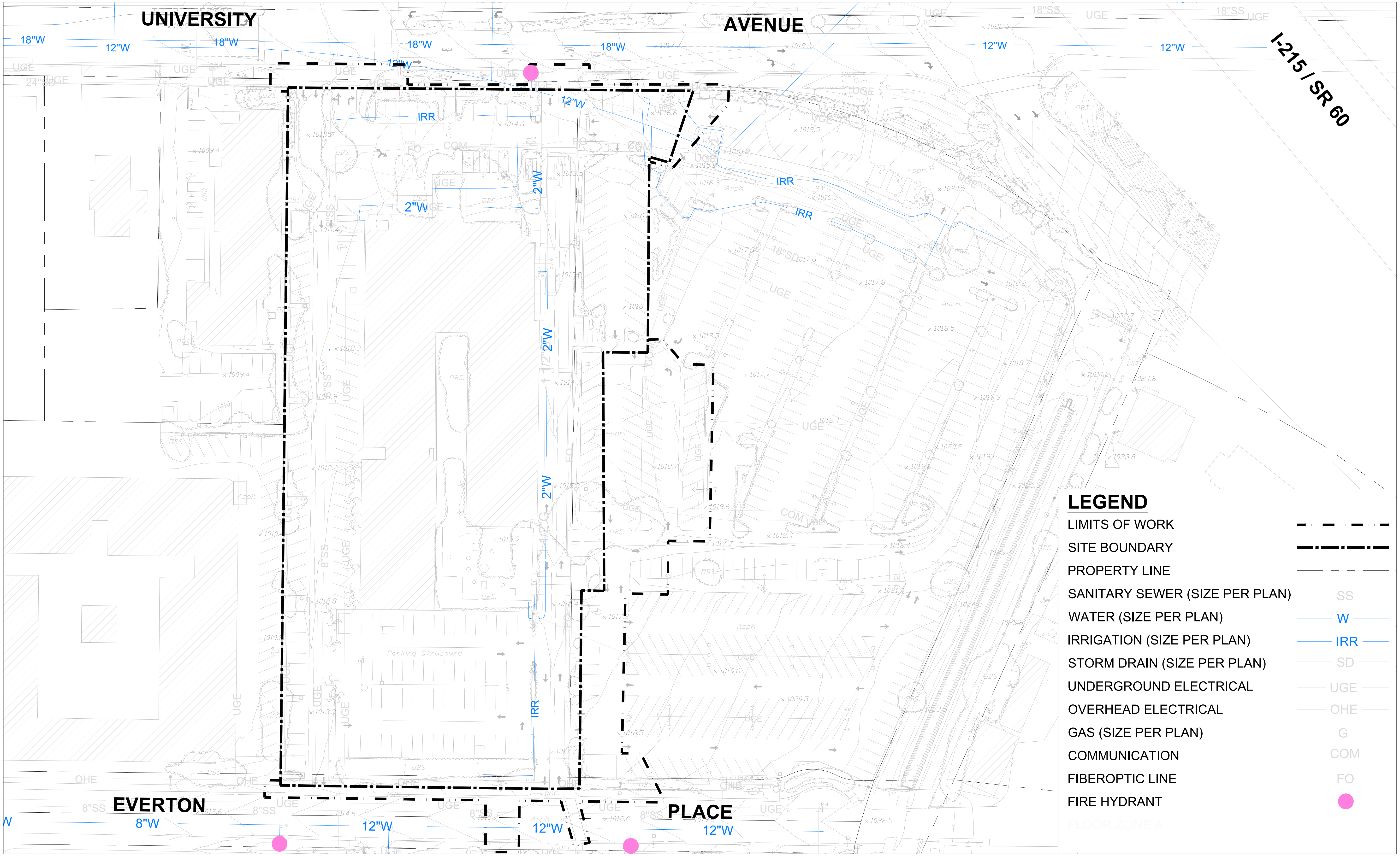
A meeting with the City of Riverside was held on May 1, 2023 and it was confirmed that, due to the reduction in water demand from the project site, no improvements will be required for the existing water system (See Attachment 4, City of Riverside Meeting Minutes). The city subsequently provided a will serve letter (Attachment 5) confirming its ability to service the Project as well as a Fire Flow Test (Attachment 6).

According to the city, the existing water meter may be salvaged for reuse, or it may be replaced with a smaller meter in order to receive a connection fee credit. The existing backflow preventer may also be salvaged for reuse or replaced with the new system.

The proposed building will include a fire sprinkler system and at least one (1) new onsite hydrant with an estimated fire demand of 1,500gpm at 20psi. A new fire service lateral will be established independently from the proposed domestic water service which will connect to the existing 12-inch City of Riverside water main. The new fire service will require backflow prevention.

Attachment 1

Existing Water System



EXISTING WATER EXHIBIT

0' 40' 80' 160'

Attachment 2

Existing and Proposed Water Demands

From: Heather Ruszczyk <hruszczyk@MillerHull.com>
Sent: Thursday, March 23, 2023 6:50 PM
To: Beeks, Kameron <kbeeks@glumac.com>; Navarro, Ari <ANavarro@glumac.com>
Cc: Sarah Curran <sarah.curran@psomas.com>
Subject: UCR_CEQA Utility Capacity

Hi Kameron and Ari,

Confirming the following areas/program mix:

- Total Building Area (CEQA): 70,000 sf
- Program: The program mix is actually going to be Lab (60% or 42,000 sf), Office (30% or 21,000 sf), Meeting/Assembly (10% or 7,000 sf)

Sanitary: 252 dfu; **6" sanitary sewer service**

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Please provide the following no later than EOD 3/31:

- Update plumbing calcs accordingly to program mix/areas identified above.
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We ran the existing fixture unit counts above. Given the large amount of tub showers we assumed that these were living/dormitories, so I ran the numbers using tank type, private water closets. If these are flush valve type water closets than the numbers will change.

Sanitary: 1200 dfu; **8" sanitary sewer service**

Domestic Water: 270 gpm; **4" domestic water service**

Regarding energy, I'll be reaching out to UCR to see if they can provide contact information for a Customer Manager either at UCR or the electrical company and whether we are able to reach out directly or if they'd like to be involved. Objective is to get a meeting with them sometime in the next month.

Please let me know if you need anything else right now for utility capacity related items.

Thanks,
Heather

Heather Ruszczyk, AIA, Associate

The Miller Hull Partnership, LLP
4980 North Harbor Drive, Suite 100
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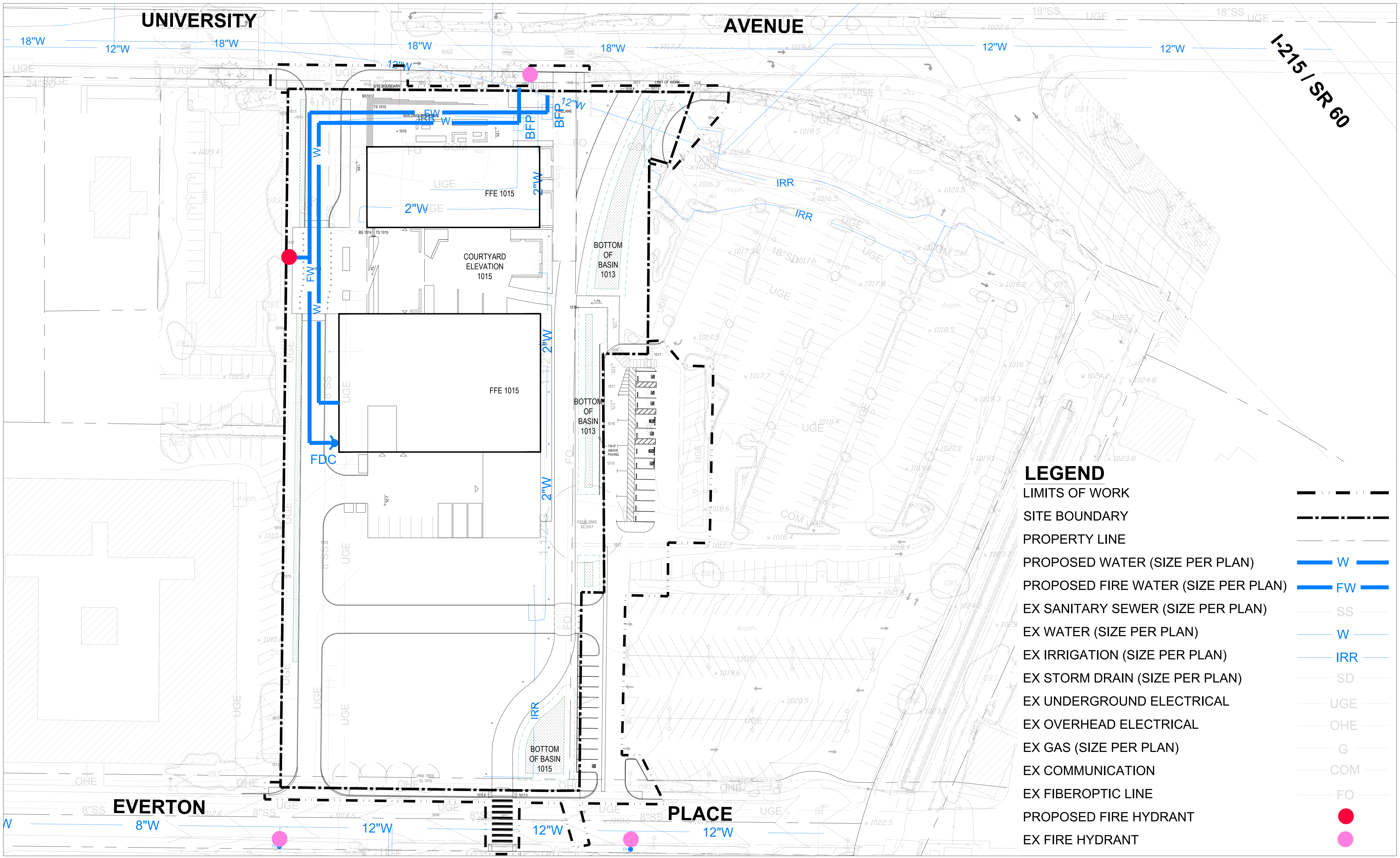
Main: 619-220-0984

Attachment 3

Proposed Water System



PROPOSED WATER EXHIBIT

0' 40' 80' 160'

PRELIMINARY - NOT FOR CONSTRUCTION

Attachment 4

City of Riverside Meeting Minutes

Meeting Notes
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05-01-2023
11:00AM-12:00AM

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Miller Hull – Heather Ruszczyk
UCR – Stephanie Tang, Daneca Stevens
City of Riverside – Chris Scully (Public Works), Chris Gross (Public Utilities Department)

Discussion:

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2. Project Overview
    a. Site study to see how it impacts utilities.
    b. Consultant team is preparing utility study for future development to be implemented via design build bid.
    c. Desire to understand utility needs/impacts to inform CEQA process, cost estimate, and future design build bid.
    d. Proposed building footprint – 70,000 sf.
    e. Existing building footprint – Just under 200,000 sf.

II. Notes:

1. Water
    a. Existing City owned water lines adjacent to project:
        i. 12-inch and 18-inch waterline within University Ave. Reclaimed water is not available at this location.
        ii. Lateral to existing building is from 12-inch main.
            - Psomas to send existing conditions exhibit to Chris Gross to review for their size and location.
        iii. What is the existing meter size?
            - Chris Gross to confirm size of existing meter(s) (Domestic and Irrigation if applicable).
        iv. Domestic water demand will decrease from existing to proposed condition (approximately 270 gpm to 150 gpm).
        v. Proposed Domestic Water Service:
            - No issues with municipal system capacity since demands of site are going down.
            - New connections should be made to 12-inch city main.
            - Use same meter, relocate, or replace
            - If meter is sized down, a connection fee credit will be retained for future meter.
            - Meter could be sized for future connection -OR- Install 2nd meter in different location as part of future project. Either would be okay.

- Backflow preventer can be reused, relocated or replaced.
- Confirm required backflow prevention type for Domestic Service.

vi. Proposed Fire Water service:

- No existing hydrants located on site. One (1) public in University and two (2) public in Everton.
- Existing building is not sprinklered. No dedicated fire service on site.
- New building will be sprinklered and overall fire hydrant demand will likely be around 1500GPM/20PSI.
- Fire service will require separate lateral.
- Backflow prevention: Sprinkler system would implicate need for backflow prevention. General backflow guidelines are available from the city website, but it would be dependent on project and designated as part of city review process. Detector Assembly to be part of backflow preventer. RPDA protection is required on City system if sprinkler water is mixed with other chemicals. Otherwise DCDA. Backflow protection. Backflow should be located as close to city system as possible.

vii. Installation:

- City will install water service up to and including meter (at or near property line). Fire water will be installed by city up to property line, or near to it. If mainline updates required within the ROW, then plans must be prepared by UCR consultant and submitted to plan check, contractor to install, City to tie-in laterals. Separate meter preferred for landscape irrigation (CG to confirm).
- Contractor to install backflow preventer and everything downstream of meter or property line (fire).
- City staff will do initial inspection/certification of backflow device to confirm installed per City standards. UCR is responsible for annual certification. No separate fee for this – included in construction cost all as 1 fee (CG will include this in the letter).

viii. Will Serve Letter:

- Based on discussion, city can provide team with fire flow letter for existing hydrants on both University and Everton Place. No additional documentation required.
- Similarly, city will prepare will serve letter including service costs, without any additional documentation from UCR team. This letter can also provide estimate of capacity for future development at the site in GPM.

2. Sewer

a. Existing sewer facilities adjacent to and within project limits:

i. Psomas exhibit indicates one 8-inch and two 12-inch city sewer mains within University. According to the city, the 8-inch sewer is abandoned and two 12-inch sewer lines abandoned and replaced by 18-inch within University. City to send us updated information. Everything drains to the West.

            - City may find record of building plan for the assumed 6-inch lateral coming onto site (appears there is only 1 lateral coming onto the site; not two as shown on Psomas exhibit).
    b. Will Serve Letter:
        i. Demands for sewer service will decrease with future development.
        ii. Psomas to prepare Technical Memo describing existing use and demands of proposed development. Submit to Public Works for use in preparing Will Serve Letter.
    c. Installation/Standards:
        i. City Standard 562 for sewer lateral connection. Minimum size is 6-inches.
        ii. CCTV will need to be performed to confirm exist line can be used to service future development.
    d. Future Capacity:
        i. In order to evaluate capacity for future improvements on site it would be necessary for the city's model to be updated to reflect future demands.

3. Storm Drain
    a. Existing City Storm Drain:
        i. 24-inch city storm drain in University as indicated on Psomas exhibit. There appears to be a 15-inch SD connecting to that not shown on Exhibit. City can provide as builts for existing Storm Drain. Storm Drain mains drain East to West.
    b. Requirements for future connection
        i. Encroachment permit required (private lateral tying into City main). Can also tie into existing private lateral without permit.

Attachment 5

City of Riverside Will Serve Letter

CITY OF RIVERSIDE
City of Arts & Innovation

May 18, 2023

Attn: Customer

RE: WATER SERVICE AVAILABILITY TO:
UCR - Oasis Park Project
1200 University Avenue, Riverside, CA 92507
APN#253-050-005, -006, -007, -008

To Whom It May Concern,

The Riverside Public Utilities Department is prepared to offer water service to the above referenced property upon completion of financial arrangements and compliance with the Department's Rules and Regulations for the installation of water facilities.

This property is currently served by (2) 3" domestic water meters and (1) 1" irrigation meter.

Please feel free to contact our office at (951) 826-5285 if you have any questions or need further information.

Sincerely,

Chris Gross

Christopher Gross
Utilities Senior Water Engineer
cgross@riversideca.gov

Riverside Public Utilities • Water Engineering

3750 University Avenue, 3rd floor • Riverside, CA 92501 • 951.826.5285 • RiversidePublicUtilities.com

WATER | ENERGY | LIFE
CITY OF RIVERSIDE
PUBLIC UTILITIES

Attachment 6

Fire Flow Test

CITY OF
RIVERSIDE

City of Arts & Innovation

May 4, 2023

UNIVERSITY OF CALIFORNIA, RIVERSIDE
1223 UNIVERSITY AVE, SUITE 240
RIVERSIDE, CA 92507

Attn: DANECA STEVENS

Subject: Fire Flow Test Results for 1200 UNIVERSITY AVE , Riverside, CA 92507-4562 – Conducted on 05/03/2023

Project: GP-2023-09166

Dear DANECA STEVENS:

The City of Riverside Public Utilities Department (RPU) is providing this letter in response to your request dated 05/04/2023 for fire flow test data near 1200 UNIVERSITY AVE , Riverside, CA 92507-4562. The following results were determined from a computer simulation of RPU's water system from a hydraulic model.

- RPU's analysis identified the available fire flow near FH 2764 (on University) is approximately 4,000 gallons per minute (gpm) at 25 psi residual. Furthermore, the anticipated static pressure in the area is 77 psi.

- RPU's analysis identified the available fire flow near FH 3032 (on Everton)is approximately 1,800 gallons per minute (gpm) at 55 psi residual. Furthermore, the anticipated static pressure in the area is 77 psi.

Please note, the results of this test are valid for one year following the date of this letter. Please contact Water Engineering at 951-826-5285, if you have any questions regarding this test.

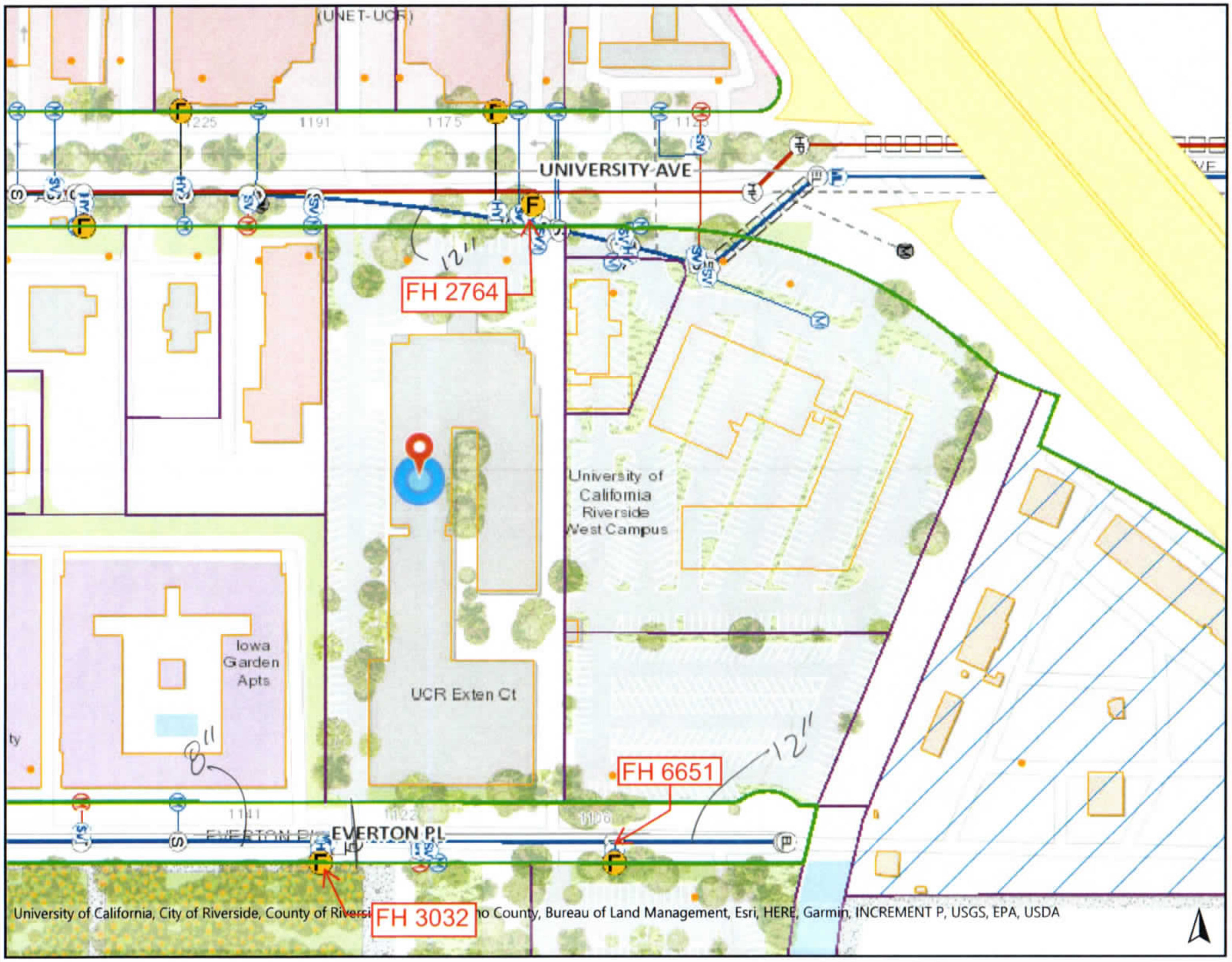
Sincerely,

RPU Water Engineering

Attachment: Fire Flow Test Exhibit

CITY OF RIVERSIDE

1200 University Ave



University of California, City of Riverside, County of Riversi[de], [Bur]eau of Land Management, Esri, HERE, Garmin, INCREMENT P, USGS, EPA, USDA

Legend

AdministrativeBoundary
  City Boundary ⬚
GeneralReference
  Freeways 🟨
Cadastral
  Address Pt
    ● Single Family
  Street Centerline —
  Waiver Of Access Restricted —
  Parcel Line
    — Lot Line
    — ROW Line
  Parcel ☐
Planimetric
  Buildings ☐

Notes

0 250 500 ft

This map was created, in part, by the City of Riverside Geographic Information System and intended to be operated solely for the convenience of the City. The City does not warrant the accuracy of this map, and no decision involving a risk of economic loss or physical injury should be made in reliance thereon.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Attachment 20

Distribution List

FONSI / RROF Distribution List

California Department of Transportation, District 8
Attn: Planning Division
464 W. 4th St
San Bernardino, CA 92401

California Department of Fish and Wildlife, Inland Deserts Region
3602 Inland Empire Blvd, Suite C-220
Ontario, CA 91764

South Coast Air Quality Management District
CEQA Inter-Governmental Review
21865 Copley Dr.
Diamond Bar, CA 91765

City of Riverside
Planning Department
Scott Watson
3900 Main Street, 3rd Floor
Riverside, CA 92522

City of Riverside
Public Works, Engineering
3900 Main Street, 4th Floor
Riverside, CA 92522

City of Riverside
Public Works, Traffic Engineering
3900 Main Street, 4th Floor
Riverside, CA 92522

City of Riverside
Public Utilities, Water Engineering
3900 University Ave., 3rd Floor
Riverside, CA 92522

Riverside County Planning Department
4080 Lemon Street
Riverside, CA 92502-1629

U.S. Army Corps of Engineers
Los Angeles District, Regulatory
915 Wilshire Blvd., Suite 1101
Los Angeles, CA 90017

California Native American Heritage Commission (NAHC)
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691

California Department of Toxic Substances Control
101 I Street, 11th Floor
Sacramento, CA 95812

Regional Water Quality Control Board
Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3348

Riverside County Transportation Commission
4080 Lemon Street, 3rd Floor
Riverside, CA 92502-2208

Southern California Association of Governments (SCAG)
Riverside County Regional Office
3403 10th Street, Suite 805
Riverside, CA 92501

Riverside County Flood Control & Water Conservation District
1995 Market Street
Riverside, CA 92501

Riverside County Clerk
2702 Gateway Drive
Riverside, CA 92507

Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, CA 94105

U.S. Dept. of Housing and Urban Development
Los Angeles Field Office
300 North Los Angeles Street, Suite 4054
Los Angeles, CA 90012

Kevin Dawson
269 Goins Court
Riverside, CA 92507

Robert A Phillips
3511 Watkins Dr.
Riverside, CA 92507-4654

Gurumantra Khalsa
4108 Watkins Dr.
Riverside, CA 92507

Lacy Padilla
Archaeological Technician
Agua Caliente Band of Cahuilla Indians
5401 Dinah Shore Drive
Palm Springs, CA 92264

Ebru Ozdil
Pechanga Cultural Resources Department
P.O. Box 2183
Temecula, CA 92593

Agua Caliente Band of Cahuilla Indians
Patricia Garcia, Director
5401 Dinah Shore Drive
Palm Springs, CA, 92264

Agua Caliente Band of Cahuilla Indians
Reid Milanovich, Chairperson
5401 Dinah Shore Drive
Palm Springs, CA, 92264

Augustine Band of Cahuilla Mission Indians
Amanda Vance, Chairperson
84-001 Avenue 54
Coachella, CA, 92236

Cabazon Band of Mission Indians
Doug Welmas, Chairperson
84-245 Indio Springs Parkway
Indio, CA, 92203

Cahuilla Band of Indians
Daniel Salgado, Chairperson
52701 CA Highway 371
Anza, CA, 92539

Cahuilla Band of Indians
Anthony Madrigal,
52701 CA Highway 371
Anza, CA, 92539

Cahuilla Band of Indians
BobbyRay Esparza, Cultural Director
52701 CA Highway 371
Anza, CA, 92539

Gabrieleno Band of Mission Indians - Kizh Nation
Andrew Salas, Chairperson
P.O. Box 393
Covina, CA, 91723

Gabrieleno Band of Mission Indians-Kizh Nation
Christina Swindall Martinez, Secretary
P.O. Box 393
Covina, CA, 91723

Gabrieleno/Tongva San Gabriel Band of
Mission Indians
Anthony Morales, Chairperson
P.O. Box 693
San Gabriel, CA, 91778

Gabrielino /Tongva Nation
Sandonne Goad, Chairperson
106 1/2 Judge John Aiso St., #231
Los Angeles, CA, 90012

Gabrielino Tongva Indians of California
Tribal Council
Robert Dorame, Chairperson
P.O. Box 490
Bellflower, CA, 90707

Gabrielino Tongva Indians of California
Tribal Council
Christina Conley, Cultural Resource Admin
P.O. Box 941078
Simi Valley, CA, 93094

Gabrielino-Tongva Tribe
Sam Dunlap, Cultural Resource Director
P.O. Box 3919
Seal Beach, CA, 90740

Gabrielino-Tongva Tribe
Charles Alvarez, Chairperson
23454 Vanowen Street
West Hills, CA, 91307

Los Coyotes Band of Cahuilla and Cupeño Indians
Ray Chapparosa, Chairperson
P.O. Box 189
Warner Springs, CA, 92086-0189

Morongo Band of Mission Indians
Robert Martin, Chairperson
12700 Pumarra Road
Banning, CA, 92220

Morongo Band of Mission Indians
Ann Brierty, THPO
12700 Pumarra Road
Banning, CA, 92220

Pala Band of Mission Indians
Alexis Wallick, Assistant THPO
PMB 50, 35008 Pala Temecula Road
Pala, CA, 92059

Pala Band of Mission Indians
Shasta Gaughen, THPO
PMB 50, 35008 Pala Temecula Road
Pala, CA, 92059

Pechanga Band of Indians
Mark Macarro, Chairperson
P.O. Box 1477
Temecula, CA, 92593

Pechanga Band of Indians
Paul Macarro, Cultural Resources Coord.
P.O. Box 1477
Temecula, CA, 92593

Quechan Tribe of the Fort Yuma Reservation
Manfred Scott, Acting Chairman
P.O. Box 1899
Yuma, AZ, 85366

Quechan Tribe of the Fort Yuma Reservation
Jordan Joaquin
P.O.Box 1899
Yuma, AZ, 85366

Quechan Tribe of the Fort Yuma Reservation
Jill McCormick, Historic Preservation Officer
P.O. Box 1899
Yuma, AZ, 85366

Ramona Band of Cahuilla
John Gomez, Environmental Coordinator
P. O. Box 391670
Anza, CA, 92539

Ramona Band of Cahuilla
Joseph Hamilton, Chairperson
P.O. Box 391670
Anza, CA, 92539

Rincon Band of Luiseno Indians
Joseph Linton, Culture Committee Member
One Government Center Lane
Valley Center, CA, 92082

Rincon Band of Luiseno Indians
Laurie Gonzalez, Culture Committee Member
One Government Center Lane
Valley Center, CA, 92082

Rincon Band of Luiseno Indians
Cheryl Madrigal, Cultural Resources Mgr.
One Government Center Lane
Valley Center, CA, 92082

Rincon Band of Luiseno Indians
Denise Turner Walsh, Attorney General
One Government Center Lane
Valley Center, CA, 92082

San Manuel Band of Mission Indians
Alexandra McCleary, Cultural Lands Manager
26569 Community Center Drive
Highland, CA, 92346

Santa Rosa Band of Cahuilla Indians
Lovina Redner, Tribal Chair
P.O. Box 391820
Anza, CA, 92539

Serrano Nation of Mission Indians
Mark Cochrane, Co-Chairperson
P. O. Box 343
Patton, CA, 92369

Serrano Nation of Mission Indians
Wayne Walker, Co-Chairperson
P. O. Box 343
Patton, CA, 92369

Soboba Band of Luiseno Indians
Isaiah Vivanco, Chairperson
P. O. Box 487
San Jacinto, CA, 92581

Soboba Band of Luiseno Indians
Joseph Ontiveros, Cultural Resource
Department
P.O. BOX 487
San Jacinto, CA, 92581

Torres-Martinez Desert Cahuilla Indians
Cultural Committee,
P.O. Box 1160
Thermal, CA, 92274