



File No. 16.01.292

September 25, 2019

**ADDENDUM NO. 2
SOUTHERN HEIGHTS AND COURTRIGHT
RETAINING WALL DESIGN**

THE CHANGES IN THIS ADDENDUM SHALL BE INCLUDED IN THE RFP AND THIS ADDENDUM SHALL BE PART OF THE RFP DOCUMENTS. ALL CONDITIONS NOT AFFECTED BY THIS ADDENDUM SHALL REMAIN UNCHANGED.

Please find enclosed with this addendum the referenced attachments noted in the Request for Proposals that were inadvertently left out. Additionally, Attachment 5, geotechnical report, has been added to the list of attachments and is included as part of this addendum.

By: 
Hunter Young
Senior Civil Engineer

Enclosure: Attachments

Attachment 1 – Sample Professional Services Agreement

AGREEMENT FOR PROFESSIONAL SERVICES

FOR _____

This Agreement is made and entered into this ____ day of _____, 20____, by and between the CITY OF SAN RAFAEL (hereinafter "**CITY**"), and _____ (hereinafter "**CONTRACTOR**").

RECITALS

WHEREAS, _____; and

WHEREAS, _____;

AGREEMENT

NOW, THEREFORE, the parties hereby agree as follows:

1. **PROJECT COORDINATION.**

A. **CITY’S Project Manager.** The _____ is hereby designated the PROJECT MANAGER for the **CITY**, and said PROJECT MANAGER shall supervise all aspects of the progress and execution of this Agreement.

B. **CONTRACTOR’S Project Director.** **CONTRACTOR** shall assign a single PROJECT DIRECTOR to have overall responsibility for the progress and execution of this Agreement for **CONTRACTOR**. _____ is hereby designated as the PROJECT DIRECTOR for **CONTRACTOR**. Should circumstances or conditions subsequent to the execution of this Agreement require a substitute PROJECT DIRECTOR, for any reason, the **CONTRACTOR** shall notify the **CITY** within ten (10) business days of the substitution.

2. **DUTIES OF CONTRACTOR.**

CONTRACTOR shall perform the duties and/or provide services as follows:

3. **DUTIES OF CITY.**

CITY shall pay the compensation as provided in Paragraph 4, and perform the duties as follows:

4. COMPENSATION.

For the full performance of the services described herein by **CONTRACTOR**, **CITY** shall pay **CONTRACTOR** as follows:

Payment will be made monthly upon receipt by **PROJECT MANAGER** of itemized invoices submitted by **CONTRACTOR**.

5. TERM OF AGREEMENT.

The term of this Agreement shall be for (____) year(s) commencing on _____ and ending on _____. Upon mutual agreement of the parties, and subject to the approval of the City Manager the term of this Agreement may be extended for an additional period of up to (____) year(s).

6. TERMINATION.

A. **Discretionary.** Either party may terminate this Agreement without cause upon thirty (30) days written notice mailed or personally delivered to the other party.

B. **Cause.** Either party may terminate this Agreement for cause upon fifteen (15) days written notice mailed or personally delivered to the other party, and the notified party's failure to cure or correct the cause of the termination, to the reasonable satisfaction of the party giving such notice, within such fifteen (15) day time period.

C. **Effect of Termination.** Upon receipt of notice of termination, neither party shall incur additional obligations under any provision of this Agreement without the prior written consent of the other.

D. **Return of Documents.** Upon termination, any and all **CITY** documents or materials provided to **CONTRACTOR** and any and all of **CONTRACTOR's** documents and materials prepared for or relating to the performance of its duties under this Agreement, shall be delivered to **CITY** as soon as possible, but not later than thirty (30) days after termination.

7. OWNERSHIP OF DOCUMENTS.

The written documents and materials prepared by the **CONTRACTOR** in connection with the performance of its duties under this Agreement, shall be the sole property of **CITY**. **CITY** may use said property for any purpose, including projects not contemplated by this Agreement.

8. INSPECTION AND AUDIT.

Upon reasonable notice, **CONTRACTOR** shall make available to **CITY**, or its agent, for inspection and audit, all documents and materials maintained by **CONTRACTOR** in connection with its performance of its duties under this Agreement. **CONTRACTOR** shall fully cooperate with **CITY** or its agent in any such audit or inspection.

9. ASSIGNABILITY.

The parties agree that they shall not assign or transfer any interest in this Agreement nor the performance of any of their respective obligations hereunder, without the prior written consent of the other party, and any attempt to so assign this Agreement or any rights, duties or obligations arising hereunder shall be void and of no effect.

10. INSURANCE.

A. **Scope of Coverage.** During the term of this Agreement, **CONTRACTOR** shall maintain, at no expense to **CITY**, the following insurance policies:

1. A commercial general liability insurance policy in the minimum amount of one million dollars (\$1,000,000) per occurrence/two million dollars (\$2,000,000) aggregate, for death, bodily injury, personal injury, or property damage.

2. An automobile liability (owned, non-owned, and hired vehicles) insurance policy in the minimum amount of one million dollars (\$1,000,000) dollars per occurrence.

3. If any licensed professional performs any of the services required to be performed under this Agreement, a professional liability insurance policy in the minimum amount of two million dollars (\$2,000,000) per occurrence/four million dollars (\$4,000,000) aggregate, to cover any claims arising out of the **CONTRACTOR's** performance of services under this Agreement. Where **CONTRACTOR** is a professional not required to have a professional license, **CITY** reserves the right to require **CONTRACTOR** to provide professional liability insurance pursuant to this section.

4. If it employs any person, **CONTRACTOR** shall maintain worker's compensation insurance, as required by the State of California, with statutory limits, and employer's liability insurance with limits of no less than one million dollars (\$1,000,000) per accident for bodily injury or disease. **CONTRACTOR's** worker's compensation insurance shall be specifically endorsed to waive any right of subrogation against **CITY**.

B. **Other Insurance Requirements.** The insurance coverage required of the **CONTRACTOR** in subparagraph A of this section above shall also meet the following requirements:

1. Except for professional liability insurance or worker's compensation insurance, the insurance policies shall be specifically endorsed to include the **CITY**, its officers, agents, employees, and volunteers, as additional insureds (for both ongoing and completed

operations) under the policies.

2. The additional insured coverage under **CONTRACTOR'S** insurance policies shall be "primary and non contributory" with respect to any insurance or coverage maintained by **CITY** and shall not call upon **CITY's** insurance or self-insurance coverage for any contribution. The "primary and noncontributory" coverage in **CONTRACTOR'S** policies shall be at least as broad as ISO form CG20 01 04 13.

3. Except for professional liability insurance or worker's compensation insurance, the insurance policies shall include, in their text or by endorsement, coverage for contractual liability and personal injury.

4. By execution of this Agreement, **CONTRACTOR** hereby grants to **CITY** a waiver of any right to subrogation which any insurer of **CONTRACTOR** may acquire against **CITY** by virtue of the payment of any loss under such insurance. **CONTRACTOR** agrees to obtain any endorsement that may be necessary to effect this waiver of subrogation, but this provision applies regardless of whether or not **CITY** has received a waiver of subrogation endorsement from the insurer.

5. If the insurance is written on a Claims Made Form, then, following termination of this Agreement, said insurance coverage shall survive for a period of not less than five years.

6. The insurance policies shall provide for a retroactive date of placement coinciding with the effective date of this Agreement.

7. The limits of insurance required in this Agreement may be satisfied by a combination of primary and umbrella or excess insurance. Any umbrella or excess insurance shall contain or be endorsed to contain a provision that such coverage shall also apply on a primary and noncontributory basis for the benefit of **CITY** (if agreed to in a written contract or agreement) before **CITY'S** own insurance or self-insurance shall be called upon to protect it as a named insured.

8. It shall be a requirement under this Agreement that any available insurance proceeds broader than or in excess of the specified minimum insurance coverage requirements and/or limits shall be available to **CITY** or any other additional insured party. Furthermore, the requirements for coverage and limits shall be: (1) the minimum coverage and limits specified in this Agreement; or (2) the broader coverage and maximum limits of coverage of any insurance policy or proceeds available to the named insured; whichever is greater. No representation is made that the minimum Insurance requirements of this agreement are sufficient to cover the obligations of the **CONTRACTOR** under this agreement.

C. **Deductibles and SIR's.** Any deductibles or self-insured retentions in **CONTRACTOR's** insurance policies must be declared to and approved by the **PROJECT MANAGER** and City Attorney, and shall not reduce the limits of liability. Policies containing any self-insured retention (SIR) provision shall provide or be endorsed to provide that the SIR may be satisfied by either the named insured or **CITY** or other additional insured party. At **CITY's** option, the deductibles or self-insured retentions with respect to **CITY** shall be reduced or eliminated to

CITY's satisfaction, or **CONTRACTOR** shall procure a bond guaranteeing payment of losses and related investigations, claims administration, attorney's fees and defense expenses.

D. **Proof of Insurance.** **CONTRACTOR** shall provide to the PROJECT MANAGER or **CITY'S** City Attorney all of the following: (1) Certificates of Insurance evidencing the insurance coverage required in this Agreement; (2) a copy of the policy declaration page and/or endorsement page listing all policy endorsements for the commercial general liability policy, and (3) excerpts of policy language or specific endorsements evidencing the other insurance requirements set forth in this Agreement. **CITY** reserves the right to obtain a full certified copy of any insurance policy and endorsements from **CONTRACTOR**. Failure to exercise this right shall not constitute a waiver of the right to exercise it later. The insurance shall be approved as to form and sufficiency by PROJECT MANAGER and the City Attorney.

11. INDEMNIFICATION.

A. Except as otherwise provided in Paragraph B., **CONTRACTOR** shall, to the fullest extent permitted by law, indemnify, release, defend with counsel approved by **CITY**, and hold harmless **CITY**, its officers, agents, employees and volunteers (collectively, the "**City Indemnitees**"), from and against any claim, demand, suit, judgment, loss, liability or expense of any kind, including but not limited to attorney's fees, expert fees and all other costs and fees of litigation, (collectively "**CLAIMS**"), arising out of **CONTRACTOR'S** performance of its obligations or conduct of its operations under this Agreement. The **CONTRACTOR's** obligations apply regardless of whether or not a liability is caused or contributed to by the active or passive negligence of the **City Indemnitees**. However, to the extent that liability is caused by the active negligence or willful misconduct of the **City Indemnitees**, the **CONTRACTOR's** indemnification obligation shall be reduced in proportion to the **City Indemnitees'** share of liability for the active negligence or willful misconduct. In addition, the acceptance or approval of the **CONTRACTOR's** work or work product by the **CITY** or any of its directors, officers or employees shall not relieve or reduce the **CONTRACTOR's** indemnification obligations. In the event the **City Indemnitees** are made a party to any action, lawsuit, or other adversarial proceeding arising from **CONTRACTOR'S** performance of or operations under this Agreement, **CONTRACTOR** shall provide a defense to the **City Indemnitees** or at **CITY'S** option reimburse the **City Indemnitees** their costs of defense, including reasonable attorneys' fees, incurred in defense of such claims.

B. Where the services to be provided by **CONTRACTOR** under this Agreement are design professional services to be performed by a design professional as that term is defined under Civil Code Section 2782.8, then, to the extent permitted by law including without limitation, Civil Code sections 2782, 2782.6 and 2782.8, **CONTRACTOR** shall indemnify and hold harmless the **CITY** and its officers, officials, and employees (collectively **City Indemnitees**) from and against damages, liabilities or costs (including incidental damages. Court costs, reasonable attorney's fees as may be determined by the Court, litigation expenses and fees of expert witnesses incurred in connection therewith and costs of investigation) to the extent they are caused by the negligence, recklessness, or willful misconduct of **CONTRACTOR**, or any subconsultants, or subcontractor or anyone directly or indirectly employed by them, or anyone for whom they are legally liable (collectively Liabilities). Such obligation to hold harmless and indemnify any indemnity shall not

apply to the extent that such Liabilities are caused in part by the negligence or willful misconduct of such City Indemnitee.

C. The defense and indemnification obligations of this Agreement are undertaken in addition to, and shall not in any way be limited by, the insurance obligations contained in this Agreement, and shall survive the termination or completion of this Agreement for the full period of time allowed by law.

12. NONDISCRIMINATION.

CONTRACTOR shall not discriminate, in any way, against any person on the basis of age, sex, race, color, religion, ancestry, national origin or disability in connection with or related to the performance of its duties and obligations under this Agreement.

13. COMPLIANCE WITH ALL LAWS.

CONTRACTOR shall observe and comply with all applicable federal, state and local laws, ordinances, codes and regulations, in the performance of its duties and obligations under this Agreement. **CONTRACTOR** shall perform all services under this Agreement in accordance with these laws, ordinances, codes and regulations. **CONTRACTOR** shall release, defend, indemnify and hold harmless **CITY**, its officers, agents and employees from any and all damages, liabilities, penalties, fines and all other consequences from any noncompliance or violation of any laws, ordinances, codes or regulations.

14. NO THIRD PARTY BENEFICIARIES.

CITY and **CONTRACTOR** do not intend, by any provision of this Agreement, to create in any third party, any benefit or right owed by one party, under the terms and conditions of this Agreement, to the other party.

15. NOTICES.

All notices and other communications required or permitted to be given under this Agreement, including any notice of change of address, shall be in writing and given by personal delivery, or deposited with the United States Postal Service, postage prepaid, addressed to the parties intended to be notified. Notice shall be deemed given as of the date of personal delivery, or if mailed, upon the date of deposit with the United States Postal Service. Notice shall be given as follows:

TO **CITY**'s Project Manager:

City of San Rafael
1400 Fifth Avenue
P.O. Box 151560
San Rafael, CA 94915-1560

TO **CONTRACTOR**'s Project Director:

16. INDEPENDENT CONTRACTOR.

For the purposes, and for the duration, of this Agreement, **CONTRACTOR**, its officers, agents and employees shall act in the capacity of an Independent Contractor, and not as employees of the **CITY**. **CONTRACTOR** and **CITY** expressly intend and agree that the status of **CONTRACTOR**, its officers, agents and employees be that of an Independent Contractor and not that of an employee of **CITY**.

17. ENTIRE AGREEMENT -- AMENDMENTS.

A. The terms and conditions of this Agreement, all exhibits attached, and all documents expressly incorporated by reference, represent the entire Agreement of the parties with respect to the subject matter of this Agreement.

B. This written Agreement shall supersede any and all prior agreements, oral or written, regarding the subject matter between the **CONTRACTOR** and the **CITY**.

C. No other agreement, promise or statement, written or oral, relating to the subject matter of this Agreement, shall be valid or binding, except by way of a written amendment to this Agreement.

D. The terms and conditions of this Agreement shall not be altered or modified except by a written amendment to this Agreement signed by the **CONTRACTOR** and the **CITY**.

E. If any conflicts arise between the terms and conditions of this Agreement, and the terms and conditions of the attached exhibits or the documents expressly incorporated by reference, the terms and conditions of this Agreement shall control.

18. SET-OFF AGAINST DEBTS.

CONTRACTOR agrees that **CITY** may deduct from any payment due to **CONTRACTOR** under this Agreement, any monies which **CONTRACTOR** owes **CITY** under any ordinance, agreement, contract or resolution for any unpaid taxes, fees, licenses, assessments, unpaid checks or other amounts.

19. WAIVERS.

The waiver by either party of any breach or violation of any term, covenant or condition of this Agreement, or of any ordinance, law or regulation, shall not be deemed to be a waiver of any other term, covenant, condition, ordinance, law or regulation, or of any subsequent breach or violation of the same or other term, covenant, condition, ordinance, law or regulation. The subsequent acceptance by either party of any fee, performance, or other consideration which may become due or owing under this Agreement, shall not be deemed to be a waiver of any preceding breach or violation

by the other party of any term, condition, covenant of this Agreement or any applicable law, ordinance or regulation.

20. COSTS AND ATTORNEY'S FEES.

The prevailing party in any action brought to enforce the terms and conditions of this Agreement, or arising out of the performance of this Agreement, may recover its reasonable costs (including claims administration) and attorney's fees expended in connection with such action.

21. CITY BUSINESS LICENSE / OTHER TAXES.

CONTRACTOR shall obtain and maintain during the duration of this Agreement, a **CITY** business license as required by the San Rafael Municipal Code **CONTRACTOR** shall pay any and all state and federal taxes and any other applicable taxes. **CITY** shall not be required to pay for any work performed under this Agreement, until **CONTRACTOR** has provided **CITY** with a completed Internal Revenue Service Form W-9 (Request for Taxpayer Identification Number and Certification).

22. SURVIVAL OF TERMS.

Any terms of this Agreement that by their nature extend beyond the term (or termination) of this Agreement shall remain in effect until fulfilled, and shall apply to both Parties' respective successors and assigns.

23. APPLICABLE LAW.

The laws of the State of California shall govern this Agreement.

24. COUNTERPARTS AND ELECTRONIC SIGNATURE.

This Agreement may be executed in any number of counterparts, each of which shall be deemed an original, but all of which together shall constitute one document. Counterpart signature pages may be delivered by telecopier, email or other means of electronic transmission.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the day, month and year first above written.

CITY OF SAN RAFAEL

CONTRACTOR

JIM SCHUTZ, City Manager

By:_____

Name:_____

Title:_____

ATTEST:

LINDSAY LARA, City Clerk

APPROVED AS TO FORM:

ROBERT F. EPSTEIN, City Attorney

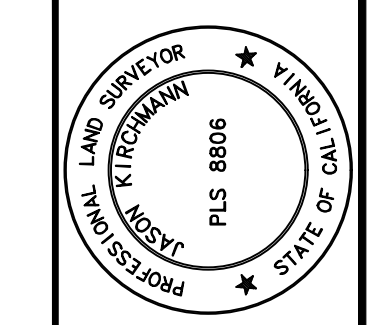
[If Contractor is a corporation, add signature of second corporate officer]

By: _____

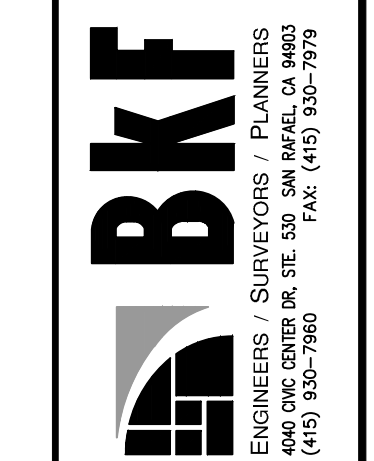
Name: _____

Title: _____

Attachment 2 – Topographic Survey



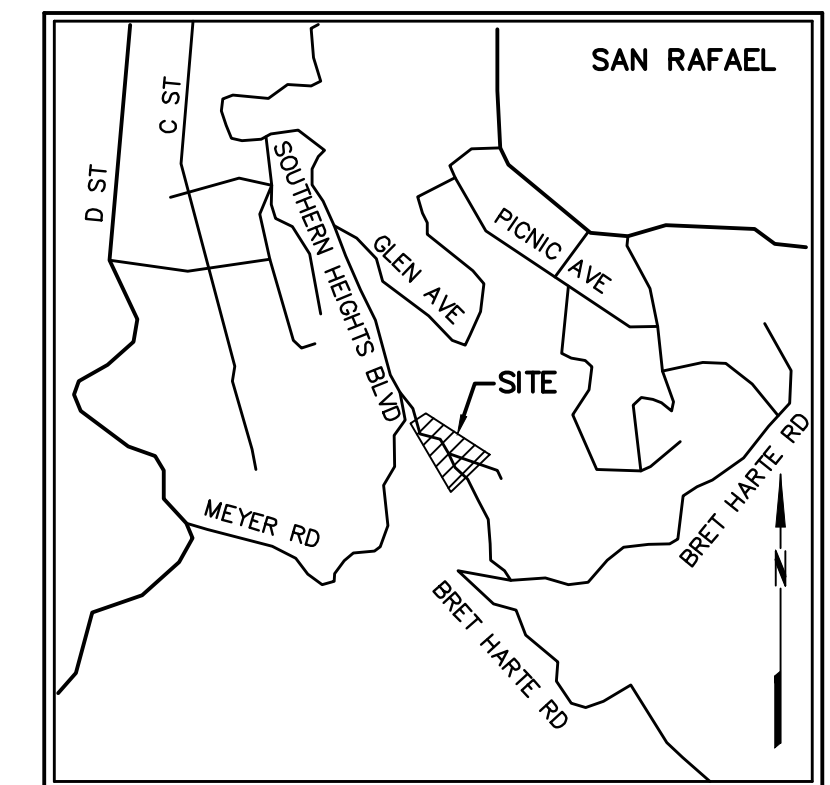
06/27/2019
JASON KIRCHMANN
 PLS 8806



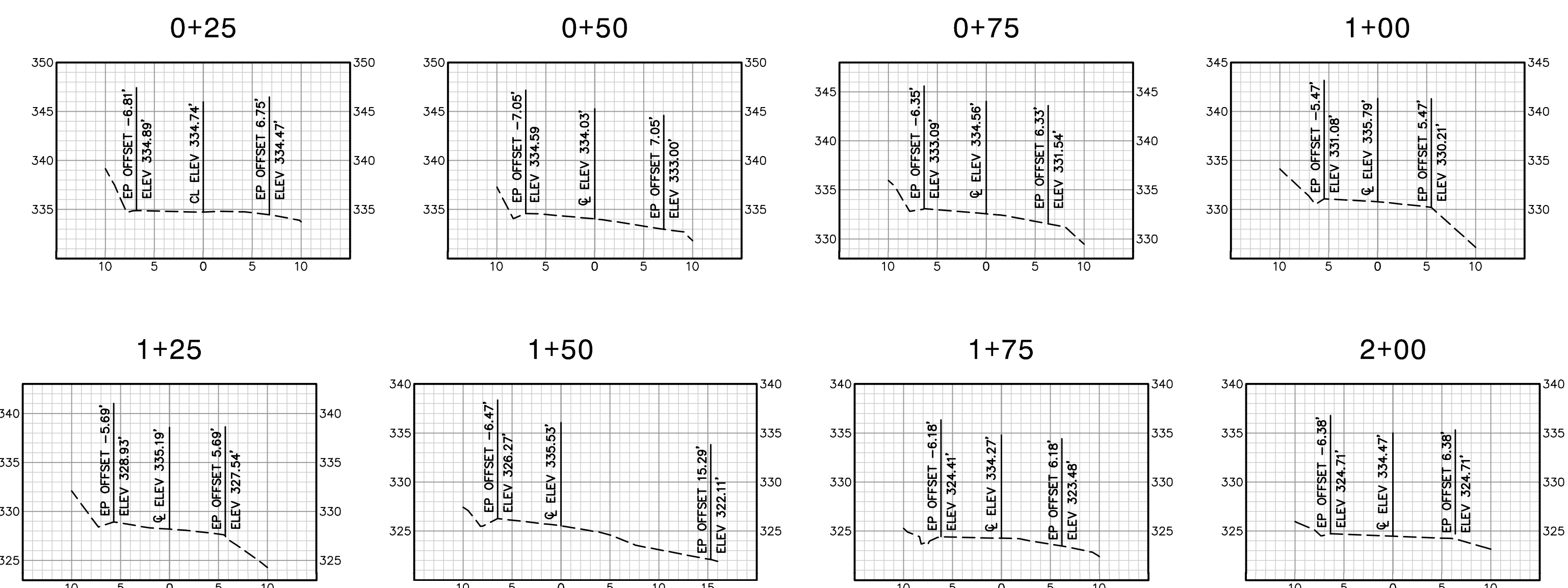
SOUTHERN HEIGHTS BLVD AT COURTRIGHT RD
 SAN RAFAEL, CALIFORNIA
TOPOGRAPHIC MAP

Revisions	
No.	Description

Date: JUN 2019	Scale: AS SHOWN
Design: N/A	Drawn: DAC
Approved: JAK	Job No: 2019023-56
Drawing Number:	



VICINITY MAP
 NOT TO SCALE



CROSS SECTIONS
 1" = 10'

- SYMBOLS & LEGEND**
- EXISTING**
- BENCHMARK
 - VALVE
 - FIRE HYDRANT
 - SIGN
 - GUY ANCHOR
 - UTILITY POLE
 - TREE
 - FLOW LINE
 - WIRE FENCE
 - STORM DRAIN
 - OVERHEAD UTILITY LINE

- ABBREVIATIONS**
- AC ASPHALT CONCRETE
 - AD AREA DRAIN
 - CL CENTERLINE
 - E EAST
 - ELEV ELEVATION
 - EP EDGE OF PAVEMENT
 - FL FLOWLINE
 - INV BOTTOM INSIDE OF PIPE
 - MB MAILBOX
 - MH MANHOLE
 - N NORTH
 - OH OVERHEAD UTILITY LINE
 - S SOUTH
 - SD STORM DRAIN
 - #-IN DIAMETER OF TREE TRUNK (INCHES)

TOPOGRAPHIC NOTES

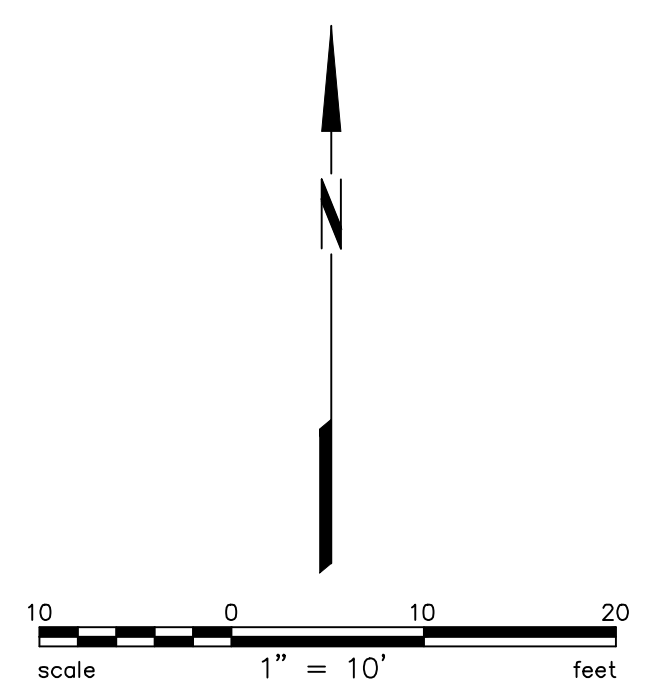
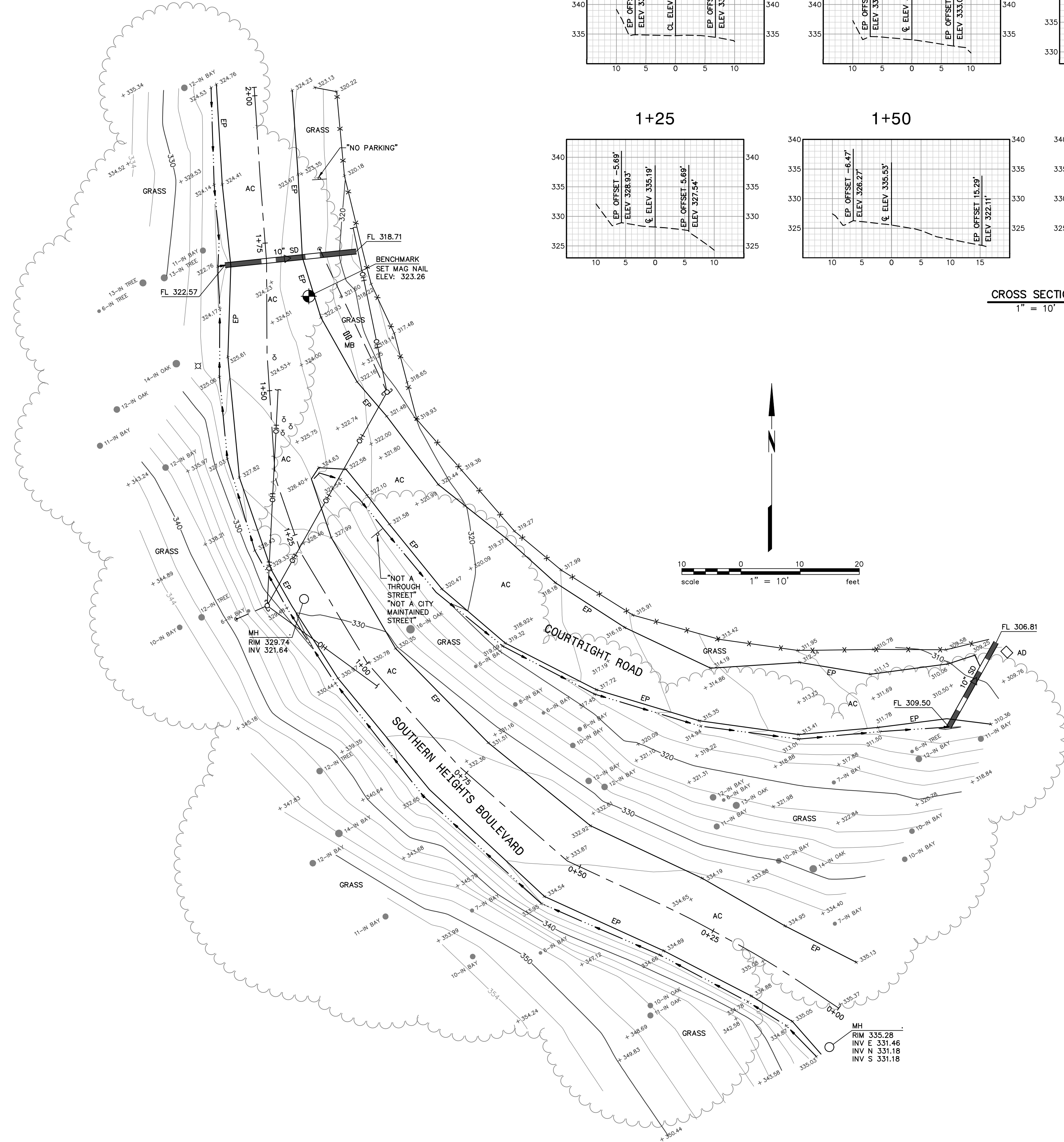
UNAUTHORIZED CHANGES & USES: THE PROFESSIONAL PREPARING THIS MAP WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THIS MAP. CHANGES TO THIS MAP MUST BE REQUESTED IN WRITING AND MUST BE APPROVED BY THE PROFESSIONAL.

THE LOCATIONS OF EXISTING UNDERGROUND FACILITIES SHOWN ON THESE DRAWINGS ARE APPROXIMATE AND ARE BASED ON OBSERVED TOPOGRAPHIC SURFACE FEATURES. THE PROFESSIONAL PREPARING THIS MAP ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THESE FACILITIES OR FOR THE INADVERTENT OMISSION OF RELATED INFORMATION.

TREE DIAMETERS ARE MEASURED AT CHEST HEIGHT (48"). DRIPLINE DIAMETERS AND TREE SPECIES ARE APPROXIMATE ONLY AND SHOULD BE VERIFIED BY A CERTIFIED ARBORIST.

BENCHMARK: MAG NAIL, LOCATION SHOWN HEREON, ELEVATION 323.26' (DATUM NAVD 88 BY GPS OBSERVATIONS UTILIZING THE CALIFORNIA SURVEY & DRAFTING SUPPLY VSN).

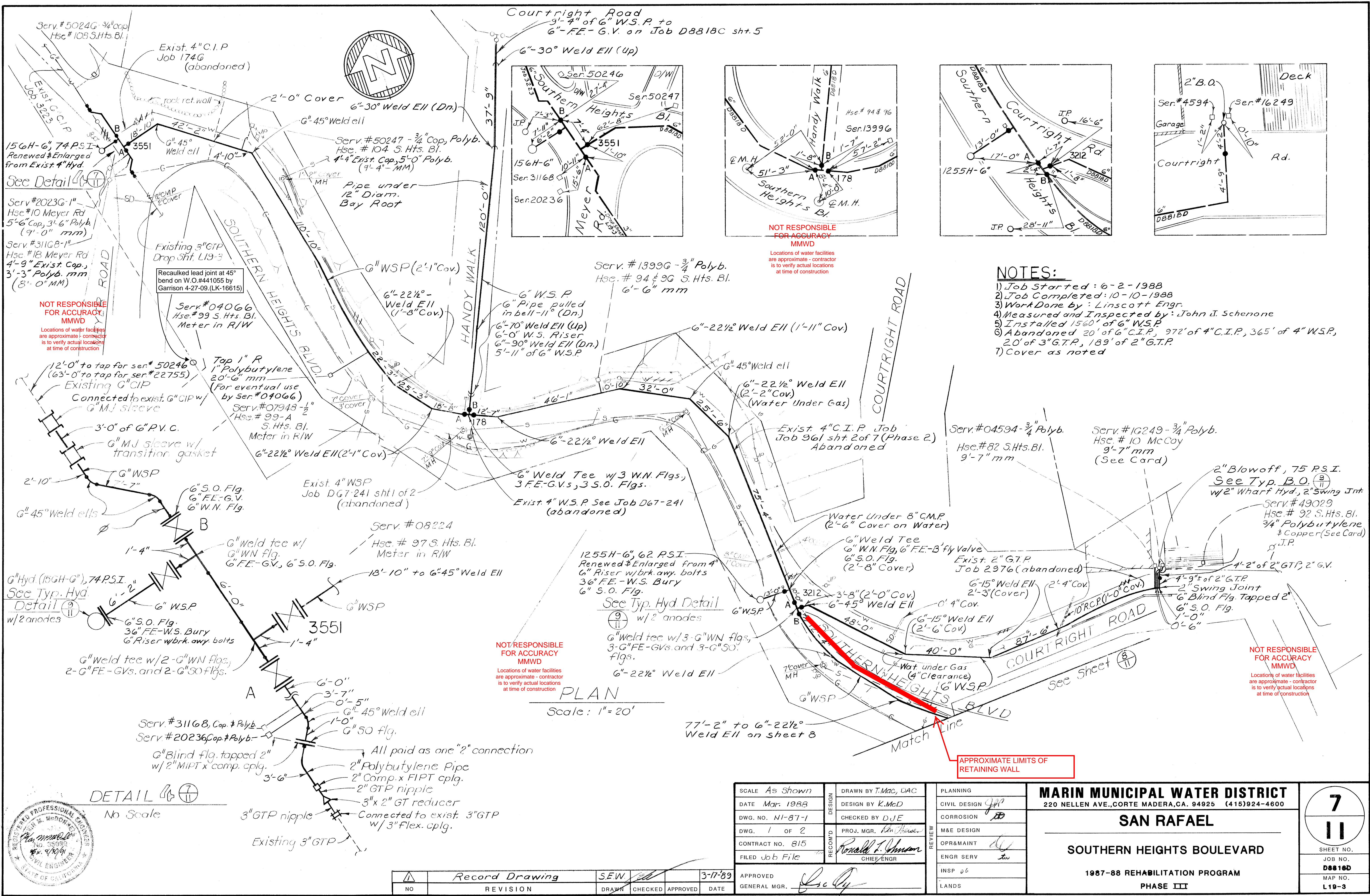
FIELD SURVEY DATE: JUNE 18, 2019



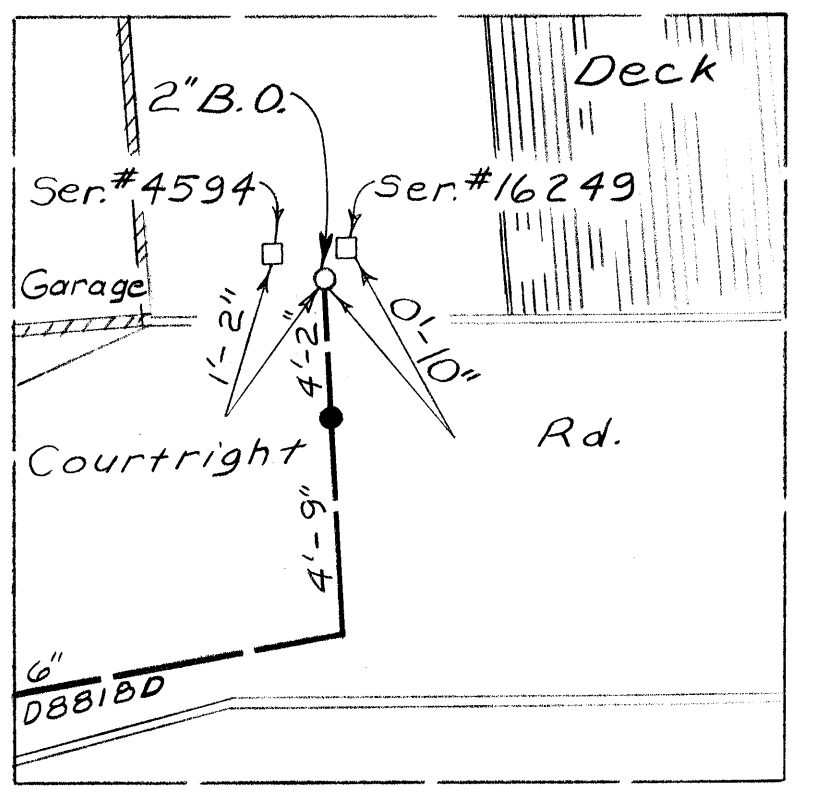
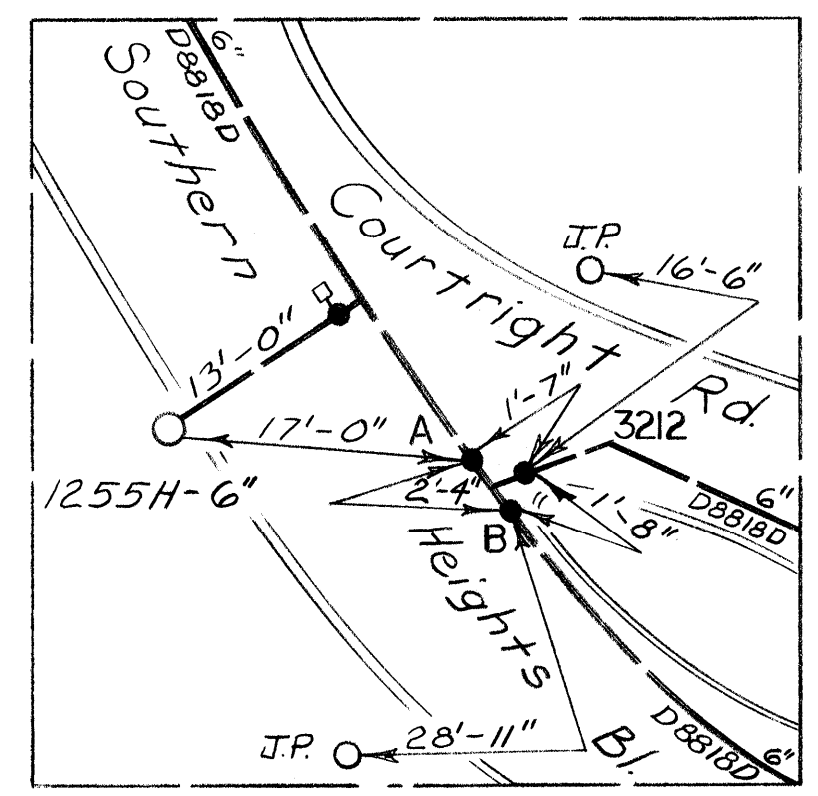
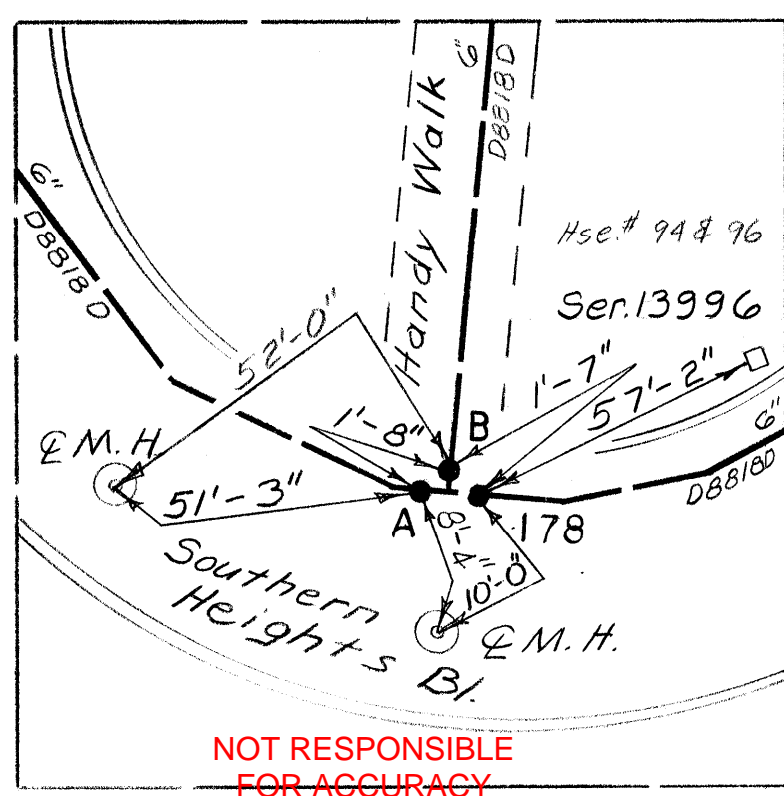
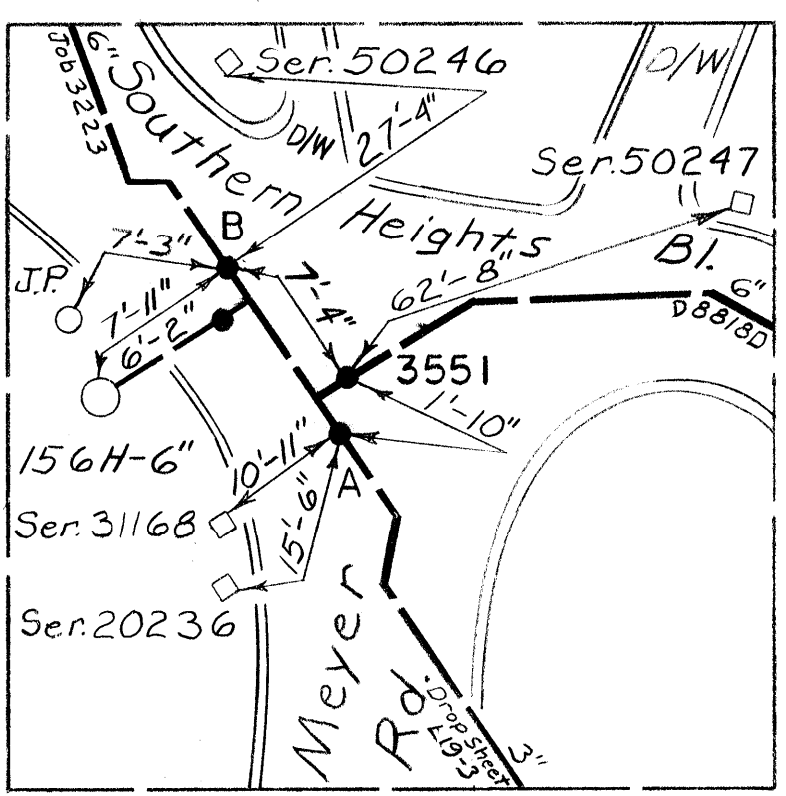
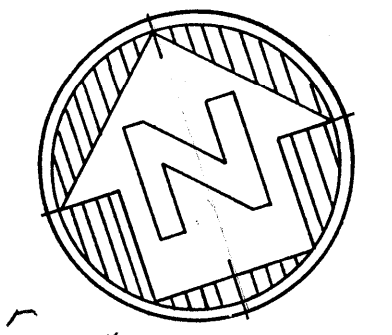
Attachment 3 – Existing Conditions Photos



Attachment 4 – MMWD Facility Map



Courtright Road
 9'-4" of 6" W.S.P. to
 6"-FE-G.V. on Job D8818C sht. 5



NOT RESPONSIBLE
 FOR ACCURACY
 MMWD
 Locations of water facilities
 are approximate - contractor
 is to verify actual locations
 at time of construction

NOTES:

- 1) Job Started: 6-2-1988
- 2) Job Completed: 10-10-1988
- 3) Work Done by: Linscott Engr.
- 4) Measured and Inspected by: John J. Schenone
- 5) Installed 1560' of 6" W.S.P.
- 6) Abandoned 20' of 6" C.I.P., 972' of 4" C.I.P., 365' of 4" W.S.P., 20' of 3" G.T.P., 189' of 2" G.T.P.
- 7) Cover as noted

NOT RESPONSIBLE
 FOR ACCURACY
 MMWD
 Locations of water facilities
 are approximate - contractor
 is to verify actual locations
 at time of construction

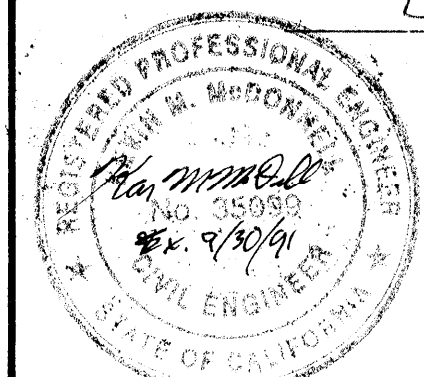
NOT RESPONSIBLE
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 Locations of water facilities
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NOT RESPONSIBLE
 FOR ACCURACY
 MMWD
 Locations of water facilities
 are approximate - contractor
 is to verify actual locations
 at time of construction

PLAN
 Scale: 1" = 20'

APPROXIMATE LIMITS OF
 RETAINING WALL

DETAIL
 No Scale



3" GTP nipple
 Existing 3" GTP
 G" Blind flg. tapped 2"
 w/ 2" MIPT x comp. cplg.
 2" Polybutylene Pipe
 2" Comp. x FIPT cplg.
 2" GTP nipple
 3" x 2" GT reducer
 Connected to exist. 3" GTP
 w/ 3" Flex. cplg.
 All paid as one "2" connection

SCALE As Shown	DESIGN DRAWN BY T. Mac, DAC	PLANNING	MARIN MUNICIPAL WATER DISTRICT 220 NELLEN AVE., CORTE MADERA, CA. 94925 (415) 924-4600 SAN RAFAEL SOUTHERN HEIGHTS BOULEVARD 1987-88 REHABILITATION PROGRAM PHASE III
DATE Mar. 1988	DESIGN BY K. McD	CIVIL DESIGN J.P.	
DWG. NO. NI-87-1	CHECKED BY D.J.E	CORROSION J.P.	
DWG. 1 OF 2	PROJ. MGR. Ron Schenone	M&E DESIGN	
CONTRACT NO. 815	RODOLPH J. SCHENONE CHIEF ENGR	OP&MAINT J.P.	
FILED Job File		ENGR SERV J.P.	
		LANDS	

NO	REVISION	DRAWN	CHECKED	APPROVED	DATE
	Record Drawing	SEW			3-17-89

7

11

SHEET NO.
 JOB NO.
D8818D
 MAP NO.
L19-3

Attachment 5 – Geotechnical Report



July 18, 2019
File: 2740.001rpt.doc

Mr. T. Peter Pierce, Esq.
RICHARDS WATSON GERSHON
44 Montgomery Street, Suite 3800
San Francisco, California 94104

Re: Geotechnical Evaluation
82 - 92 Southern Heights
San Rafael, California

Introduction and Project Background

This letter presents the results of our Geotechnical Investigation and recommended mitigation measures for a span of Southern Heights Boulevard in San Rafael, California, where drainage, erosion, and soil creep concerns have been reported.

The project area is shown on the Site Location Map, Figure 1, and encompasses a portion of a steep, northeasterly-facing hillside in southern San Rafael. A portion of Southern Heights, in the vicinity of residences 82 - 92, has visible cracking of the roadway surface from apparent lateral soil creep and settlement along the downslope side of the roadway. The distressed portion of roadway encompasses an approximately 6-foot-wide area that extends about 70-feet. The approximate limits of the distressed roadway are shown on the Site Plan, Figure 2.

The purpose of our services is to investigate soil and groundwater conditions within the project area, and to provide geotechnical recommendations and criteria for use in the design and construction of the stabilization measures. Our scope includes reviewing readily available geologic information, exploring subsurface conditions with two soil borings, and preparation of this report which summarizes our subsurface exploration, conceptual repair alternatives and geotechnical recommendations and design criteria.

Regional Geology and Seismicity

Regional geologic mapping¹ shows the site is underlain by Franciscan mélange which generally consists of a tectonic mixture of resistant rock types embedded in a matrix of pervasively sheared or pulverized rock material. Sandstone masses are mapped within the mélange near the site vicinity. The mapping further indicates that the northern portion of the project area is underlain by colluvial soils. Several landslides are mapped on the slopes near the site, with a relatively large landslide mapped east of the site, extending over Southern Heights. A Regional Geologic Map and descriptions of the mapped geologic units are shown on Figure 3.

The project site is located within the seismically active San Francisco Bay Area and will therefore experience the effects of future earthquakes. The California Division of Mines and Geology has mapped various active and inactive faults in the region. These faults are shown in relation to the project site on the attached Active Fault Map, Figure 4. The nearest known active faults to the site are the San Andreas and Hayward Faults which are located approximately 14.0 kilometers and 14.0 kilometers to the southwest and northeast, respectively.

¹ California Division of Mines and Geology, "Geology of the Eastern Part of the San Rafael Area, Marin County, California" (Open-File Report 76-2 SF, Plate 1C), 1976.

Surface Conditions

As shown on Figure 2, the distressed portion of roadway is located on Southern Heights, which ascends from the southeastern portion of the property at 94 Southern Heights upwards toward 78 Southern Heights. A downslope fork off Southern Heights (also known as Courtright) provides access to residences 82 through 92. The roadways appear to be constructed by cutting into the hillside and filling on the downslope side of the roadway. The slope between the diverging segments of Southern Heights and Courtright ranges from approximately 0.8:1 (horizontal:vertical) at the north end to 1.7:1 towards the south end. The slope is moderately vegetated with many, small diameter trees in place. Existing trees showed potential evidence for soil creep as some had slightly curved trunks. The upslope cut exposes hard, sandstone bedrock and soil, which appears to be experiencing erosion/minor sloughing as some soil debris was found on the uphill side of the roadway.

The outer portion of Southern Heights has arcuate cracking of the pavement which mirrors the orientation of the roadway. Additionally, settlement of the roadway towards the downslope side was observed. Two layers of sandbags had been placed on the downslope edge of Southern Heights to convey water runoff.

Field Exploration and Laboratory Testing

We explored subsurface conditions within the distressed portion of Southern Heights on March 27, 2019 with two borings at the approximate locations shown on Figure 2. Our borings were excavated to maximum explored depths of approximately 20.0-feet using a track-mounted drilling rig with 3.0-inch solid-stem continuous flight augers. Soil and rock materials encountered were logged by our Geologist and samples were obtained from select intervals for laboratory testing. A brief description of the terms and methodology used in classifying earth materials is shown on the Soil Classification Chart, Figure A-1, and the Rock Classification Chart, Figure A-2. The exploratory boring logs are shown on Figures A-3 and A-4.

Geotechnical laboratory testing for the project was performed in general accordance with applicable ASTM standards and included determination of moisture content, dry density, unconfined compressive strength, and soil plasticity. The results of our laboratory tests are presented on the boring logs and our laboratory testing program is discussed in greater detail in Appendix A.

Subsurface Conditions

Based on the results of our exploration, subsurface conditions at the site generally reflect the regionally-mapped geology. The borings indicate the project area is underlain by approximately 7.0- to 8.0-feet of fill consisting of soft to medium stiff, sandy clay with trace gravels. The fill is underlain by about 2.0-feet of sandy clay residual soils over shale bedrock that is hard and strong.

Groundwater was not encountered in Boring 1 but was encountered in Boring 2 at a depth of 6.0-feet upon completion. Since the borings were not left open for an extended period of time, a stabilized depth to groundwater may not have been observed. Groundwater elevations fluctuate seasonally and higher groundwater levels may be present during periods of intense rainfall. The potential also exists for perched water tables within the soils and bedrock.

Geologic Hazards Evaluation

Based on our site reconnaissance observations, geologic mapping, and the results of our subsurface exploration and laboratory testing, we have evaluated a variety of geologic hazards which may affect the site. We judge that primary hazards to be considered during project design include strong seismic ground shaking, erosion, and slope instability. Other hazards, such as fault surface rupture, liquefaction, flooding, settlement, and others, are judged less than significant and are not discussed in detail. More detailed discussion of significant hazards and corresponding conceptual mitigation measures is presented in the following sections.

Seismic Ground Shaking

The site will experience seismic ground shaking similar to other areas in the seismically active Bay Area. The intensity of ground shaking will depend on the characteristics of the causative fault, distance from the fault, the earthquake magnitude and duration, and site-specific geologic conditions. Using the Caltrans ARS Online web application (2017), we have calculated the median peak ground acceleration for various nearby active faults, as presented below in Table A. The acceleration values shown are for an earthquake originating on the closest portion of the fault to the site.

TABLE A
ESTIMATED DETERMINISTIC PEAK GROUND ACCELERATION
82 - 92 Southern Heights
San Rafael, California

<u>Fault</u>	<u>Moment Magnitude for Characteristic Earthquake⁽¹⁾</u>	<u>Closest Estimated Distance⁽¹⁾</u>	<u>Median Peak Ground Acceleration⁽¹⁾</u>
San Andreas	8.0	14.0 km	0.29 g
Hayward	7.3	14.0 km	0.24 g
San Gregorio	7.4	15.0 km	0.23 g
Rodgers Creek	7.3	24.1 km	0.15 g
Mount Diablo	6.6	44.5 km	0.09 g

- (1) California Department of Transportation (Caltrans) (2017), "Caltrans ARS Online", http://dap3.dot.ca.gov/ARS_Online/, Version 2.3.09, accessed April 12, 2018.
 (2) Values calculated using $V_{s30} = 560$ m/s for Site Class C per 2016 CBC.
-

The calculated accelerations in Table A should only be considered as reasonable estimates. Many factors (soil conditions, orientation to the fault, etc.) can influence the actual ground surface accelerations.

Ground shaking can result in structural failure and collapse of structures or induce ground failure or slope instability. Compliance with the provisions of the most recent edition (2016) of the California Building Code (CBC) should result in structures that do not collapse in an earthquake. Hazards associated with falling objects or non-structural building elements will remain.

The potential for strong seismic shaking at the project site is high. Due to their close proximity and historic rate of activity, the San Andreas, Hayward, and San Gregorio Faults present the

highest potential for severe ground shaking. The significant adverse impact associated with strong seismic shaking is potential damage to structures and improvements.

Evaluation: Less than significant with mitigation. Geotechnical recommendations include designing the new repairs in accordance with the most recent edition of the California Building Code (2016), seismic surcharge loads on retaining structure and checking slope stability during strong ground shaking. Site-specific seismic coefficients are presented in the recommendations of this report.

Erosion

Sandy soils on moderately steep slopes or clayey soils on steep slopes are susceptible to erosion when exposed to concentrated surface water flow. The potential for erosion is increased when established vegetation is disturbed or removed. The project site is located in moderately- to steeply-sloping terrain and both the upslope cut and fill slope are highly susceptible to erosion. Surface water flow over the downslope side of the roadway can cause soil erosion and accelerate creep movement. Erosion is considered a significant geologic hazard at the site.

Evaluation: Less than significant with mitigation. Roadway should be regraded to direct surface water to the upslope side of the roadway and into the existing storm drain system that discharges water at appropriate locations (existing drainage ravine). Periodic maintenance and clearing of the swale on the upslope side of the roadway should be performed.

Re-establishment of vegetation on disturbed areas will minimize erosion. Erosion control measures during and after construction should be in accordance with a prepared Storm Water Pollution Prevention Plan and should conform to the most recent version of the Marin County Stormwater Pollution Prevention Program or other appropriate standards.

Slope Instability/Landsliding

The project site is a roadway which has been constructed on a moderately- to steeply- sloping hillside with evidence of erosion and potential soil creep. We judge that left unmitigated, a high risk of slope instability will remain, including further creep / slumping of the downslope edge of the roadway, which could result in more significant landsliding.

Evaluation: Less than significant with mitigation. The existing road damages should be repaired and slope stabilized with a combination of site grading and/or new retaining structures. Conceptual stabilization/mitigation options are discussed in more detail in the following sections of this report.

Road Repair and Slope Stabilization Alternatives and Design Criteria

Conceptual options to stabilize the outer portion are limited considering the steepness of the existing slope between roadways, maintaining vehicular access and existing vegetation. The most favorable option to stabilize the outer portion of the roadway is a drilled pier retaining structure with tiebacks. This option would slightly improve stability of the slope below the wall by reducing driving forces but would not repair the slope. Additional lower walls or installing soil nails and Tecco mesh would be required to stabilize the slope between roadways. The following sections provide a general discussion of these repair alternatives along with geotechnical criteria for use in designing the selected alternative.

Option 1 – Retaining Structure with Deep Foundations

This option would include constructing a new retaining structure along the outboard side of the roadway to stabilize the road, as schematically shown on Figure 6. While various wall systems are feasible, a drilled pier-supported, reinforced concrete wall or soldier pile and lagging wall appears to be most appropriate. Depending upon the wall configuration and height, tiebacks may also be used to provide additional lateral support. Foundation design criteria for a drilled pier- or soldier pile-supported wall is presented in Table B.

TABLE B
FOUNDATION DESIGN CRITERIA
82 - 92 Southern Heights
San Rafael, California

<u>Drilled Piers or Soldier Piles:</u>	
Minimum diameter:	16 inches
Skin friction	
Soil:	300 psf
Shale Bedrock:	2,000 psf
Minimum penetration into bedrock ⁽¹⁾ :	5 feet
Lateral passive resistance ^(2,3)	
2:1 slope below wall:	250 pcf
1:1 slope below wall:	200 pcf

- (1) Depth to firm rock will vary.
 - (2) Apply values over effective width of 2 pier diameters. Ignore upper 2 feet.
 - (3) Equivalent Fluid Pressure, not to exceed 4,000 psf. Neglect upper 3 feet where wall is located on sloping ground.
-

Based on the site conditions and exploratory borings, the retaining structure should be designed to retain soils to a depth of 8 feet and traffic loads. Retaining walls that are free to rotate can be designed using the unrestrained criteria shown below. Walls that are structurally connected and not allowed to deflect (e.g., tied-back walls) are restrained and are commonly designed using a uniform active earth pressure distribution rather than an equivalent fluid pressure. Design criteria for drilled pier- or soldier pile-supported retaining wall systems are summarized in Table C below.

TABLE C
RETAINING WALL DESIGN CRITERIA
82 - 92 Southern Heights
San Rafael, California

<u>Lateral Earth Pressure</u>	<u>Unrestrained^{1,2}</u>	<u>Restrained^{1,3}</u>
Level Ground	40 pcf	25 X H psf
2:1 Slope	60 pcf	35 X H psf
1.5:1 Slope	80 pcf	45 X H psf
<u>Seismic Surcharge³</u>	15 X H psf	
<u>Traffic Surcharge⁴</u>	100 psf	
<u>Soil Nails/Tiebacks⁵</u>		
Min. Diameter	6 inches	
Grouted Holes:		
Skin Friction: Shale Bedrock:	2,000 psf	

Notes:

- (1) Interpolate earth pressures for intermediate slopes.
- (2) Equivalent fluid pressure.
- (3) Rectangular uniform pressure distribution (H = height of wall).
- (4) Rectangular uniform pressure applied to upper five feet of wall. Applies only where traffic loads are within five feet of the wall.
- (5) Soil nails and tiebacks should be designed for load-testing up to 150% of the design load. Load testing to be performed in general accordance with the procedures recommended by the Post-Tensioning Institute.

Wall drainage should consist of either Caltrans Class 1B permeable material within filter fabric or Caltrans Class 2 permeable material. The permeable material should extend at least 12 inches from the back of the wall and be continuous from the bottom of the wall to within 12 inches of the ground surface, as shown on Figure 7. Alternatively, drainage panels, such as Mirafi 100N, may be utilized.

Wall drainage should be collected in a 4-inch-diameter, perforated, and Schedule 40 PVC drain line placed at the base of the wall. Seepage collected in the drain line should be conveyed in a non-perforated pipe to a suitable discharge outlet, preferably into an established storm drainage system or through weep holes in the wall. To maintain the wall drainage system, a cleanout must be provided for the perforated pipe at the upstream end. Sweep fittings should be used at all major changes in direction.

Option 2 – Soil Nails with Tecco® Mesh

This approach could consist of installing soil nails and a Tecco® mesh facing to retain slope below the road, as conceptually shown on Figure 8. Some additional creep movement would need to occur before the mesh and cables transfer load to the soil nails. Thus, the roadway regarding would need to be delayed for about a year. In addition, several of the trees would need to be removed. Mesh and cable can be installed around larger trees. The soil nails would be installed in a grid pattern throughout the slide and the Tecco® mesh (a proprietary, galvanized steel mesh) would be

Mr. T. Peter Pierce, Esq.
Page 7 of 7

July 18, 2019

secured to the soil nails by a series of face plates. A backing material would need to be installed behind the mesh to prevent migration of surficial soils through the mesh. Cables are then installed around the perimeter of the mesh and are tensioned so that the mesh facing is taut. Design criteria for soil nails used to anchor the mesh is presented above in Table C.

Alternatively, a retaining wall could be constructed along the uphill side of Courtright (shared driveway) to support the toe of the slope.

Recommendations / Conclusion

Based on our geotechnical evaluation of various conceptual options, we recommend road repair include a drilled pier and tied-back retaining structure near the upper portion of the slope along with roadway drainage improvements. With all the options, the pavement surface should be ground and overlaid with new asphalt-concrete to slope the road surface towards the uphill side of the roadway.

Supplemental Services

Upon selection of the "preferred" stabilization option, supplemental services may include geo-civil design of the road stabilization (including preparation of full construction plans and technical specifications), geotechnical review of plans prepared by others, and provide observation and testing during construction to ensure conditions are as expected, and the work is performed in accordance with the contract documents.

We trust that this letter contains the information you require at this time. Please do not hesitate to contact us should there be any questions or should you wish to discuss the various stabilization alternatives.

Very truly yours,
MILLER PACIFIC ENGINEERING GROUP

REVIEWED BY:

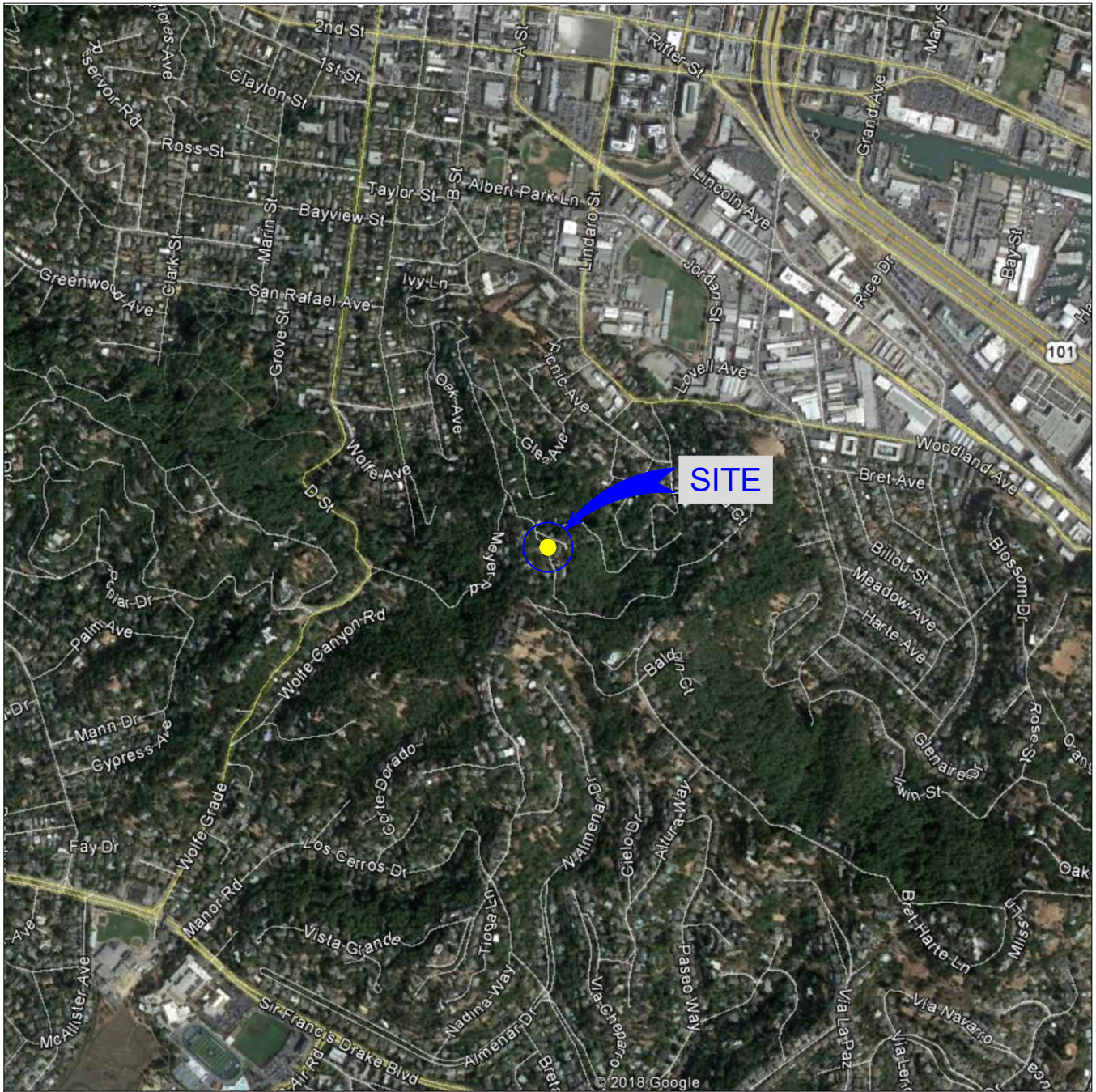


Emily Carreno
Staff Geologist



Scott Stephens
Geotechnical Engineer No. 2398
(Expires 6/30/19)

Attachments: Figures 1 to 8, Appendix A



SITE COORDINATES
 LAT. 37.9608°
 LON. -122.5278°

SITE LOCATION
 N.T.S.



REFERENCE: Google Earth, 2019



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SITE LOCATION MAP

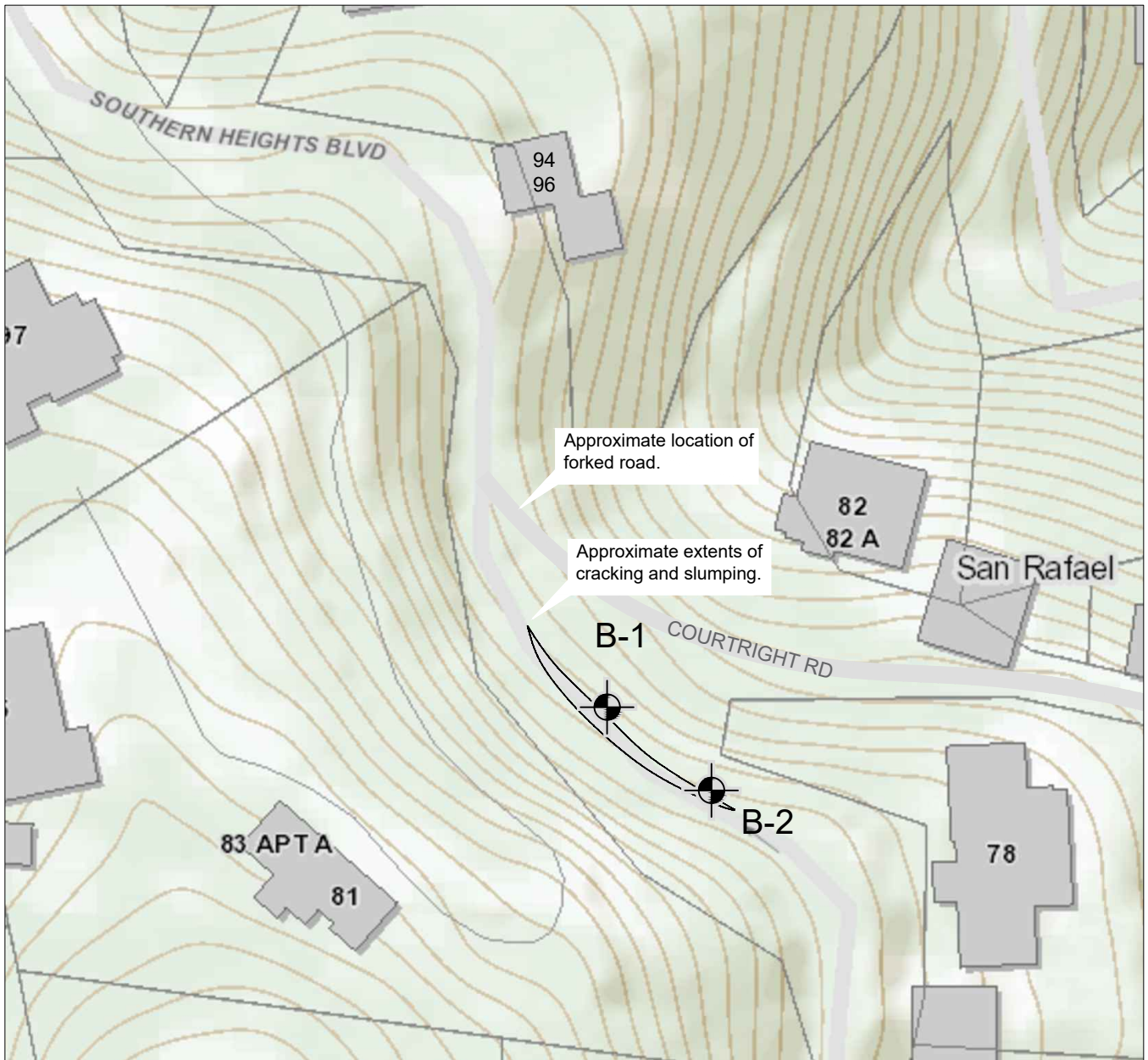
San Rafael Courtright Drainage
 Southern Heights Boulevard
 San Rafael, California

Project No. 2740.001

Date: 4/4/2019

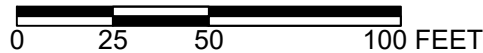
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1
 FIGURE



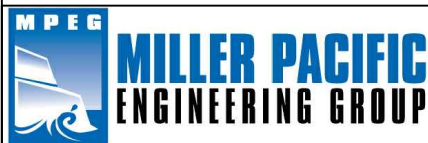
SITE PLAN

SCALE



 Approximate boring location completed by MPEG, 2019

REFERENCE: MarinMap 2019



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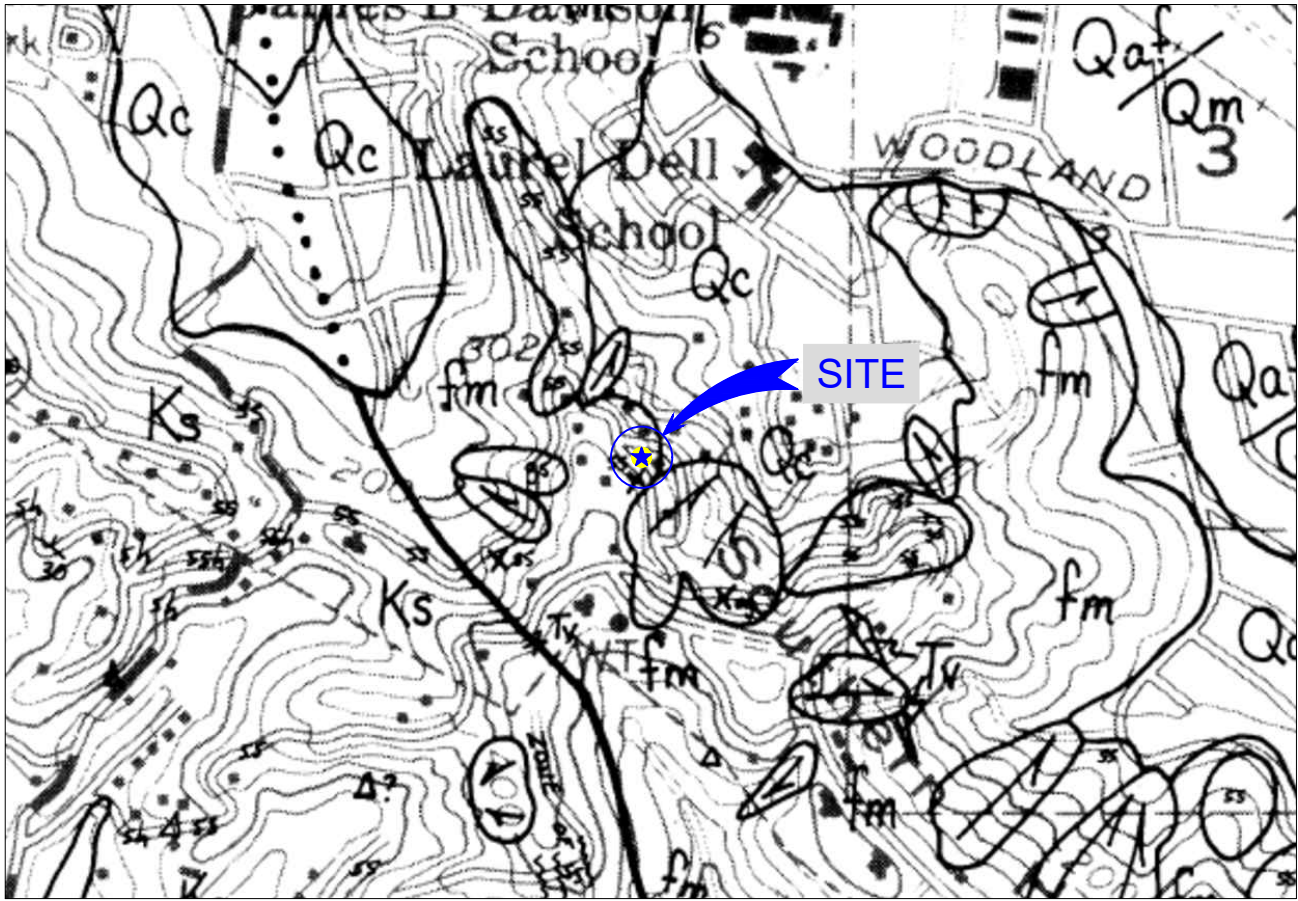
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SITE PLAN

San Rafael Courtright Drainage
 Southern Heights Boulevard
 San Rafael, California
 Project No. 2740.001 Date: 4/4/2019

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2
 FIGURE




REGIONAL GEOLOGIC MAP

(NOT TO SCALE)



LEGEND

- Qaf** **Artificial Fill** [Quaternary] - Includes rock, soil, garbage and trash, or bay mud placed by man. Highly variable composition and degree of compaction from location to location.
-  **Debris Flow Landslides** [Quaternary] - Unconsolidated and unsorted soil and rock debris. Arrows indicate direction of motion.
- Qm** **Bay Mud** [Quaternary] - Marshlands, former marshlands, and mudflats bordering San Francisco and San Pablo Bays. Thick deposits of unconsolidated, low-density, semi-fluid, highly compressible, highly impermeable silty clay.
- Qc** **Colluvium** [Quaternary] - Unconsolidated and unsorted soil material and weathered rock fragments accumulated on or at the base of slopes by gravity. Derived by weathering and decomposition of bedrock material underlying the slopes.
- Ks** **Sandstone and Shale** [Cretaceous] - (ss) Light gray to buff, thickly bedded, medium to coarse grained arkosic sandstone. (sh) Well-bedded siltstone, dark gray where fresh, light gray to buff with iron oxide staining where weathered.
- fm** **Franciscan Melange** [Jurassic] - A tectonic mixture consisting of small to large masses of resistant rock types, principally of sandstone (ss), greenstone (gs), chert (ch), and serpentine (sp), but includes various exotic metamorphic rock types embedded in a matrix of pervasively sheared rock material.

Reference: Rice, S.J., Strand, R.G., and Smith, T.C. (1976), "Geology of the Tiburon Peninsula, Sausalito, and Adjacent Areas, Marin County, California" in *Geology for Planning in Central and Southeastern Marin County, California*, California Department of Conservation, Division of Mines and Geology Open-File Report 76-2 S.F., Plate 1A, Map Scale 1:12,000.



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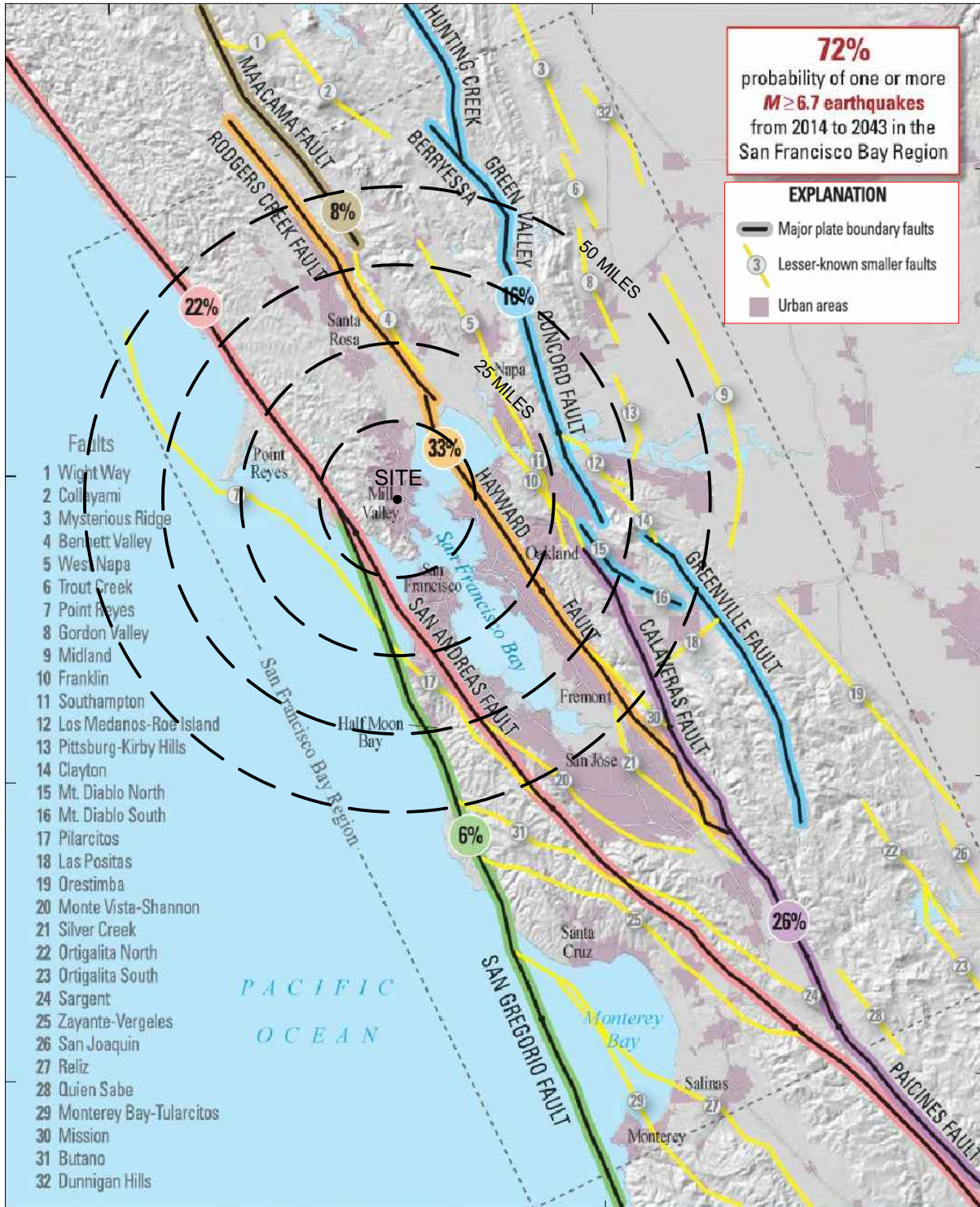
REGIONAL GEOLOGIC MAP

San Rafael Courtright Drainage
Southern Heights Boulevard
San Rafael, California

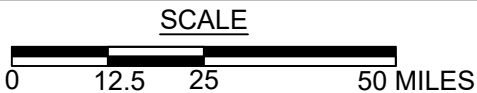
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3

FIGURE



SITE COORDINATES
LAT. 37.9608°
LON. -122.5278°



DATA SOURCE:

1) U.S. Geological Survey, U.S. Department of the Interior, "Earthquake Outlook for the San Francisco Bay Region 2014-2043", Map of Known Active Faults in the San Francisco Bay Region, Fact Sheet 2016-3020, Revised August 2016 (ver. 1.1).



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ACTIVE FAULT MAP

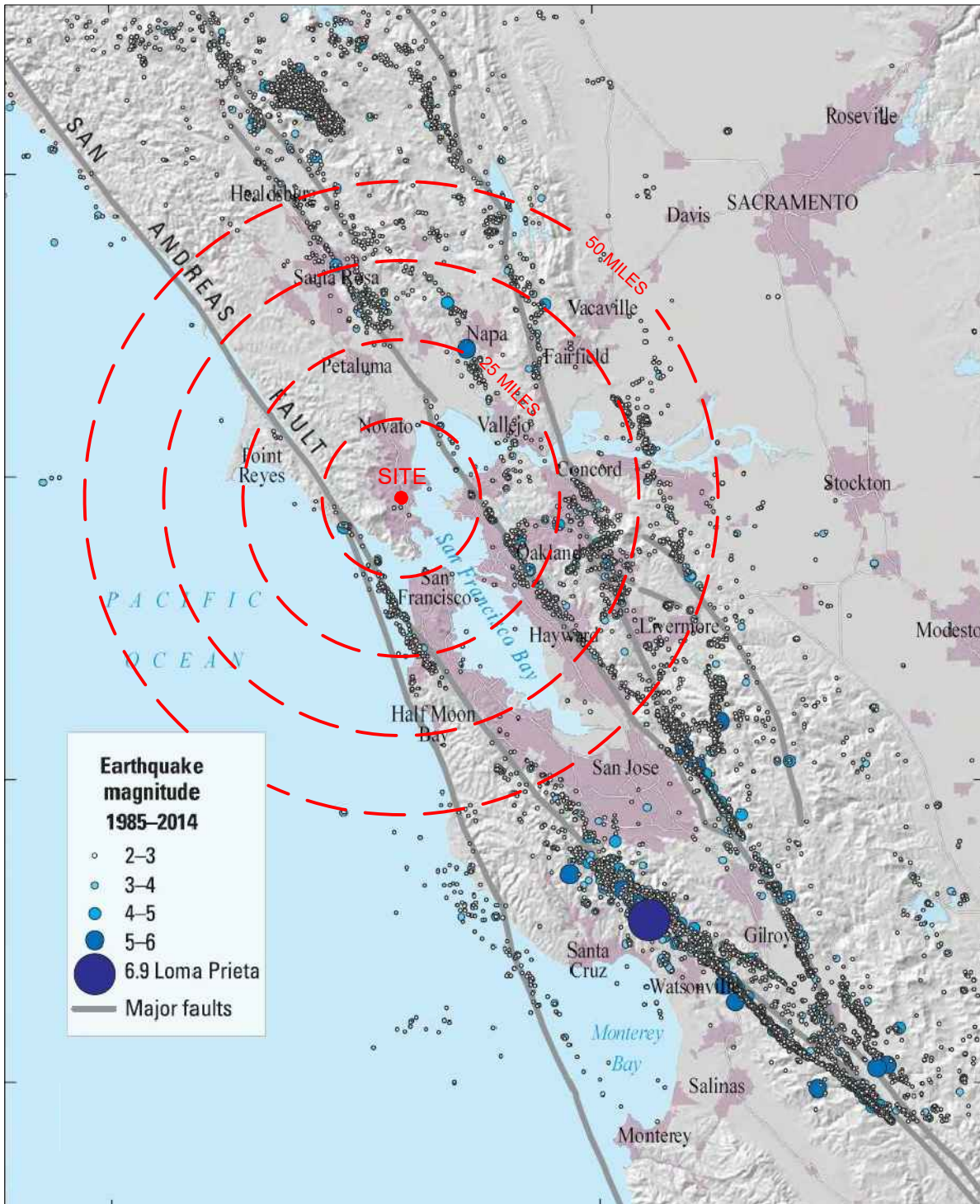
San Rafael Courtright Drainage
Southern Heights Boulevard
San Rafael, California

Project No. 2740.001

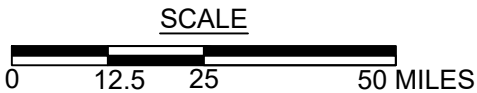
Date: 4/4/2019

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EIC

4
FIGURE



SITE COORDINATES
 LAT. 37.9608°
 LON. -122.5278°



DATA SOURCE:

1) U.S. Geological Survey, U.S. Department of the Interior, "Earthquake Outlook for the San Francisco Bay Region 2014-2043", Map of Earthquakes Greater Than Magnitude 2.0 in the San Francisco Bay Region from 1985-2014, Fact Sheet 2016-3020, Revised August 2016 (ver. 1.1).



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HISTORIC EARTHQUAKE MAP

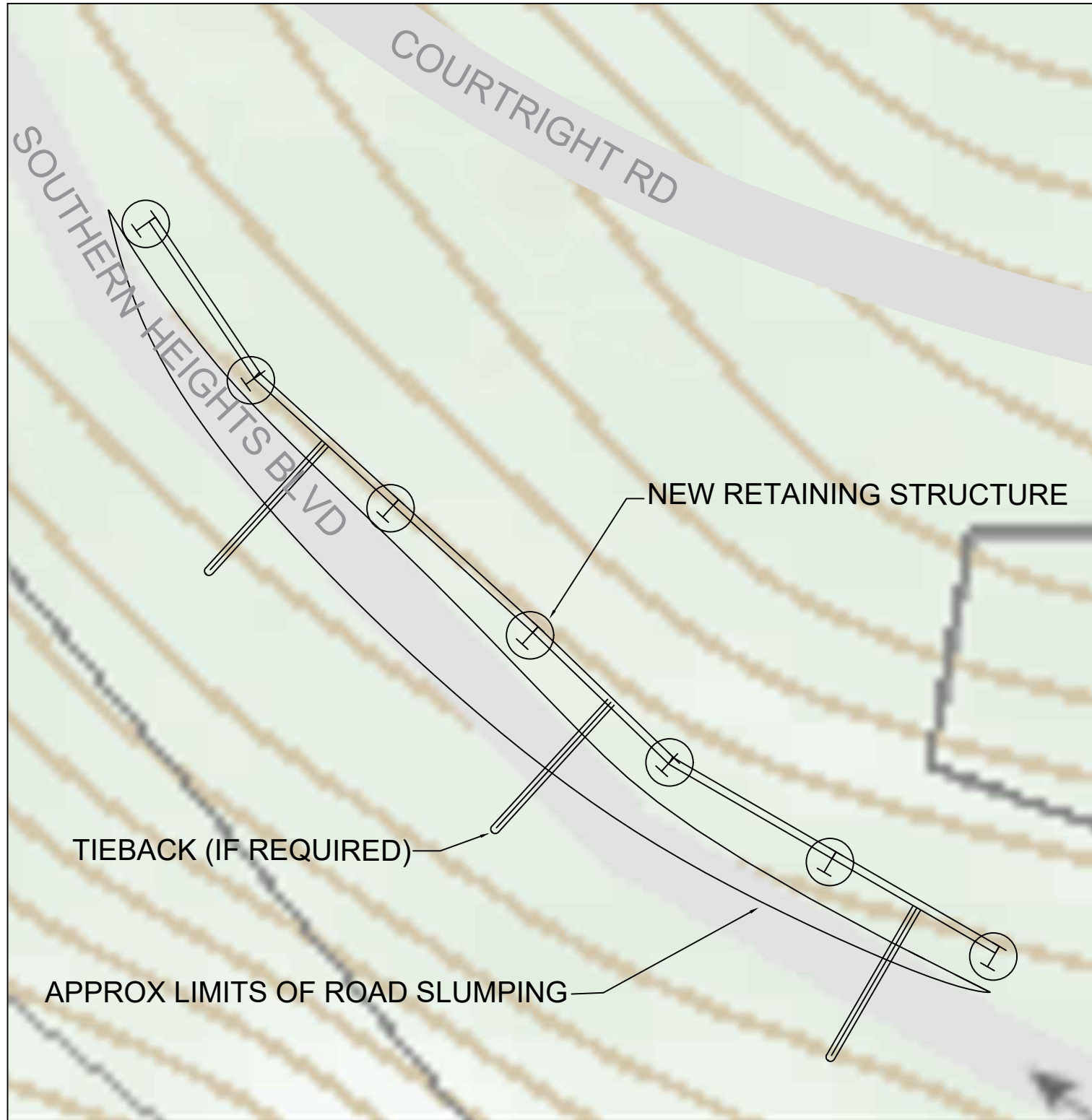
San Rafael Courtright Drainage
 Southern Heights Boulevard
 San Rafael, California

Project No. 2740.001

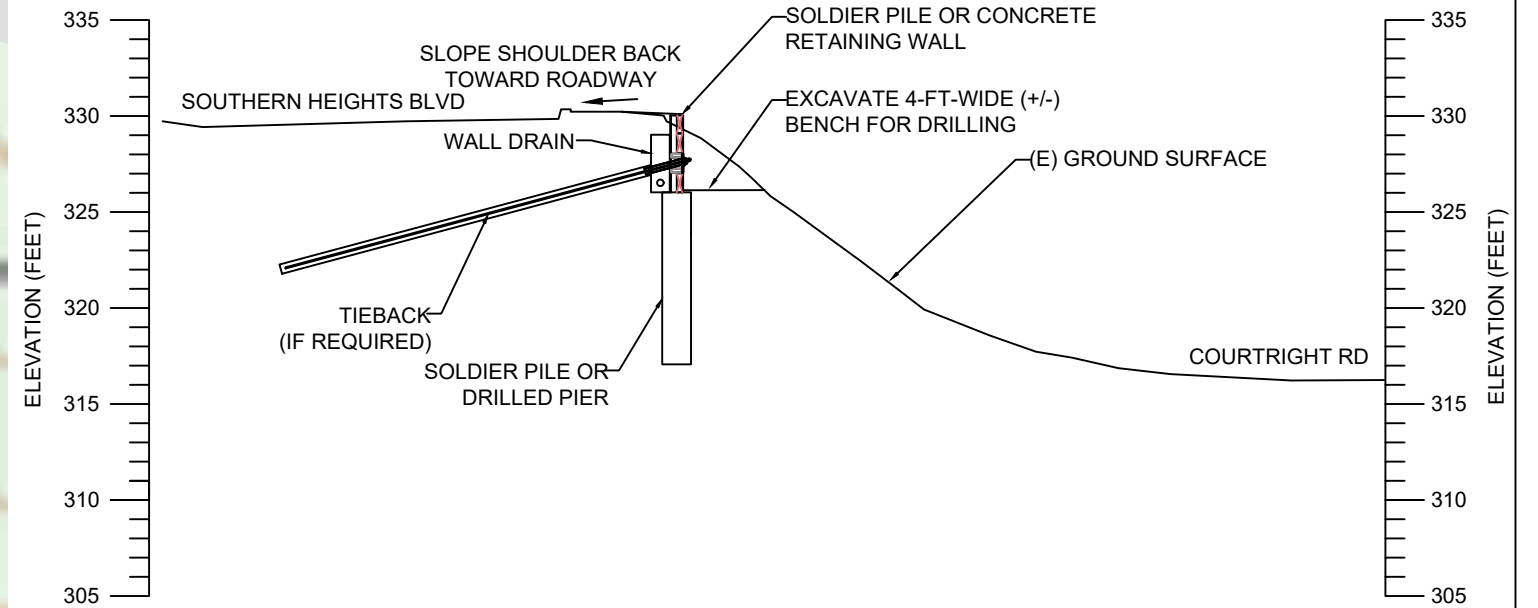
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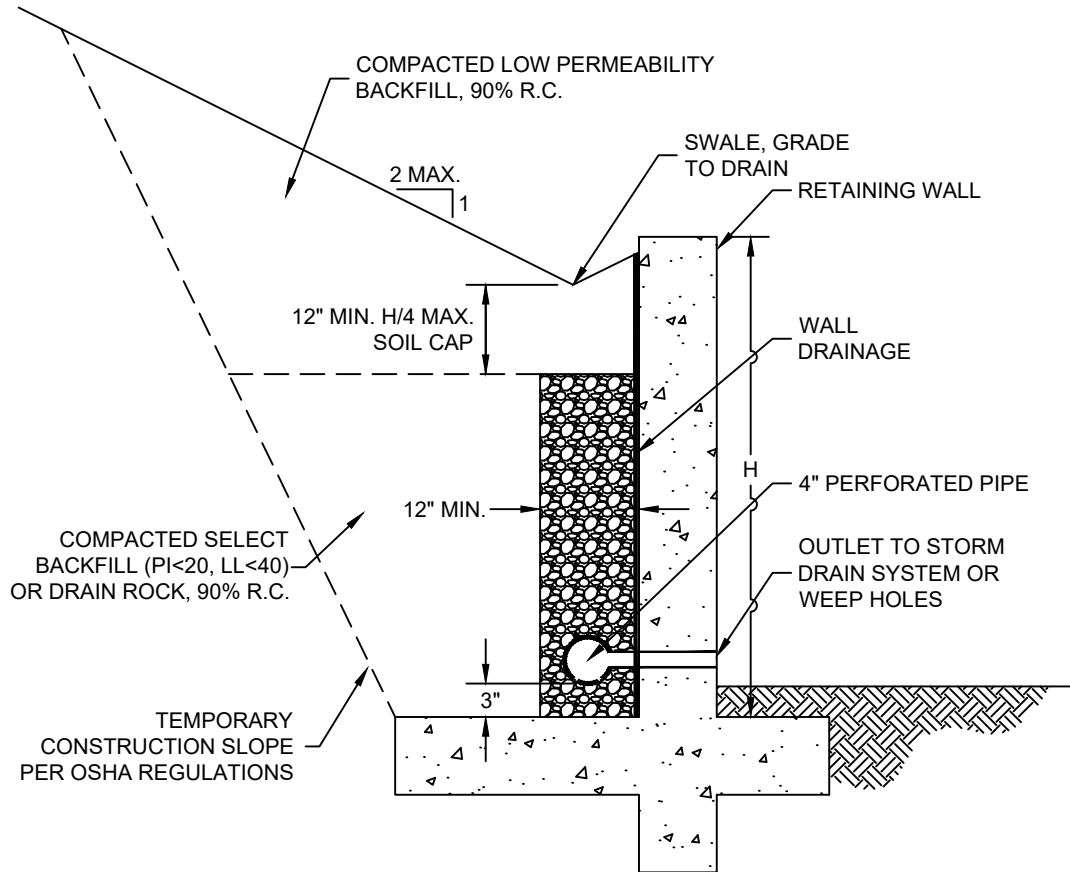
5
 FIGURE



SCHEMATIC PLAN
(SCALE: 1" = 10'-0")



SCHEMATIC PROFILE
(SCALE: 1" = 10'-0")



NOTES:

1. Wall drainage should consist of clean, free draining 3/4 inch crushed rock (Class 1B Permeable Material) wrapped in filter fabric (Mirafi 140N or equivalent) or Class 2 Permeable Material. Alternatively, pre-fabricated drainage panels (Miradrain G100N or equivalent), installed per the manufacturers recommendations, may be used in lieu of drain rock and fabric.
2. All retaining walls adjacent to interior living spaces shall be water/vapor proofed as specified by the project architect or structural engineer.
3. Perforated pipe shall be SCH 40 or SDR 35 for depths less than 20 feet. Use SCH 80 or SDR 23.5 perforated pipe for depths greater than 20 feet. Place pipe perforations down and slope at 1% to a gravity outlet. Alternatively, drainage can be outlet through 3" diameter weep holes spaced approximately 20' apart.
4. Clean outs should be installed at the upslope end and at significant direction changes of the perforated pipe. Additionally, all angled connectors shall be long bend sweep connections.
5. During compaction, the contractor should use appropriate methods (such as temporary bracing and/or light compaction equipment) to avoid over-stressing the walls. Walls shall be completely backfilled prior to construction in front of or above the retaining wall.
6. Refer to the geotechnical report for lateral soil pressures.
7. All work and materials shall conform with Section 68, of the latest edition of the Caltrans Standard Specifications.



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RETAINING WALL BACKDRAIN

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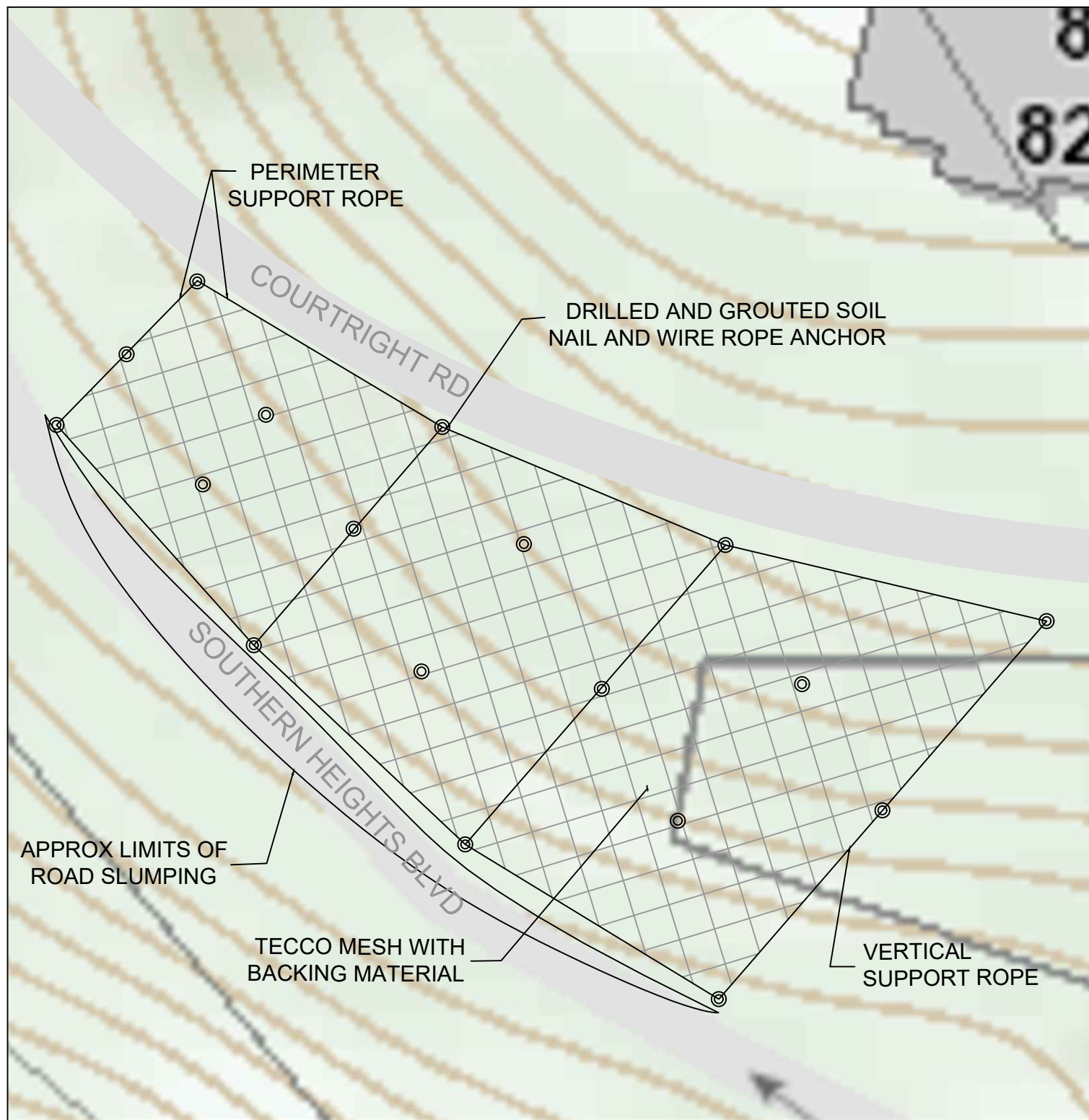
Project No. 2740.001

Date: 4/4/2019

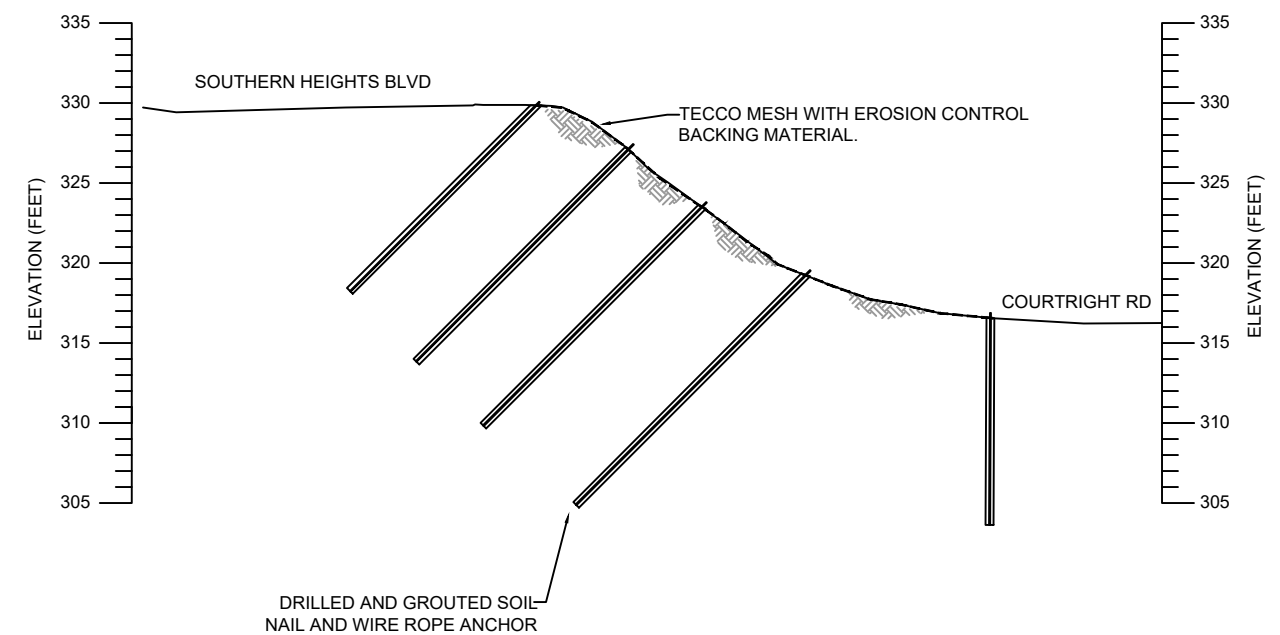
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7

FIGURE



SCHMATIC PLAN
(SCALE: 1" = 12'-0")



SCHMATIC PROFILE
(SCALE: 1" = 12'-0")

APPENDIX A

MAJOR DIVISIONS		SYMBOL	DESCRIPTION
COARSE GRAINED SOILS over 50% sand and gravel	CLEAN GRAVEL	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
	GRAVEL with fines	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	CLEAN SAND	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
	SAND with fines	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS over 50% silt and clay	SILT AND CLAY liquid limit <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 silt-clays of low plasticity
	SILT AND CLAY liquid limit >50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS	PT	Peat, muck, and other highly organic soils	
ROCK		Undifferentiated as to type or composition	

KEY TO BORING AND TEST PIT SYMBOLS

CLASSIFICATION TESTS

PI	PLASTICITY INDEX
LL	LIQUID LIMIT
SA	SIEVE ANALYSIS
HYD	HYDROMETER ANALYSIS
P200	PERCENT PASSING NO. 200 SIEVE
P4	PERCENT PASSING NO. 4 SIEVE

STRENGTH TESTS

TV	FIELD TORVANE (UNDRAINED SHEAR)
UC	LABORATORY UNCONFINED COMPRESSION
TXCU	CONSOLIDATED UNDRAINED TRIAXIAL
TXUU	UNCONSOLIDATED UNDRAINED TRIAXIAL
	UC, CU, UU = 1/2 Deviator Stress

SAMPLER TYPE

	MODIFIED CALIFORNIA		HAND SAMPLER
	STANDARD PENETRATION TEST		ROCK CORE
	THIN-WALLED / FIXED PISTON		DISTURBED OR BULK SAMPLE

SAMPLER DRIVING RESISTANCE

Modified California and Standard Penetration Test samplers are driven 18 inches with a 140-pound hammer falling 30 inches per blow. Blows for the initial 6-inch drive seat the sampler. Blows for the final 12-inch drive are recorded onto the logs. Sampler refusal is defined as 50 blows during a 6-inch drive. Examples of blow records are as follows:

- 25 sampler driven 12 inches with 25 blows after initial 6-inch drive
- 85/7" sampler driven 7 inches with 85 blows after initial 6-inch drive
- 50/3" sampler driven 3 inches with 50 blows during initial 6-inch drive or beginning of final 12-inch drive

NOTE: Test boring and test pit logs are an interpretation of conditions encountered at the excavation location during the time of exploration. Subsurface rock, soil or water conditions may vary in different locations within the project site and with the passage of time. Boundaries between differing soil or rock descriptions are approximate and may indicate a gradual transition.



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SOIL CLASSIFICATION CHART

San Rafael Courtright Drainage
Southern Heights Boulevard
San Rafael, California

Project No. 2740.001

Date: 3/27/2019

Drawn _____
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A-1
FIGURE

FRACTURING AND BEDDING

Fracture Classification

Crushed
 Intensely fractured
 Closely fractured
 Moderately fractured
 Widely fractured
 Very widely fractured

Spacing

less than 3/4 inch
 3/4 to 2-1/2 inches
 2-1/2 to 8 inches
 8 to 24 inches
 2 to 6 feet
 greater than 6 feet

Bedding Classification

Laminated
 Very thinly bedded
 Thinly bedded
 Medium bedded
 Thickly bedded
 Very thickly bedded

HARDNESS

Low
 Moderate
 Hard
 Very hard

Carved or gouged with a knife
 Easily scratched with a knife, friable
 Difficult to scratch, knife scratch leaves dust trace
 Rock scratches metal

STRENGTH

Friable
 Weak
 Moderate
 Strong
 Very strong

Crumbles by rubbing with fingers
 Crumbles under light hammer blows
 Indentations <1/8 inch with moderate blow with pick end of rock hammer
 Withstands few heavy hammer blows, yields large fragments
 Withstands many heavy hammer blows, yields dust, small fragments

WEATHERING

Complete	Minerals decomposed to soil, but fabric and structure preserved
High	Rock decomposition, thorough discoloration, all fractures are extensively coated with clay, oxides or carbonates
Moderate	Fracture surfaces coated with weathering minerals, moderate or localized discoloration
Slight	A few stained fractures, slight discoloration, no mineral decomposition, no affect on cementation
Fresh	Rock unaffected by weathering, no change with depth, rings under hammer impact

NOTE: Test boring and test pit logs are an interpretation of conditions encountered at the location and time of exploration. Subsurface rock, soil and water conditions may differ in other locations and with the passage of time.



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ROCK CLASSIFICATION CHART

San Rafael Courtright Drainage
 Southern Heights Boulevard
 San Rafael, California

Drawn _____
 NAR
 Checked _____

A-2
 FIGURE

DEPTH				BORING 1		BLOWS / FOOT (1)	DRY UNIT WEIGHT pcf (2)	MOISTURE CONTENT (%)	SHEAR STRENGTH psf (3)	OTHER TEST DATA	OTHER TEST DATA
meters	feet	SAMPLE	SYMBOL (4)	EQUIPMENT:	DATE:						
0	0			Track-mounted Drill Rig with 3.0-inch Solid Flight Auger	3/27/19						
				ELEVATION: 330 - feet*							
				*REFERENCE: Google Earth, 2019							
				2" Asphalt Concrete over Aggregate Base							
				Sandy CLAY(CL) Medium brown, moist, soft, medium plasticity, ~25-35% fine to very coarse, subrounded to angular sand with occasional angular gravel.[Fill]		5	106	17.8	550		
1				Grades to medium yellow-brown and gray, stiff.		12	104	16.1	550		
5				SHALE Dark gray, hard, moderate to strong, slight to moderate weathering.[Bedrock]		34		11.4			
2				Grades harder, stronger, and less weathered.							
3	10										
4											
15						50" 4 50" 3					
5											
6	20			Boring terminated at at 20 feet 4 inches. No groundwater encountered.		50" 4		4.2			

- ▽ Water level encountered during drilling
- ▼ Water level measured after drilling

NOTES: (1) UNCORRECTED FIELD BLOW COUNTS
(2) METRIC EQUIVALENT DRY UNIT WEIGHT $\text{kN/m}^3 = 0.1571 \times \text{DRY UNIT WEIGHT (pcf)}$
(3) METRIC EQUIVALENT STRENGTH (kPa) = $0.0479 \times \text{STRENGTH (psf)}$
(4) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY



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BORING LOG

San Rafael Courtright Drainage
Southern Heights Boulevard
San Rafael, California

Project No. 2740.001

Date: 3/27/2019

Drawn _____
NAR
Checked _____

A-3
FIGURE

DEPTH				BORING 2		BLOWS / FOOT (1)	DRY UNIT WEIGHT pcf (2)	MOISTURE CONTENT (%)	SHEAR STRENGTH psf (3)	OTHER TEST DATA	OTHER TEST DATA
meters	feet	SAMPLE	SYMBOL (4)	EQUIPMENT:	DATE:						
0	0			Track-mounted Drill Rig with 3.0-inch Solid Flight Auger	3/27/19						
				ELEVATION: 333 - feet*							
				*REFERENCE: Google Earth, 2019							
0	0			Sandy CLAY(CL)							
				Medium brown, moist, soft, medium plasticity, ~20-25% fine to medium, subrounded to angular sand, with occasional subrounded to angular gravel. [Fill]							
1				As above, grades medium stiff.		12	105	17.3	925		
5											
2				Grades to medium orange-brown and gray, stiff, with ~10% shale gravel.[Residual Soil]		18	109	19.1	625		
3											
10				SHALE		50" 2		13.6			
				Dark gray, hard, moderate to strong, slight weathering.[Bedrock]							
4											
15				Grades harder, stronger, and less weathered.		50" 1.5		14.8			
5											
6	20			Boring terminated at at 20 feet 1 inch. Groundwater encountered at 8 feet 6 inches and rose to 6 feet after completion.		50" 1		16.2			

- ▽ Water level encountered during drilling
- ▼ Water level measured after drilling

NOTES: (1) UNCORRECTED FIELD BLOW COUNTS
(2) METRIC EQUIVALENT DRY UNIT WEIGHT $\text{kN/m}^3 = 0.1571 \times \text{DRY UNIT WEIGHT (pcf)}$
(3) METRIC EQUIVALENT STRENGTH (kPa) = $0.0479 \times \text{STRENGTH (psf)}$
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BORING LOG

San Rafael Courtright Drainage
Southern Heights Boulevard
San Rafael, California

Project No. 2740.001

Date: 3/27/2019

Drawn: NAR
Checked:

A-4
FIGURE