SESPE
CONSULTING, INC.

374 Poli Street, Suite 200 • Ventura, California 93001

RECLAMATION PLAN
AREA Q QUARRY

Vulcan Materials Company – Western Division
San Bernardino County, California

CA Mine ID No. – TBD

June 2020

Prepared for: County of San Bernardino
Land Use Services Department
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San Bernardino County, California

CA Mine ID No. – TBD

June 2020

This Reclamation Plan was prepared by the undersigned on behalf and under the direction of the Vulcan Materials Company – Western Division.

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RECLAMATION PLAN

Vulcan Materials Company – Area Q Quarry
San Bernardino County, California
CA Mine ID No. – TBD

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RECLAMATION PLAN

Vulcan Materials Company – Area Q Quarry
San Bernardino County, California
CA Mine ID No. – TBD

June 2020

1.0 INTRODUCTION

Vulcan Materials Company – Western Division ("Vulcan") owns and operates the Cajon Creek Quarry (consisting of Areas L, M, and N), located adjacent to the northwest side of the City of San Bernardino ("City"). The Cajon Creek Quarry is currently providing high-quality aggregate (sand and gravel) to Vulcan's San Bernardino processing facility located 2.5 miles to the south. Upon completion of mining at the Cajon Creek Quarry, specifically within the mine area referred to as Area L, Vulcan is proposing to relocate the mining operation to an adjacent 196.0-acre site, referred to as the "Area Q Quarry" or "Area Q." In preparation for transferring the mining operation to the adjacent site, Vulcan submitted an application to the County of San Bernardino ("County") for a Conditional Use Permit (CUP) permit and a General Plan Land Use Zoning Designation change to conduct aggregate material extraction and ancillary activities. Extraction of sand and gravel at the Area Q Quarry will occur over a 182.1-acre area. Additionally, as required by the State Surface Mining and Reclamation Act (SMARA) and the County mining ordinance(s), this Reclamation Plan was prepared and submitted to the County as part of the CUP application package. Please see Figure 4 which shows the Area Q boundary.

The Area Q site, as well as Vulcan's other operating mines in the area, lies within the Cajon Wash Mineral Resource Zone (MRZ), which is included in the 1987 SMARA Designation Report No. 5 (DR-5) and designated as Sector C-5. The Cajon Wash area is classified as MRZ-2, and is designated as having construction grade aggregate deposits of regional significance. The mineral resource classification and designation of the Cajon Wash area is incorporated into the Conservation Element of the County's General Plan.

This Reclamation Plan was prepared in compliance with the following:

- SMARA, as amended (Public Resources Code Section 2710 et seq.);
- California Code of Regulations (Title 14, Division 2, Chapter 8, Subchapter 1, Section 3500 et seq.);
- San Bernardino County Development Code (Division 8, Chapter 88.03);
- San Bernardino County General Plan; and
- San Bernardino County Mining and Reclamation Plan Conditional Use Permit – Information Sheet and Application.

1.1 Site Location

The Area Q Quarry is located in unincorporated San Bernardino County, east of Cajon Creek and north of the community of Muscoy. The site is located in a non-sectioned portion of Township 1 North, Range 5 West, San Bernardino Baseline and Meridian. It is depicted on the United States Geological Survey (USGS) San Bernardino North, California (1980) 7.5-minute topographic quadrangle. The approximate site coordinates are at latitude 34.17° N and longitude 117.36° W.

Surrounding land uses near the Area Q Quarry include Vulcan's adjacent Cajon Creek Quarry and auxiliary facilities located to the north, as well as developed residential neighborhoods located to the southeast, across the Devil Creek Diversion Channel. The Devil Creek Diversion Channel runs down the southern boundary of the site, and the residential community of Muscoy is located directly south of this diversion channel. The site's western boundary is bordered by the Southern Pacific Railroad (SPRR) track, which lies between the site and the Lytle Creek/Cajon Creek drainage located to the west. The site is protected from surface flows in Cajon Creek through a series of groins (levees), including Muscoy Groin #3, which is located west of the site's western boundary (see Figure 8). Industrial developments are located east of the site, across Cajon Boulevard. Please see Figures 1 through 4 which show general site location.

The existing site is generally undeveloped and degraded, but has been subject to a variety of human-related disturbances. Disturbances include the presence of approximately fifteen (15) homes in poor condition and unauthorized dumped miscellaneous debris throughout the site. Figure 5 shows an aerial of the existing Area Q site and the surrounding Vulcan Cajon Creek Quarry operations to the north. The proposed end use of the reclaimed Area Q Quarry is open space, and has been designed to complement the reclamation currently approved for the existing Vulcan Cajon Creek mining operations to the north. Please see Figures 1 and 2 which show the regional and vicinity locations of the site, and Figures 3 and 4 which depict the property and permitting boundaries of the Area Q Quarry. Table 1 below summarizes general land use information for the Area Q Quarry.

Table 1: Site Information

General Plan/Community Plan & Zoning Designation(s)	Existing: **Muscoy/Single Residential – 1-acre Minimum (MS/RS-1), MS/RS, Single Residential (RS-1AA, AG Overlay)** Proposed: **Community Industrial (IC)**
Site Size	**Area Q Quarry Area:** Approximately 196.0 acres **Mining Area:** Approximately 182.1 acres (mining activity area) **Reclamation Area:** 187.6 acres (includes the setbacks and berm areas)
Current Use & Development	Rural Residences, Unauthorized Miscellaneous Dumping, Dirt Roadways, Disturbed Open Space
Adjacent Land Use Designations	**North:** Calmat/Cajon Creek – Specific Plan (SP 90-01)[1] **South:** Muscoy/Single Residential – 1-acre Minimum (MS/RS-1) **East:** Industrial Heavy (IH) **West:** Industrial Extractive (IE)[1] / SPRR / Cajon Creek & Lytle Creek (FW – Floodway)

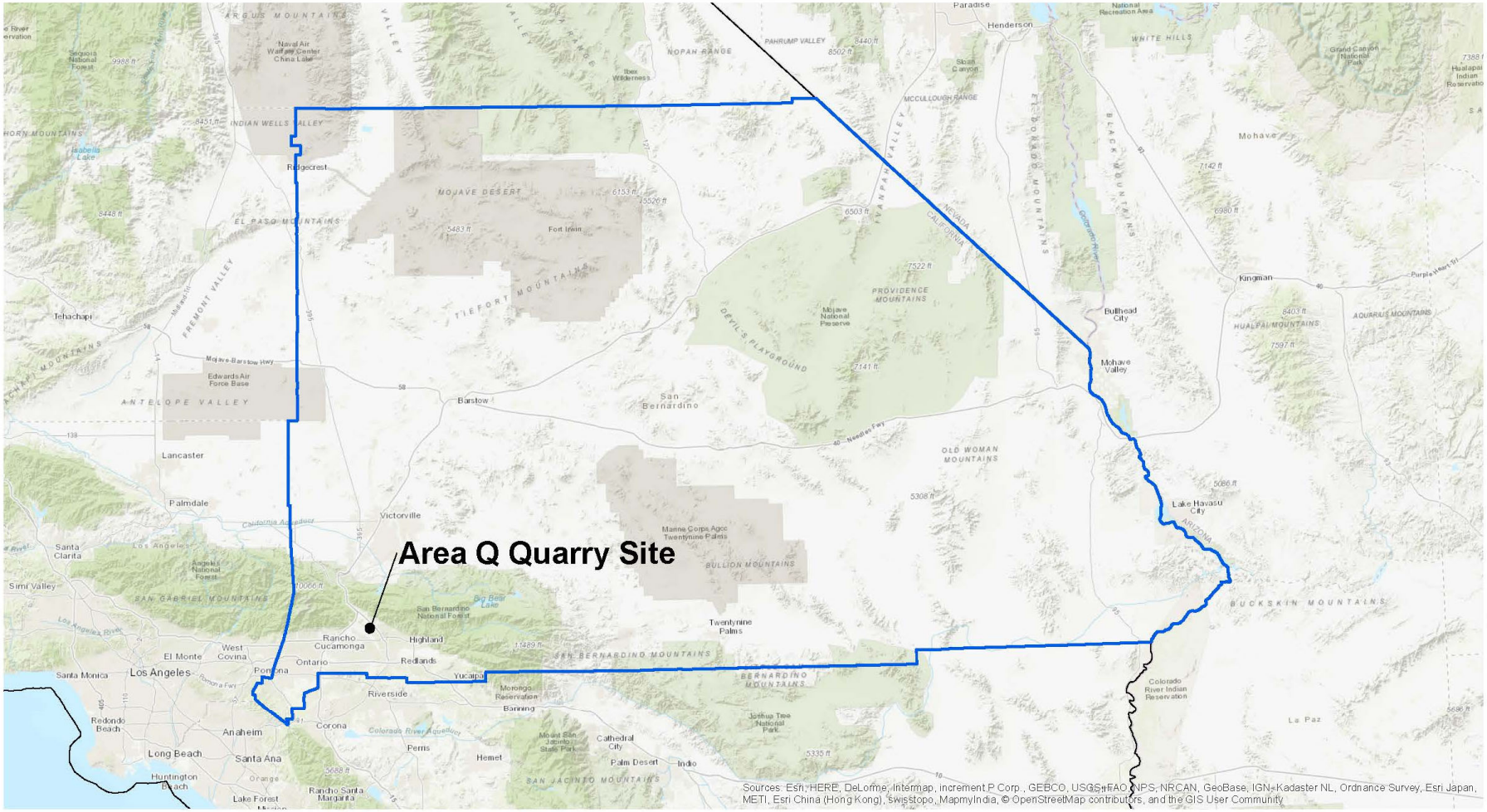
Access	Vehicular access to the mine site would come from the existing entrance which connects to Cajon Boulevard at the northeast corner of the site. This point would serve as the single ingress and egress point for employees and other work vehicles, which includes small work trucks as well as employee and visitor passenger vehicles. No on-road haul trucks would enter or leave the site onto public roads, as material will be conveyed to the existing Cajon Creek Quarry (Area L) to the north. See Figure 5 for the Area Q Quarry site plan.
Public Services / Utilities	– The adjacent Cajon Creek Quarry is an existing operation with established utility and public service providers. No major changes to the current system are proposed. – Water will continue to be provided by existing private water well located within the adjacent Cajon Creek Quarry (i.e. Area M) to the northwest. Water will be used onsite primarily for fugitive dust control. – The site will operate with portable sanitation facilities, as is presently the case for the Cajon Creek Quarry (i.e. Area L) to the north. – Electrical service required for the conveyor system or other equipment requiring electricity would be obtained from the existing connection at the Cajon Creek Quarry, provided by Southern California Edison (SCE). No additional power lines will be necessary. – No natural gas or propane will be utilized at the site. – No fixed landline telephone service is required. Employees will continue to utilize cellular phones around the site. – Trash will be collected onsite and disposed of by Burrtec Waste Industries.

1 – Vulcan's existing Cajon Creek Quarry adjacent to the north and a portion to the west, and is within the City of San Bernardino.

1.2 Background & Permit History

Vulcan currently operates the Cajon Creek Quarry adjacent to the north of the proposed Area Q Quarry. Although Area Q is within the County's jurisdiction, Vulcan's Cajon Creek Quarry is located within the City and operates under City CUP No. 91-31/Specific Plan No. 90-01 and associated Reclamation Plan (CA Mine ID No. 91-36-0137), both approved by the City in 1993. Operations at Cajon Creek Quarry have been ongoing since 1995. Please see Figures 3 and 4, which show the extent of Vulcan's holdings for the Area Q Quarry.

Upon completion of mining within the Cajon Creek Quarry, specifically Area L, Vulcan is proposing to relocate the mining operation to the adjacent Area Q Quarry. In preparation for mining the Area Q Quarry, Vulcan has submitted an application to the County for a new CUP and this Surface Mining and Reclamation Plan, to conduct aggregate material extraction and ancillary activities within the 196.0-acre Area Q Quarry, including post-mining reclamation. Additionally, Vulcan is requesting Area Q be rezoned from RS-1 (Single Residential) to IC (Community Industrial) to allow the proposed mining and reclamation operations.



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0 5 10 20 30 40 Miles

Legend

San Bernardino County

Date Prepared: 1/10/2019

File Name: Vulcan/Area _Q/Figures/CAD/2019_Reclamation

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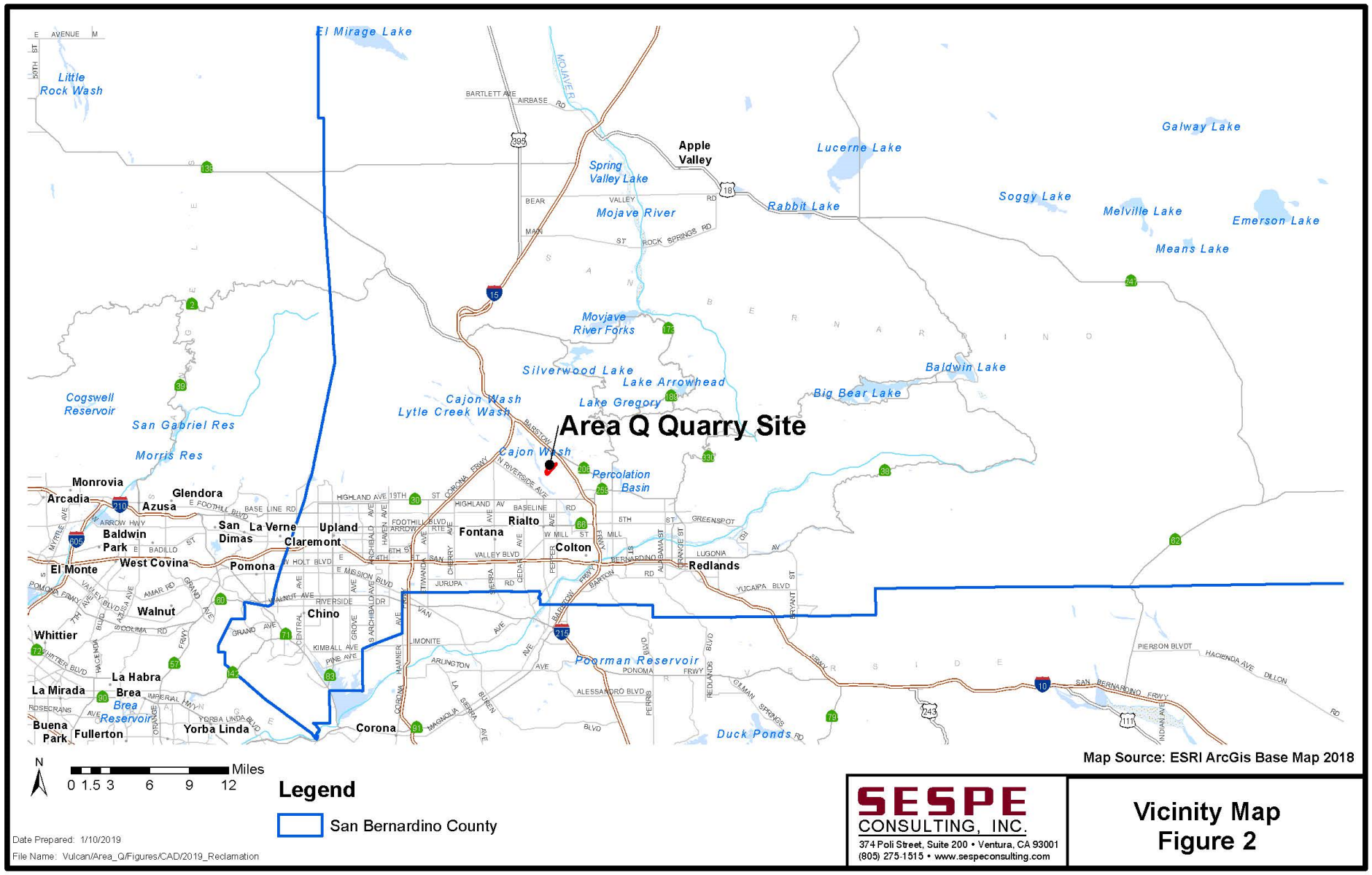
General Location Map
Figure 1


Area Q Quarry Site
El Mirage Lake
Little Rock Wash
Apple Valley
Spring Valley Lake
Mojave River
Lucerne Lake
Rabbit Lake
Galway Lake
Soggy Lake
Melville Lake
Emerson Lake
Means Lake
Movjave River Forks
Silverwood Lake
Lake Arrowhead
Lake Gregory
Baldwin Lake
Big Bear Lake
Cajon Wash
Lytle Creek Wash
Cogswell Reservoir
San Gabriel Res
Morris Res
Percolation Basin
Monrovia
Arcadia
Azusa
Glendora
Baldwin Park
San Dimas
La Verne
Claremont
Upland
Fontana
Rialto
Colton
Redlands
El Monte
West Covina
Pomona
Walnut
Chino
Whittier
La Habra
La Mirada
Brea
Brea Reservoir
Buena Park
Fullerton
Yorba Linda
Corona
Prado Reservoir
Duck Ponds
Map Source: ESRI ArcGis Base Map 2018
N
0 1.5 3 6 9 12 Miles
Legend
San Bernardino County
Date Prepared: 1/10/2019
File Name: Vulcan/Area_Q/Figures/CAD/2019_Reclamation
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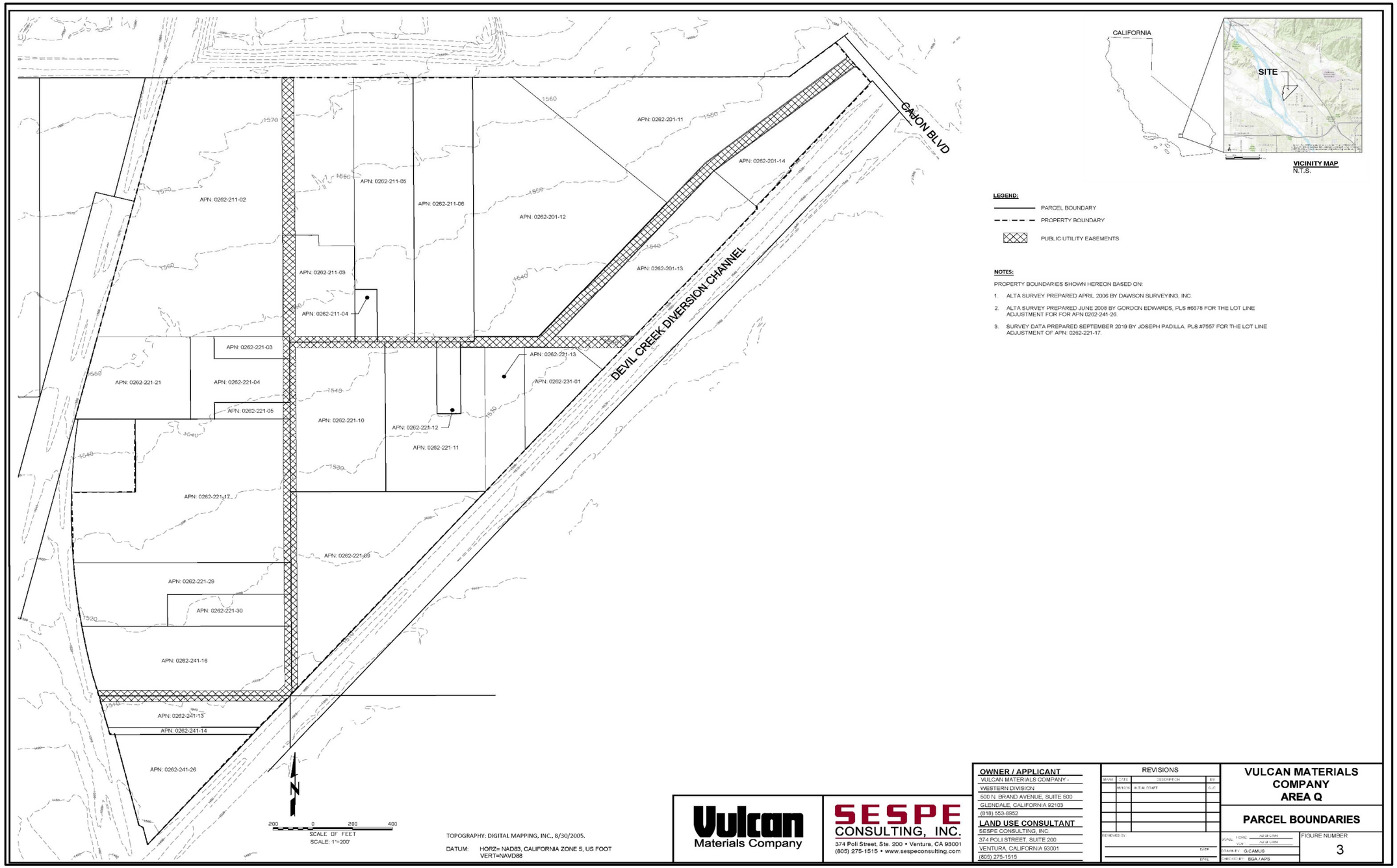
Vicinity Map
Figure 2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APN: 0262-211-05
APN: 0262-211-06
APN: 0262-211-03
APN: 0262-211-04
APN: 0262-201-11
APN: 0262-201-12
APN: 0262-201-13
APN: 0262-201-14
CAMON BLVD
DEVIL CREEK DIVERSION CHANNEL
APN: 0262-221-03
APN: 0262-221-21
APN: 0262-221-04
APN: 0262-221-05
APN: 0262-221-13
APN: 0262-231-01
APN: 0262-221-10
APN: 0262-221-12
APN: 0262-221-11
APN: 0262-221-17
APN: 0262-221-29
APN: 0262-221-30
APN: 0262-241-16
APN: 0262-241-13
APN: 0262-241-14
APN: 0262-241-26
SCALE OF FEET
SCALE: 1"=200'
TOPOGRAPHY: DIGITAL MAPPING, INC., 8/30/2005.
DATUM: HORZ= NAD83, CALIFORNIA ZONE 5, US FOOT
VERT=NAVD88
CALIFORNIA
SITE
VICINITY MAP
N.T.S.
LEGEND:
PARCEL BOUNDARY
PROPERTY BOUNDARY
PUBLIC UTILITY EASEMENTS
NOTES:
PROPERTY BOUNDARIES SHOWN HEREON BASED ON:
1. ALTA SURVEY PREPARED APRIL 2006 BY DAWSON SURVEYING, INC.
2. ALTA SURVEY PREPARED JUNE 2008 BY GORDON EDWARDS, PLS #6678 FOR THE LOT LINE ADJUSTMENT FOR FOR APN 0262-241-26.
3. SURVEY DATA PREPARED SEPTEMBER 2019 BY JOSEPH PADILLA, PLS #7557 FOR THE LOT LINE ADJUSTMENT OF APN: 0262-221-17.
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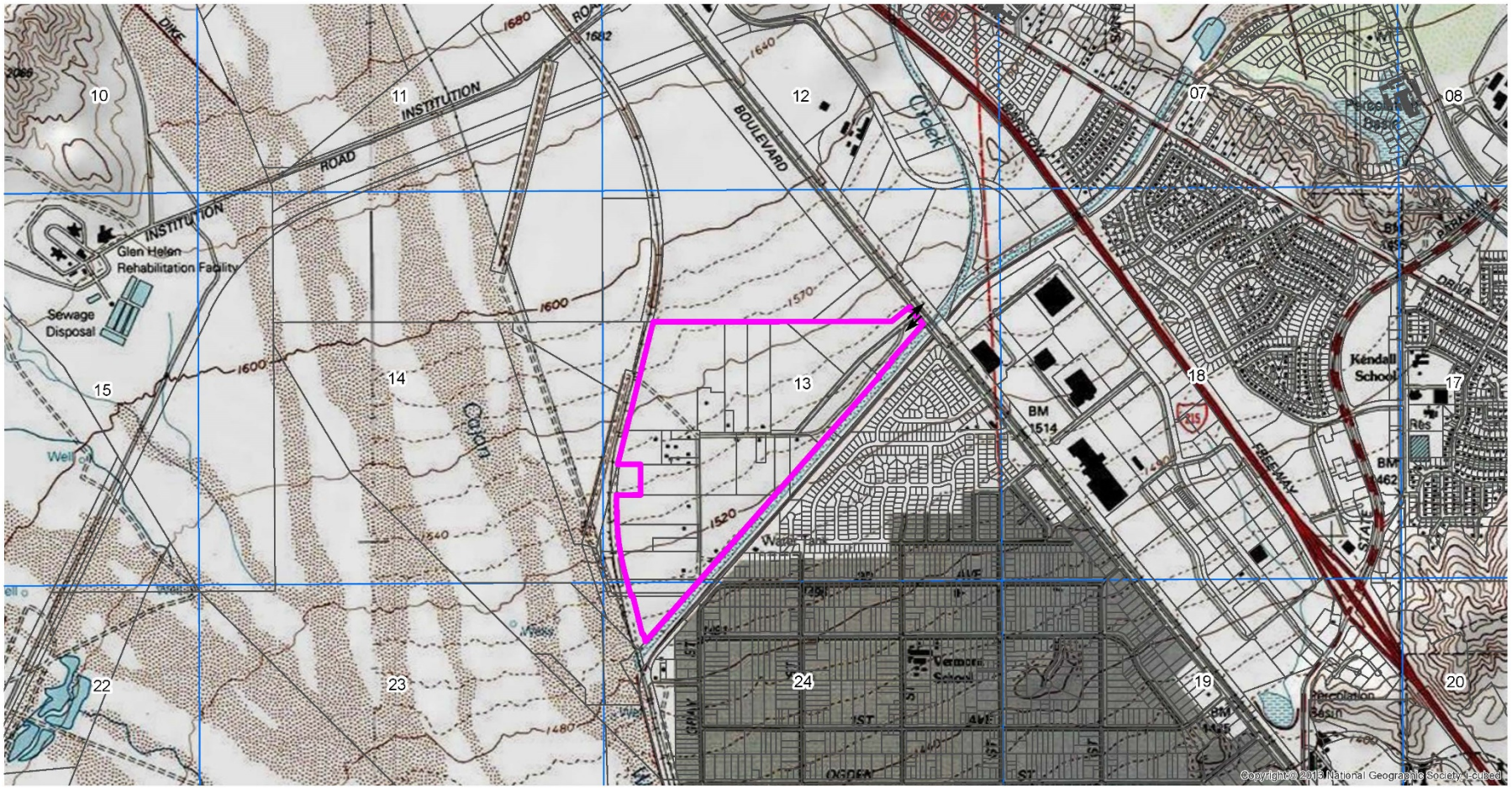
REVISIONS
VULCAN MATERIALS COMPANY
AREA Q
PARCEL BOUNDARIES
FIGURE NUMBER
3
DRAWN BY: G.CAMUS
CHECKED BY: BGA / AIPS



N

2,500 1,250 0 2,500 Feet

Legend

- Property Boundary
- San Bernadino County Parcels
- Sections
- Ingress/Egress

Source: Quad Maps 2013 National Geographic Society

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Location Map
Figure 4

1.3 Summary of Mining & Reclamation Activities

Operations in Area Q will not involve any changes to Vulcan's existing mining or processing operations, other than installation of a new or modified conveyor and changing the location of material extraction from Area L to Area Q. There are no proposed changes to the existing mining methods, extraction rates or material processing rates. Aggregate extracted from Area Q will be transferred via a conveyor system to the existing conveyance infrastructure in place at Area L. Material would then be processed and shipped from Vulcan's existing and/or permitted locations. No on-road haul trucks would enter or leave the site onto public roads. Blasting will not be required to conduct the mining operations. Please see Figure 6 which shows the layout of the proposed Area Q Quarry and conveyor system. Also see Figure 12, which shows cross-sections of both the mine and reclamation sites.

The mining operations will be typical of surface aggregate mining operations, and mining would involve the use of mobile equipment to excavate and load material onto a conveyor, that terminates at Area L to the north. The materials would then be transported to other Vulcan permitted facilities for processing. It is expected that approximately 40,000,000 tons of saleable (net) sand and gravel (i.e. aggregate) would be extracted over approximately 30-years, depending on market demand and once mining in Area L is complete. The gross extraction of all material over 30-years would be approximately 42.1 million tons which includes the removal of the overburden and waste rock (unusable aggregate). There would also be approximately 100,000 tons of topsoil and subsoil removed and used onsite to construct an approximately 10-foot tall berm along the southern perimeter of Area Q. The mine would provide a high-quality source of local aggregate materials to serve the regional market.

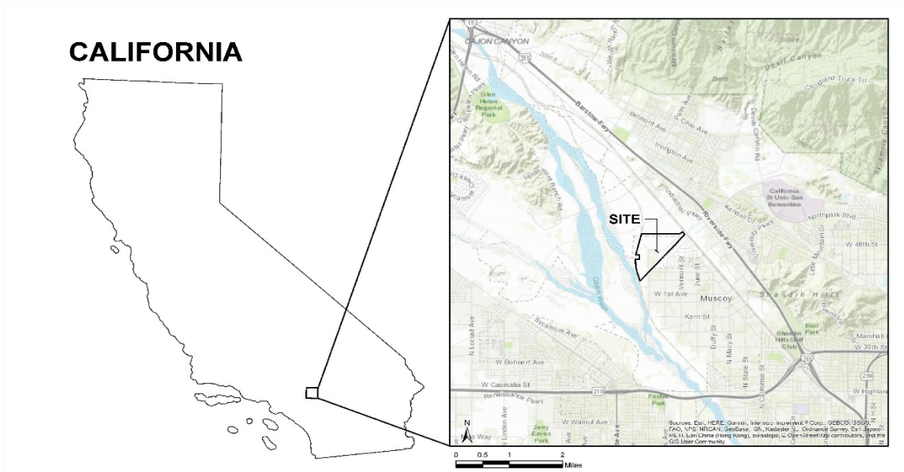
Mining in Area Q would be initiated once mining in Area L is complete, which is estimated to occur in 2023. The mining would be conducted in one (1) mining phase, with reclamation occurring concurrently, as feasible, as mining activities progress through the site. Prior to initiating mining, the existing debris and structures currently present at the site would be demolished and removed in accordance with local, state, and federal regulations. Topsoil and subsoil from Area Q will be used to construct a minimum 10-foot tall landscaped earthen berm along the entire southern site boundary adjacent to the residential neighborhoods in Muscoy. Topsoil and subsoil stored within the berm will be used as revegetation cover during reclamation. The vegetated berm has been designed to provide visual and noise screening between mining operations and public viewpoints to the south. Overburden will be handled and conveyed to the other Vulcan facilities in the same manner as the mined sand and gravel.

Once site preparation is completed (approximately 3 months), mining at the site would commence in the northeast corner of the site, reaching a final depth of 120-feet below ground surface (bgs). Groundwater is expected to occur at depths below 200-feet bgs. Therefore, mining activities would take place above groundwater and dewatering of the excavation would not be required.

The major components of the proposed Area Q mining operation include the following (see Figure 6):

- Open-pit surface mine;
- Temporary stockpiles of excavated materials;
- Various site improvements for access, safety, and other requirements;
- Ancillary mining equipment; and
- Reclamation to open space.

Once mining operations are complete, the Area Q Quarry would be reclaimed back to open space, consistent with the approved end use for the Cajon Creek Quarry. Figure 11 shows the reclaimed site.



INDEX MAP

SHEET INDEX:

SHEET 1: EXISTING SITE
SHEET 2: PARCEL BOUNDARIES
SHEET 3: MINING PLAN
SHEET 4: RECLAMATION PLAN
SHEET 5: CROSS - SECTIONS

SITE INFORMATION:

ASSESSORS PARCEL NUMBER(S)

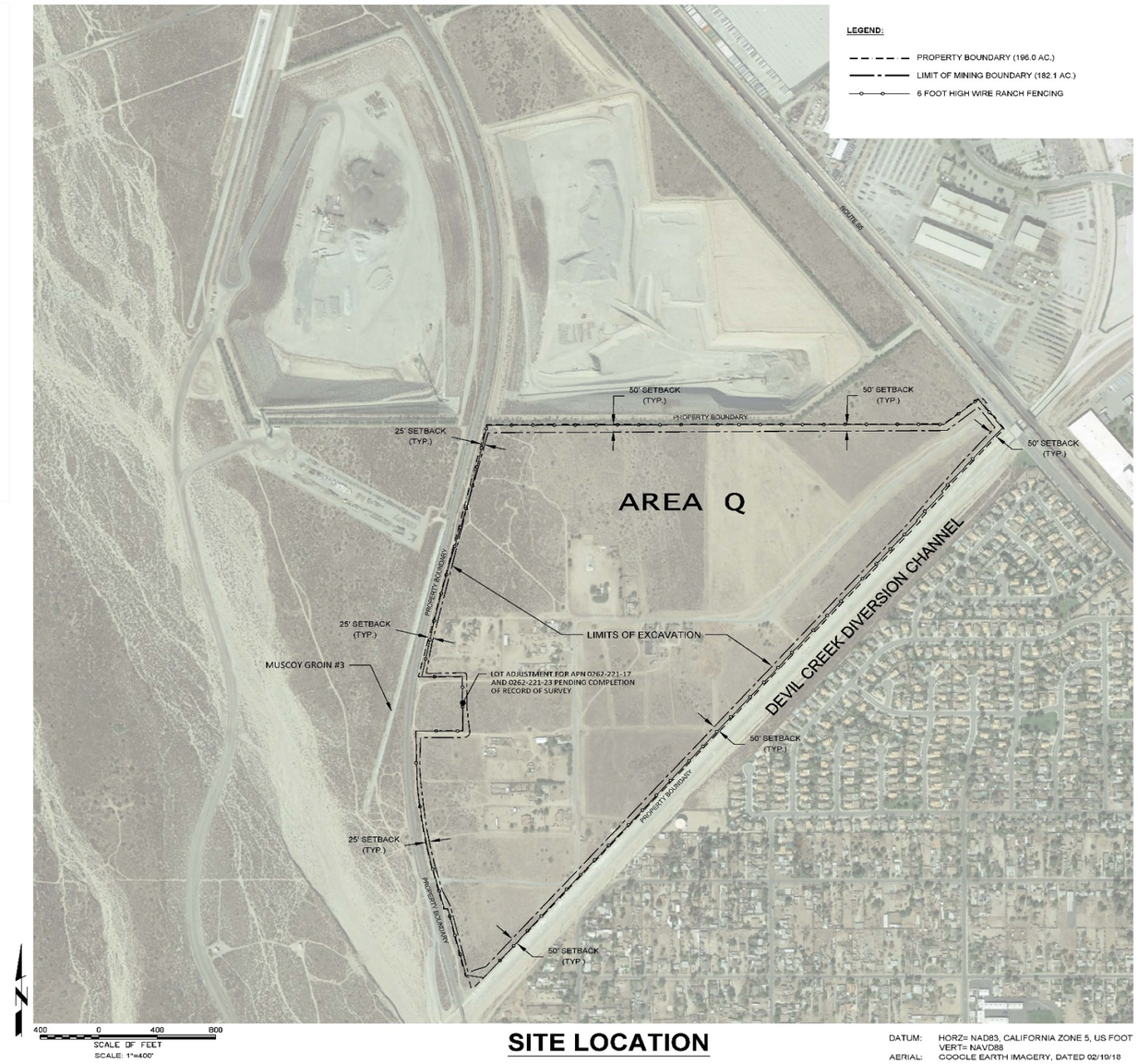
APN
262-201-11
262-201-12
262-201-13
262-201-14
262-211-02
262-211-03
262-211-04
262-211-05
262-211-06
262-221-03
262-221-04
262-221-05
262-221-09
262-221-10
262-221-11
262-221-12
262-221-13
262-221-17
262-221-21
262-221-29
262-221-30
262-231-01
262-241-13
262-241-14
262-241-16
262-241-26
TOTAL ACRES: 196.0

SURROUNDING LAND USES:

Direction	Land Use	District/Zoning
North	Cajon Creek Quarry	Calmat/Cajon Creek Specific Plan (90-01)[1]
South	Residences / Community of Muscoy	Muscoy/Single Residential – 1-acre Minimum (MS/RS-1)
East	Industrial Developments	Industrial Heavy (IH)
West	Cajon Creek Quarry (i.e. Area N)	Industrial Extractive (IE)[1] / SPRR / Cajon Creek & Lytle Creek
	Cajon Creek / Lytle Creek	

1 – Vulcan's existing Cajon Creek Quarry adjacent to the north and a portion to the west, and is within the City of San Bernardino.

EASEMENT:	PUBLIC UTILITIES; TO BE VACATED
MINERAL BEING EXTRACTED:	SAND & GRAVEL
ADJACENT AREA:	NO OFF-SITE ADJACENT STRUCTURES. NO PRIVATE PROPERTY OWNERS WITHIN 200 FT OF SITE BOUNDARIES
PROJECT AREA:	FIFTEEN (15) EXISTING HOMES TO BE DEMOLISHED NO PERMANENT STRUCTURES PROPOSED
PROTECTED PLANTS:	NONE
GROUNDWATER LEVEL:	+200 FEET BELOW GROUND SURFACE
EXISTING LAND USE DESIGNATION:	MUSCOY/SINGLE RESIDENTIAL - 1-ACRE MINIMUM (MS/RS-1)
PROPOSED LAND USE DESIGNATION:	COMMUNITY INDUSTRIAL (IC)
ELECTRICITY:	SOUTHERN CALIFORNIA EDISON (SCE) P.O. BOX 800 ROSEMEAD, CA 91770 (800) 655-4555
GAS:	N/A (NO NATURAL GAS AND/OR PROPANE SERVICE REQUIRED)
WATER:	EXISTING WATER WELL (LOCATED WITHIN CAJON CREEK QUARRY TO THE NORTH)
SEWER:	EXISTING PORTABLE SANITATION FACILITIES (LOCATED WITHIN CAJON CREEK QUARRY TO THE NORTH)
TELEPHONE:	N/A (NO FIXED LANDLINE TELEPHONE SERVICE REQUIRED)



SITE LOCATION

DATUM: HORZ= NAD83, CALIFORNIA ZONE 5, US FOOT
VERT= NAVD88
AERIAL: GOOGLE EARTH IMAGERY, DATED 02/19/18

NOTES:

1. NO PERMANENT STRUCTURES WITHIN 20-FEET OF AREA Q PROPERTY
2. NO SIGNAGE PROPOSED
3. NO PROTECTED AND/OR ENDANGERED TREES ONSITE
4. THE AFFECTED PARCELS ARE INCLUDED IN THE TABLE ABOVE. DUE TO THE NUMBER AND COMPLEXITY OF THE AFFECTED PARCELS, LEGAL DESCRIPTIONS FOR LANDS THAT WILL BE AFFECTED BY THE MINING OPERATIONS ARE INCLUDED IN APPENDIX D OF THE RECLAMATION PLAN RATHER THAN ON THIS FIGURE.
5. PROPERTY BOUNDARIES SHOWN HEREON BASED ON:
   - 5.1. ALTA SURVEY PREPARED APRIL 2006 BY DAWSON SURVEYING, INC.
   - 5.2. ALTA SURVEY PREPARED JUNE 2008 BY GORDON EDWARDS, PLS #6678 FOR THE LOT LINE ADJUSTMENT FOR FOR APN 0262-241-26.
   - 5.3. SURVEY DATA PREPARED SEPTEMBER 2019 BY JOSEPH PADILLA, PLS #7557 FOR THE LOT LINE ADJUSTMENT OF APN: 0262-221-17 AND 0262-221-23 (PENDING COMPLETION OF RECORD OF SURVEY).

Vulcan Materials Company

SESPE CONSULTING, INC.
374 Poli Street, Ste. 200 • Ventura, CA 93001
(805) 275-1515 • www.sespeconsulting.com

OWNER / APPLICANT
VULCAN MATERIALS COMPANY - WESTERN DIVISION
500 N. BRAND AVENUE, SUITE 500
GLENDALE, CALIFORNIA 92103
(818) 553-8952

LAND USE CONSULTANT
SESPE CONSULTING, INC.
374 POLI STREET, SUITE 200
VENTURA, CALIFORNIA 93001
(805) 275-1515

REVISIONS

MARK	DATE	DESCRIPTION	BY
	10/13/20	INITIAL DRAFT	GLC

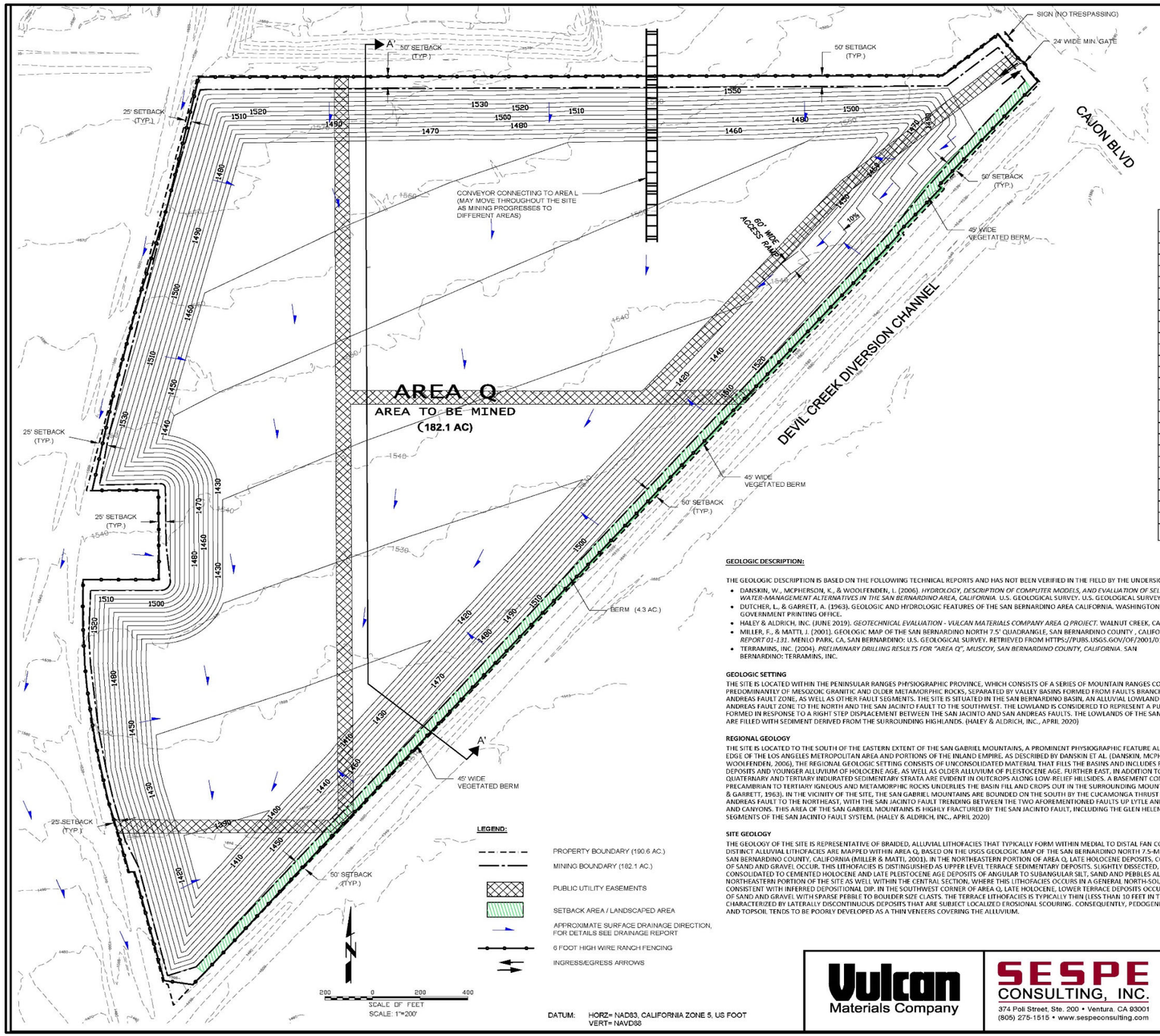
REVIEWED BY: DATE
DATE

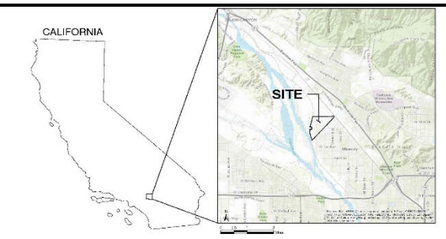
VULCAN MATERIALS COMPANY AREA Q

EXISTING SITE

SCALE: HORZ: AS SHOWN VERT: AS SHOWN
DRAWN BY: G.CAMUS
CHECKED BY: BGA / APS

FIGURE NUMBER 5





APN
262-201-11
262-201-12
262-201-13
262-201-14
262-211-02
262-211-03
262-211-04
262-211-05
262-211-06
262-221-03
262-221-04
262-221-05
262-221-09
262-221-10
262-221-11
262-221-12
262-221-13
262-221-17
262-221-21
262-221-29
262-221-30
262-231-01
262-241-13
262-241-14
262-241-16
262-241-26
TOTAL ACRES: 190.6

VULCAN AREA Q MINE SITE INFORMATION

MINERAL COMMODITY:	SAND AND GRAVEL
APPLICANT: OPERATOR: FEE LAND OWNER:	VULCAN MATERIALS COMPANY - WESTERN DIVISION 500 N. BRAND AVENUE, SUITE 500 GLENDALE, CALIFORNIA 91203 (931) 768-2641
MINERAL RIGHTS OF FEE LAND:	VULCAN MATERIALS COMPANY - WESTERN DIVISION 500 N. BRAND AVENUE, SUITE 500 GLENDALE, CALIFORNIA 91203 (931) 768-2641
OWNER OF MINING LAND:	VULCAN MATERIALS COMPANY - WESTERN DIVISION 500 N. BRAND AVENUE, SUITE 500 GLENDALE, CALIFORNIA 91203 (931) 768-2641
PLAN DESIGN:	SESPE CONSULTING 374 POLI ST., STE. 200 • VENTURA CALIFORNIA 93001 (805) 275-1515
MAP PREPARER & SOURCE:	SESPE CONSULTING 374 POLI ST., STE. 200 • VENTURA CALIFORNIA 93001 (805) 275-1515
LAND USE ZONING:	COMMUNITY INDUSTRIAL (IC)
BASE MAP SOURCES:	TOPOGRAPHY: DIGITAL MAPPING, INC., 8/30/2005.
CONTOURS INTERVAL:	10 FEET

NOTES:

1. RECLAMATION OF THE SITE WILL INCLUDE SITE CLEANUP, PUBLIC SAFETY MEASURES, DRAINAGE CONTROLS, RECONTOURING AND RIPPING WHERE APPLICABLE, AND REVEGETATION UTILIZING NATIVE SPECIES, MONITORING AND MAINTENANCE.
2. PROPERTY BOUNDARY BASED ON ALTA SURVEY PREPARED APRIL 2006 BY DAWSON SURVEYING, INC.; JUNE 2008 ALTA SURVEY FOR LOT LINE ADJUSTMENT FOR APN: 0262-241-26, PREPARED BY GORDON EDWARDS, PLS #6678; AND SEPTEMBER 2019 LOT LINE ADJUSTMENT FOR APN: 0262-221-17, PREPARED BY JOSEPH PADILLA, PLS #7557

INITIATION/TERMINATION MINING DATES:

MINING INITIATION: 2023 MINING TERMINATION: APPROXIMATELY 2053
TIMEFRAMES SHOWN ABOVE ARE APPROXIMATE ESTIMATIONS, AND MAY CHANGE DEPENDING ON MARKET DEMANDS, ETC. MINING IN AREA Q WILL COMMENCE ONCE MINING IN AREA L IS COMPLETE

GEOLOGIC DESCRIPTION:

THE GEOLOGIC DESCRIPTION IS BASED ON THE FOLLOWING TECHNICAL REPORTS AND HAS NOT BEEN VERIFIED IN THE FIELD BY THE UNDERSIGNED:

- DANSKIN, W., MCPHERSON, K., & WOOLFENDEN, L. (2006). *HYDROLOGY, DESCRIPTION OF COMPUTER MODELS, AND EVALUATION OF SELECTED WATER-MANAGEMENT ALTERNATIVES IN THE SAN BERNARDINO AREA, CALIFORNIA.* U.S. GEOLOGICAL SURVEY. U.S. GEOLOGICAL SURVEY.
- DUTCHER, L., & GARRETT, A. (1963). GEOLOGIC AND HYDROLOGIC FEATURES OF THE SAN BERNARDINO AREA CALIFORNIA. WASHINGTON, D.C.: US GOVERNMENT PRINTING OFFICE.
- HALEY & ALDRICH, INC. (JUNE 2019). *GEOTECHNICAL EVALUATION - VULCAN MATERIALS COMPANY AREA Q PROJECT.* WALNUT CREEK, CA: HALEY & ALDRICH, INC.
- MILLER, F., & MATTI, J. (2001). GEOLOGIC MAP OF THE SAN BERNARDINO NORTH 7.5' QUADRANGLE, SAN BERNARDINO COUNTY , CALIFORNIA. *OPEN-FILE REPORT 01-131.* MENLO PARK, CA, SAN BERNARDINO: U.S. GEOLOGICAL SURVEY. RETRIEVED FROM HTTPS://PUBS.USGS.GOV/OF/2001/0131.
- TERRAMINS, INC. (2004). *PRELIMINARY DRILLING RESULTS FOR "AREA Q", MUSCOY, SAN BERNARDINO COUNTY, CALIFORNIA.* SAN BERNARDINO: TERRAMINS, INC.

GEOLOGIC SETTING

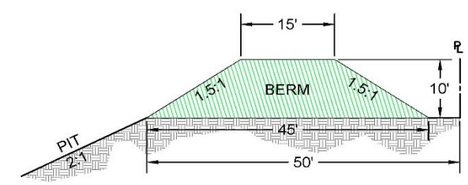
THE SITE IS LOCATED WITHIN THE PENINSULAR RANGES PHYSIOGRAPHIC PROVINCE, WHICH CONSISTS OF A SERIES OF MOUNTAIN RANGES CONSISTING PREDOMINANTLY OF MESOZOIC GRANITIC AND OLDER METAMORPHIC ROCKS, SEPARATED BY VALLEY BASINS FORMED FROM FAULTS BRANCHING FROM THE SAN ANDREAS FAULT ZONE, AS WELL AS OTHER FAULT SEGMENTS. THE SITE IS SITUATED IN THE SAN BERNARDINO BASIN, AN ALLUVIAL LOWLAND BOUNDED BY THE SAN ANDREAS FAULT ZONE TO THE NORTH AND THE SAN JACINTO FAULT TO THE SOUTHWEST. THE LOWLAND IS CONSIDERED TO REPRESENT A PULL-APART BASIN FORMED IN RESPONSE TO A RIGHT STEP DISPLACEMENT BETWEEN THE SAN JACINTO AND SAN ANDREAS FAULTS. THE LOWLANDS OF THE SAN BERNARDINO BASIN ARE FILLED WITH SEDIMENT DERIVED FROM THE SURROUNDING HIGHLANDS. (HALEY & ALDRICH, INC., APRIL 2020)

REGIONAL GEOLOGY

THE SITE IS LOCATED TO THE SOUTH OF THE EASTERN EXTENT OF THE SAN GABRIEL MOUNTAINS, A PROMINENT PHYSIOGRAPHIC FEATURE ALONG THE NORTHERN EDGE OF THE LOS ANGELES METROPOLITAN AREA AND PORTIONS OF THE INLAND EMPIRE. AS DESCRIBED BY DANSKIN ET AL. (DANSKIN, MCPHERSON, & WOOLFENDEN, 2006), THE REGIONAL GEOLOGIC SETTING CONSISTS OF UNCONSOLIDATED MATERIAL THAT FILLS THE BASINS AND INCLUDES RIVER-CHANNEL DEPOSITS AND YOUNGER ALLUVIUM OF HOLOCENE AGE, AS WELL AS OLDER ALLUVIUM OF PLEISTOCENE AGE. FURTHER EAST, IN ADDITION TO YOUNGER ALLUVIUM, QUATERNARY AND TERTIARY INDURATED SEDIMENTARY STRATA ARE EVIDENT IN OUTCROPS ALONG LOW-RELIEF HILLSIDES. A BASEMENT COMPLEX OF PRECAMBRIAN TO TERTIARY IGNEOUS AND METAMORPHIC ROCKS UNDERLIES THE BASIN FILL AND CROPS OUT IN THE SURROUNDING MOUNTAIN RANGES (DUTCHER & GARRETT, 1963). IN THE VICINITY OF THE SITE, THE SAN GABRIEL MOUNTAINS ARE BOUNDED ON THE SOUTH BY THE CUCAMONGA THRUST FAULT AND THE SAN ANDREAS FAULT TO THE NORTHEAST, WITH THE SAN JACINTO FAULT TRENDING BETWEEN THE TWO AFOREMENTIONED FAULTS UP LYTLE AND GLEN HELEN WASHES AND CANYONS. THIS AREA OF THE SAN GABRIEL MOUNTAINS IS HIGHLY FRACTURED BY THE SAN JACINTO FAULT, INCLUDING THE GLEN HELEN AND LYTLE CREEK SEGMENTS OF THE SAN JACINTO FAULT SYSTEM. (HALEY & ALDRICH, INC., APRIL 2020)

SITE GEOLOGY

THE GEOLOGY OF THE SITE IS REPRESENTATIVE OF BRAIDED, ALLUVIAL LITHOFACIES THAT TYPICALLY FORM WITHIN MEDIAL TO DISTAL FAN COMPLEXES. THREE (3) DISTINCT ALLUVIAL LITHOFACIES ARE MAPPED WITHIN AREA Q, BASED ON THE USGS GEOLOGIC MAP OF THE SAN BERNARDINO NORTH 7.5-MINUTE QUADRANGLE, SAN BERNARDINO COUNTY, CALIFORNIA (MILLER & MATTI, 2001). IN THE NORTHEASTERN PORTION OF AREA Q, LATE HOLOCENE DEPOSITS, CONSISTING PRIMARILY OF SAND AND GRAVEL OCCUR. THIS LITHOFACIES IS DISTINGUISHED AS UPPER LEVEL TERRACE SEDIMENTARY DEPOSITS. SLIGHTLY DISSECTED, SLIGHTLY CONSOLIDATED TO CEMENTED HOLOCENE AND LATE PLEISTOCENE AGE DEPOSITS OF ANGULAR TO SUBANGULAR SILT, SAND AND PEBBLES ALSO OCCUR IN THE NORTHEASTERN PORTION OF THE SITE AS WELL WITHIN THE CENTRAL SECTION, WHERE THIS LITHOFACIES OCCURS IN A GENERAL NORTH-SOUTH ORIENTATION CONSISTENT WITH INFERRED DEPOSITIONAL DIP. IN THE SOUTHWEST CORNER OF AREA Q, LATE HOLOCENE, LOWER TERRACE DEPOSITS OCCUR, CONSISTING CHIEFLY OF SAND AND GRAVEL WITH SPARSE PEBBLE TO BOULDER SIZE CLASTS. THE TERRACE LITHOFACIES IS TYPICALLY THIN (LESS THAN 10 FEET IN THICKNESS), AND CHARACTERIZED BY LATERALLY DISCONTINUOUS DEPOSITS THAT ARE SUBJECT LOCALIZED EROSIONAL SCOURING. CONSEQUENTLY, PEDOGENESIS IS CONSTRAINED AND TOPSOIL TENDS TO BE POORLY DEVELOPED AS A THIN VENEERS COVERING THE ALLUVIUM.



VEGETATED BERM CROSS - SECTION (TYP.)

PROFESSIONAL GEOLOGIST BRIAN G. ANDERSON NO. 7599 STATE OF CALIFORNIA

BRIAN G. ANDERSON CA P.G. 7599 EXP. 03-31-2020

REGISTERED PROFESSIONAL ENGINEER A. PEARCE SWEROFEGER NO. C87466 CIVIL STATE OF CALIFORNIA

A. PEARCE SWEROFEGER R.C.E. 87466 EXP. 09-30-2019

Vulcan Materials Company

SESPE CONSULTING, INC.
374 Poli Street, Ste. 200 • Ventura, CA 93001
(805) 275-1515 • www.sespeconsulting.com

OWNER / APPLICANT
VULCAN MATERIALS COMPANY - WESTERN DIVISION
500 N. BRAND AVENUE, SUITE 500
GLENDALE, CALIFORNIA 92103
(818) 553-8852

LAND USE CONSULTANT
SESPE CONSULTING, INC.
374 POLI STREET, SUITE 200
VENTURA, CALIFORNIA 93001
(805) 275-1515

REVISIONS

MARK	DATE	DESCRIPTION	BY
	09/23/19	INITIAL DRAFT	

REVIEWED BY: DATE

DATE

VULCAN MATERIALS COMPANY AREA Q

MINING PLOT PLAN

SCALE: HORIZ: AS SHOWN VERT: AS SHOWN
DRAWN BY: G. CAMUS
CHECKED BY: BGA / APS

FIGURE NUMBER 6

2.0 GENERAL OWNERSHIP / OPERATION INFORMATION

2.1 Mine Operator & Property Owner Information

MINE NAME: Area Q Quarry

CA MINE ID NUMBER: TBD

LOCATION OF MINE: The site has no physical address per the San Bernardino County Office of Assessor, though it is located just north of the intersection of Gray Street and 5th Avenue in Muscoy, San Bernardino County, CA 92407.

ASSESSOR PARCEL NUMBERS (APN): The Area Q Quarry lies on portions of multiple APNs shown in Table 2 below.

Table 2: APN's & Acreages

Parcel Number	Property Owner	Zoning Designation
0262-201-11-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-201-12-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-201-13-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-201-14-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-211-02-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-211-03-0000	Calmat Co. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-211-04-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-211-05-0000	Calmat Co. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-211-06-0000	Arundel Company, LLC P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)

Parcel Number	Property Owner	Zoning Designation
0262-221-03-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-221-04-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-221-05-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-221-09-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-221-10-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-221-11-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-221-12-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-221-13-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-221-17-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-221-21-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-221-29-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-221-30-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-231-01-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-241-13-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-241-14-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)

Parcel Number	Property Owner	Zoning Designation
0262-241-16-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
0262-241-26-0000	Vulcan Lands, Inc. P.O. Box 385014 Birmingham, Alabama 35242	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
Total Acres:	**196.0**	

COUNTY USE PERMIT: Mining & Reclamation Plan CUP No. TBD

MINE OPERATOR: Vulcan Materials Company – Western Division

TELEPHONE NUMBER: (951) 768-2641

MAILING ADDRESS: 500 N. Brand Avenue, Suite 500
Glendale, CA 91203

OWNERS OF POSSESSORY INTEREST: Vulcan Lands, Inc.
Calmat Co.
Arundel, LLC

LEGAL DESCRIPTION: Portions of Sections 12, 14, 23 and 24, Township 1 North, Range 5 West, San Bernardino Base and Meridian

2.2 Lead Agency Information

LEAD AGENCY: County of San Bernardino

STAFF CONTACT: George Kenline, P.E., C.E.G., C.H.G.
Senior Mining/Engineering Geologist

TELEPHONE NUMBER: (909) 387-8311

MAILING ADDRESS: 385 N. Arrowhead Avenue
San Bernardino, CA 92415-0187

2.3 General Mining Operation Information

START-UP DATE: Estimated 2023 (or once operations in Area L complete)

MINERAL RESOURCE ZONE (MRZ): Mineral Resource Zone 2 (MRZ-2)

Table 3: Mining Operation Information

Component	Proposed Plan
Mineral Commodity	Sand and Gravel
Estimated Total Aggregate Production of Area Q Quarry (tons)	40 million tons
Estimated Average Annual Production (tons/year)[1]	1.3 to 3.1 million tons/year
Area Q Quarry Area in Acres (including setbacks)	196.0 acres
Number of Acres of Mining Area	182.1 acres
Anticipated Depth of Mining (feet bgs)	120-feet bgs
Anticipated Depth of Pit at Reclamation (feet bgs)	120-feet bgs
Total Life of Mine[1]	30 years (approximate)
Estimated Mining Initiation Date	2023 (approximate)
Estimated Mining Termination Date	2053 (approximate)
Estimated Reclamation Completion Date	2055 (approximate)
Estimated Monitoring Completion Date	2058 (approximate)

"bgs" = below ground surface
1 – Depends on market demand. Based on historical extraction rate(s) at Cajon Creek Quarry.

3.0 ENVIRONMENTAL SETTING, CCR §3502 (B)(1)

The Area Q Quarry covers 196.0 acres located within the County of San Bernardino, southwest of Cajon Boulevard. Although the site is located within the County's jurisdiction, the City is adjacent to portions of the site to the west, north and east (see Figures 2 and 3). Access to the mine site for employee vehicles will come via the existing entrance which connects to Cajon Boulevard at the northeast corner of the site. No on-road haul trucks would enter or exit the site onto public roads, as material will be conveyed to the existing Cajon Creek Quarry, specifically Area L, to the north. Please see Figure 5 which shows an aerial of the existing site, Figure 6 which shows the layout of the Area Q Quarry, and Figure 12 which shows the cross-sections.

3.1 Geologic Setting

The Area Q Quarry is located within the Peninsular Ranges Physiographic Province, which consists of a series of mountain ranges consisting predominantly of Mesozoic granitic and older metamorphic rocks, separated by valley basins formed from faults branching from the San Andreas Fault zone, as well as other fault segments. The site is situated in the San Bernardino Basin, an alluvial lowland bounded by the San Andreas Fault zone to the north and the San Jacinto Fault to the southwest. The lowland is considered to represent a pull-apart basin formed in response to a right step displacement between the San Jacinto and San Andreas Faults (Haley and Aldrich, 2019/2020). The lowlands of the San Bernardino Basin are filled with sediment derived from the surrounding highlands. The sections that follow describe more fully the regional geologic framework. Also see the Geotechnical Evaluation competed by Haley and Aldrich in Appendix A for more detail (Haley and Aldrich, 2019/2020).

3.1.1 Regional Geology

The site is located to the south of the eastern extent of the San Gabriel Mountains, a prominent physiographic feature along the northern edge of the Los Angeles metropolitan area and portions of the Inland Empire. A generalized regional geologic map of the San Bernardino area that includes the site is provided as Figure 7. As described by Danskin et al. (Danskin, McPherson, & Woolfenden, 2006), the regional geologic setting consists of unconsolidated material that fills the basins and includes river-channel deposits and younger alluvium of Holocene age, as well as older alluvium of Pleistocene age. Further east, in addition to younger alluvium, Quaternary and Tertiary indurated sedimentary strata are evident in outcrops along low-relief hillsides. A basement complex of Precambrian to Tertiary igneous and metamorphic rocks underlies the basin fill and crops out in the surrounding mountain ranges (Dutcher & Garrett, 1963). In the vicinity of the site, the San Gabriel Mountains are bounded on the south by the Cucamonga Thrust Fault and the San Andreas Fault to the northeast, with the San Jacinto Fault trending between the two aforementioned faults up Lytle and Glen Helen washes and canyons. This area of the San Gabriel Mountains is highly fractured by the San Jacinto Fault, including the Glen Helen and Lytle Creek segments of the San Jacinto Fault system.

Regionally, the area encompassing the Area Q Quarry is considered seismically active. There are numerous active faults in addition to those discussed above. According to a Geotechnical Evaluation prepare by Haley and Aldrich (Haley and Aldrich, 2019/2020), many of faults in the region have been designated as being in Alquist-Priolo (AP) Special Studies Zones (Earthquake Fault Zones as known today), as these faults exhibit evidence of surface rupture in the last 11,700 years (Holocene Epoch) or are "sufficiently active and/or well-defined".

Rocks types occurring along the eastern extent of the San Gabriel Mountains and San Bernardino Mountains include igneous and metamorphic rocks. The metamorphic rocks include schist, gneiss, granulite, as well as marble. Quartz monzonite and quartz diorite rock types intrude into large areas of the metamorphic complexes. Many areas of the igneous plutonic rock are foliated with cataclastic textures. Tertiary conglomerates, sandstones and mudstones unconformably lie on top of, or at fault contact with, the metamorphic and igneous rock masses. Collectively, these rock types are considered the source provenance for the basin alluvium.

The alluvial geomorphic features expressed in the basin consist principally of alluvial fans and braided stream channels. According to the study prepared by Danskin et al. (Danskin, McPherson, & Woolfenden, 2006), the alluvial fans are mid- to late Pleistocene age, and exhibit well-developed incisions, or are younger with less pronounced incisions.

3.1.2 Site Geology

The geology of Area Q is representative of braided, alluvial lithofacies that typically form within medial to distal fan complexes. As such, three (3) distinct alluvial lithofacies are mapped within Area Q, based on the USGS Geologic Map of the San Bernardino North 7.5-Minute Quadrangle, San Bernardino County, California (Miller & Matti, 2001). In the northeastern portion of Area Q, late Holocene deposits, consisting primarily of sand and gravel occur. This lithofacies is distinguished as upper level terrace sedimentary deposits. Slightly dissected, slightly consolidated to cemented Holocene and late Pleistocene age deposits of angular to subangular silt, sand and pebbles also occur in the northeastern portion of the site as well within the central section, where this lithofacies occurs in a general north-south orientation consistent with inferred depositional dip. In the southwest corner of Area Q, late Holocene, lower terrace deposits occur, consisting chiefly of sand and gravel with sparse pebble to boulder size clasts. The terrace lithofacies is typically thin (less than 10-feet in thickness), and characterized by laterally discontinuous deposits that are subject localized erosional scouring. Consequently, pedogenesis is constrained and topsoil tends to be poorly developed as thin veneers covering the alluvium.

In 2004, TerraMins Inc. (TerraMins, Inc., 2004) completed three (3) exploratory boreholes at the Area Q site, each to a depth of 200-feet bgs. Based on the boring logs prepared by TerraMins (TerraMins, Inc., 2004), the site stratigraphy is interpreted as comprising stacked alluvial and fluvial lithofacies, and is described below.

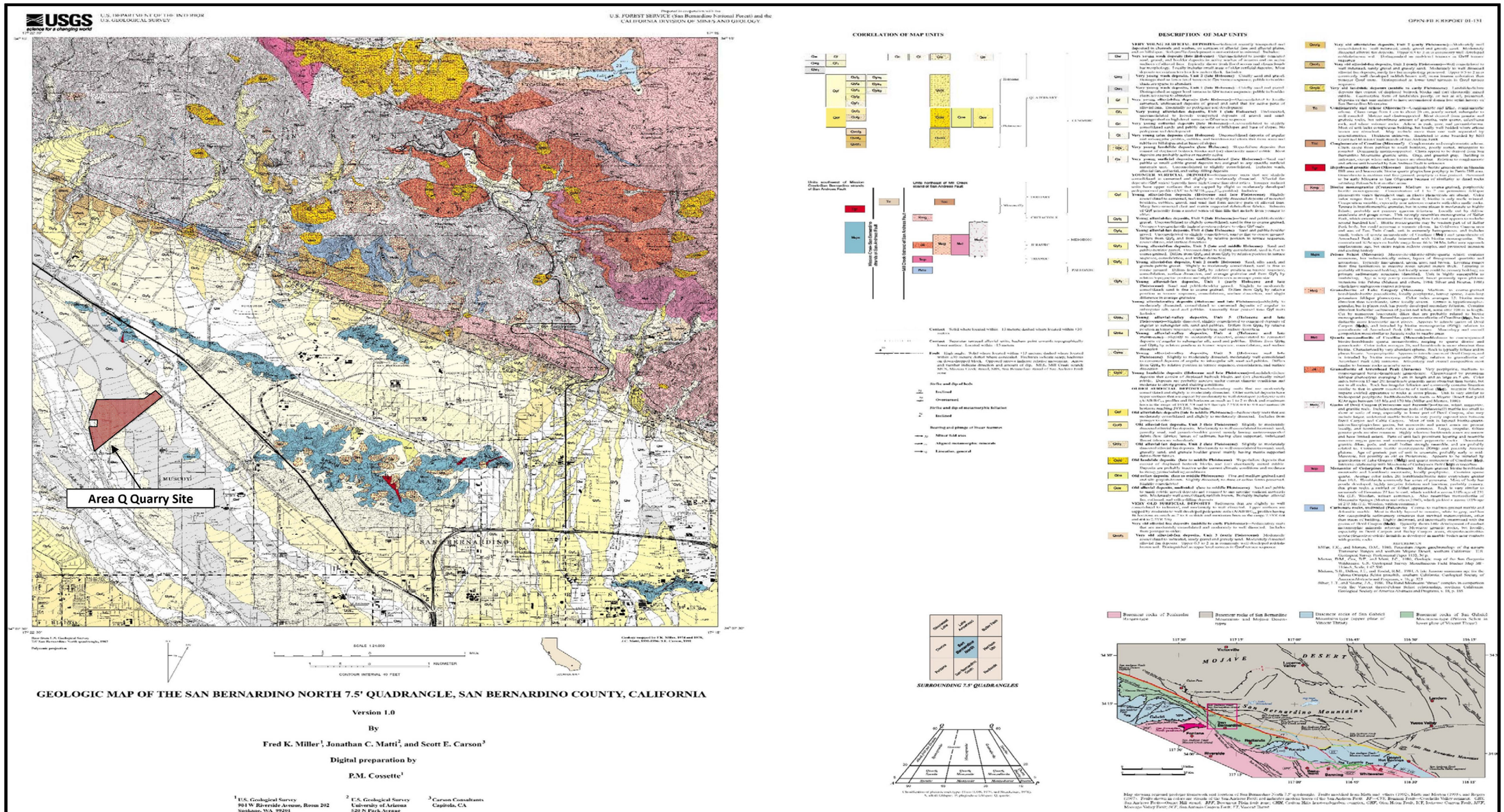
The lithologic logs prepared for the three (3) boreholes indicate the stratigraphy in Area Q appears generally uniform across the site. The material in the upper 100-feet of all three (3) holes is a dark brown to dark grayish brown clean sand and silt with very minor clay. The sand and gravel are moderately graded. Sand is predominant in the upper 100-feet. Coarse gravel is rounded to subrounded, with clast sizes up to 4 inches and averaging between 1-2 inches in size. Very minor clay in the samples is limited to coatings on the coarse gravel. Preliminary screening of samples from two (2) of the boreholes indicates sand is the principal grain size in the upper 100-feet.

Material samples collected by TerraMins Inc. in the upper portion of the borings indicates the lithologies consist mostly of clean sand with silt with some gravels and clay from the surface to about 30-feet bgs. From about 40-feet to 90-feet bgs and between 100-feet and 200-feet bgs, the sands appear cleaner with an increase in gravel and clean sand layers. TerraMins (TerraMins, Inc., 2004) suggests the clean sands are an indication of a greater wash gradient or lower baseline during their deposition. Some of the interbeds reportedly exhibit broken clasts and clays, which TerraMins attributes to moderate weathering.

The deposits appear to be loose and poorly indurated.

Based on the logs prepared by TerraMins, the material from 120-feet to 150-feet bgs is predominantly gravel and sand; and silt with coarse gravel comprising 50% to 60% of the material. Very minor clay is limited to coatings on clasts. Coarse gravel ranges in size from 0.5-inch to over 6-inches in size. Gravels exhibit subrounded to angular textures. The sediment below 120-feet bgs includes more broken rock chips. Some broken clasts exhibited moderate weathering. The sand lenses interbedded within these gravel beds is very clean and moderately graded. The logs indicate the sand and gravel containing clean sand is the dominant lithology below depths of 145-feet to 150-feet bgs; however, some coarse gravel and cobble occur at depths of 180-feet to 190-feet bgs, based on samples collected by TerraMins (TerraMins, Inc., 2004) from two (2) of the boreholes.

With regard to the structural geology of the site, the Glen Helen Fault Strand of the San Jacinto Fault is likely the most active strand of the San Jacinto Fault (Haley and Aldrich, 2019/2020). Most of the fault studies done to determine if the Glen Helen Strand was active were performed north of the site in the Glen Helen area. The portion of the fault that trends by the site is mapped on published geology maps (e.g., California Geological Survey [CGS] Fault Evaluation Report [FER-240]) as a “concealed” fault trending though the southwest portion of the Area Q Quarry. The Haley and Aldrich (Haley and Aldrich, 2019/2020) study notes that this segment is listed as a State of California AP Earthquake Fault Zone. Please see the Geotechnical Evaluation in Appendix A for more detail.



Source: U.S. Geologic Survey

- Approximate Area Q Quarry Site

SESPE CONSULTING, INC.

FIGURE 7	REGIONAL GEOLOGY MAP Area Q Quarry Project Vulcan Materials Company San Bernardino County, California		
PROJECT #:	VU01.17.77	DATE:	8/21/19
SCALE:	N/A	DRAWN BY:	GPS

3.2 Hydrology & Climate

3.2.1 Climate

A study prepared by Danskin et al. (Danskin, McPherson, & Woolfenden, 2006) provides a description of the San Bernardino area climatic setting, which is presented herein. The climate in the San Bernardino area is characterized by relatively warm, dry summers and cool, wet winters. Temperatures range from daytime highs of about 90° Fahrenheit (F) in Summer to night-time lows of about 40° F in Winter. Precipitation is nearly always in the form of rain in the lower elevations and mostly in the form of snow above an altitude of about 6,000-feet above mean sea level (amsl) in the surrounding San Bernardino and San Gabriel Mountains. Mean annual precipitation ranges from less than about 15-inches over much of the valley floor, to about 20-inches along the base of the mountains, to more than 30-inches along the crest of the mountains. Precipitation recorded at the City of San Bernardino from 1871 to 1998 indicates that a period of below-average precipitation can last more than 30 years, such as a dry period that extended from 1947 to 1977. Periods of above-average precipitation have tended to be shorter with a few, very wet years.

3.2.2 Surface Water & Hydrology

With respect to surface water hydrology, Danskin et al. (Danskin, McPherson, & Woolfenden, 2006) note that the San Bernardino area is located in the upper part of the Santa Ana River drainage basin. Runoff, particularly from the San Bernardino Mountains, flows in several small streams, Lytle Creek, and the Santa Ana River. The streams merge mostly within the San Bernardino area, flow southwest through Riverside and Orange Counties, and eventually empty into the Pacific Ocean. Seepage from the streams replenishes the valley-fill aquifer, which provides most of the water used within the San Bernardino area.

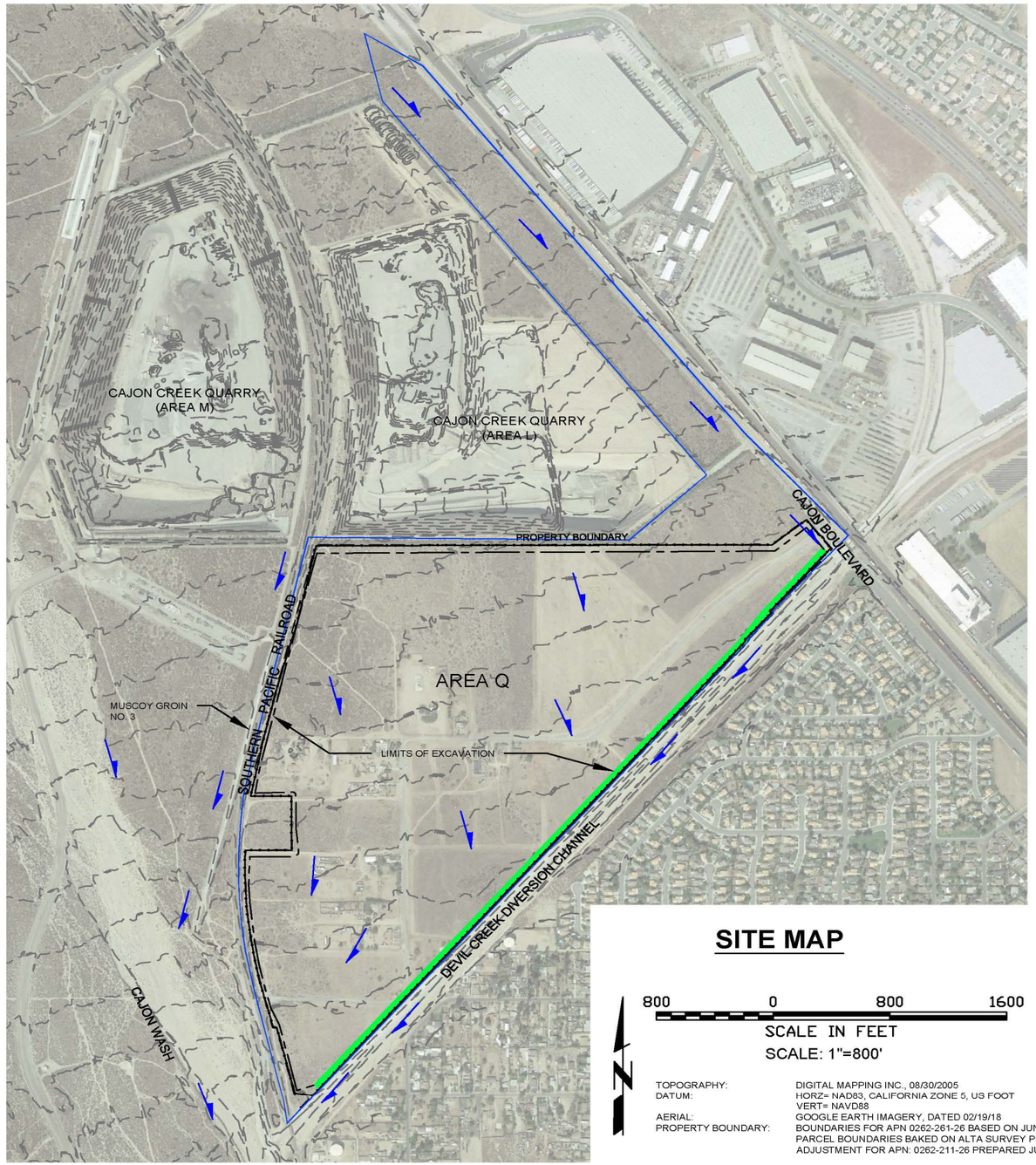
Based on the study prepared by Danskin et al. (Danskin, McPherson, & Woolfenden, 2006), steams originating from the San Bernardino Mountains do not flow continuously across the land surface, except during the largest floods. Rather they stop after a short distance, having lost flow as recharge to the groundwater system. Then, further downstream, flow resumes as a result of groundwater, restricted from flowing across the less permeable San Jacinto Fault, rising to the land surface and reestablishing flow in the streams. According to Danskin et al. (Danskin, McPherson, & Woolfenden, 2006) this intermittent condition was true for all streams except for Lytle Creek and for the Santa Ana River, prior to diversions in the mid-1800's. Moreover, in addition to the stream segments, surface flow occurs within conveyance structures, such as the Devil Creek Diversion Channel and other features, such as upstream groins within Cajon Creek, which divert or otherwise facilitate recharge of surface water.

Most of the Area Q Quarry's surface area is flat, previously disturbed ground with few features or developments. The general direction of the surface slope appears to be to the southeast following the trend of the Cajon Wash. The general flow direction of surface water across the site appears to be to the south, toward the concrete-lined flood control channel (Devil Creek Diversion Channel) along the southern boundary. The Cajon Wash, Cajon Creek and Lytle Creek are just east of the site. The site's western boundary is bordered by the SPRR track on an approximately 5-foot-high earthen berm. A series of certified groins along the eastern edge of Cajon Wash serve as flood control levees, which direct surface flow from away from the Area Q Quarry. Moreover, next to the SPRR track is Muscoy Groin #3, which provides flood control along a portion of the site's western boundary. Cajon Creek Quarry is to the north and Cajon Boulevard is on the eastern boundary.

Given current site topography, typical storm precipitation is generally contained and thus infiltrates into the ground. In the event of a large storm, surface runoff occurs generally as sheet flow to the south and into the adjacent concrete Devil Creek Diversion Channel. The Devil Creek Diversion Channel flows south and eventually discharges to the Cajon Wash east of Area Q. See Figure 8 for more details regarding the existing site topography as well as onsite and adjacent area drainage features. While the Devil Creek Diversion Channel is situated adjacent to the southern boundary of Area Q, design flows within the channel are not expected to impact the site, based on a comprehensive levee study prepared by Tetra Tech and Amec (Tetra Tech, Inc. & Amec, 2009) that includes the Devil Creek Diversion Channel. Based on modeling of predicted surface flow using the Hydrologic Engineering Center's River Analysis System (HEC-RAS), surface flows within the diversion channel are fully contained for the 100-year as well as the 500-year flood event.

The Area Q Quarry is not expected to receive significant local run-on from the surrounding areas due to existing topography and adjacent land uses. Vulcan's existing Cajon Creek Quarry borders Area Q to the north. The SPRR line and the Muscoy Groin #3, which is a certified flood control levee, to the west, and Cajon Boulevard to the east of the site tends to act a barrier to run-on from Cajon Creek to the west. Minimal run-on may originate from the east, but existing drainage features along Cajon Boulevard generally direct flows away from the site.

Onsite drainage, runoff volumes, and inundation depths within Area Q were analyzed in the Drainage Report prepared by Sespe Consulting, Inc. (Sespe) in November 2019 (see Appendix B). As described in the Drainage Report, the proposed mining operations within Area Q site would ultimately result in a reduction of runoff from the site area (Sespe Consulting, Inc., November 2019). As mining in Area Q progresses downward and the pit walls deepen to a final depth of 120-feet bgs, the site will have a greater ability to retain larger quantities of rainfall. Additionally, the proposed approximately 10-foot high earthen landscaped berm along the site's southern perimeter adjacent to the concrete Devil Creek Diversion Channel will also help control stormwater runoff. The HydroCAD® model was used for the existing and proposed site conditions to calculate the estimated maximum pre-runoff flow from the site as well as the containment potential of the Area Q pit once mining commences. Ultimately, at the completion of mining and post-reclamation, the lowered pit will retain onsite rainfall compared to current site conditions (Appendix B).



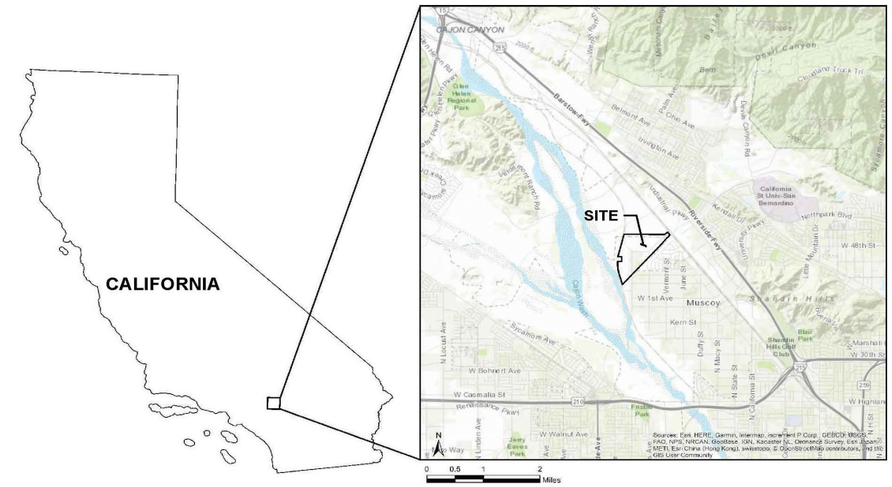
SITE MAP

800 0 800 1600

SCALE IN FEET

SCALE: 1"=800'

TOPOGRAPHY: DIGITAL MAPPING INC., 08/30/2005
DATUM: HORZ= NAD83, CALIFORNIA ZONE 5, US FOOT
VERT= NAVD88
AERIAL: GOOGLE EARTH IMAGERY, DATED 02/19/18
PROPERTY BOUNDARY: BOUNDARIES FOR APN 0262-261-26 BASED ON JUNE 2008 ALTA SURVEY PREPARED BY GORDON EDWARDS, PLS #6678. PARCEL BOUNDARIES BAKED ON ALTA SURVEY PREPARED APRIL 2006 BY DAWSON SURVEYING, INC. AND LOT LINE ADJUSTMENT FOR APN: 0262-211-26 PREPARED JUNE 2008 BY GORDON EDWARDS, PLS #6678.



VICINITY MAP

N.T.S.

LEGEND

- EXISTING TOPOGRAPHY
- WASTERSHED LIMIT
- FACILITY BOUNDARY
- PROJECT SITE AREA BOUNDARY
- TOP OF PIT
- 45' WIDE BERM LANDSCAPED AREA
- SURFACE DRAINAGE DIRECTION

PROJECT SITE PLAN
DRAINAGE REPORT

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VULCAN MATERIALS COMPANY
AREA Q
DRAINAGE REPORT - SITE PLAN

SCALE: HORZ: AS SHOWN VERT: AS SHOWN
DRAWN BY: G. CAMUS
CHECKED BY: APS
FIGURE 8
DATE: JUNE 2019

3.3 Groundwater System

3.3.1 Regional Hydrogeology

Groundwater in the vicinity of the site and more broadly the San Bernardino area occurs primarily in the basin-fill alluvium. The small quantity of groundwater that is found in, or moves through, consolidated and crystalline rocks surrounding and underlying the valley fill is considered negligible (Danskin, McPherson, & Woolfenden, 2006).

The extent of the valley-fill aquifer includes the Bunker Hill and Lytle Creek groundwater basins as defined by Dutcher and Garrett (Dutcher & Garrett, 1963), and is comprised of both unconsolidated alluvium and sedimentary strata. The unconsolidated deposits, which constitute the primary reservoir for storing large quantities of water, are composed of gravel, sand, silt, and clay. Near the mountain front, unconsolidated deposits tend to be coarse grained and poorly sorted, becoming finer grained and better sorted downstream from the mountains. Zones of well sorted sand and gravel, where saturated, yield significant quantities of water according to a study by Danskin et al. (Danskin, McPherson, & Woolfenden, 2006).

The unconsolidated deposits have been divided further by Dutcher and Garrett into older (Pleistocene) and younger (Holocene) alluvium and Holocene river-channel deposits. The older alluvium consists of continental, fluvial deposits ranging in thickness from a few tens of feet to more than 800-feet. The younger alluvium is about 100-feet thick, composed mainly of flood-plain deposits. The thin river-channel deposits are among the most permeable sediments in the San Bernardino area and cause large seepage losses from streams. Hydraulic conductivity for these deposits ranges from about 40 to 100 feet per day (ft/d) (Dutcher & Garrett, 1963).

Sedimentary rocks crop out mainly in the southern part of the San Bernardino area between the San Jacinto fault and Crafton Hills and underlie unconsolidated deposits near Redlands, California. Well yields are moderate from the more permeable layers, generally less than 1 cubic feet per second (ft^3/s); hydraulic conductivity ranges from 7 to 29 ft/d (Dutcher & Garrett, 1963) (Dutcher & Fenzel, 1972).

The valley-fill aquifer has been divided by Dutcher and Garrett (1963, pl. 7) into six (6) hydrogeologic units: an upper confining member, an upper water-bearing zone, a middle confining member, a middle water bearing zone, a lower confining member, and a lower water-bearing zone.

In places, the near surface upper confining member exhibits relatively low hydraulic conductivity, and is thin and discontinuous (Dutcher & Garrett, 1963). It appears to have been eroded by streamflow and replaced with coarse sand and gravel. Boreholes drilled to a depth of about 50-feet bgs in the vicinity of the Santa Ana River and the San Jacinto fault indicates a predominance of coarse sand and gravel, not fine-grained silt and clay. In these locations, the coarse material is essentially part of the upper water-bearing unit, vertical ground-water flow is less restricted, and unconfined conditions are likely to be present throughout the upper 100- to 200-feet of valley-fill sediment.

North of the Banning fault, the slope of the land surface increases and a more permeable deposit, considered to be part of the upper water-bearing zone, overlies the upper confining member. This overlying deposit appears to be the result of aggrading alluvial fans being deposited over the finer grained upper confining member.

The upper and middle water-bearing zones provide most of the water to municipal and agricultural wells. In the central part of the San Bernardino area, these zones are separated by as much as 300-feet of

interbedded silt, clay, and sand (the middle confining member). This middle confining member produces confined conditions over the central part of the basin, but thins and becomes less effective toward the margins of the basin (Dutcher & Garrett, 1963). In the area where the middle confining layer is effective, it is referred to locally as the confined area (Mendenhall, 1905; Dutcher and Garrett, 1963). Although not as permeable as the adjacent water-bearing zones, the middle confining member does yield significant quantities of water to wells (Dutcher & Garrett, 1963).

The lower confining member and lower water-bearing zone play a lesser role in the valley-fill aquifer. When penetrated by a production well, the lower confining member is used to increase the yield of the well. The lower water-bearing zone may be composed of poorly consolidated or partly cemented older alluvium, or may be composed solely of even older sedimentary rocks. In either case, the top of the lower water-bearing zone forms the effective bottom of the groundwater flow system within the valley-fill aquifer (Danskin, McPherson, & Woolfenden, 2006) (Dutcher & Garrett, 1963).

3.3.2 Site Groundwater Conditions

A Geotechnical Evaluation was prepared by Haley and Aldrich in April 2020 (see Appendix A), which found that the groundwater level underlying the site is below 200-feet bgs. Groundwater levels measured from 2011 to 2017 range between elevations 1,328.5- and 1,263.1-feet amsl (217.5- to 282.9-feet bgs), as reported by the State of California Department of Water Resources for a well approximately 200-feet south of the site. Similarly, data provided by San Bernardino Valley Municipal Water District reports that the depth to groundwater at the site in Fall 2010 was between 250- and 300-feet bgs (Haley and Aldrich, 2019/2020). Groundwater levels may fluctuate with time due to seasonal rainfall changes.

As described previously, mining on the site would commence in the northeast corner of the site, reaching a final depth of 120-feet bgs. Per the Geotechnical Evaluation completed by Haley and Aldrich, groundwater occurs at depths below 200-feet bgs. Therefore, mining activities would take place above groundwater and dewatering of the excavation would not be required.

3.4 Soils, Erosion, & Slope Stability

3.4.1 Soils

Soils underlying the Area Q Quarry were assessed and discussed in both the Habitat and Jurisdictional Assessment prepared by ELMT Consulting, Inc. (ELMT) (ELMT Consulting, Inc., May 2020) and the Geotechnical Evaluation (Haley and Aldrich, 2019/2020). Onsite surface elevation within Area Q ranges from approximately 1,495 to 1,580 feet amsl and generally slopes from north to south. Please see Appendix A for the Geotechnical Evaluation and Appendix C for the Habitat and Jurisdictional Assessment.

As previously discussed, topsoil is poorly developed across the Area Q Quarry, and is classified as three (3) distinct units, based on the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Also see Figure 9 below whish displays the soil units found within Area Q:

- **Soboba gravelly loamy sand, 0-9% slopes (SoC):** The Soboba gravelly loamy sand (0-9% slopes) consists of excessively drained soils formed from alluvium derived from granite sources. It is found on alluvial fans. Elevations are recorded at 25 to 3,700 feet amsl (ELMT Consulting, Inc., May 2020).

  The Soboba Stony Loamy Sand consists of an A horizon's dry color of grayish brown, brown or pale brown coarse sand, sand to loamy sand to fine loamy sand with gravels, cobbles having a hue

of Munsell 2.5Y or 10YR with a value of 4 or 6 dry and 4 or 5 moist with a chroma of 2 or 3. The moist, dark grayish brown (Munsell 2.5Y), stony loamy sand is generally loose, very friable, with abundant medium to fine roots and interstitial pores. The C horizon's dry color is generally a grayish brown or a bit lighter in color than the A horizon when dry (Haley and Aldrich, 2019/2020).

- **Tujunga gravelly loamy sand, 0-9% slopes (TvC):** The Tujunga gravelly loamy sand (0-9% slopes) consists of somewhat excessively drained soils formed from alluvium derived from granite sources. It is found on alluvial fans. Elevations are recorded at 10 to 1,500 feet amsl (ELMT Consulting, Inc., May 2020).

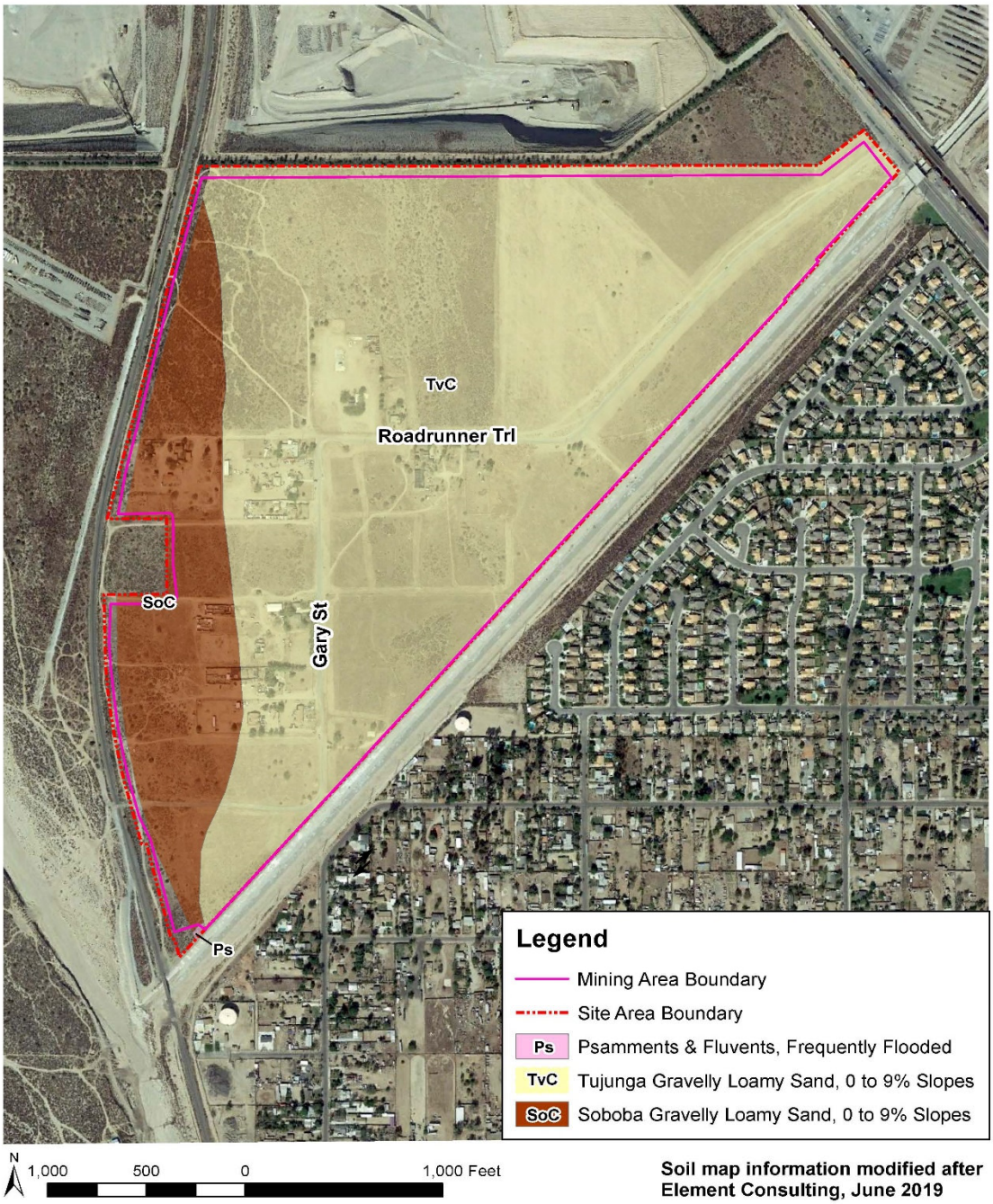
  The Tujunga Gravelly Loamy Sand (TvC) consists of an A horizon's dry color of brown to grayish brown fine sand, sand to sandy loam having a hue of Munsell 2.5Y or 10YR with a value of 4 or 7 dry and 3 or 5 moist, with a chroma of 1 to 4 dry and 2 to 4 moist. The moist color is Munsell 2.5Y. The C horizon's dry color is generally pale brown with a Munsell hue of 2.5Y or 10YR with a value of 5 to 8 and a chroma of 1 to 6 when dry and a value of 3 to 5 with a chroma of 2 to 4 when moist. These two (2) soil types have a tonal difference that may explain some of the tonal changes found along concealed faults in the area mentioned in the FER-240. During Haley and Aldrich's May 5th, 2018 site visit, the area near the site where surficial tonal changes and fault features such as lineations and scarps were mapped in FER-240 was visited. The area was disturbed by anthropogenic processes and changes in the wash morphology (Haley and Aldrich, 2019/2020).

- **Psamments, Fluvents and Frequently flooded soils (Ps):** Psamments form on terraces or outwash plants and contain well sorted, freely draining soils that contain sand, fine sand, loamy sand or coarse sand in subsoils between 10 and 40 inches in depth. Fluvents are formed by recent water-deposited sediments in floodplains, fans and stream or river deltas and consist of layers of various soil textures. These soils consist of somewhat excessively drained soils formed in sandy alluvium (ELMT Consulting, Inc., May 2020).

SMARA regulations (§3711) require salvage of topsoil and other suitable growth media (subsoil) prior to mining and redistribution in areas to be revegetated. SMARA regulations (§3705) also require soil analysis to determine if the growth media in revegetation areas consists of native topsoil and is otherwise adequate to support successful revegetation. In accordance with §3711, prior to initiation of mining in Area Q, topsoil and subsoil will be scraped off of the excavation area and will be used to construct the berm that will be constructed along the southern perimeter. The topsoil and subsoil will be salvaged and stored in the berm through the duration of mining in Area Q. Please see Section 5.11.1 for more detail related to topsoil and subsoil storage.

3.4.2 Erosion, Sediment Transport, & Windblown Dust

Erosion, sediment transport and windblown dust are controlled by implementation of the storm water Best Management Practices (BMPs), compliance with South Coast Air Quality Management District (SCAQMD) applicable rules and regulations, and site-specific inspections conducted by the operator. BMPs which manage off-site sediment transport during operations and rain events are outlined in the Drainage Report (Appendix B). The Area Q Quarry is within the jurisdiction of the SCAQMD. The SCAQMD Rule 403 (Fugitive Dust) and Rule 1157 (PM_{10} Emission Reductions from Aggregate and Related Operations) prescribe measures for the management of windblown dust. See Sections 4.5 and 5.12 for summaries of storm water BMPs to be implemented onsite.



Soil map information modified after Element Consulting, June 2019

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(805) 275-1515 • www.sespeconsulting.com

FIGURE 9

SOILS MAP
Area Q Mine Site
Vulcan Materials Company
San Bernardino County, California

3.5 Vegetation & Biological Resources

A Habitat and Jurisdictional Assessment (HJA) was conducted by ELMT in June 2019 for the Area Q Quarry (ELMT Consulting, Inc., May 2020). Please see Appendix C for the full HJA report prepared by ELMT. A Biological Study Area (BSA) was identified within the HJA that includes both the Area Q Quarry. The BSA is shown on Figure 10 below. The following sections discuss the existing biological and vegetative resources found on the Area Q Quarry.

3.5.1 Vegetation Communities

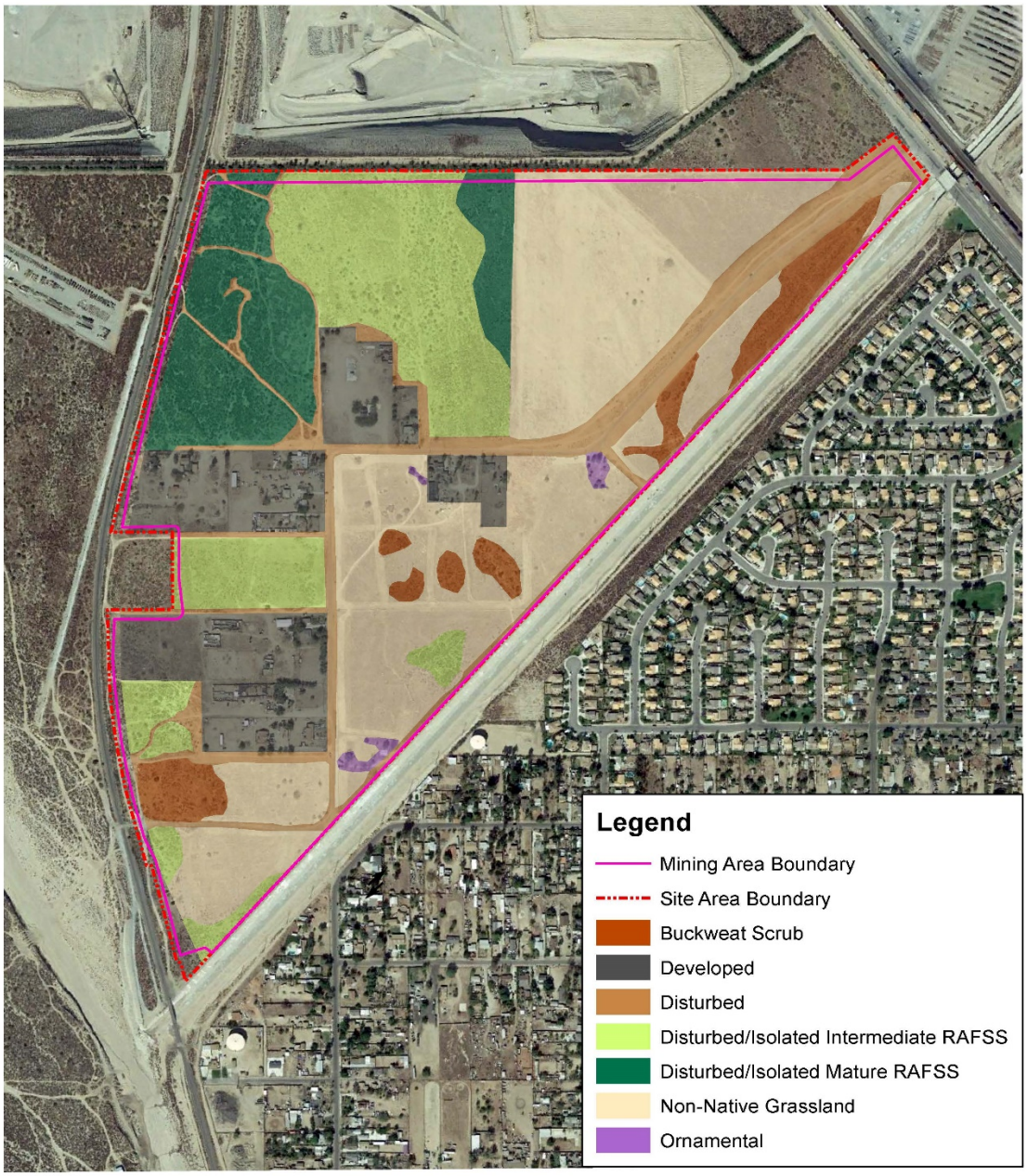
The pre-mining condition of the Area Q Quarry was characterized by ELMT in May 2017. Available aerial photos and topographic maps of the Area Q Quarry were also reviewed. As described in ELMT's report, the existing Area Q Quarry consists of both developed and undeveloped land that has been subject to a variety of human-related disturbances from existing rural residential developments, weed abatement activities, and unauthorized miscellaneous dumping. These historical land uses have resulted in most of the site being converted to a mosaic of non-native grasses and highly disturbed plant communities that have been cut off from the influences of the Cajon Wash by the SPRR tracks that border the western boundary of the site.

Four (4) plant communities were observed within the boundaries of the Area Q Quarry during the HJA: highly disturbed and degraded Riversidean alluvial fan sage scrub (RAFSS), buckwheat scrub, non-native grassland, and ornamental. The existing site contains land cover types that would be classified as disturbed and developed. The breakdown of the approximate acreages of these existing vegetation communities on the Area Q Quarry are presented on Figure 10. The RAFSS plant community is described in further detail below. Please see the HJA in Appendix C for a detailed discussion of all existing plant communities.

Riversidean Alluvial Fan Sage Scrub

RAFSS is considered a sensitive plant community in the County's General Plan. RAFSS is a community restricted to intermittently or rarely-flooded, low-gradient alluvial deposits along streams, washes, and fans within large canyons on the coastal slopes of the San Gabriel Mountains and San Bernardino Mountains in San Bernardino County. This community is composed of a variety of drought-deciduous subshrubs and large evergreen woody shrubs. Due to intense, periodic flooding and erosion within the alluvial plain, a series of step-like terraces are created above wash channels, each exhibiting a different successional phase. These phases are related to the amount of time elapsed since the most recent flood and occur as a sequential gradation of terrace types with increasing distance from the active channel.

The existing habitats within Area Q have either succeeded to upland chaparral habitat or are no longer functioning as viable RAFSS habitat with long-term conservation value for a number of reasons. First, the site's RAFSS habitat has been extensively disturbed by human activity for decades, and is heavily fragmented by roads, trails, and other human development (e.g. yard storage, unauthorized miscellaneous dumping, vehicle activity, etc.). Second, the RAFSS habitat is isolated from the historic fluvial flow patterns and scouring regimes due to residential and industrial development. Third, the elimination of fluvial processes from within Area by construction of the SPRR has removed the physical and biotic attributes needed to support viable RAFSS habitat and sensitive plant and wildlife species. Fourth, the RAFFS habitat is not occupied by any listed or otherwise sensitive plant or animal species, indicating minimal or no value as biological habitat.



Vegetation Map information modified after Element Consulting, June 2019, showing the plant communities within the Area Q Quarry boundaries.

SESPE CONSULTING, INC. 374 Poli Street, Suite 200 • Ventura, CA 93001 (805) 275-1515 • www.sespeconsulting.com	FIGURE 10	VEGETATION MAP Area Q Mine Site Vulcan Materials Company San Bernardino County, California

3.5.2 Wildlife

Plant communities provide foraging habitat, nesting/denning sites, and shelter from adverse weather or predation. Specifically, the site and surrounding habitat have the potential to support a variety of reptilian and mammalian species adapted to a high level of human disturbances. Additionally, the site provides suitable foraging, nesting, and cover habitat for a variety of resident and migrant bird species. Additionally, the site provides suitable foraging, nesting, and cover habitat for a variety of resident and migrant bird species; however, none of potential habitat is suitable for the special status reptilian, mammalian, or bird species. Fish and amphibian species are presumed absent from the site. Please see the HJA included in Appendix C for a comprehensive list of wildlife species that could potentially occur within the Area Q Quarry (ELMT Consulting, Inc., May 2020).

3.5.3 Special-Status Species

The HJA prepared by ELMT evaluated the conditions of the habitat(s) within the boundaries of the site to determine if the existing plant communities, at the time of the survey, had the potential to provide suitable habitat(s) for special-status plant and wildlife species. Special-status plant and wildlife species were evaluated for their potential to occur within the site based on habitat requirements, availability and quality of suitable habitat, and known distributions. No special-status plant or wildlife species were observed within the Area Q Quarry. Refer to the HJA (Appendix C) for a detailed special-status plant and wildlife species analysis.

Special-Status Wildlife

San Diego black-tailed jackrabbit (*Lepus californicus bennettii*), a California "Species of Special Concern," is the only special-status species that was observed on the site. A "Species of Special Concern" is an administrative designation and carries no formal legal status (ELMT Consulting, Inc., May 2020). Due to existing anthropogenic disturbances on-site, the observation of the San Diego black-tailed jackrabbit is assumed to be a fleeting occurrence and no mitigation is proposed. Additionally, the area west of the site, associated with the Cajon Wash, provides high quality habitat for San Diego black-tailed jackrabbit where the animal is expected to occur, and has ample area to disperse into the Cajon Wash from the Area Q site.

Special-Status Plant Communities

Highly disturbed and degraded RAFSS habitat was the only potentially sensitive habitat observed on the site during the HJA. However, as noted in Section 3.5.1 above, the biological assessment determined that the isolated and senescing RAFSS habitats identified on the site have either succeeded to upland chaparral habitat or is no longer functioning as viable RAFSS habitat with long-term conservation value, per the conclusions presented within the HJA prepared by ELMT (ELMT Consulting, Inc., May 2020). More specifically, the RAFFS has been extensively disturbed by human activity for decades, and is fragmented by roads, trails, and development. The site is surrounded to the north, south, and east sides by residential and industrial development. The SPRR tracks and a man-made berm to the west of the site separate the site's RAFSS habitats from less disturbed vegetation in the Cajon Wash.

4.0 MINING PLAN, CCR §2772, §3502, §3503

4.1 Mining Operations, CCR §2772(c)(3)-(4), (6)

As described previously, Vulcan is proposing to extract sand and gravel (aggregate) from a 182.1-acre portion (mining area) of the 196.0-acre Area Q Quarry. Mining presently occurs at the Cajon Creek Quarry, specifically within Area L north of the Area Q site, which commenced in 1995. Mining in Area Q would be initiated once mining within Area L is completed, which is anticipated to occur in 2023. An estimated total of approximately 40,000,000 tons of saleable (net) aggregate would be extracted over approximately 30-years, depending on market demand and/or at what point mining in Area L ceases. The gross extraction of all material over 30-years would be approximately 42.1 million tons which includes the removal of the overburden and waste rock (unusable aggregate). There would also be approximately 100,000 tons of topsoil and subsoil removed and used onsite at Area Q to construct the approximately 10-foot tall berm along the southern perimeter of the site (see Figure 6). Mining in Area Q would provide a high-quality source of local aggregate materials to serve the regional market, and would provide a continuing source of raw aggregate materials for processing at other permitted Vulcan facilities.

Aggregate would be mined from Area Q using mobile equipment (excavators, loaders, dozers, etc.) transferred from Area L. Aggregates mined from Area Q would be transferred via a conveyor system to the existing conveyance infrastructure in place at Area L. Material would then be processed and shipped from Vulcan's existing permitted locations. Mining would occur in one (1) single phase, beginning in the northeast corner of the Area Q Quarry and progressing until the excavation pit reaches a final depth of 120-feet below ground surface (bgs).

During the life of the mine, if feasible, portions of Area Q not subject to further disturbance would be reclaimed concurrent with mining operations. It is estimated that mining operations in Area Q would cease by approximately the end of 2053, and reclamation of the full site would be completed by approximately 2055 with onsite monitoring until the year 2058.

4.1.1 History of Project Area, CCR §3502 (b)(1)

Mining at Vulcan's existing Cajon Creek Quarry, immediately north of Area Q, was originally approved by the City in 1993 as part of the Cajon Creek Specific Plan and CUP/Reclamation Plan No. 90-01. Based on historical aerials, Vulcan's mining operations within the adjacent Cajon Creek Quarry began in 1995 and have been ongoing since that time (Haley and Aldrich, 2019/2020). While Area Q is located within the County, the adjacent Cajon Creek Quarry is located within the City.

Vulcan's Cajon Creek Quarry will be reclaimed per an existing separate CUP/Reclamation Plan (Specific Plan No. 90-01, CUP No. 91-31) approved by the City in 1993. Operations in Area Q will not involve any significant changes to the existing mining and/or processing operations currently occurring within the Cajon Creek Quarry, other than shifting the location of material extraction from Area L to Area Q. There are no proposed changes to the mining methods and equipment, or extraction rates and processing rates currently approved for the Cajon Creek Quarry. The aggregate from Area Q would be transferred via a conveyor system to the existing conveyance infrastructure in place at Area L. Material would then be processed and shipped from Vulcan's existing permitted locations.

The existing Area Q property is generally undeveloped and degraded, but has been subject to a variety of human-related disturbances, including approximately fifteen (15) homes in poor condition. Unauthorized, miscellaneously dumped debris occurs throughout the existing site, as the secluded nature

of the site and numerous internal dirt roads and trails facilitate trespassing and dumping.

4.1.2 Site Preparation

Operations in Area Q will commence once mining in Area L to the north is complete. Although dependent upon market demand, Area Q operations are estimated to begin in 2023. Prior to initiating mining, the existing fifteen (15) homes and ancillary structures/debris will be demolished and removed from the site in accordance with local, state and federal regulations. Please note, none of the existing structures to be demolished are considered historic-era buildings or have cultural significance.

Once the buildings and debris are removed, the site will then be stripped of vegetation using existing mobile equipment (i.e. scrapers, dozers, and excavators). The topsoil and subsoil will be removed as a separate layer from the mining area by using existing dozers or scrapers, and will be stored within the approximately 10-foot high earthen berm along the southern boundary of the site for use in later reclamation. If conditions become more difficult or access constraints prevent the use of scrapers, a hydraulic excavator, bulldozer, or front-end loader may be used to remove topsoil/subsoil. Under typical conditions, topsoil/subsoil removal will be completed approximately one (1) month ahead of mining. Approximately 100,000 tons of topsoil and subsoil will be removed as a separated layer, approximately 2-feet thick, from the site. Enough topsoil and subsoil will be removed and placed within the berm to ensure it extends the full length of the site adjacent to the Devil Creek Diversion Channel to the south. Once formed, the berm will be landscaped with native and non-native species to provide visual screening between mining operations and public viewpoints located to the south. Landscaping will also be an effective means for preventing water and wind erosion. Any excess material will be processed at Vulcan's existing San Bernardino facility as salable product.

Site preparation (i.e. removal of structures/debris, removal of soil, and construction of the berm) is expected to take approximately three (3) months to complete. Please see Figure 5 which shows the location of the existing site, and Figure 6 which shows the design of the landscaped perimeter berm.

4.1.3 Mining Operations

Once the topsoil and subsoil have been removed and the approximately 10-foot high perimeter berm constructed, normal mining operations will commence within the Area Q Quarry. As described previously, mining operations will be typical of surface aggregate mining operations, and will be conducted in the same manner as currently occurs at Vulcan's existing Cajon Creek Quarry to the north. There will be no concurrent mining operations in Area L and Area Q, as mining in Area Q would only initiate once the reserves in Area L are either depleted or no longer being mined.

Operations within Area Q consists of one (1) single mining phase to extract construction grade aggregate (sand and gravel) from the site. Mining would commence in the northeast corner of the site and progress to the south and west. The final depth of the excavation pit would be 120-feet bgs. As shown on Figures 6 and 12, the finished cut slopes will be excavated to a maximum 2H:1V (horizontal to vertical) gradient or flatter. Aggregate material in Area Q will be excavated using the same equipment (e.g. hydraulic excavators, dozers, front-loaders, etc.) currently operating at Cajon Creek Quarry to the north. Once mining in Area L is complete, existing equipment would simply be transferred over to Area Q to commence operations. Reclamation would be conducted concurrently during the mining phase if possible, or after mining is complete.

As shown on Figure 6, the existing conveyor system located within Area L will be extended into Area Q once mining commences. Electrical for the conveyor system and related equipment will be served by Southern California Edison. No mined material will be processed within the Area Q Quarry. All excavated aggregate will be transported via conveyor to the site's northern fence line, at which point it would be transferred over to Vulcan's existing conveyor system located within the Cajon Creek Quarry (i.e. Area L and Area M). From there, material would then be processed and shipped from Vulcan's existing permitted locations. No on-road haul trucks would enter or leave the site onto public roads.

Hours of operation will remain the same as they currently are at Cajon Creek Quarry. Additionally, the number of employees will be consistent with the number of employees needed to operate the Cajon Creek Quarry, and will fluctuate with seasonal demand. Employees working onsite will be moved from the existing Cajon Creek Quarry to work at Area Q.

4.1.4 Buffer Zones/Setbacks

No excavation of material, topsoil or subsoil will take place within 45- to 50-feet of any adjacent public rights-of-way (e.g. SPRR tracks, Cajon Boulevard, etc.) or within 50-feet from other property lines. Excavation will also be setback a minimum of 50-feet from Devil Creek Diversion Channel to the south, however the proposed perimeter berm will be constructed within this setback area (see Figure 6).

As described previously and shown on Figure 6, an approximately 10-foot high landscaped berm will be installed along the site's southern boundary. The berm will be installed within a 50-foot setback along the Devil Creek Diversion Channel and Cajon Boulevard. Visual screening (i.e. landscaping) will be provided along the perimeter berm. This berm and frontage road setback areas will be landscaped with native and nonnative landscape varieties of plants within a 15- to 30-foot planting area. The plant species and planting methods used at Area Q will be similar to those currently employed along the perimeter areas of the Cajon Creek Quarry to the north. The proposed berm will create a noise and visual barrier between mining activities and the residential neighborhoods within the community of Muscoy to the south.

4.2 Mine Wastes, CCR §2772 (c)(8)(A)

Mining waste is all solid, semisolid, and liquid waste materials from the extraction, beneficiation, and processing of ores and minerals. Mining waste includes, but is not limited to, soil, waste rock, and overburden, as defined in Section 2732 of the Public Resources Code, and tailings, slag, and other processed waste materials, including cementitious materials that are managed at the cement manufacturing facility where the materials were generated. There are no mining wastes produced as a result of this project. However, prior to initiating mining in Area Q, the debris and structures currently present at the site will be demolished and disposed of in accordance with local, state and federal regulations. Additionally, as discussed previously, Overburden will be handled and conveyed to the other Vulcan facilities in the same manner as the mined sand and gravel.

4.3 Material Processing

As described previously, none of the material extracted from Area Q will be processed onsite. Rather, aggregate extracted from Area Q will be transported from the mine pit via an onsite conveyor located at the northern boundary of the site, which will transfer the material to Vulcan's existing conveyance infrastructure in place at the southern boundary of Area L (see Figure 6). Once excavated, raw material

from Area Q will be placed directly into the conveyor feed hopper by front-end loader and transferred to Area L. Material will then be processed and shipped from Vulcan's existing permitted locations.

4.4 Production Water

4.4.1 Fresh Water

During operations, water will primarily be utilized for dust control within Area Q. If needed, minimal quantities will also be used as needed to irrigate the approximately 10-foot landscaped earthen berm along the southern site boundary. An existing water well and 15,000-gallon water tank, located at Vulcan's Cajon Creek site (Area M), will supply water to Area Q. Water for dust suppression and landscaping will be transported to the site via a mobile water truck. The quantity of water estimated to be used for Area Q is the same as what is currently used at Vulcan's Cajon Creek Quarry mining activities. There will be no change in water use. On average, Area L uses approximately 19.5 acre-feet (AF) per year (Haley and Aldrich, 2019/2020) for dust control and landscaping. Table 4 below describes the estimated maximum and average water usage for Area Q operations.

Table 4: Estimated Water Usage

Usage	Units		Notes
	Gallons per Minute (gal/min)	Acre-Feet per Year (AF/year)	
Average	50.91	19.5	Estimated based on historical water usage in Area L and the proposed operating schedule within Area Q.
Maximum	51.18	29.4	

Source: Water Supply Assessment (Haley and Aldrich, 2019/2020)

Water that falls on the Area Q Quarry, either due to dust suppression applications or as a result of a storm event, will be contained onsite and either naturally evaporate or infiltrate into the ground. No permanent waterways, streams, or diversions channels exist within Area Q, and none are proposed as a result of site development. The approximately 10-foot perimeter berm along the southern site boundary will help control stormwater runoff and erosion from impacting the adjacent Devil Creek Diversion Channel. For these reasons, operations within Area Q will not impact any nearby streams or waterways (i.e. Cajon Wash, Cajon Creek, Lytle Creek, and Devil Creek Diversion Channel). Please see the Drainage Report in Appendix B for more detail regarding onsite drainage.

4.4.2 Wastewater

No wastewater will be generated during Area Q operations, as no onsite processing will occur within the site. A mobile water truck will be utilized onsite for dust suppression, and applied water will either naturally evaporate or infiltrate into the ground.

At some point, there may be the need to have temporary portable toilets placed at the Area Q Quarry. If installed within Area Q, portable bathroom facilities will be placed within secondary containment and regularly maintained by a local contractor. Operations in Area Q will not produce any industrial or domestic wastewater discharges onsite.

The final excavation depth of Area Q pit will be 120-feet bgs. As noted in the Haley and Aldrich, August 2019 report, groundwater occurs at depths below 200-feet bgs. Therefore, mining will not reach

groundwater and thus dewatering is not warranted. Groundwater levels measured over a six (6) year period (2011 to 2017) ranged between 217.5 to 282.9 feet bgs, as reported by the State of California Department of Water Resources for a well approximately 200-feet south of the site (Haley and Aldrich, 2019/2020).

Diesel, gasoline and/or lubricating oil will be used in equipment and vehicles operating onsite. Although not anticipated, there may be dedicated storage of hazardous materials, including fuels, oils, and fluids, within ASTs onsite as needed. Other hydrocarbons, including fuels and lubricants, will be stored "in use" in a mobile fueling and maintenance trucks. Vehicle and equipment maintenance and repairs will primarily occur offsite at Vulcan's San Bernardino facility. However, if failures occur onsite and the equipment cannot be moved to the San Bernardino facility, onsite maintenance may occur. If required, onsite maintenance activities will utilize good housekeeping and BMPs outlined within the SWPPP to ensure hazardous materials are contained and properly disposed. The following good housekeeping measures for vehicle storage and maintenance will be implemented at the site:

- Prevent oil, grease, or fuel leaks to the ground, storm drains or surface waters.
- Place equipment and vehicles that are to be fueled, maintained, or stored in designated areas with appropriate BMPs installed.
- Clean up spills and leaks immediately and dispose of spilled material and spill cleanup materials properly.

Any potentially hazardous wastes generated during cleanup of accidental spills and/or equipment repairs will be properly disposed of in accordance with local, state, and federal regulations.

4.5 Erosion & Sediment Control, CCR §3503(a), §3503(e), §3506

Operations in Area Q will be subject to the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Industrial Activities (Industrial General Permit). Prior to commencement of mining, a site-specific SWPPP will be prepared that complies with the Industrial General Permit (IGP). The SWPPP will include the following: specific prohibitions, effluent limitations, source identification, practices to reduce pollutants, assessment of pollutant sources, materials inventory, preventative maintenance program, spill prevention and response procedures, general storm water best management practices (BMPs), training, record keeping, sampling procedures and a description of the monitoring program. Additionally, the SWPPP is considered a living document, and will be updated as needed to address changing conditions on the site. In addition to the SWPPP, the Drainage Report (Appendix B) also presents BMPs that will be implemented onsite to control erosion and sedimentation.

Table 5 summarizes the key erosion control BMPs for Area Q Quarry, as outlined in the Drainage Report prepared by Sespe Consulting (please see Appendix B for detailed descriptions of the BMPs). These BMPs will also be incorporated into the site-specific SWPPP, which will be prepared at a later date prior to commencement of mining operations:

Table 5: Summary of Erosion BMPs

Industrial Activity/Material	Potential Pollutants	BMPs Implemented	Required Equipment & Tools
Excavation and transfer of aggregate materials	Sediment	Erosion control; Sediment control; Stormwater containment.	Silt fencing and fiber rolls; Bulldozer for berm maintenance as needed.
	Dust	Wind erosion control; Erosion control; Sediment control; Tracking control.	Water truck; Soil binders.
Equipment and vehicle maintenance	Oil & Grease Hydrocarbons Gross Pollutants Trace Metals	Good housekeeping; Spill prevention & maintenance; Interior berms as needed to direct surface flows to pit; Secondary containment.	Covered trash bin; Spill kit; Bulldozer for berm maintenance.

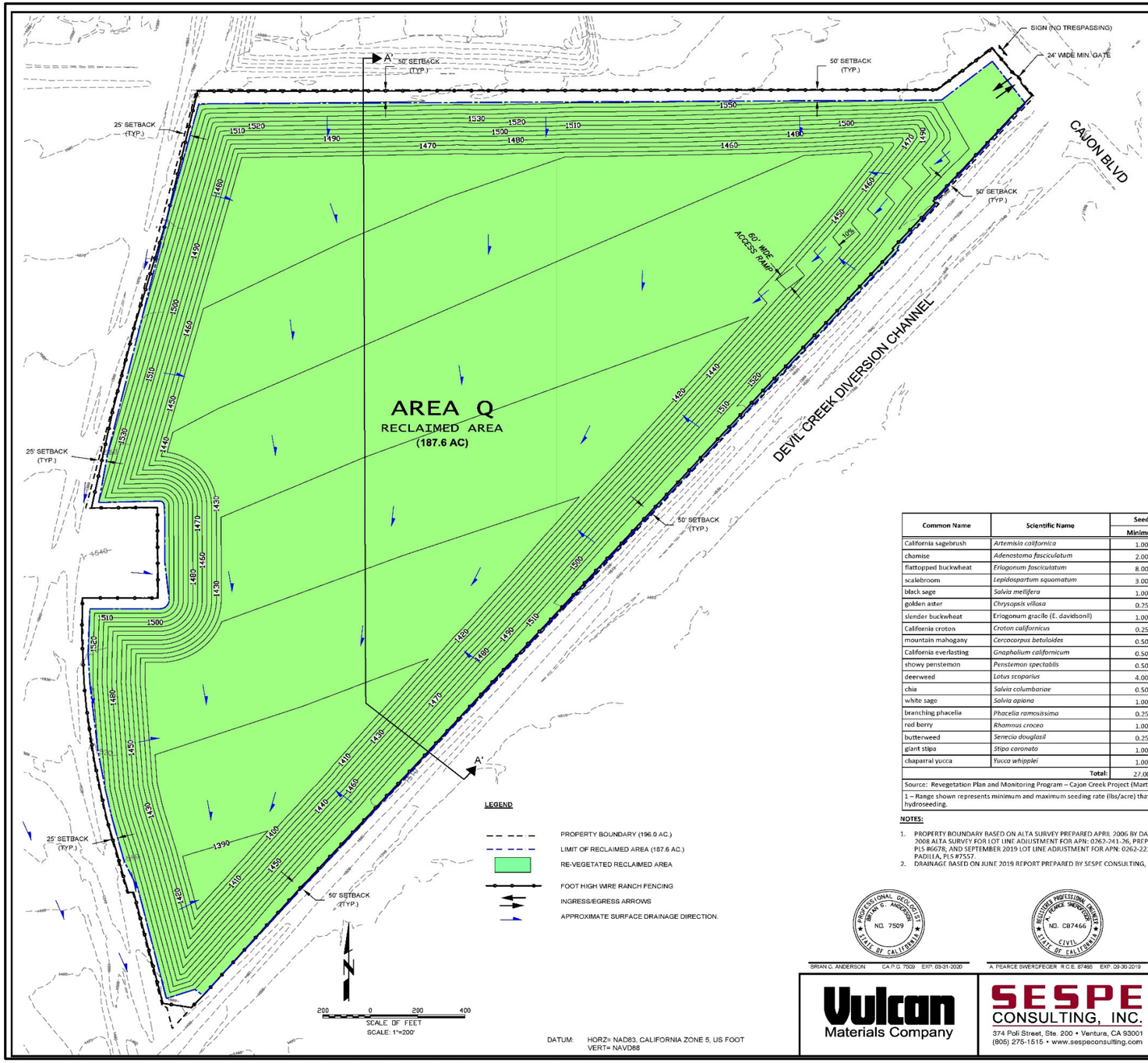
Source: Drainage Report (Sespe Consulting, Inc., November 2019)

Since no processing will occur onsite, no stockpiling of material is anticipated other than for temporary storage as may be necessary. For example, temporary stockpiles may be formed as part of stripping of topsoil and subsoil materials. As noted previously, the approximately 10-foot high earthen landscaped berm located along the southern site boundary will serve as the storage location for topsoil and subsoil for later use as reclamation cover. If needed, additional BMPs, such as sandbags, fiber rolls, or silt fencing, will be installed along the east side of the berm to ensure sediment does not inadvertently erode into the adjacent Devil Creek Diversion Channel during a large storm event.

Due to the existing topography (e.g. raised SPRR 5-foot-high earthen berm along the western boundary) and the approximately 10-foot high earthen berm along the southern boundary, stormwater runoff and sediment erosion from the Area Q Quarry is considered unlikely. Furthermore, as the pit walls deepen, the excavation area will act as a containment structure further decreasing the potential for offsite discharges as mining progresses to a final depth of 120-feet bgs. Development of Area Q would not add any paving or impervious surface areas. Due to site topography, and through the implementation of BMPs outlined in the SWPPP and Drainage Report (Appendix B), the chances of discharge, erosion, and/or sedimentation from Area Q that could adversely impact adjacent properties is considered very low.

4.6 Blasting

Due to the nature of the aggregate reserves (sand and gravel), blasting is not required. Therefore, no explosives will be stored and/or utilized within the Area Q Quarry.



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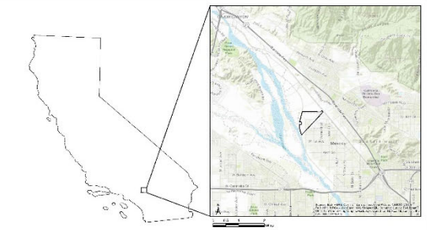

RECLAIMED CONDITIONS

MINERAL COMMODITY:	SAND AND GRAVEL
APPLICANT: OPERATOR: FEE LAND: OWNER:	VULCAN MATERIALS COMPANY - WESTERN DIVISION 500 N. BRAND AVENUE, SUITE 500 GLENDALE, CALIFORNIA 91203 (931) 768-2641
MINERAL RIGHTS OF FEE LAND:	VULCAN MATERIALS COMPANY - WESTERN DIVISION 500 N. BRAND AVENUE, SUITE 500 GLENDALE, CALIFORNIA 91203 (931) 768-2641
OWNER OF MINING LAND:	VULCAN MATERIALS COMPANY - WESTERN DIVISION 500 N. BRAND AVENUE, SUITE 500 GLENDALE, CALIFORNIA 91203 (931) 768-2641
PLAN DESIGN:	SESPE CONSULTING 374 POLI ST., STE. 200 • VENTURA CALIFORNIA 93001 (805) 275-1515
MAP PREPARER & SOURCE:	SESPE CONSULTING 374 POLI ST., STE. 200 • VENTURA CALIFORNIA 93001 (805) 275-1515
LAND USE ZONING:	COMMUNITY INDUSTRIAL (IC)
BASE MAP SOURCES:	TOPOGRAPHY: DIGITAL MAPPING, INC., 8/30/2005.
CONTOURS INTERVAL:	10 FEET

GENERAL RECLAMATION NOTES:

1. RECLAMATION OF THE SITE WILL INCLUDE SITE CLEANUP, PUBLIC SAFETY MEASURES, DRAINAGE CONTROLS, RECONTOURING AND RIPPING WHERE APPLICABLE, AND REVEGETATION UTILIZING NATIVE SPECIES, MONITORING AND MAINTENANCE.
2. THE ENTIRE PIT SHALL BE RE-VEGETATED WITH HYDROSEED.

RECLAMATION SCHEDULE:

Activity	Approximate Size (Acres)	Schedule		Land Use/End Use
		Time Start	Time End	
Site Preparation	187.6	January 2023	March 2023	Cleared Site
Mining Phase	182.1	March 2023	December 2053	Excavation Pit
Reclamation	187.6	January 2053	December 2055	Open Space
Reclamation Monitoring	187.6	January 2055	December 2058	Revegetated Open Space

NOTES:

1. TIMEFRAMES SHOWN ABOVE ARE ESTIMATIONS, AND MAY CHANGE DEPENDING ON MARKET DEMANDS, ETC. MINING IN AREA Q WILL COMMENCE ONCE MINING IN AREA L IS COMPLETE.
2. SITE PREPARATION WILL INVOLVE CLEARING THE SITE OF VEGETATION, AND REMOVING TOPSOIL/OVERBURDEN TO CONSTRUCT A 10-FOOT HIGH EARTHEN PERIMETER BERMS. LANDSCAPING ALONG THE PERIMETER BERM WILL ALSO BE PLANTED DURING THE SITE PREPARATION PHASE.
3. ONCE MINING IS COMPLETE, ALL AREAS WILL BE RECLAIMED TO OPEN SPACE. THE PERIMETER BERM WILL BE DECONSTRUCTED AND TOPSOIL SPREAD ON SLOPES TO FACILITATE REVEGETATION.
4. REVEGETATION ACTIVITIES WILL BE MONITORED BY A QUALIFIED REVEGETATION SPECIALIST. CHANGES TO REVEGETATION METHODS AND DEVELOPMENT OF POSSIBLE ALTERNATIVES TO ACHIEVE SMARA MINIMUM REVEGETATION STANDARDS WILL BE REVIEWED IN COORDINATION WITH SAN BERNARDINO COUNTY.
5. REVEGETATION ACTIVITIES WILL NOT PRECLUDE ACCESS TO, OR MINING OF ANY AGGREGATE RESERVES REMAINING AFTER COMPLETION OF THE PROPOSED MINING ACTIVITIES.
6. PROPOSED FINAL USE OF THE RECLAIMED SITE WILL BE OPEN SPACE.
7. OFFICIALS OF VULCAN WILL BE RESPONSIBLE FOR ACCOMPLISHING THE MAINTENANCE AND MONITORING PROGRAM IN COORDINATION WITH THE SAN BERNARDINO COUNTY PLANNING DEPARTMENT.
8. DATES AND TIMEFRAMES ARE APPROXIMATE.

FIVE-YEAR PERFORMANCE STANDARDS FOR REVEGETATION:

Performance Criteria	Monitoring Method	Success Criteria (5-Years)1	Management Response
Vegetative Cover	Transect/Plot or Aerial Photos Analysis	25% cover all native perennials combined per 50-meter by 1-meter transect	Reseed and/or identify and repair influencing variable
Density	Transect/Plot	5 native perennial species per 50-meter by 1-meter transect	Substitute failing species with planted species that is thriving
Species Richness	Transect/Plot	20 native perennials per 50-meter by 1-meter transect	Reseed and/or identify and repair influencing variable

1 – Within the 187.6-acre reclamation area, six (6) randomly placed 50-meter by 1-meter transects will be utilized to determine the success of revegetation efforts at Area Q. Data for all transects will be averaged to produce the final success criteria results.

Common Name	Scientific Name	Seeding Rate (lbs./acre) 1	
		Minimum	Maximum
California sagebrush	*Artemisia californica*	1.00	2.00
chamise	*Adenostoma fasciculatum*	2.00	4.00
flattopped buckwheat	*Eriogonum fasciculatum*	8.00	12.00
scalebroom	*Lepidospartum squamatum*	3.00	5.00
black sage	*Salvia mellifera*	1.00	2.00
golden aster	*Chrysopsis villosa*	0.25	0.50
slender buckwheat	Eriogonum gracile (E. davidsonii)	1.00	2.00
California croton	*Croton californicus*	0.25	0.50
mountain mahogany	*Cercocarpus betuloides*	0.50	1.50
California everlasting	*Gnaphalium californicum*	0.50	1.00
showy penstemon	*Penstemon spectablis*	0.50	1.50
deerweed	*Lotus scoparius*	4.00	8.00
chia	*Salvia columbariae*	0.50	2.00
white sage	*Salvia apiana*	1.00	2.00
branching phacelia	*Phacelia ramosissima*	0.25	1.00
red berry	*Rhamnus crocea*	1.00	2.00
butterweed	*Senecio douglasii*	0.25	0.50
giant stipa	*Stipa coronata*	1.00	2.00
chaparral yucca	*Yucca whipplei*	1.00	2.00
	Total:	27.00	51.50

Source: Revegetation Plan and Monitoring Program – Cajon Creek Project (Martha Blane, November 1992)

1 – Range shown represents minimum and maximum seeding rate (lbs/acre) that should be utilized during hydroseeding.

NOTES:

1. PROPERTY BOUNDARY BASED ON ALTA SURVEY PREPARED APRIL 2006 BY DAWSON SURVEYING, INC.; JUNE 2008 ALTA SURVEY FOR LOT LINE ADJUSTMENT FOR APN: 0262-241-26, PREPARED BY GORDON EDWARDS, PLS #6678; AND SEPTEMBER 2019 LOT LINE ADJUSTMENT FOR APN: 0262-221-17, PREPARED BY JOSEPH PADILLA, PLS #7557.
2. DRAINAGE BASED ON JUNE 2019 REPORT PREPARED BY SESPE CONSULTING, INC.

PROFESSIONAL GEOLOGIST BRIAN C. ANDERSON NO. 7509 STATE OF CALIFORNIA

BRIAN C. ANDERSON CA P.G. 7509 EXP. 03-31-2020

REGISTERED PROFESSIONAL ENGINEER A. PEARCE SWERDFEGER NO. C87466 CIVIL STATE OF CALIFORNIA

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REVISIONS

NUMBER	DATE	DESCRIPTION	BY
	06/12/19	INIT. A. DRAFT	GAC

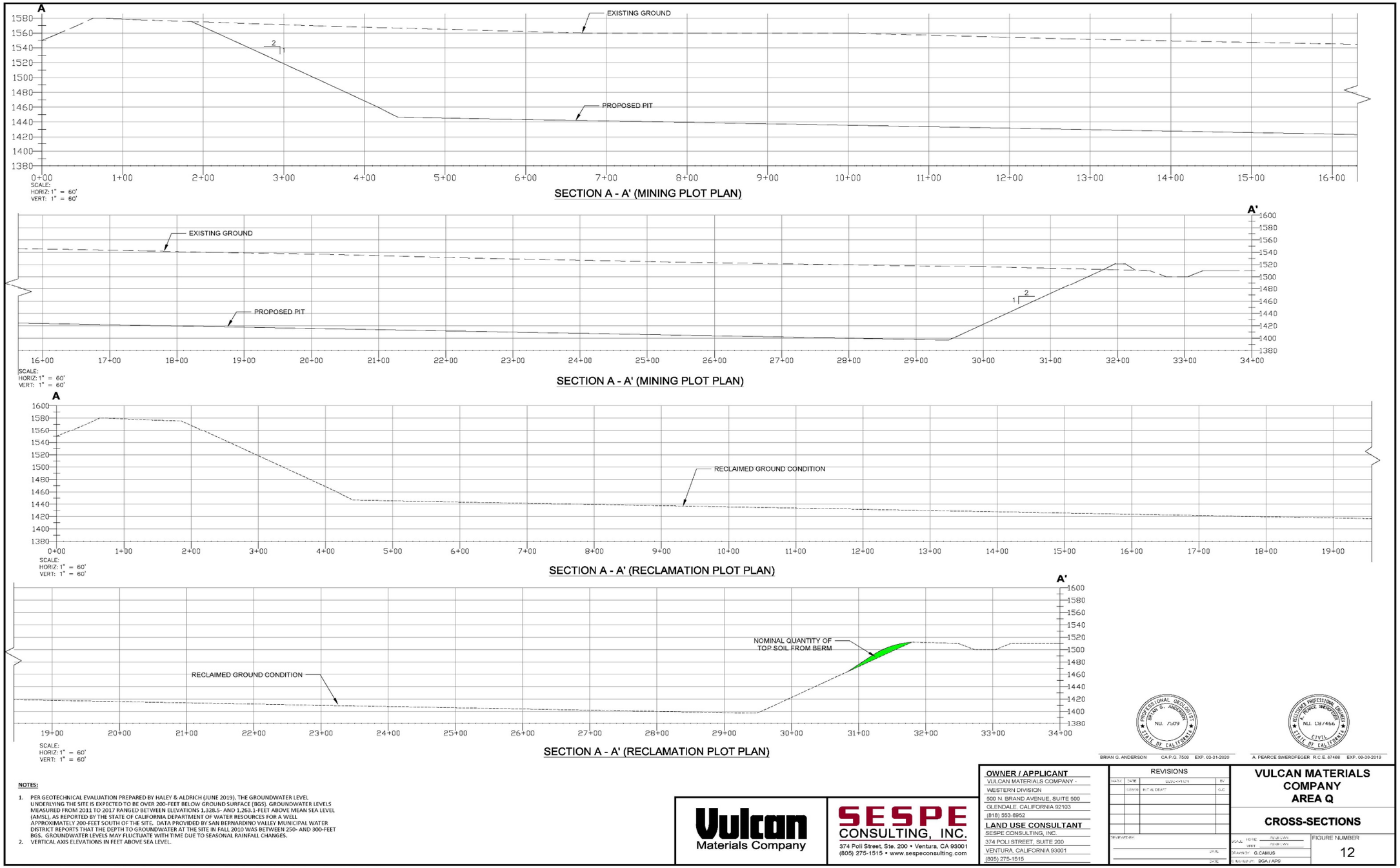
REVIEWED BY: DATE / DATE

VULCAN MATERIALS COMPANY AREA Q

RECLAMATION PLOT PLAN

SCALE: HOR.= AS SHOWN VERT.= AS SHOWN
DRAWN BY: G. CAMUS
DESIGNED BY: BGA / APS

FIGURE NUMBER 11


A
EXISTING GROUND
PROPOSED PIT
SCALE:
HORIZ: 1" = 60'
VERT: 1" = 60'
SECTION A - A' (MINING PLOT PLAN)
A'
EXISTING GROUND
PROPOSED PIT
SCALE:
HORIZ: 1" = 60'
VERT: 1" = 60'
SECTION A - A' (MINING PLOT PLAN)
A
RECLAIMED GROUND CONDITION
SCALE:
HORIZ: 1" = 60'
VERT: 1" = 60'
SECTION A - A' (RECLAMATION PLOT PLAN)
A'
NOMINAL QUANTITY OF TOP SOIL FROM BERM
RECLAIMED GROUND CONDITION
SCALE:
HORIZ: 1" = 60'
VERT: 1" = 60'
SECTION A - A' (RECLAMATION PLOT PLAN)
NOTES:
1. PER GEOTECHNICAL EVALUATION PREPARED BY HALEY & ALDRICH (JUNE 2019), THE GROUNDWATER LEVEL UNDERLYING THE SITE IS EXPECTED TO BE OVER 200-FEET BELOW GROUND SURFACE (BGS). GROUNDWATER LEVELS MEASURED FROM 2011 TO 2017 RANGED BETWEEN ELEVATIONS 1,328.5- AND 1,263.1-FEET ABOVE MEAN SEA LEVEL (AMSL), AS REPORTED BY THE STATE OF CALIFORNIA DEPARTMENT OF WATER RESOURCES FOR A WELL APPROXIMATELY 200-FEET SOUTH OF THE SITE. DATA PROVIDED BY SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT REPORTS THAT THE DEPTH TO GROUNDWATER AT THE SITE IN FALL 2010 WAS BETWEEN 250- AND 300-FEET BGS. GROUNDWATER LEVELS MAY FLUCTUATE WITH TIME DUE TO SEASONAL RAINFALL CHANGES.
2. VERTICAL AXIS ELEVATIONS IN FEET ABOVE SEA LEVEL.
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VULCAN MATERIALS COMPANY
AREA Q
CROSS-SECTIONS
FIGURE NUMBER
12
DRAWN BY: G.CAMUS
CHECKED BY: BGA / APS

5.0 RECLAMATION PLAN

The following section has been prepared and organized pursuant to the requirements outlined within the Surface Mining and Reclamation Act (SMARA) and the County's requirements. The California Code of Regulations (CCR) citations presented within each titled section reference specific SMARA statutes applicable to each section (also see the "Table of Compliance for SMARA Requirements").

5.1 Existing & Proposed Land Uses, CCR §2772 (c)(7), §3502 (b)(1)

Existing land uses near the site include Vulcan's Cajon Creek Quarry and auxiliary facilities located immediately north and northwest of the site, and developed residential neighborhoods located to the south and east, across the Devil Creek Diversion Channel. The Devil Creek Diversion Channel runs down the southern boundary of the site, and the residential community of Muscoy is located directly south of the diversion channel. The site's western boundary is bordered by the SPRR, which lies between the site, Lytle Creek and Cajon Creek. Industrial developments are located to the east of the site, across Cajon Boulevard. Please see Figures 1 through 5, as well as Table 6 below, which describe the surrounding setting. Also see Figure 11 which shows the layout and design of the reclaimed Area Q Quarry, and Figure 12 which shows the reclamation cross-sections.

Table 6: Surrounding Land Uses

Direction	Land Use	Distance from Site (feet)
North	Cajon Creek Quarry (i.e. Area L)	Adjacent
South	Residences / Community of Muscoy	Approximately 200-feet (across Devil Creek Diversion Channel)
East	Industrial Developments	Approximately 225-feet (across Cajon Boulevard/SPRR track)
West	Cajon Creek Quarry (i.e. Area N) Cajon Creek / Lytle Creek	Approximately 90-feet (across SPRR track)

Note: See Figures 1 through 5 which depict the local setting.

As discussed in Section 1.2, the existing Area Q property is generally undeveloped but has been subject to a variety of human-related disturbances and degradation, including approximately fifteen (15) former homes in poor condition. Unauthorized, miscellaneously dumped debris occurs throughout the site, as the secluded nature of the site and numerous internal dirt roads and trails facilitate trespassing and dumping.

The existing County zoning designation of Area Q is Muscoy/Single Residential – 1 Acre Minimum (MS/RS-1). Vulcan is requesting a General Plan Land Use Zoning Designation change as part of their CUP application to rezone the property to Community Industrial (IC). Subject to approval of a CUP, surface mining operations and related facilities and activities are an allowable use within the IC land use designation.

Reclamation of Area Q has been designed to complement the reclamation currently approved and partially implemented for the existing mining operation within Vulcan's Cajon Creek Quarry to the north. Portions of Area M to the northwest have been successfully reclaimed and revegetated per CUP No. 91-31/Specific Plan No. 90-01, and therefore offers a direct reference standard for comparison. As with Cajon Creek, the proposed end-use of the reclaimed Area Q Quarry is revegetated open space.

5.2 Visibility, CCR §3502 (b)(2)

The site is located in an urban area of unincorporated San Bernardino County, California, immediately west of the City of San Bernardino. Surrounding land uses near the site are described in Section 5.1 and summarized in Table 6 above.

The existing topography immediately surrounding the Area Q Quarry is generally flat. Foothills of the San Bernardino Mountains are located approximately 3.0 miles to the northeast of the site, and foothills of the San Gabriel Mountains are located approximately 4.0 miles to the northwest. The undeveloped Cajon Creek Wash is located just west of the site.

Numerous prominent roadways are located nearby the site. Please see Table 7 below which summarizes nearby public roadways in proximity to the Area Q Quarry.

Table 7: Surrounding Roadways

Direction	Roadway	Distance from Site
North	Interstate 15 (I-15)	3.5 miles
	State Route 138 (SR-138)	5.8 miles
South	State Route 210 (SR-210) / East Highland Avenue	1.8 miles
East	Cajon Boulevard	Adjacent
	Interstate 215 (I-215)	0.5 miles
	State Route 18 (SR-18)	4.4 miles
West	Riverside Avenue	1.8 miles

The areas surrounding the site are mostly flat with existing vegetation and buildings/structures that generally obscure views of Area Q from most distant viewpoints. For this reason, the Area Q viewshed is generally limited to the publicly accessible areas and roadways located adjacent to the perimeter of the site. Specifically, reclamation activities at the Area Q Quarry have the potential to be visible from the nearby neighborhoods in the community of Muscoy to the south, and to a lesser extent from adjacent Cajon Boulevard to the east. Visual screening will be installed along portions of the Area Q Quarry prior to mining, as described in Section 5.2.1 below.

5.2.1 Berms & Screens

The Area Q Quarry has been designed to reduce potential visual impacts. Specifically, during site preparation, an approximately 10-foot high earthen berm will be constructed along the southern boundary of Area Q Quarry. As discussed previously, this berm will not only serve to store topsoil and subsoil, but once constructed this berm will also provide visual screening between mining and reclamation activities and the residences to the south within the community of Muscoy. Proposed visual screening in this area will include native and non-native landscape varieties of plants established within a 15-to-30-foot-wide planting area along the site perimeters. Please see Figure 6, which shows the location of the proposed screening berm and landscaping. Furthermore, operations will generally occur below grade as mining progresses and the excavation pit deepens to a final depth of 120-feet bgs, which will further reduce visual impacts. Ultimately, installation of the berm and native vegetation along the site boundaries is expected to improve the overall visual quality within the Area Q vicinity during mining operations, as the existing site with miscellaneous dumped debris and outdoor storage will no longer be visible.

Prior to reclamation/revegetation, the perimeter berm will be deconstructed and the topsoil and subsoil will be spread throughout the area to be reclaimed to facilitate revegetation.

5.2.2 Fencing

The entire perimeter of the Area Q Quarry will be fenced with 6-foot high wire fencing. The entrance gate located at the northeast corner of the site along Cajon Boulevard will be a minimum 24-feet wide. Signs will be placed at the access road and as necessary on the perimeter fencing to identify the mining operation (in English and Spanish, as necessary). Please see Figure 6 which shows the location of perimeter fencing and road signs.

5.2.3 Lighting

Lighting for nighttime operations and security will be provided as needed. Lighting within Area Q will be installed in a manner so as to minimize glare onto adjacent sites. The lights will comply with all applicable County standards and industry practices. High pressure sodium and/or cut-off fixtures (or equivalent IDA-approved fixtures) will be used instead of mercury-vapor fixtures for any required nighttime lighting. The lighting will also be designed to confine illumination to the site and/or to areas that do not include light-sensitive uses.

5.3 Existing Vegetation, CCR §3502 (b)(1), §3503 (c), §3703

As described in Section 3.5, historical land uses have resulted in the majority of the site being converted to a mosaic of non-native grasses and highly disturbed plant communities that have been cut off from the influences of the Cajon Wash by the SPRR railroad tracks that border the western boundary of Area Q.

As described in the HJA prepared by ELMT in 2019 (ELMT Consulting, Inc., May 2020), four (4) plant communities are currently found within the boundaries of the Area Q Quarry: highly disturbed and degraded Riversidean alluvial fan sage scrub (RAFSS), buckwheat scrub, non-native grassland, and ornamental (see Figure 10). In addition, the site contains a land cover type that would be classified as disturbed and developed. Please see the HJA in Appendix C for more details.

There are very few existing trees found within the Area Q Quarry. Per the HJA prepared by ELMT, the only trees observed were ornamentals, consisting of various pine trees (*Pinus* sp.), china berry (*Melia azedarach*), Peruvian pepper (*Schinus molle*), Brazilian pepper (*Schinus terebinthifolius*), and jacaranda (*Jacaranda mimosifolia*). None of these existing trees have trunks greater than 6-inches in diameter, and none are considered protected and/or special-status tree species (e.g. Joshua/Yucca trees).

5.3.1 Special-Status Plant Species

The Area Q Quarry is unoccupied by special-status plant species. As noted previously, the highly disturbed RAFSS community was observed by ELMT within the middle portion of the western boundary of the site (see Figures 5 and 6). However, the existing habitats within Area Q have either succeeded to upland chaparral habitat or are no longer functioning as viable RAFSS habitat with long-term conservation value. The site's RAFSS habitat has been extensively disturbed and degraded by human activity for decades, and is heavily fragmented by roads, trails, and other human development (e.g. yard storage, illicit dumping, vehicle activity, etc.). Additionally, the RAFSS habitat is isolated from the historic fluvial flow patterns and scouring regimes due to residential and industrial development. The elimination of fluvial processes from within the site area has removed the physical and biotic attributes needed to support viable RAFSS habitat

and sensitive plant and wildlife species. No other federally or State listed wildlife species were observed within the Area Q Quarry. Please see the HJA in Appendix C for more detail.

5.4 Wildlife, CCR §3503 (c), §3703

The Area Q Quarry is unoccupied by special-status wildlife species. As part of the HJA completed June 2019, ELMT assessed the potential for wildlife species to be found within the site. Wildlife detections were based on calls, songs, scat, tracks, burrows, and direct observation. ELMT also utilized field guides to assist with identification of species during surveys.

ELMT determined there was a potential for various reptiles, birds, and mammal species to be found within the Area Q Quarry. However, none of these wildlife species were identified as special-status species. Based on existing conditions, fish and amphibians are presumed absent from the site, as there is no habitat to support these species. Please see Section 3.5.2 above for more detail on wildlife species found within the site. Also, please see the HJA provided in Appendix C for a comprehensive list of wildlife species that could potentially occur within the area.

5.4.1 Special-Status Wildlife Species

Thirty-one (31) special-status wildlife species have been reported in the San Bernardino North and Devore USGS 7.5-minute quadrangles (refer to Appendix C). San Diego black-tailed jackrabbit (*Lepus californicus bennettii*), a California "Species of Special Concern," is the only special-status species observed on the site. A "Species of Special Concern" is an administrative designation and carries no formal legal status.

Due to existing anthropogenic disturbances on-site, the observation of the San Diego black-tailed jackrabbit is assumed to be a fleeting occurrence and no mitigation is proposed. Additionally, the area west of the Area Q Quarry, associated with the Cajon Wash, provides high quality habitat for San Diego black-tailed jackrabbit where the animal is expected to occur, and has ample area to disperse into the Cajon Wash from the Area Q Quarry.

5.5 Reclamation Specifics & Schedule, CCR §2772 (c)(8)

5.5.1 Reclamation Slopes, CCR §3502 (b)(3), §3704

Once mining in Area Q is complete, a 120-foot deep excavation pit with side slopes of 2H:1V (horizontal: vertical) will remain. Because all excavated material will be transported offsite for processing, no excess material (e.g. tailings, overburden, sediment, waste rock) will be generated and/or stored within Area Q, other than the topsoil and subsoil stored in the berm along the southern boundary. As such, backfilling of the pit will be limited to placement of a nominal quantity of material, and therefore the reclaimed site will be essentially the same depth and grade as described above.

A Geotechnical Evaluation for the Area Q Quarry was performed by Haley and Aldrich (Haley and Aldrich, 2019/2020). A copy of the report is provided in Appendix A. As discussed in Section 3.4, the slope stability analysis determined the static and seismic factors of safety for the proposed reclamation slopes are 1.87 and 1.34 for static and seismic conditions, respectively. These factors of safety are considered acceptable for the proposed site design features and considered representative of stable slope configurations. Furthermore, proposed revegetation will help further stabilize the reclaimed side slopes and prevent erosion once roots are established. See Section 3.4 above for more detail.

5.5.2 Reclamation Backfilling, CCR §3502 (b)(4), §3704

Other than the placement of the topsoil and subsoil stored in the berm at the southern site boundary, no backfilling of the 120-foot excavation pit will occur as part of site reclamation. The bermed material, which totals approximately 100,000 tons, is anticipated to be spread across the excavation areas to help facilitate revegetation efforts. Please see Section 5.9 below for more detail.

5.5.3 Proposed Time Schedule of Reclamation, CCR §2772 (c)(6)

Mining operations in Area Q will be conducted in one (1) phase followed by reclamation. If feasible, portions of Area Q may be reclaimed and revegetated concurrent with mining in other areas. Mining in Area Q will commence once operations in Area L are complete, which is estimated to occur in 2023. Assuming operations in Area Q commence in 2023, it is estimated that mining activities in Area Q will terminate by approximately the end of 2053. Final site reclamation and revegetation is estimated to take approximately two (2) years to complete following termination of mining. Revegetation monitoring is anticipated to require an additional three (3) years, with final site reclamation completed around 2058. Please see Table 8 below, which summarizes the estimated Area Q mining and reclamation schedule.

Table 8: General Mining & Reclamation Schedule

Phase/Activity	Approximate Size (Acres)	Anticipated Schedule		Land Use/End Use
		Time Start	Time End	
Site Preparation [1]	187.6	January 2023	March 2023	Cleared Site
Mining Phase [2]	182.1	March 2023	December 2052	Excavation Pit
Reclamation	187.6	January 2053	December 2055	Open Space
Reclamation Monitoring	187.6	January 2055	December 2058	Revegetated Open Space

Note: Timeframes shown above are estimations, and may change depending on market demands, etc. Mining in Area Q will commence once mining in Area L is complete.

1 – Site preparation will involve clearing the site of vegetation, and removing topsoil/subsoil to construct the approximately 10-foot high earthen perimeter berm. Landscaping along the perimeter berm will also be planted during the site preparation phase.
2 – Once mining is complete; all areas will be reclaimed to open space. The perimeter berm will be deconstructed and topsoil/subsoil spread throughout the site to facilitate revegetation.

3 – Dates and corresponding timeframes are approximate.

5.6 Revegetation Plan, CCR §3703 (g), §3705

The proposed revegetation approach and methods for the Area Q Quarry are consistent with those already approved and partially implemented at Vulcan's Cajon Creek Quarry to the north. Specifically, portions of Area M to the northwest have been successfully reclaimed and revegetated per CUP No. 91-31/Specific Plan No. 90-01. Accordingly, test plots are not being proposed pursuant to SMARA Regulation Section 3750(b), as discussed below in Section 5.6.2. The revegetation plan is based on proposed final reclamation of the 120-foot deep mining pit floor and undulating side slopes, with a gradient of 2:1 (H:V), for use as open space. The proposed revegetation seed mix for Area Q is identical to the approved seed mix for Vulcan's Cajon Creek Quarry, which includes a large percentage of native grassland species. The following sections outline the specifics related to proposed revegetation efforts for Area Q.

Following completion of mining operations, the following typical sequence of revegetation activities will be undertaken:

- Re-contouring of planting areas, if necessary;
- Control of invasive weeds;
- Placement of topsoil and subsoil;
- Installation of temporary irrigation systems, if necessary;
- Installation of erosion control devices;
- Planting and seeding;
- Maintenance and monitoring; and
- Reporting.

Revegetation of the Area Q Quarry will be achieved by using a combination of site preparations, planting activities, and ongoing maintenance procedures. This revegetation plan generally addresses and defines the following components; description of planting zones, timing, soil preparation, weed control, planting and seeding materials and techniques, implementation monitoring, establishment maintenance, horticultural monitoring and biological monitoring.

5.6.1 Revegetation Personnel & Methods

Revegetation activities will be conducted under the supervision of an experienced revegetation specialist. The revegetation specialist will work closely with Vulcan operations personnel to assure that revegetation is accomplished according to applicable plans (e.g. County Conditions of Approval, Reclamation Plan, etc.) and is consistent with revegetation efforts at Cajon Creek Quarry to the north. Any deviation from the applicable revegetation plans will be approved by the revegetation specialist prior to implementation. The revegetation specialist will be onsite during initiation of each revegetation task (e.g., site preparation, plant installation, seeding, etc.), and work will be monitored on a regular basis. The revegetation specialist will be required to keep activity logs to document the work accomplished and any issues encountered. These logs will be reviewed with the revegetation specialist on a weekly basis. The revegetation specialist will also prepare field memos to document the progress of revegetation.

5.6.2 Site Preparation for Revegetation, CCR §3503 (f), §3711

The soils in the areas to be reclaimed will consist of placed layers of topsoil and subsoil, which will serve as the growing medium for revegetation. The objectives of the soil preparation are to loosen the soil surface to prepare a seedbed for the hydroseeding. After the final grade has been established (i.e. 120-foot pit, 2H:1V side slopes) and just prior to planting and seeding the soil surface will be prepared. In areas where access is possible, the planting areas will be cross-ripped. The soil will be ripped to a depth of 10-inches to 12-inches and ripping will be performed in two (2) directions. The first pass will be contrary to the contour and the second pass with the contour. On steep slopes, where cross-ripping is not feasible, the soil surface will be either track walked vertically or rolled with a sheep's foot roller to create a rough surface. Soil surfaces will be left in as rough a condition as possible. The intent is to create small cracks, crevices and "micro-habitats" for the seeds to lodge and to improve water infiltration/retention, which will reduce erosion. Should areas become compacted or eroded prior to hydroseeding, re-roughening of the soil surface will be monitored.

Prior to hydroseeding, the final contours, hydrology, and soils composition of the revegetation areas will be reviewed by the revegetation specialist to determine the best locations for the plantings and to make any appropriate modifications to the overall revegetation plan.

Topsoil

As described in Section 5.5.2 above, an estimated 100,000 tons of topsoil and subsoil is present throughout the Area Q mining area. Prior to mining, topsoil and subsoil will be removed as a separate layer from the site using existing mobile equipment (i.e. front-loaders, scrapers and/or hydraulic excavator), and stored within the approximately 10-foot tall earthen landscaped berm along the site's southern boundary. Materials stored within the berm will serve as the final reclamation cover for the areas to be revegetated.

Prior to revegetation, the perimeter berm will be deconstructed and topsoil/subsoil spread throughout the area to be reclaimed.

Planting Method

Prior to starting revegetation efforts, the revegetation specialist will establish and stake the limits of planting areas. These efforts may involve making adjustments from plan locations as dictated by field conditions. All access routes, staging areas, and similar features will be located and staked in the field. Although not anticipated, if necessary, orange construction fencing will be installed to delimit sensitive areas adjacent to construction areas. Areas to be revegetated will be prepared as follows:

- Vegetation, trash, debris, and weeds will be cleared. All weeds will be removed from the area and properly disposed of offsite.
- Any eroded areas will be repaired uniformly without leaving pits, holes, or depressions that would potentially prohibit plant growth.

Seeds will be sown by hydroseeding using the same methods approved for the Cajon Creek Quarry. Hydroseeding will consist of a hydraulic application of a homogeneous slurry mixture consisting of water, organic soil stabilizer, cellulose wood fiber, and seed. Unless recommended by the revegetation specialist, fertilizer will not be included as an additive to the slurry mix, since native plants have very low nutrient requirements and application of fertilizer encourages the establishment of non-native, weedy species. Hydroseeding will be performed only at times when winds are calm. The slurry will be mixed in the hydroseeder tank just prior to the application and will not be allowed to remain in the tank for more than one (1) hour before application. The following specification will apply for areas to be hydroseeded:

- The seed mix in Table 9 will be applied.
- No fertilizer will be added to the hydroseed mix, unless recommended by the revegetation specialist.
- At the time of hydroseeding, all hydroseed mixing will be performed in a tank, with a built-in, continuous agitation and recirculation system of sufficient operating capacity to produce a homogeneous slurry; and a discharge system that will apply the slurry to designated areas at a continuous and uniform rate. Water will be provided using the existing groundwater well and the 15,000-gallon tank located in Area M. This water source is free of impurities, excess chlorine, and salts. Irrigation of revegetated areas will be applied by a mobile water truck. The tank and all hoses will be rinsed before entering the Area Q Quarry.
- The hydroseeder will spray designated areas with the slurry in a sweeping motion and in an arched stream, until a uniform coat is achieved with no slumping or shadowing. The material will be spread at the application rate recommended by the revegetation specialist.

- The following materials will be applied in a one (1) step hydroseed operation:
    - Seed mixes and application rates specified in Table 9.
    - 2,000 lbs./acre – virgin cellulose wood fiber.
    - 160 lbs./acre – soil stabilizer.

Once hydroseeded, the revegetation areas will be watered as needed with a watering truck and/or by hand. The revegetation specialist will be responsible for identifying equipment and personnel for watering the revegetation areas as deemed appropriate. Once the plants are established, further artificial irrigation will not be necessary and will be discontinued.

Although not anticipated, a temporary irrigation system may be installed to facilitate establishment of the plants. If a temporary irrigation system is used, the revegetation specialist will be responsible for the design and initial installation of equipment necessary for temporary irrigation. The design of an irrigation system is subject to the approval of the revegetation specialist. This temporary irrigation system will be monitored by the revegetation specialist, if it is needed.

Timing

In general, hydroseeding in revegetation areas will be performed and completed between November 30th and January 30th of any given calendar year. However, due to yearly variations in weather patterns, planting may be performed earlier or later than these dates if conditions are deemed favorable. The revegetation specialist will be responsible for monitoring weather patterns and determining the best time for planting. All efforts will be made to plant during the time when beneficial temperatures and soil moisture will promote germination, establishment and growth of seeds and container plants. Ideally hydroseeding will be performed after the first substantial rainfall of the season.

Reference Areas

Because Area M within the Cajon Creek Quarry has already been, in part, successfully revegetated, it will be used as a reference area for the establishment of revegetation at Area Q.

In addition to the revegetated areas within Cajon Creek Quarry, specifically Area M, nearby naturally occurring habitat areas (e.g. Cajon Wash/Lytle Creek) will be examined by the revegetation specialist for potential use as reference sites prior to the completion of mining in Area Q. Proposed revegetation standards, including plant palettes, plant densities and performance standards, will be evaluated and revised by the revegetation specialist as appropriate based on the observed reference areas.

Test Plots

SMARA regulations require test plots be established to determine appropriate planting procedures to assure successful revegetation (14 CCR §3705(b)). However, this requirement may be waived if success can be documented from previous experience with similar species and conditions, or based on competent professional advice.

As described above, Vulcan has successfully revegetated portions of the existing Cajon Creek Quarry site directly northwest of Area Q, specifically Area M, with the native seed mix shown in Table 9. This work was completed as part of the approved reclamation and revegetation programs implemented at the Cajon Creek Quarry. Due to the age of the Cajon Creek Quarry Reclamation Plan, specific revegetation success criteria were not prescribed. However, successful performance in these revegetated/reclaimed areas has

been demonstrated based on achieving: 1) high survivorship of the plants through the first year after installation; 2) progressively higher rates of cover from the first year through the fifth year after planting; 3) normal growth rates for trees; and 4) adequate germination of seeded species to exclude weeds and control erosion.

Based on knowledge of previous and successful revegetation efforts in Area M, as well as ongoing revegetation efforts at Area L, test plots are not necessary. Rather, the revegetation efforts at Cajon Creek Quarry have shown which methods are most effective at achieving successful revegetation. Methods and plant species will be used in Area Q that have been previously demonstrated most effective at achieving survival of plantings in the local area. Therefore, it is unlikely that additional test plots would yield any new information that would help assure successful revegetation. Consequently, no additional test plots are proposed within Area Q.

5.6.3 Seed Mixes

The seed mix shown in Table 9 will be applied to all Area Q revegetation areas indicated on Figure 11. Please note, this seed mix is identical to what is approved and currently being implemented for revegetation efforts at Vulcan's existing Cajon Creek Quarry to the north.

Research has established that plant materials genetically adapted to the particular environmental conditions of a given site are critical to the success of revegetation. Seeds for hydroseeding can either be purchased from a commercial vendor, or collected from the Area Q area. If commercial seed sources are unavailable for the selected species, the revegetation specialist can choose to use local seed propagules collected from the general area of the site. Propagule collection sites will have similar characteristics, such as elevation, slope, aspect and soil type, if selected as the revegetation site to ensure genetically appropriate source materials. Site-specific propagule and seed collections will begin a minimum of two (2) years in advance of installation to ensure availability of adequate quantities of plants and seed for revegetation planting. The preliminary seed collections of species for hydroseeding will be tested to determine the purity and germination rates of the materials collected. The final seed mix species and application rates to be used for hydroseeding will be determined based on the actual quantity and quality of the seed materials collected.

The seed mix application rates listed below define a minimum to maximum application rate (pounds/acre) for each revegetation species. These application rates are based in part on average seed counts, quality, success rates and amounts normally available for collection. Just prior to hydroseeding, the revegetation monitor will determine the final species type and application rates based on the amount and quality of the seeds collected. Detailed information of the type and amount of seed planted will be recorded.

All seeds, of only native species, will be either purchased commercially or collected from the site area. To ensure adequate quantities of appropriate species a seed collection contract will be initiated by Vulcan with a native seed supplier no sooner than two (2) years in advance of revegetation implementation. Seed purchasing and/or collecting will be overseen by the revegetation specialist.

Table 9: Revegetation Seed Mix – Area Q Quarry

Common Name	Scientific Name	Seeding Rate (lbs./acre) [1]	
		Minimum	Maximum
California sagebrush	*Artemisia californica*	1.0	2.0
chamise	*Adenostoma fasciculatum*	2.0	4.0
flattopped buckwheat	*Eriogonum fasciculatum*	8.0	12.0
scalebroom	*Lepidospartum squamatum*	3.0	5.0
black sage	*Salvia mellifera*	1.0	2.0
golden aster	*Chrysopsis villosa*	0.25	0.5
slender buckwheat	*Eriogonum gracile* (E. *davidsonil*)	1.0	2.0
California croton	*Croton californicus*	0.25	0.5
mountain mahogany	*Cercocarpus betuloides*	0.5	1.5
California everlasting	*Gnaphalium californicum*	0.5	1.0
showy penstemon	*Penstemon spectablis*	0.5	1.5
deerweed	*Lotus scoparius*	4.0	8.0
chia	*Salvia columbariae*	0.5	2.0
white sage	*Salvia apiana*	1.0	2.0
branching phacelia	*Phacelia ramosissima*	0.25	1.0
red berry	*Rhamnus crocea*	1.0	2.0
butterweed	*Senecio douglasil*	0.25	0.5
giant stipa	*Stipa coronata*	1.0	2.0
chaparral yucca	*Yucca whipplei*	1.0	2.0
	Total:	27.0	51.5

Source: *Revegetation Plan and Monitoring Program – Cajon Creek Project* (Martha Blane, November 1992)
Notes:
1) Reclamation area is approximately 187.6-acres total.
2) Range shown represents minimum and maximum seeding rate (lbs./acre) that should be utilized during hydroseeding.

5.6.4 Control of Weeds & Non-Native Vegetation

The predominance of exotic, invasive weed species throughout California has presented a formidable challenge to most revegetation projects. Weed species are opportunistic and have mechanisms for dispersal and establishment that can eventually lead to displacement of native species. At the Area Q Quarry, potential problem weed species will not be known until after mining is completed. To ensure that weed species competition is controlled, the site will be inspected prior to revegetation implementation by the revegetation specialist. The monitor will also determine the most effective treatments for control of invasive species. If weed control activities are necessary, they will likely include a combination of treatments such as herbicide application, hand removal, and soil solarization. All weed control activities will be observed by the revegetation specialist. The monitor will instruct the weed eradication personnel in identification of native and weed species.

Herbicide Application

If deemed necessary, a systemic herbicide will be applied to exotic plants and noxious weeds that may re-sprout from underground roots or rhizomes, therefore requiring root kill. Species likely to occur onsite which may require herbicide treatment are: giant reed *(Arundo donax),* castor bean *(Ricinus communis)* and tree tobacco *(Nicotiana glauca).* If needed, the targeted vegetation will be sprayed with an herbicide

such as glyphosate (trade name Roundup). The herbicide treatments will employ conservative application methods, such as spot spraying or "painting". Extreme care will be exercised to ensure that herbicides are be used properly and only when necessary. The actual type and amount of herbicide to be used will be based on recommendations by a licensed pest control advisor and product labels. If required, herbicides will be applied prior to revegetation implementation.

Hand Removal

Just prior to the revegetation planting, the site will be reviewed by the revegetation specialist to determine if any additional weed control is required. If weeds are present onsite, then the weeds will be removed by manual methods. Hand removal will employ the use of tools, hand pulling and possibly weed whipping.

Soil Solarization

Soil solarization, a nonchemical technique used to control many weeds, soil-borne pathogens, and pests, may be used as recommended by the revegetation specialist. This technique captures radiant heat energy from the sun, thereby causing physical, chemical, and biological changes in the soil. Based on the results of revegetation efforts at Cajon Creek Quarry, this weed control treatment may be most practical and effective within Area Q for large stands of weeds where the soil surface and gradient are suitable. To properly utilize soil solarization, transparent polyethylene plastic is placed on moist soil during the hot summer months to increase soil temperatures. In general, for warm inland areas, two (2) to four (4) weeks of hot weather are required to reach the soil temperatures needed for effective soil solarization. As the plastic lays on the soil, surface temperatures rise to levels lethal to many weed seeds, soilborne plant pathogens, seedlings, nematodes, and some soil-residing mites. The main benefit of using soil solarization will be effective weed control without the use of soil fumigants. Soil fumigants used for pest control are often undesirable due to unfavorable effects on animals or humans, resulting toxic plant and soil residues, complexity of treatments, and high costs. Seed and seedlings of many annual and perennial weeds have been effectively controlled with soil solarization in farming applications. Some weed species are very sensitive to solarization while others are moderately resistant. Control of winter weed species is often evident for more than one (1) year after treatment. Winter annual grasses seem to be especially sensitive to solarization.

Invasive Plant Species

Non-native invasive plants that threaten California's wildlands have been categorized by the California Invasive Plant Council (Cal-IPC). Invasive plants that have been classified by Cal-IPC as "High" (severe ecological impacts on physical processes, plant and animal communities, and vegetation structure) or "Moderate" (substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure) in terms of ecological threat will be controlled as necessary within the revegetation areas for a minimum of three (3) years in order to prevent aggressive weeds from out-competing native plant species for resources (e.g., space, water, nutrients, and light). These invasive weeds will be removed mechanically, if feasible. In circumstances where mechanical control is not effective, EPA-approved systemic herbicides may be used. Herbicides will be applied under the direction of a licensed applicator.

Prior to initiation of revegetation efforts, the revegetation specialist will consult the most recent Cal-IPC list, and a list of specific species to be controlled under this Reclamation Plan will be developed. Additional

species may be added to the list based on actual conditions and the recommendation of the revegetation specialist.

5.6.5 Revegetation Success Criteria (Performance Standards), CCR §3705(m)

The basic goal of revegetation is to re-establish self-sustaining native plant communities within the areas disturbed by mining activities. California Code of Regulations (CCR) Section 3705(m) requires that reclaimed revegetated sites be "similar to naturally occurring habitats in the surrounding area." Additionally, SMARA also requires the operator to demonstrate that vegetation on reclaimed sites is self-sustaining without irrigation, fertilization, or weeding for a minimum of two (2) years prior to release of a performance bond.

Specifically, the goal for the mined areas of Area Q is to provide surface erosion control through revegetation using native plant species. This goal will be achieved by hydroseeding with the seed mix shown in Table 9 along with fiber mulch and soil stabilizer. When applied, the hydroseed mix should establish a quick-growing native plant cover to retard the downward movement of soil. The revegetation plantings are intended to provide the foundation for which natural successional patterns may develop into mature habitat.

The existing 1992 Revegetation Plan approved for the Cajon Creek Quarry was used to determine the appropriate vegetation community types, and initial planting diversities, and densities for this Reclamation Plan. However, prior to determining the final planting and seeding densities and diversities, quantitative baseline measurements will be collected from naturally occurring habitats within the Cajon Creek watershed habitat to the west. In addition, quantitative baseline measurements will be collected yearly from previously revegetated reference areas within Cajon Creek Quarry to the north, to document current vegetation density, species abundance and diversity. The revegetated areas within Area Q are expected to ultimately achieve a vegetation cover similar to vegetation in these reference areas. Within the three (3) to five (5) year monitoring period following revegetation, trend analyses will be performed to assess whether the revegetation plantings are progressing toward a mature reference habitat.

Generally, revegetation success is based on achieving: 1) acceptable survivorship of plants through the first year following planting; 2) vigorous growth resulting in progressively higher rates of cover from the first year through the fifth year after planting; and 3) adequate germination of seeded species to control weed growth and erosion. Specific SMARA performance standards for revegetation success are based on achieving vegetation density, cover, and species richness comparable with pre-mining conditions, or with naturally occurring habitats in the area based on appropriate reference sites. As described in Section 5.6.4 above, due to the high percentage of undesirable nonnative species currently found within the existing Area Q Quarry, areas to be restored to native habitats will be reclaimed to conditions that differ from the pre-mining condition (14 CCR §3705 (a), §3705 (m)). The pit floor and side slopes will be reclaimed to open space grassland similar to current conditions, but with a larger percentage of native perennial species. Ultimately, performance in these areas will be based on a combination of establishing vegetative cover and species richness.

The goal of revegetation is to establish land suitable for use as open space as well as provide erosion control. The combined seed mix described in Table 9 above should create a vegetative cover suitable for this proposed end use. Table 10 below presents the specific performance criteria that will be utilized to determine the success of revegetation efforts at Area Q. Please note, success criteria may be revised by the revegetation specialist depending on the future results of revegetation within Cajon Creek Quarry

and/or measurements collected from naturally occurring reference habitats within the Cajon Creek watershed habitat.

Table 10: Five-Year Performance Standards for Revegetation

Performance Criteria	Monitoring Method	Success Criteria (5-Years)[1]	Management Response
Vegetative Cover	Transect/Plot or Aerial Photos Analysis	25% cover all native perennials combined per 50-meter by 1-meter transect	Reseed and/or identify and repair influencing variable
Density	Transect/Plot	5 native perennial species per 50-meter by 1-meter transect	Substitute failing species with planted species that is thriving
Species Richness	Transect/Plot	20 native perennials per 50-meter by 1-meter transect	Reseed and/or identify and repair influencing variable

1 – Within the 187.6-acre reclamation area, six (6) randomly placed 50-meter by 1-meter transects will be utilized to determine the success of revegetation efforts at Area Q. Data for all transects will be averaged to produce the final success criteria results.

As shown in Table 10, data will be collected using the line-intercept method along each 50-meter by 1-meter transect. Specifically, monitoring will include sampling along six (6) randomly placed 50-meter by 1-meter transects per reclaimed area, which will cover approximately 187.6 acres total. Data for all transects will then be averaged to produce the results. Success criteria are based on the overall quality of the revegetation results compared to recorded vegetation data collected from either Cajon Creek Quarry or nearby areas within the Cajon Creek watershed. From completion of the revegetation for a specific area, the surviving perennial plant species will be evaluated annually by the revegetation specialist. The first 2 to 3 years will measure survival of hydroseeded areas, need for weeding, and successful establishment of seeded native plants. In later years (i.e. years 4 to 5), monitoring will focus on the site's resemblance to undisturbed vegetation in terms of the criteria presented in Table 10. This schedule may be revised depending on the results of the revegetation effort and the meeting of the success criteria. Monitoring data will be reviewed by the revegetation specialist and reviewed annually by the County through submittal of the annual SMARA report (see Section 5.14).

5.7 Site Cleanup, CCR §3502 (b)(5)

5.7.1 Building Structure & Equipment Removal, CCR §3709

There are no permanent buildings or structures proposed within the Area Q Quarry. Temporary structures, such as the conveyor system connecting to Area L, will be dismantled and removed during final reclamation. No other temporary and/or permanent structures that would require specific reclamation will be installed in Area Q.

All mobile equipment (e.g. loaders, dozers, scrappers, water truck, etc.) will be removed following the completion of reclamation activities. Any residual wastes (debris, revegetation materials, etc.) will also be removed and properly disposed of in accordance with applicable health and safety regulations and/or local ordinances.

5.7.2 Tailing & Mine Waste Management, CCR §3712

As described previously, no mine wastes and/or tailings will be generated by mining operations in Area Q.

5.7.3 Closure of Surface Openings, CCR §3713

No drill holes, water wells, or other underground workings (e.g. portals, shafts, tunnels, etc.) that would require closure are proposed within Area Q. An existing water well and 15,000-gallon water tank, located on Vulcan's Cajon Creek Area M, will supply water to the site using mobile water trucks. The existing offsite well found within Area M will be abandoned in accordance with applicable local and state regulations per the approved Cajon Creek Quarry (CA Mine ID# 91-36-0137) reclamation plan for that site.

5.8 Post-Reclamation & Future Mining, CCR §2772 (c)(7)

The proposed end use of the final reclaimed Area Q Quarry will be revegetated open space. As discussed above, the 120-foot deep excavation pit will remain post-reclamation and will not be backfilled. Final reclaimed side-slopes will not exceed the SMARA criteria of 2:1 (H:V). The site will be revegetated using the seed mix shown in Table 9, which is the identical seed mix approved for the Cajon Creek Quarry. The reclaimed Area Q Quarry will be compatible with adjacent properties, including Vulcan's reclaimed Cajon Creek Quarry to the north which will also be open space. Please see Figures 11 and 12 above, which displays the final design of the reclaimed Area Q Quarry.

5.8.1 Impact of Reclamation on Future Mining, CCR §2772 (c)(9)

The proposed end use of the final reclaimed Area Q Quarry will be open space. As such, the implementation of the reclamation plan will not preclude or impact future mining in the area.

5.9 Slopes & Slope Treatment, CCR §3502 (b)(3)

5.9.1 Backfilling, Regrading, Slope Stability, and Recontouring, CCR §3704

As discussed in Section 5.5.2, no backfilling will be required. Once mining operations are complete, the final reclaimed site will remain a 120-foot deep pit with 2:1 (H:V) side-slopes. To ensure the pit walls will not exceed the SMARA criteria of 2:1 (H:V), and to prepare the site for revegetation, minimal regrading/re-contouring may be required. The reclaimed side-slopes will be stabilized through the hydroseeding and the establishment of native vegetation.

As part of the Geotechnical Evaluation completed by Haley and Aldrich (Haley and Aldrich, 2019/2020), a slope stability analysis was performed for both the proposed mine and reclamation slope designs. During mining and following reclamation, the side slopes will not exceed a maximum inclination of 2H:1V. The analysis was performed on a single, design mine slope cross-section at Area Q, set back at a maximum inclination of 2H:1V. While mining in Area Q is planned to terminate at a depth of 120-feet bgs, the excavation modeled in this cross-section was conservatively divided into 120-foot, 150-foot, and 200-foot-deep mine slope scenarios. The stability analysis was performed using RocScience™ *Slide* 7.0, a limit-equilibrium software program for analyzing static and pseudo-static (seismic) factors of safety for soil slopes.

The following sections describe the results of the slope stability analysis performed by Haley and Aldrich (Haley and Aldrich, 2019/2020). Also see the full Geotechnical Evaluation in Appendix A for more detail.

Materials Properties

Material properties for the slope stability analysis performed by Haley and Aldrich is based on subsurface logs provided by Vulcan, observations of the adjacent Areas L and M, and the results of limited laboratory testing on bulk samples collected from Area L. Subsurface materials within the Area Q mining limits are

expected to include granular alluvial deposits consisting of sand, gravel, cobbles, and boulders. For the slope stability analysis, the design subsurface profile was simplified to consist of layers of well-graded sand with gravel ("sand") and well-graded gravel with sand ("gravel"), consistent with the boring logs prepared by TerraMins (2004), and described in Section 3.1.2 (see Appendix A).

Soil shear strength properties for the sand and gravel layers were selected based on laboratory shear strength testing. Samples of the sand and gravel materials were retrieved from the southern sidewall of Area L, just north of the Area Q Quarry. A design friction angle and adhesion value for each material was selected based on the peak strengths. The unit weight of each soil type was estimated based on typical values for similar materials in this region. The material properties used for the analysis are presented in Table 11 below. Full laboratory test results are presented in the Geotechnical Evaluation report (see Appendix A).

Table 11: Material Properties Used for Slope Stability Analysis

Material Name	Unit Weight (lbs. per cubic feet (pcf))	Friction Angle (degrees)	Adhesion (pounds per square foot (psf))
Sand	130	37	180
Gravel	130	41	0

Source: Geotechnical Evaluation (Haley and Aldrich, 2019/2020).

Seismic Coefficient for Pseudo-Static Slope Stability Analysis

Static conditions evaluate long-term open cut excavation slope configurations and pseudostatic conditions evaluate the effect of a seismic event on the open excavation slope configuration. County and SMARA regulations require that static and pseudo-static factors of safety (FOSs) for excavation and fill slopes are suitable for the proposed end use and conform to the surrounding topography and uses (see 14 CCR § 3704(d)).

The pseudo-static (seismic) stability of the five (5) cross-sections was analyzed by Haley and Aldrich in accordance with the recommendations presented in California Geological Survey's (CGS's) Special Publication 117A, specifically the method developed by Seed (1979). Using this method, a horizontal seismic coefficient, kh, equal to 0.15 was applied to each section to determine that a FOS of at least 1.15 could be achieved. This FOS marks an acceptable level of pseudo-static slope stability, defined by Seed (1979) as slope movement limited to approximately 3.3 feet (1 meter).

Additionally, a supplemental analysis of seismic slope stability was performed by Haley and Aldrich (Haley and Aldrich, 2019/2020) using the Franklin and Chang (1977) Method. With this method, the yield acceleration of the slope (i.e., pseudo-static acceleration where the slope FOS is equal to one) was calculated and compared to a peak ground acceleration (PGA) of 0.82g, or the PGA for a seismic event with a 475-year return period.

The proposed sidewall slopes were analyzed by the limit equilibrium (method of slices) method, using circular searches with the Simplified Bishop's Method to calculate the FOS against sliding. A static FOS of 1.5 or greater for slopes analyzed using this method is typically considered adequate for demonstrating stability. The minimum FOS for each slope height scenario under static and pseudo-static conditions is shown in Table 12. Graphical depictions of each analysis scenario and associated critical failure surface are provided in the Geotechnical Evaluation report (see Appendix A).

Table 12: Results of Slope Stability Analyses (by limit equilibrium method)

Slope Height (ft.)	Factor of Safety	
	Static	Pseudo-Static
120	1.87	1.34
150	1.76	1.26
200	1.75	1.25

Source: Geotechnical Evaluation (Haley and Aldrich, 2019/2020).

As shown in Table 12 above, Haley and Aldrich's analysis demonstrates that the calculated static and seismic FOS for the proposed mine and reclamation slopes are or will be in excess of 1.87 and 1.34, respectively, indicating stable conditions. These FOSs are considered acceptable for the proposed design features of Area Q and considered representative of stable slope configurations. Although not part of the design, Haley and Aldrich anticipated that 2H:1V mine slopes at lower depths of 150-feet bgs and 200-feet bgs would also generate acceptable stability results (Haley and Aldrich, 2019/2020). Please see Appendix A for more detail.

5.10 Ponds, Reservoirs, Tailings & Wastes, CCR §3706, §3712

No ponds, tailings, and/or mine waste basins or impoundments will be present within the Area Q Quarry. Additionally, no dams, embankments, or foundations will be present onsite.

5.11 Soil & Fine Textured Waste

Please see Section 3.1, which describes the site geology and soils found within the Area Q Quarry. The following section describes how topsoil and other fine soils will be managed as part of site reclamation.

5.11.1 Topsoil Salvage, Maintenance, & Redistribution, CCR §3711

As discussed previously, prior to mining topsoil and subsoil will be salvaged from Area Q and stored onsite during operations. There is an approximately 2-foot thick layer of topsoil/subsoil at the Area Q Quarry. The soil will be removed as a separate layer prior to normal mining. Approximately 100,000 tons of topsoil and subsoil will be salvaged and stored within the approximately 10-foot landscaped earthen berm along the southern boundary of the site. The berm will be maintained and BMPs implemented to minimize soil erosion.

After final grading of mine areas to be reclaimed, the topsoil and subsoil will be redistributed throughout the site to help facilitate revegetation.

5.12 Drainage & Erosion Controls

5.12.1 Drainage, Diversion Structures, & Erosion Control, CCR §3706

As described in Section 4.5 and the Drainage Report (see Appendix B), mining and reclamation activities in Area Q will not impact nearby waterways. There are no existing or proposed drainage or stream features within Area Q.

Per the Drainage Report prepared by Sespe Consulting in November 2019 (Appendix B), the site is not expected to create an increased potential for stormwater runoff that could adversely impact adjacent areas. Due to the existing topography and land uses, the site is not expected to receive significant local runoff from neighboring properties. Generally, stormwater that falls on the site will be contained by the

120-foot deep mine pit and the approximately 10-foot high earthen berm along the southern site perimeter. Contained stormwater will either naturally evaporate or infiltrate into the ground. Because runoff will ultimately decrease due to containment provided by the pit walls/berm, post-reclamation runoff and erosion sedimentation will also decrease.

Drainage and erosion control during and after reclamation activities will be managed using best management practices (BMPs) identified in the Drainage Report (Appendix B) and the site-specific SWPPP. For further detail on drainage and erosion control measures, please refer to Section 4.5 and the Drainage Report (Appendix B).

5.12.2 Stream Protection, Including Surface Water, & Groundwater, CCR §3710

Approved BMPs to protect the surface water quality of areas surrounding Area Q are identified in the site-specific SWPPP and the Drainage Report (Appendix B). Many of these BMPs are currently being implemented at Vulcan's Cajon Creek Quarry to the north. As shown on Figure 5, the Area Q Quarry is east of the Lytle Creek and north of Devil Creek Diversion Channel. Per the Drainage Report (Appendix B), mining and reclamation within Area Q will not directly encroach into the adjacent creek or existing floodplain. The approved BMPs identified in the SWPPP and Drainage Report (Appendix B) will be implemented at the Area Q Quarry to prevent runoff and control erosion that could impact nearby surface waters (i.e. Cajon Creek, Lytle Creek, Devil Diversion Channel).

As previously discussed, groundwater is expected to occur at depths below 200-feet bgs. The final depth of excavation is anticipated to be 120-feet bgs; therefore, it is not anticipated that groundwater will be encountered during mining operations. Therefore, dewatering of the excavation pits will not be required.

5.13 Public Health & Safety, CCR §3502 (b)(2)

Vehicles will access the Area Q Quarry using the existing access road off of Cajon Boulevard in the northeast corner of the site (see Figure 6). This access will serve as the single ingress and egress point for all employees and other work vehicles, which includes small work trucks, and employee/visitor passenger vehicles. No mined materials will be transported off-site from this access point. A security gate with required signage will be located on the access road at the boundary of the site, and will be locked during non-working hours.

Public access to the site will be restricted with perimeter fencing and locked gates along Cajon Boulevard. The gates will have signs reading "NO TRESPASSING." The 6-foot high perimeter fence and gates will restrict access to foot traffic and motor vehicles from the public roads, and will remain in place during mining and reclamation activities.

Mining and reclamation activities will comply with all Federal Mine Safety and Health Administration (MSHA) and State Occupational Safety and health Administration (OSHA) mine safety regulations concerning operating standards and operation of equipment.

Workers, including contract labor, will be trained in mine safety and first aid. Refresher courses will be conducted periodically in accordance with applicable regulations.

Mine operators will carry portable cellular phones for offsite communication. All visitors, outside vendors, and truck drivers will be required to check-in and check-out with the site manager. Conditions affecting safety will be continually monitored by onsite operations personnel.

The Area Q Quarry is private property. During mining and after reclamation of the site is complete, the general public will not be admitted to these lands without prior permission of the onsite manager.

When mining has concluded and reclamation is complete, there will be no open shafts or any hazardous materials remaining on the reclaimed lands.

5.13.1 Control of Potential Contaminants & Non-Marketable Material, CCR §2772 (c)(8)

Water Quality

Groundwater underlying Area Q is estimated to be below 200-feet bgs (Haley and Aldrich, 2019/2020). The proposed final depth of the excavation area is 120 feet bgs. Therefore, groundwater will not be encountered during mining and/or reclamation operations. As such, no impacts to groundwater quality are expected.

Approved BMPs to protect the surface water and the water quality will be identified in the SWPPP. BMPs are also outlined in the Drainage Report (Appendix B). These site-specific BMPs will be implemented onsite during the life of the mining and reclamation activities. Additionally, the approximately 10-foot tall earthen berm adjacent to the Devil Creek Diversion Channel will contain stormwater and prevent runoff. As discussed in the, Drainage Report (Appendix B), the Area Q Quarry is east of the Lytle Creek/Cajon Wash area and will not directly encroach into the creek or existing floodplain.

5.14 Monitoring, Maintenance, & Reporting

Performance monitoring will include both qualitative and quantitative assessment. Qualitative monitoring will occur during periodic inspections of the reclamation and revegetation areas. These inspections will occur frequently (approximately every month) during the first year of reclamation, and less often in subsequent years. Quantitative monitoring will typically occur annually, beginning during the first year after planting.

5.14.1 Qualitative Monitoring

Qualitative monitoring methods will include visual observation and photo documentation. There are no specific performance criteria associated with this monitoring.

During monitoring events, the revegetation specialist will document the conditions, potential issues (i.e. vandalism, fence damage, presence of exotic species, herbivory, erosion, etc.), and recommended actions will be documented in a field memo. Copies of all field memos will be included in each year's annual SMARA report, which will be submitted to the County for review.

Annual photographs of revegetation areas will be taken from preset photo stations during data collection events. Additional photographs will be taken of any potential problem areas. All photographs will be logged and included in each annual report.

5.14.2 Quantitative Monitoring

Vegetative cover and species composition will be assessed using the sampling methods described below and the success criteria described in Section 5.6.5. Sampling will generally be conducted at the end of the growing season. Following each annual data collection event, the revegetation specialist will compile data and prepare an analysis of the results.

As discussed in Section 5.6.5, quantitative data will be collected using the line-intercept method along each 50-meter by 1-meter transect. Success monitoring will include sampling along six (6) randomly placed 50-meter by 1-meter transects per the approximately 187.6-acre reclaimed area. Data for all transects will then be averaged to produce the results. Success criteria are based on the overall quality of the revegetation results compared to recorded vegetation data collected from either Cajon Creek Quarry or nearby reference areas within the Cajon Creek watershed. Following completion of revegetation for a specific area, the surviving perennial plant species will be evaluated annually by the revegetation specialist. The first 2 to 3 years will measure survival of hydroseeded areas, need for weeding, and successful establishment of seeded native plants. In later years (i.e. years 4 to 5), monitoring will focus on the site's resemblance to undisturbed vegetation in terms of the criteria presented in Table 10. This schedule may be revised depending on the results of the revegetation effort and the meeting of the success criteria. Monitoring data will be reviewed by the revegetation specialist and reviewed annually by the County.

5.14.3 Annual Monitoring Reports

Annual monitoring reports will be prepared that include a summary of the revegetation effort, site conditions, any issues encountered, evaluation of the data collected and success achieved, and recommendations for meeting the performance criteria. Reports will be submitted to the County for review and annually.

5.15 Reclamation Assurance, CCR §2773.1 (a)

A detailed Financial Assurance Cost Estimate (FACE) will be prepared prior to commencement or operations in Area Q, "Financial Assurance Cost Estimate." The FACE will include detailed descriptions and spreadsheets estimating the cost for reclamation of the site to the specifications established in this Reclamation Plan.

A performance bond payable to the County and, in the alternative, the California Department of Conservation (DOC), Office of Mine Reclamation (OMR), will be provided to the County in the amount of the estimated cost of reclamation. Alternatively, if provided for by future regulations, other forms of equivalent surety may be substituted.

Please see Section 8.0 below for more detail.

6.0 OTHER SMARA RECLAMATION STANDARDS

6.1 Protection of Fish and Wildlife Habitat, CCR §3503(c)

As discussed in Section 3.5, a HJA was performed by ELMT in June 2019 (ELMT Consulting, Inc., May 2020). The only plant community of note found within the site is an isolated and highly disturbed and degraded RAFSS (see Figure 10). No federally or State listed wildlife or plant species were observed within the Area Q Quarry. ELMT concluded that RAFSS within Area Q have either succeeded to upland chaparral habitat or are no longer functioning as viable RAFSS habitat with long-term conservation value for a number of reasons. First, the site's RAFSS habitat has been extensively disturbed by human activity for decades, and is heavily fragmented by roads, trails, and other human development (e.g. yard storage, unauthorized miscellaneous dumping, vehicle activity, etc.). Second, the RAFSS habitat is isolated from the historic fluvial flow patterns and scouring regimes due to residential and industrial development. Third, the elimination of fluvial processes from within Area by construction of the SPRR has removed the physical and biotic attributes needed to support viable RAFSS habitat and sensitive plant and wildlife species. Fourth, the RAFFS habitat is not occupied by any listed or otherwise sensitive plant or animal species, indicating minimal or no value as biological habitat.

Additionally, removal of any trees, shrubs, or any other potential nesting habitat will be conducted outside the avian nesting season as warranted during mining and reclamation. The nesting season generally extends from early February through August, but can vary slightly from year to year based upon seasonal weather conditions. Therefore, if ground disturbance and vegetation removal cannot occur outside of the nesting season, a pre-construction clearance survey for nesting birds will be conducted within thirty (30) days of the start of any vegetation removal or ground disturbing activities to ensure that no nesting birds will be disturbed during construction. As part of the nesting bird clearance survey, a pre-construction burrowing owl clearance survey will be conducted within thirty days of the start of ground disturbing activities. Please see the HJA in Appendix C for more detail related to the pre-construction nesting birds and burrowing owl surveys recommended by ELMT.

6.2 Prime Agricultural Land Reclamation, CCR §3707

Per the California Department of Conservation's Farmland Mapping and Monitoring Program, the proposed Area Q Quarry is not located within Prime Agricultural land.

6.3 Other Agricultural Land Reclamation, CCR §3708

The reclaimed area will be returned to open space.

6.4 Other Lead Agency Requirements, CCR §2772(c)(11)

In addition to the SMARA requirements addressed in this Reclamation Plan, the following San Bernardino County zoning/land use requirements and California Environmental Quality Act (CEQA) requirements are applicable to the Area Q Quarry:

- County of San Bernardino – 2007 Development Code, Division 8 (Resource Management & Conservation), Chapter 88.03 (Surface Mining & Reclamation).
- CEQA Appendix G Environmental Checklist and subsequent CEQA documents.

7.0 STATEMENT OF RESPONSIBILITY, CCR §2772(C)(10)

As required by Public Resources Code §2772 (c)(10), the owner and operator accept responsibility for reclaiming the mined lands in accordance with the provisions of this Reclamation Plan.

I, the undersigned, hereby acknowledge that all of the provisions of said permit and reclamation plan, and any and all conditions appended thereto will be faithfully performed and completed within the time therein provided, or within any additional time as may be allowed pursuant to the Surface Mining Ordinance Code of the lead agency and with the applicable requirements of Articles 1 and 9 (commencing with section 3500 et seq., respectively) of Chapter 8, Division 2, Title 14, of the California Code of Regulations, the Surface Mining and Reclamation Act of 1975 (SMARA), as amended (Section 2710 et seq. of the Public Resources Code) which are incorporated herein by reference.

I, the undersigned, hereby agree to perform and complete the provisions of said permit and/or plan, including any and all conditions appended thereto, shall be subject to the provisions of said Ordinance Code and SMARA and the State Mining and Geology Board's implementing regulations and guidelines.

That the place of performance by the undersigned of the covenants herein, shall be the area managed by the lead agency in the State of California.

That, pursuant to Public Resources Code section 2774.1 (a) notice procedures, any notice required to be given, or otherwise given to the undersigned may be by personal service or by certified mail.

Signature _____

Name _____

Signed this _____ day of _____, 20_____

8.0 FINANCIAL ASSURANCES, CCR §2773.1 (A)

A Financial Assurance Cost Estimate (FACE) will be prepared for the Area Q Quarry. This FACE will be reviewed annually and updated accordingly.

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APPENDIX A

Geotechnical Evaluation – Vulcan Materials Company Area Q Project
(Haley & Aldrich, Inc. – October 2019/April 2020)

www.haleyaldrich.com

REPORT ON

GEOTECHNICAL EVALUATION
VULCAN MATERIALS COMPANY AREA Q PROJECT
2400 WEST HIGHLAND AVENUE
SAN BERNARDINO, CALIFORNIA

by Haley & Aldrich, Inc.
Walnut Creek, California

for Harrison, Temblador, Hungerford & Johnson LLP
Sacramento, California

File No. 132051-002
October 2019

HALEY & ALDRICH, INC.
2033 N. Main Street
Suite 309
Walnut Creek, CA 94596
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17 October 2019
File No. 132051-002

ATTORNEY-CLIENT PRIVILEGE

Harrison, Temblador, Hungerford & Johnson LLP
2801 T Street
Sacramento, California 95816

Attention: Mr. Adam Guernsey
aguernsey@hthjlaw.com

Subject: Geotechnical Evaluation
Vulcan Materials Company Area Q Project
2400 West Highland Avenue
San Bernardino, California

Ladies and Gentlemen:

We are pleased to submit this geotechnical evaluation report for Vulcan Materials Company's (Vulcan) proposed Area Q mining project (Project). The report summarizes our field data collection, provides our interpretation of the subsurface data based on current and previous investigations, and includes geotechnical recommendations for the proposed Project.

The Project site is located in unincorporated San Bernardino County, east of Cajon Creek and north of the community of Muscoy. The Project site is bounded by residential neighborhoods to the south, a Union Pacific rail line to west, Historic Route 66 to the east and Vulcan's existing Cajon Creek aggregates mine, specifically Area L, to the north. The Project site is located approximately 2.5 miles away from Vulcan's existing San Bernardino facility, which is located directly north of State Route 210 and Highland Avenue. Nearby communities include Muscoy, the City of San Bernardino (adjacent to the east/north), and the City of Rialto (1.25 miles west).

The Project calls for aggregate material extraction and ancillary activities on 186.7 acres within the 196.0-acre Area Q property. Specifically, Vulcan is requesting that the County of San Bernardino approve a Conditional Use Permit (CUP) authorizing the following uses and activities on the Project site, for a 12-hour period between the hours of 6:00 AM and 10:00 PM, Monday through Saturday:

- Mineral resource extraction activities in one (1) phase. The maximum depth of mining would be 120 feet below natural ground surface (bgs). The design incorporates a standard final reclaimed slope configuration of 2:1 (horizontal to vertical).
- Construction of a minimum 10-foot tall vegetated earthen berm along the southeastern portion of the Project site (along the Devil Creek Diversion Channel) using topsoil and subsoil from the Project site, and planting of landscape screening along the berm; and extending the existing berm on Area L to the southern end of Area Q.

- Construction and operation of an elevated conveyor system arm across the Project site, connecting with Vulcan's existing conveyor system located on the Cajon Creek extraction site.
- Construction and maintenance of on-site roads.
- Operation of loaders, conveyors, and related equipment as necessary to move material from the Project site to the conveyor system that will transport materials to Vulcan's existing conveyor system located on the Cajon Creek extraction site.
- Conduct all activities as described above and herein on approximately 186.7 acres of the Project site.

Based on our evaluation of the subsurface conditions at the site, we conclude that mining and future reclamation of the proposed Area Q mine to a depth of 120 feet bgs at a standard slope configuration of 2:1 (horizontal to vertical) is geotechnically feasible. Based on our slope stability analysis, the static and seismic factors of safety for the Project's proposed mine slopes are 1.87 and 1.34, respectively. These factors of safety are considered acceptable for the proposed project design features and are considered stable slope configurations.

Our findings and recommendations regarding geotechnical aspects of this project are presented in the sections that follow.

Sincerely yours,
HALEY & ALDRICH, INC.

Katy Decker, P.G.
Project Manager

Catherine H. Ellis
Geotechnical Engineer

Voytek Bajsarowicz
Senior Client Leader

Enclosures

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1. Introduction

This report presents the results of our geotechnical evaluation for the proposed Area Q Project (Site). The Project allows for the continued operation of Vulcan's Cajon Creek and San Bernardino facilities through sand and gravel mining operations and reclamation at Area Q.

The Project site is located in unincorporated San Bernardino County, east of Cajon Creek and north of the community of Muscoy. The Project site is bounded by residential neighborhoods to the south, a Union Pacific rail line to west, Historic Route 66 to the east and Vulcan's existing Cajon Creek aggregates mine, specifically Area L, to the north. The Project site is located approximately 2.5 miles away from Vulcan's existing San Bernardino facility, which is located directly north of State Route 210 and Highland Avenue. Nearby communities include Muscoy, the City of San Bernardino (adjacent to the east/north), and the City of Rialto (1.25 miles west), as shown on Figures 1 and 2. The approximate Site coordinates are 34.17°N and 117.36°W.

Vulcan currently operates two distinct yet integrated operations adjacent to the Project site. Vulcan transports pit run material from its Cajon Creek extraction site, located within the City of San Bernardino, to the San Bernardino facility, located within the County, for processing. Materials are transported via an existing 2.5-mile-long haul road running through the Cajon Creek Wash. Please note, these existing operations are part of the environmental baseline conditions and are not part of the proposed Project.

The Project will provide a high-quality source of local aggregate materials to serve the regional market. The Project will also allow for the continued operation of Vulcan's Cajon Creek and San Bernardino facilities. These existing operations are not part of the Project. All mined materials will be transported via conveyor from the Project site to Vulcan's existing Cajon Creek extraction site. Material will then be processed and shipped at Vulcan's existing and/or permitted locations. No haul trucks would enter or exit the Project site from public roads.

1.1 BACKGROUND AND EXISTING SITE CONDITIONS

The Area Q Site includes some houses and general storage buildings and yards. The land is currently zoned for residential use, and several lots within the site are occupied by single-story residential structures. Signs of active dumping of trash including the presence of deleterious materials are evident.

Based on our review of historical aerial photographs, the Area Q site and surrounding area was generally vacant and unimproved in 1938, with the exception of Route 66 to the northeast. By 1959, several houses had been constructed within the limits of Area Q, and the currently existing dike was built along a portion of the Site's western boundary. The Devil Creek Diversion Channel appears to have been converted to a trapezoidal concrete-lined channel. By 1966, the Southern Pacific Railroad Tracks along the western boundary of Area Q were under construction, and construction of these tracks appears to have been completed by 1968. The 1966 and 1968 historical photos also show several new houses within the limits of Area Q. In 1995, excavation of Area M (northwest of Area Q) appears to have been initiated. Between 2005 and 2009, mining operations had also begun at Area L (north of Area Q).

1.2 PROJECT DESCRIPTION

The Project calls for aggregate material extraction and ancillary activities on 187.6 acres within the approximately 196.0-acre Area Q property. Specifically, Vulcan is requesting that the County of San Bernardino approve a Conditional Use Permit (CUP) authorizing the following uses and activities on the Project site, for a 12-hour period between the hours of 6:00 AM and 10:00 PM, Monday through Saturday:

- Mineral resource extraction activities in one (1) phase. The maximum depth of mining would be 120 feet below natural ground surface (bgs). The design incorporates a standard final reclaimed slope configuration of 2:1 (horizontal to vertical).
- Construction of a minimum 10-foot tall vegetated earthen berm along the southeastern portion of the Project site (along the Devil Creek Diversion Channel) using overburden and top soil from the Project site, and planting of landscape screening along the berm; and extending the existing berm in Area L to the southern end of Area Q.
- Construction and operation of an elevated conveyor system arm across the Project site, connecting with Vulcan's existing conveyor system located on the Cajon Creek extraction site.
- Construction and maintenance of on-site roads.
- Operation of loaders, conveyors, and related equipment as necessary to move material from the Project site to the conveyor system that will transport materials to Vulcan's existing conveyor system located on the Cajon Creek extraction site.
- Conduct all activities as described above and herein on approximately 187.6 acres of the Project site.

2. Scope of Services

Haley & Aldrich's approved services were presented in our proposal dated 23 March 2018 and included: 1) performing site visits to collect data and observe existing Area Q Site conditions and surrounding features as they pertain to the proposed Project, 2) geologic logging of soil strata as exposed at the adjacent mining Areas L and M, and 3) collection of physical samples for laboratory testing. The results of our field exploration and laboratory testing were evaluated and engineering analyses were performed to develop conclusions and recommendations regarding:

- soil and groundwater conditions at the site;
- comparison of the design topography to flooding from design storm events as required for compliance with County of San Bernardino standards;
- site seismicity and seismic hazards including landslide potential;
- slope stability analysis using limit-equilibrium methods;
- site grading, including criteria for fill quality and compaction;
- seismic design parameters in accordance with the 2016 California Building Code; and
- mine operational considerations (as appropriate).

3. Field Investigation and Laboratory Testing

This investigation comprised compilation of existing geologic and geotechnical data, field observations and evaluation of current Site conditions, limited laboratory testing, and analysis to evaluate the stability of the proposed cut slopes and post-mining slope configurations. The methods and rationale are introduced in this section.

3.1 LITERATURE REVIEW

We performed a review of readily available documents pertaining to subsurface conditions at Area Q and the immediately surrounding areas. Documents reviewed during our study include boring logs for six air-rotary borings (named SB-04-01 through SB-04-06), prepared by Cleath & Associates (CA, 2004), and a brief data report titled, "Preliminary drilling results for 'Area Q', Muscoy, San Bernardino County, California," dated 11 November 2004, prepared by TerraMins, Inc. The borings described in these documents were advanced to depths ranging from 110 to 230 feet bgs. These documents are presented in Appendix A.

3.2 FIELD OBSERVATION AND LABORATORY TESTING

We visited Area Q and the existing Vulcan Materials operations on 12 April 2018 to collect physical samples of the native soils for laboratory testing. Two bulk samples were collected from the southern sidewall of Area L north of Area Q, as shown on Figure 2. These samples were shipped to Geo-Logic Associates of Grass Valley, California for shear strength testing. Due to the coarse nature of the material, a large-box direct shear test (ASTM D-3080 Modified) was performed on remolded 12-inch-square samples. Each remolded test sample was passed through a sieve prior to direct shear testing, to remove particles greater than 1.5 inches in size. Laboratory test results are presented in Appendix B.

Our Certified Engineering Geologist performed a Site visit on Saturday, 5 May 2018 to evaluate geologic conditions within Area Q and adjacent Areas L and M. Areas L and M showed slope walls consisting of similar alluvium material. However, most of the Area M slopes were smoothly graded and vegetated.

4. Physical and Geologic Setting

4.1 TOPOGRAPHY

The Area Q property consists of a 196.0-acre, low-lying, relatively flat area. The elevations range from a high of approximately 1,574 feet above mean sea level (amsl) to a low of 1,495 feet amsl. The Site gently slopes to the south-southeast at an average gradient of less than 2 percent.

4.2 REGIONAL GEOLOGY

The eastern San Gabriel Mountains are to the north of the Site. The uplift of the San Gabriel Mountains is the result of north-south compression. East-west extension is another minor tectonic factor of this area. In the area of the Site, the San Gabriel Mountains are bounded on the south by the Cucamonga Thrust Fault and the San Andreas Strike-Slip Fault to the northeast, with the San Jacinto Fault trending between the two aforementioned faults up Lytle and Glen Helen washes and canyons. This area of the San Gabriel Mountains is highly fractured by the San Jacinto Fault, including the Glen Helen and Lytle Creek fault segments of the San Jacinto Fault system.

Rocks exposed in the eastern San Gabriel Mountains include metamorphic schist, gneiss, granulite, and areas of marble. Quartz monzonite and quartz diorite rock types intrude into large areas of the metamorphic complexes. Many areas of the igneous plutonic rock are foliated with cataclastic textures. Tertiary conglomerates, sandstones and mudstones unconformably lie on top of, or at fault contact with, the metamorphic and igneous rock masses.

The alluvial process in the area is illustrated by mid to late Pleistocene fans, having well developed incisions, while the latest Pleistocene to Holocene fan incisions are not as greatly developed. Fan geomorphology helps determine relative age of faulting in this area where the faults cut the different aged alluvial fans. A regional geology map is presented as Figure 3.

4.3 LOCAL GEOLOGIC UNITS

The Area Q Site subsurface consists primarily of alluvial deposits of various ages and thicknesses, which correspond to different flood events during large rainstorms. The San Gabriel Mountains to the north, and San Bernardino Mountains to the east, consist of mostly granitic and metamorphic rock types. The sands and gravels at the Vulcan Area L and Area M operations consist mostly of similar rock compositions, suggesting that the sands and gravels originated from the local mountains to the north and east.

Based on boring logs from TerraMins Inc. (2004), from the surface to a depth of 200 feet bgs, sediments were found to consist of moist to slightly moist sands and gravels with cobbles as large as 6 inches. Though not encountered, larger cobbles and even boulders could be present throughout the sediment layers. The boring samples' colors had a hue of Munsell 10YR with a value ranging from 4 to 5 and a chroma ranging from 2 to 3 from the surface to 200 feet bgs. One gravel layer color was estimated to be Munsell 10YR 6/1. These Munsell colors are in the range of the local soils in the Soil Survey Map for this Site, as discussed in detail in Section 4.6.2.

The samples collected by TerraMins Inc. in the upper portion of the borings consisted mostly of clean sand with silt with some gravels and clay from the surface to about 30 feet bgs. From about 40 feet to 90 feet and between 100 and 200 feet bgs, the sands were cleaner with an increase in gravel and clean sand layers indicating a greater wash gradient or lower baseline during their deposition. Some of the interbeds showed broken clasts and clays indicating moderate weathering. There was no indication of the sands and gravels being cemented or indurated from clays filling the pore spaces between the sands and gravels. Some clay coated gravels were mentioned indicating a mild pedogenic development of deeper sediments. No diluted hydrochloric acid was applied to determine if there was any carbonate formation within the samples.

After evaluating the boring logs and reports by others, the alluvial deposits of the area, the Munsell 10YR colors, lack of good clay development around the in situ clasts and thick zones of clay, it was determined the quarry materials are likely the result of basin deposition of the San Bernardino Valley with Holocene sands, along with gravel deposition from the Cajon Creek wash during the Holocene.

4.3.1 Exposed Conditions in Adjacent Areas

During our visit on 5 May 2018, a limited walkover was performed to evaluate the quarry materials, existing slope conditions within Area Q and adjacent Areas L and M. The existing Area L and M cut slopes exhibit large tabular beds and lenses of clean sand with some traces of silt and clay, cobbles and a few small boulders. The clasts were comprised mostly of metamorphic gneiss, schists and white marble with some granitic clasts. The sands were generally clean of fines, with a cemented matrix holding the sand grains in place but friable. A small talus pile consisting mostly of sand with some gravel and cobbles was forming at the toe of the slopes. The exposed slope showed evidence of having water flow across the face.

Active mine slopes at Area L held a high angle of repose with some slopes being vertical to nearly vertical. Washout erosional gullies in the central portion of Area L had high vertical cut slopes within the gullies with large fans of cobbles and large gravels on the gully bottom and spreading across the quarry bottom after exiting the gully. The fans were washed nearly clean of sand due to the velocity of water running across the mid slopes. After the sands were deposited onto the floor away from the cobble-gravel fans, the sand matrix hardened. When 10 percent HCl was applied to the sands, they effervesced, indicating that a fraction of carbonate was present in the sands giving a hardening effect to the slopes. The material in Area M appeared compositionally similar to Area L.

A small section of alluvial tabular and lens shaped deposits along the south slope above the sand conveyor in Area M and northwest of Area Q was exposed undisturbed. The remaining portion of the slopes were mechanically smoothed out and planted and did not show any significant slope failures or stability issues during the visit. In both Areas L and M, a levee system was constructed around the top of the quarry slopes and along the edges of the access roads to prevent surface waters from pouring over the edge and eroding the existing slopes. Levees were also observed along elevated areas along the top of inter-quarry slopes.

4.3.2 Exposed Faulting

Evidence of faulting was assessed during the 5 May 2018 visit. No faulting was seen offsetting exposed beds and lenses in the Area L slopes. A small section of alluvial tabular and lens shaped deposits along the south slope above the sand conveyor in Area M and northwest of Area Q was exposed, so that portion was examined for faulting and none was observed present.

4.4 LOCAL GROUNDWATER

The Site groundwater level is expected to be over 200 feet bgs. Groundwater levels measured from 2011 to 2017 ranged between elevations 1328.5 and 1263.1 feet (217.5 to 282.9 feet bgs), as reported by the State of California Department of Water Resources for a well approximately 200 feet south of the Site. Similarly, data provided by San Bernardino Valley Municipal Water District reports that the depth to groundwater at the Site in Fall 2010 was between 250 and 300 feet bgs (SBVMWD, 2011). Groundwater levels may fluctuate with time due to seasonal rainfall changes.

4.5 REGIONAL AND LOCAL HOLOCENE FAULTS

Southern California is a very active seismic area consisting of many Holocene faults, and there are three major faults near the Vulcan San Bernardino operation. Many of the Holocene faults in the region have been designated as being in Alquist-Priolo (AP) Special Studies Zones (Earthquake Fault Zones as known today), as these faults exhibit evidence of surface rupture in the last 11,000 years (Holocene Epoch) or are "sufficiently active and/or well-defined." Only the active faults and strands of the Cucamonga Thrust Fault and the San Andreas Fault are discussed briefly, since they are nearest the Site. Since the San Jacinto Fault's Glen Helen Fault strand trends through the south end of the proposed Area Q Site, the San Jacinto Fault and especially the Glen Helen Fault Strand will be discussed in greater detail. Below in Table I, known Holocene faults within 100 km of Area Q are listed.

TABLE I
Active Faults within 100 km of the Area Q Site (from USGS, 2008).

Fault Name	Distance (km)
San Jacinto	1
S. San Andreas	4.5
Cucamonga	7.6
Cleghorn	12
North Frontal (West)	18
San Jose	31
Sierra Madre	35
Sierra Madre Connected	35
Chino, alt 2	39
Chino, alt 1	39
Elsinore	43
Clamshell-Sawpit	45
Helendale-So Lockhart	48

Fault Name	Distance (km)
North Frontal (East)	55
Puente Hills (Coyote Hills)	56
Raymond	58
Pinto Mtn	60
Puente Hills (Santa Fe Springs)	66
San Joaquin Hills	68
Lenwood-Lockhart-Old Woman Springs	69
Elysian Park (Upper)	69
Verdugo	73
Johnson Valley (No)	74
Puente Hills (LA)	74
Newport Inglewood Connected alt 1	80
Newport Inglewood Connected alt 2	80
Hollywood	80
Landers	82
Newport-Inglewood (Offshore)	82
So Emerson-Copper Mtn	85
Santa Monica Connected alt 2	85
San Gabriel	86
Sierra Madre (San Fernando)	87
Burnt Mtn	88
Gravel Hills-Harper Lk	88
Eureka Peak	89
Calico-Hidalgo	95
Palos Verdes	95
Northridge	95
Santa Monica Connected alt 1	98
Blackwater	98

4.5.1 Cucamonga Fault

The Cucamonga Fault is a thrust fault that trends along the southern front of the San Gabriel Mountains and terminates in the bedrock on the west side of Lytle Creek Wash. The thrust faulting component of the Cucamonga Fault and the uplift of the San Gabriel Mountains further illustrates the north-south tectonic compression in this area.

Historically, this fault has not been seismically active but past studies illustrate that the Cucamonga Fault is defined by large scarps that displace Holocene to latest Pleistocene alluvial sediments with all the scarps offsetting Holocene alluvial fan deposits. Eighteen recognizable seismic events were inferred within the last 12,600 years on three major strands of the Cucamonga Fault, as discussed in the California Department of Mines and Geology (CDMG) Fault Evaluation Report FER-240 (1994). The scarps that cut older alluvium sediments had greater displacements and progressively were found to have lesser displacements in the younger alluvium sediments. In the last 13,000 years, the Cucamonga

Fault showed a slip rate of about 5 mm/year but it could be greater (CDMG, 1994). The Cucamonga Fault near the Vulcan San Bernardino operation has produced earthquakes resulting in vertical displacements of approximately 6 feet, occurring every 625 years (Matti and others, 1992). This fault is not considered a fault rupture hazard that would impact the proposed project. This fault and other seismogenic faults in the area could create a local earthquake with the possibility of ground lurching on the Site's quarry perimeter where the surface seismic waves meet the quarry slopes (though not common in sandy and gravelly materials) generating parallel cracks forming rough blocks on the ground and minor slope failures such as dislodging of cobbles and boulders along the side slopes.

4.5.2 San Andreas Fault

The San Andreas Fault is a right-lateral strike-slip fault that is less than 3 miles from the Site and considered to be one of the most active faults in California. Seismicity associated with the 744-mile long San Andreas Fault system varies significantly, with observed recurrence intervals ranging from 20 to more than 300 years. Seismic events occurring along the San Andreas Fault near Area Q tend to occur at longer recurrence intervals but may be less than other strand locations in the higher range of return intervals. According to Weldon and Seih, 1985, the San Andreas Fault has a slip rate of approximately 24.5 +/- 3.5 mm/year during the last 14,000 years in the nearby Cajon Pass. In past studies, in order to include the San Andreas Fault in the State of California AP zone, it was concluded that the fault consisted of a series of parallel and subparallel branches more than a mile wide.

The main trace is defined by linear scarps and fault displacement of Holocene alluvium. The branches are defined as high angle strike-slip faults and low angle thrust faults displacing rock and alluvium of various ages. Though the fault does not intersect with Area Q at the Vulcan Quarry, it could create local earthquakes with a moment magnitude (M_w) as high as 8.1 or slightly greater if most, if not all, of the fault's strands were to break during one event (United States Geological Survey [USGS], 2008). During the month of December 2015, a swarm of earthquakes and two earthquakes of M_w=2.7 and 4.4 were monitored in the Devore area north of the Site near the intersection of the San Andreas and San Jacinto Faults. Earthquakes on the San Andreas Fault have had pre-historic seismic events that shook the study area numerous times with high ground accelerations during the Holocene and Pleistocene periods.

4.5.3 San Jacinto Fault

The San Jacinto Fault is a right-lateral strike-slip fault that trends from below the Mexican border for about 135 miles where it terminates to the north, near the Site, where it meets the San Andreas Fault in the San Gabriel Mountains. This fault has a slip rate of approximately 7 to 17 mm/year with a return interval estimated in the 100- to 300-year range which can produce an earthquake in the M_w 6.5 to 7.5 range (Southern California Earthquake Data Center (SCEDC), Significant Earthquakes and Faults); (USGS, 2008a). The Lytle Creek Fault Strand of the San Jacinto Fault system was found trending north through Lytle Creek into the San Gabriel Mountains approximately 3.5 miles west from the Site.

4.6 FAULT RUPTURE HAZARDS

To illustrate the active nature of the San Jacinto Fault, the five historic earthquakes along the southern section of the fault, but not in the area of the Site, are as follows:

1. The 1889 Earthquake near the city of San Jacinto. Though the epicenter was not well located, the major damage in the cities of San Jacinto and Hemet suggests that the epicenter was close to these two towns.
2. The 1918 Earthquake near the city of San Jacinto. This earthquake had an estimated local magnitude (M_L) approximately 6.5. The earthquake was late Sunday afternoon so casualties were low though damage to unreinforced brick buildings was high.
3. The 1937 Earthquake in the Terwilliger Valley some 20 miles south of the city of Indio. This earthquake had an estimated M_L approximately 6.0. Since the Terwilliger Valley was in a sparsely populated area, little damage was noted except for a few chimneys, cracked plaster and broken windows near the area where the most intense shaking was experienced.
4. The 1954 Earthquake, sometimes known as the Arroyo Salada earthquake. The epicenter was about 30 miles south of the city of Indio. This M_L approximately 6.4 earthquake cracked plaster in San Diego and Los Angeles.
5. The 1968 Coyote Creek Fault Earthquake near the city of Borrego Springs and surrounding cities. This seismic event generated an M_w=6.5 earthquake. The Coyote Creek Fault Earthquake is mentioned since it is probably a strand of the San Jacinto Fault.

At the Site, the Glen Helen Fault strand of the San Jacinto Fault is likely the most active strand of the San Jacinto Fault. Most of the fault studies done to determine if the Glen Helen strand was active were performed north of the Site in the Glen Helen area. The portion of the fault that trends by the Site is mapped on published geology maps (e.g., California Geological Survey [CGS] Fault Evaluation Report [FER-240]) as a "concealed" fault trending though the southwest portion of the Vulcan Cajon Creek Area Q San Bernardino quarry. The fault near the Site is mapped in an active wash and as crossing the Site at the southwest tip. If any pre-historic breaks of the Glen Helen Fault had broken the surface, forming a scarp displacing the ground, rainstorm flooding, sedimentation, wind and/or anthropogenic processes may have covered or concealed the fault's trace. This portion of the Glen Helen Fault (see Figure 3) is listed as a State of California AP Earthquake Fault Zone. Though the fault trace is not well defined near Area Q, the City and County of San Bernardino Department of Building and Safety considers the concealed fault trend of the Glen Helen Fault a Holocene Fault and suggests that this strand is the most active portion of the San Jacinto Fault system.

Given the seismic characteristics of the San Jacinto Fault and in particular its surface rupture history, relevant topographic, soils and geologic maps, as well as aerial photos were analyzed as part of this geotechnical evaluation, as discussed below.

4.6.1 Topographic Maps

Two topographic quadrangle maps, the Arrowhead Quadrangle 7.5-Minute (USGS, 1941) and the San Bernardino North Quadrangle 7.5-Minute (USGS, 1996), were examined and compared to determine whether there was a topographic expression of the Glen Helen Fault. The quadrangles were used to demonstrate changes during the period of time between 1941 and 1996. The topographic maps show two large washes that are linear in a northerly to southerly direction. Older topographic quadrangles did not express enough detail to delineate geomorphology of the fault trace.

In general, the Arrowhead and San Bernardino North 7.5-Minute quadrangle maps do not show lineations in the active washes of the Cajon or Lytle Creeks, but linear drainages are well defined in the bedrock to the north of the Site indicating a fault trace or other lineament type.

4.6.2 Soil Survey Map

The USDA Soil Survey Map (USDA, 2018) of the site area mapped two surficial soil units in the general area of Area Q, the Soboba Stony Loamy Sand (SoC) and the Tujunga Gravelly Loamy Sand (TvC). The Soboba Stony Loamy Sand consists of an A horizon's dry color of grayish brown, brown or pale brown coarse sand, sand to loamy sand to fine loamy sand with gravels, cobbles having a hue of Munsell 2.5Y or 10YR with a value of 4 or 6 dry and 4 or 5 moist with a chroma of 2 or 3. The moist, dark grayish brown (Munsell 2.5Y), stony loamy sand is generally loose, very friable, with abundant medium to fine roots and interstitial pores. The C horizon's dry color is generally a grayish brown or a bit lighter in color than the A horizon when dry.

The Tujunga Gravelly Loamy Sand (TvC) consists of an A horizon's dry color of brown to grayish brown fine sand, sand to sandy loam having a hue of Munsell 2.5Y or 10YR with a value of 4 or 7 dry and 3 or 5 moist, with a chroma of 1 to 4 dry and 2 to 4 moist. The moist color is Munsell 2.5Y. The C horizon's dry color is generally pale brown with a Munsell hue of 2.5Y or 10YR with a value of 5 to 8 and a chroma of 1 to 6 when dry and a value of 3 to 5 with a chroma of 2 to 4 when moist. These two soil types have a tonal difference that may explain some of the tonal changes found along concealed faults in the area mentioned in the FER-240. During the 5 May 2018 visit, the area near the Site where surficial tonal changes and fault features such as lineations and scarps were mapped in FER-240 was visited. The area was disturbed by anthropogenic processes and changes in the wash morphology.

4.6.3 Geology Map

Three geologic maps: Regional Geology Map Series, San Bernardino Quadrangle (USGS, 2001), Geologic Map of the San Bernardino North 7.5-Minute quadrangle (Miller et. al., OFR 2001-131), and the Dibblee Devore and San Bernardino North 7.5-quadrangle maps (Dibblee, 2003 and 2004), were examined to analyze the geology and fault trends at and near the Area Q Site. The first map does show the San Jacinto and the San Andreas Faults trending near but not through the Site. The Miller geologic map shows the Glen Helen strand of the San Jacinto Fault to the west, while the Dibblee maps show the strand trending through the mid-section of the Site but terminating at the quadrangle boundary between the Devore and San Bernardino North quadrangles. The Miller geologic map locates the Glen Helen strand at nearly parallel to the 1974 AP Earthquake Fault Map, while the AP zone fault has a splay coming off the common Miller and AP strand and crossing the southwest end of the Site (see Figure 4). The Dibblee maps seem to have placed a concealed lineament that was placed on the FER-240 map that trends through the central portion of Area L located in the San Bernardino North quadrangle. During the field visit on 5 May 2018, the south walls of Area L were examined and no fault was seen displacing the alluvium on the slope.

4.6.4 Aerial Photo Analysis

During the compiling of the FER-240, black and white vertical aerial photo stereo pairs from the Department of Agriculture flown in late 1952 and early 1953, and USGS Water Resources Division black

and white vertical photos flown in June 1967 were analyzed to identify any geomorphic changes in the landscape due to geologic and/or other natural processes. Tonal changes in the alluvium noted in these photos coincided with trenches by private consultants in which fault traces were found (FER-240). In the Muscoy area, other linear tonal features coincided with faults reported by the County of San Bernardino that could be explained as surface step-overs between the San Jacinto Fault to the south and the Glen Helen Fault to the north. There was no indication from aerial photos that subsidiary traces of the San Jacinto Fault are active, since they did not show offset or other geomorphic features that are indicative of Holocene movement.

Aerial photos were downloaded from the UC Santa Barbara Frame Finder website and briefly compared to features analyzed during the compiling of FER-240. These photos did show some tonal contrasts, but some of the scarps could well be from changes in the channels in the washes during large rainstorms or from Holocene movement on the San Jacinto Fault. The map from the FER-240 map 2A shows evidence of the active faults identified during our ground reconnaissance and aerial photo analysis. Aerial photo interpretations are shown in purple. A “check-mark” indicates that the features found on the aerial photos could be verified, from other investigations, as traces of a Holocene fault and an “NV” indicates faults which could not be verified as Holocene faults.

5. Geotechnical Evaluation and Slope Stability Analysis

The primary geotechnical aspects considered for this project include:

- site seismicity and potential seismic hazards;
- stability of proposed mine slopes; and
- the potential presence of active faults within the Site limits.

Based on our review of subsurface information for the Site, we conclude that mining and future reclamation of the proposed Area Q mine to a depth of 120 feet bgs at a standard slope configuration of 2:1 (horizontal to vertical) is geotechnically feasible. Based on the Simplified Bishop Method for slope stability analysis, we calculated the static and seismic factors of safety for the proposed mine slopes are or will be in excess of 1.87 and 1.34, respectively. These factors of safety are considered acceptable for the proposed project design features and are considered stable slope configurations.

Our discussion of slope stability of proposed Area Q mine slopes and other geotechnical issues are presented in the remainder of this report.

5.1 SEISMIC HAZARDS

During a major earthquake, very strong to severe shaking has the potential to occur at the Site. Shaking during an earthquake can result in ground failure, such as that associated with soil liquefaction, lateral spreading, and cyclic densification. Haley & Aldrich's assessment of these potential seismic hazards are presented in the following sections.

5.1.1 Site Seismicity

A probabilistic seismic hazard analysis (PSHA) was performed using the USGS deaggregation website (https://earthquake.usgs.gov/hazards/interactive/). The USGS deaggregation utilizes the next generation attenuation (NGA) models and the 2014 USGS/CGS California Fault Model. For our analysis, we used a shear wave velocity over the top 100 feet (30 meters) of the site (V_{s30}) of 360 meters per second. Based on the seismicity of faults that may impact Area Q and the results of the deaggregation analysis, a design earthquake with an M_w of 7.9 was selected for the seismic hazard evaluation. The peak horizontal ground acceleration (PHGA), which is based on the Maximum Considered Earthquake (MCE) with a return interval of 2,500 years, or a 2 percent probability of exceedance in 50 years, is 1.63g. The risk-based site-modified peak ground acceleration (PGA_M) is 0.96g; this value was computed based on procedures outlined in American Society of Civil Engineers (ASCE) 7-16.

5.1.2 Fault Rupture

Historically, ground surface displacements typically follow the trace of Holocene faults; however, in some cases an unknown fault may be located, resulting from a modern historic event. Based on the AP State of California Special Studies Zones Official Map for the San Bernardino North Quadrangle (CGS, 1974), the Glen Helen Fault crosses the southwestern tip of the Site and is located within an Earthquake Fault Zone for a concealed Holocene fault.

The Miller map and the 1974 Special Studies Zones map locate the Glen Helen Fault as being nearly parallel or at the same location at the southwestern corner of the proposed Area Q limits. The Dibblee map shows the Glen Helen Fault passing through the site in a northwestern orientation, trending closer to the geographic center of the Area Q Site (see Figure 4).

The information in the FER-240 shows a branch of the Glen Helen Fault trace a few tens of feet west of Area Q, and the AP map shows a splay of the strand crossing the southwest section of Area Q. Based on this location of the Glen Helen Fault trace and its seismicity, Haley & Aldrich concludes the risk of surface faulting and secondary ground failure due to fault rupture to be high especially in the south end of Area Q.

5.1.3 Other Seismic Hazards

Known faults including the San Jacinto, San Andreas, and Cucamonga Faults are capable of inducing moderate to strong seismic events and geological seismic hazards, such as ground heave and lurching, ridge shattering, land sliding, and avalanches. These hazards could locally dislodge cobbles and boulders from slopes and could break the matrix bonds between sand grains causing local instabilities.

The Site groundwater level is expected to be over 200 feet bgs. Groundwater levels measured from 2011 to 2017 ranged between elevations 1328.5 and 1263.1 feet (217.5 to 282.9 feet bgs), as reported by the State of California Department of Water Resources for a well approximately 200 feet south of the Site. Similarly, data provided by San Bernardino Valley Municipal Water District reports that the depth to groundwater at the Site in Fall 2010 was between 250 and 300 feet bgs. Groundwater levels may fluctuate with time due to seasonal rainfall changes.

Based on the currently proposed excavation depth of 120 feet bgs, we conclude the potential for liquefaction-related secondary effects, such as sand boils, lurch cracking, and lateral spreading to develop at the site following the design seismic event is low, based on the depth of the proposed pit and the depth to groundwater conditions.

5.2 SLOPE STABILITY ANALYSIS

A slope stability analysis was performed on a single, design mine slope cross-section at Area Q, set back at a maximum inclination of 2:1 (horizontal: vertical), as proposed under the current proposed mine and reclamation plan. Although the Project calls for mining to a depth of 120 feet bgs, the excavation modeled in this cross-section was divided into 120-, 150-, and 200-foot-deep mine slope scenarios. The stability analysis was performed using RocScience *Slide* 7.0, a limit-equilibrium software program for analyzing static and pseudo-static (seismic) factors of safety for soil slopes.

5.2.1 Material Properties

Material properties for the slope stability analysis are based on subsurface logs provided by Vulcan, observations of the adjacent Areas L and M, and the results of limited laboratory testing on bulk samples collected from Area L. Subsurface materials within the Area Q mining limits are expected to include granular alluvial deposits consisting of sand, gravel, cobbles, and boulders. For slope stability analysis,

the design subsurface profile has been simplified to consist of layers of well-graded sand with gravel ("Sand") and well-graded gravel with sand ("Gravel"), primarily based on interpretations of the boring logs prepared by TerraMins (2004).

Soil shear strength properties for the Sand and Gravel layers were selected based on laboratory shear strength testing. Samples of the Sand and Gravel materials were retrieved from the southern sidewall of Area L, just north of the Area Q Site. The samples were shipped to Geo-Logic Associates of Grass Valley, California, a specialty geotechnical lab with direct shear testing equipment capable of evaluating the shear strength of normally oversize gravel soils. A design friction angle and adhesion value for each material was selected based on the peak strengths. The unit weight of each soil type was estimated based on typical values for similar materials in this region. The soil properties used for analysis are presented in Table II. Laboratory test results are presented in Appendix B.

TABLE II
Material Properties Used for Slope Stability Analysis

Material Name	Unit Weight (pounds per cubic foot (pcf))	Friction Angle (degrees)	Adhesion (pounds per square foot (psf))
Sand	130	37	180
Gravel	130	41	0

5.2.2 Seismic Coefficient for Pseudo-Static Slope Stability Analysis

The pseudo-static approach involves calculation of a factor of safety against land sliding through limit equilibrium techniques, when an inertial force is applied to the slope. This inertial force is represented by the product of the seismic coefficient and weight of the sliding mass. Although it has been established by researchers that this is a simplification of a very complex process, and in fact is very conservative, it is the most common tool and generally accepted practice for analysis.

The pseudo-static (seismic) stability of the five cross-sections was analyzed in accordance with the recommendations presented in CGS' Special Publication 117A, specifically the method put forward by Seed (1979). In accordance with this method, a horizontal seismic coefficient, k_h, equal to 0.15 was applied to each section to determine that a factor of safety of at least 1.15 had been achieved. This factor of safety marks an acceptable level of pseudo-static slope stability, defined by Seed (1979) as slope movement limited to approximately 3.3 feet (1 meter).

Additionally, a supplemental analysis of seismic slope stability was performed by the Franklin and Chang (1977) Method. In accordance with this method, the yield acceleration of the slope (i.e., pseudo-static acceleration where the slope factor of safety is equal to one) was calculated and compared to a peak ground acceleration (PGA) of 0.82g, or the PGA for a seismic event with a 475-year return period.

5.2.3 Slope Stability Results

The proposed sidewall slopes were analyzed by the limit equilibrium (method of slices) method, using circular searches with Simplified Bishop's Method to calculate the factor of safety against sliding (FOS). A static factor of safety of 1.5 or greater for slopes analyzed using this method is typically considered adequate for demonstrating stability. The minimum factor of safety for each slope height scenario

under static and pseudo-static conditions is shown on Table III. Graphical depictions of each analysis scenario and associated critical failure surface are provided in Appendix C.

TABLE III
Results of Slope Stability Analyses

Slope Height (ft)	Factor of Safety	
	Static	Pseudo-Static
120	1.87	1.34
150	1.76	1.26
200	1.75	1.25

We have analyzed the geotechnical slope stability of the design slopes for the Area Q Project, based on our current field investigation, previous geological investigations, results of geotechnical laboratory testing, and topographic data provided by Vulcan. Through this analysis, the calculated static and seismic factors of safety for the proposed mine slopes are or will be in excess of 1.87 and 1.34, respectively, and indicating stable conditions. These factors of safety are considered acceptable for the proposed project design features and considered representative of stable slope configurations. Although not proposed by the Project, we would anticipate that 2:1 (horizontal to vertical) mine slopes at depths of 150 feet bgs and 200 feet bgs would also generate acceptable stability results.

In summary, the results of the field observations and the slope stability analysis lead us to conclude that the subsurface conditions at the Area Q Site support mine to depths of 120 to 200 feet bgs to be geotechnically feasible.

6. Conclusions

Based on our evaluation of the subsurface conditions at the Area Q Site, we conclude that construction of the proposed Area Q mine to depths of 120 to 200 feet bgs is geotechnically feasible.

We have analyzed the geotechnical slope stability of the design slopes for the Area Q Project, based on our current field investigation, previous geological investigations, results of geotechnical laboratory testing, and topographic data provided by Vulcan. Based on our slope stability analysis, the static and seismic factors of safety for the proposed 120-foot-tall Area Q slopes are 1.87 and 1.34, for static and seismic conditions, respectively. These factors of safety are considered acceptable for the proposed project design features and considered representative of stable slope configurations.

The scope of this report is limited to a geotechnical evaluation of the proposed Area Q project. We understand that the proposed mine and reclamation plan evaluated for this study do not include construction of new temporary or permanent structures. If temporary or permanent structures are subsequently planned at the Site, we recommend that a supplemental study be performed to address geotechnical impacts and provide recommendations for foundation and seismic design, especially if these structures are planned within a State-designated Earthquake Fault Zone.

7. Limitations

The conclusions and recommendations presented in this report result from limited engineering studies and are based on our interpretation of the existing geotechnical conditions and available subsurface data. Actual subsurface conditions may vary. If any variations or unforeseen conditions are encountered during Site development, or if the proposed project differs from that which is described in this report, Haley & Aldrich should be notified so that supplemental recommendations can be made.

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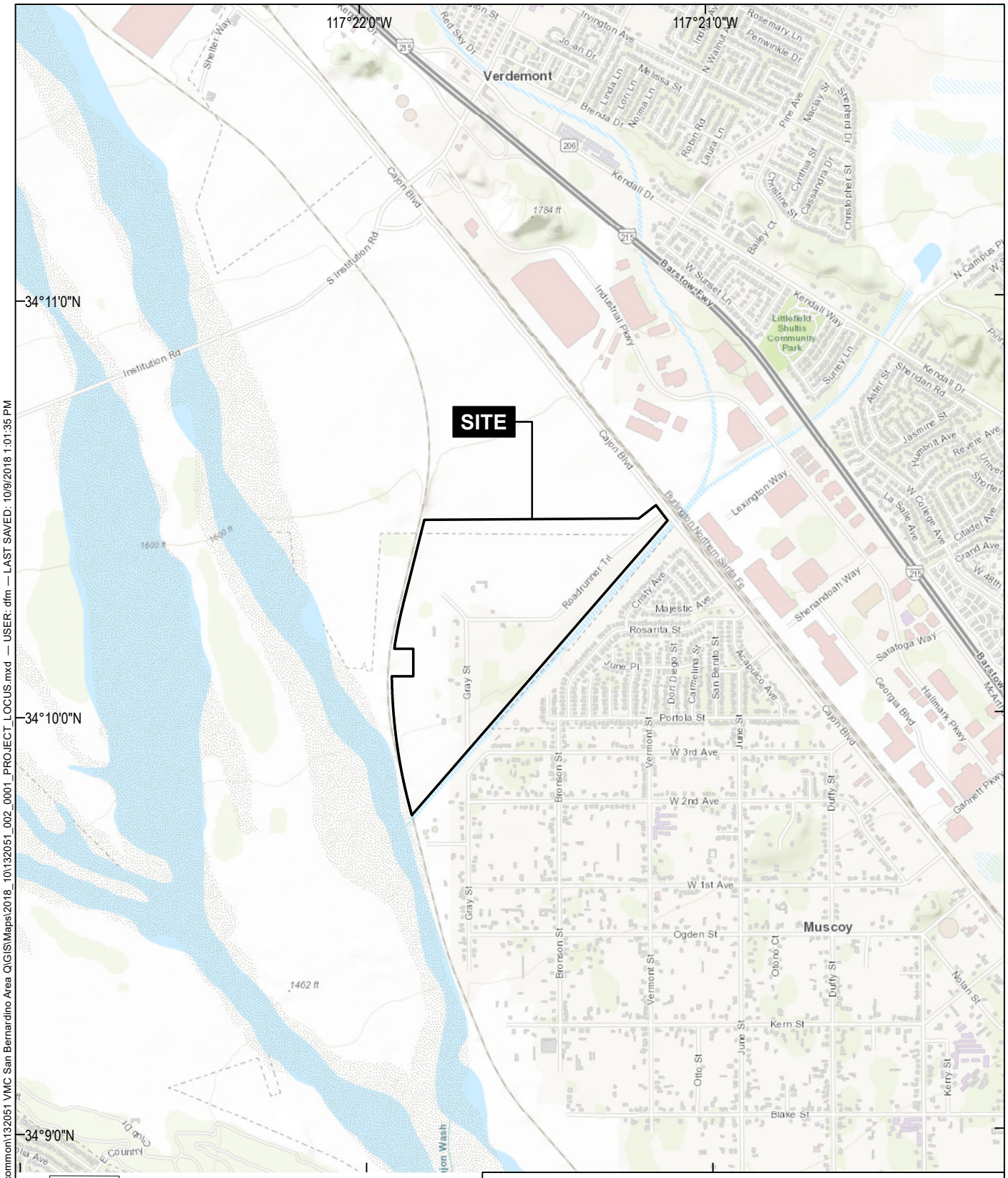
Z:\132051 VMC San Bernardino Area Q\Reports, Letters, Transmittals\Geotechnical Evaluation\2019_08-13_HAI_San Bernardino_Geotechnical_Evaluation_Frev2.docx

FIGURES



N

MAP SOURCE: ESRI
SITE COORDINATES: 34°10'13"N, 117°21'36"

HALEY ALDRICH

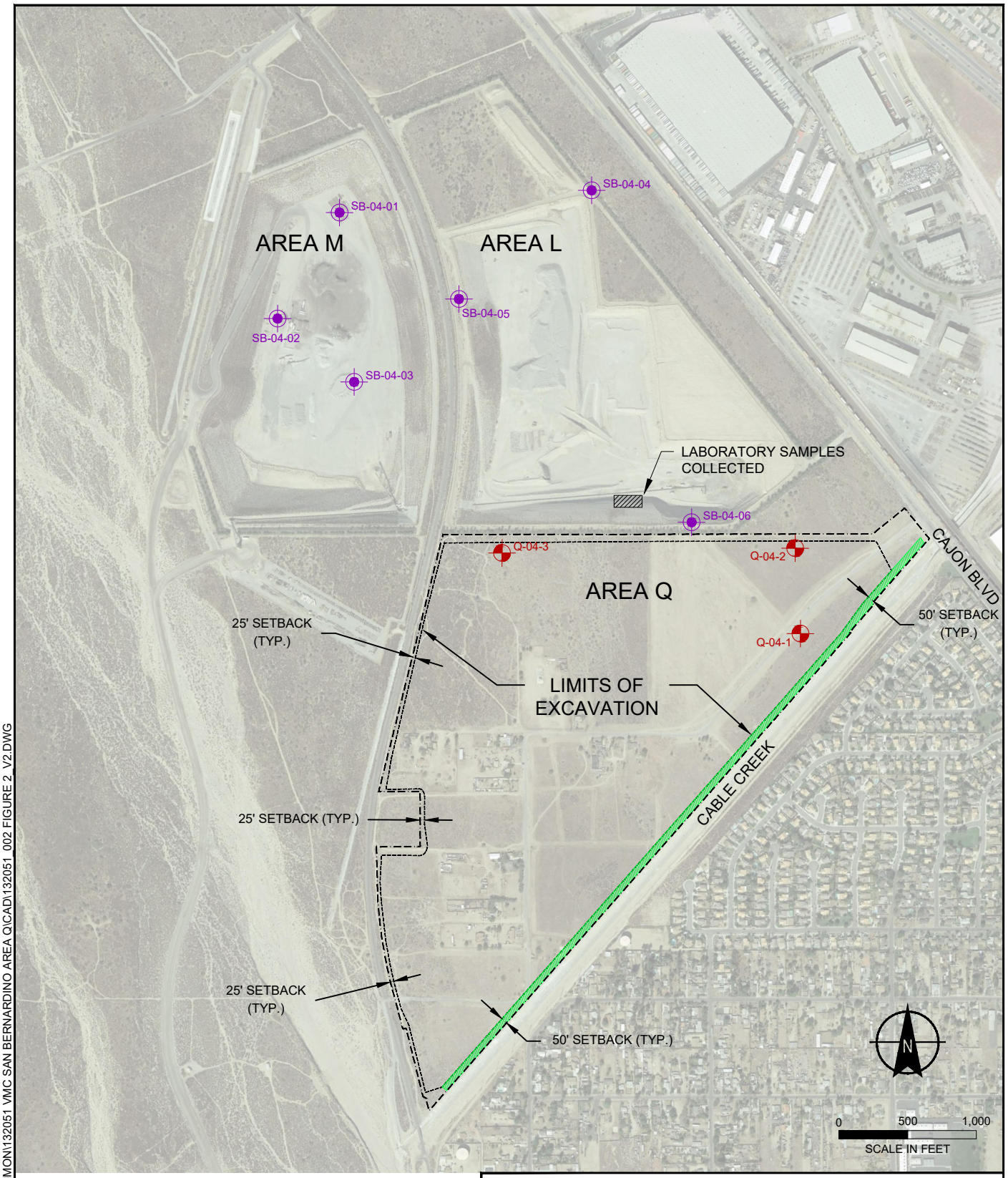
VULCAN MATERIALS COMPANY
SAN BERNARDINO MINE - AREA Q EXPANSION
2400 W. HIGHLAND AVENUE
SAN BERNARDINO, CALIFORNIA

PROJECT LOCUS

JUNE 2019

FIGURE 1

GIS FILE PATH: \\haleyaldrich\share\wnc_common\132051 VMC San Bernardino Area Q\GIS\Maps\2018_10\132051_002_0001_PROJECT_LOCUS.mxd — USER: dfm — LAST SAVED: 10/9/2018 1:01:35 PM



LEGEND

HOLLOW-STEM AUGER BORINGS (CLEATH & ASSOCIATES, 2004)

HOLLOW-STEM AUGER BORINGS (TERRAMINS, INC. 2004)

NOTES

1. BASEMAP SOURCE PROVIDED BY SESPE CONSULTING, INC., JUNE 2019

HALEY ALDRICH

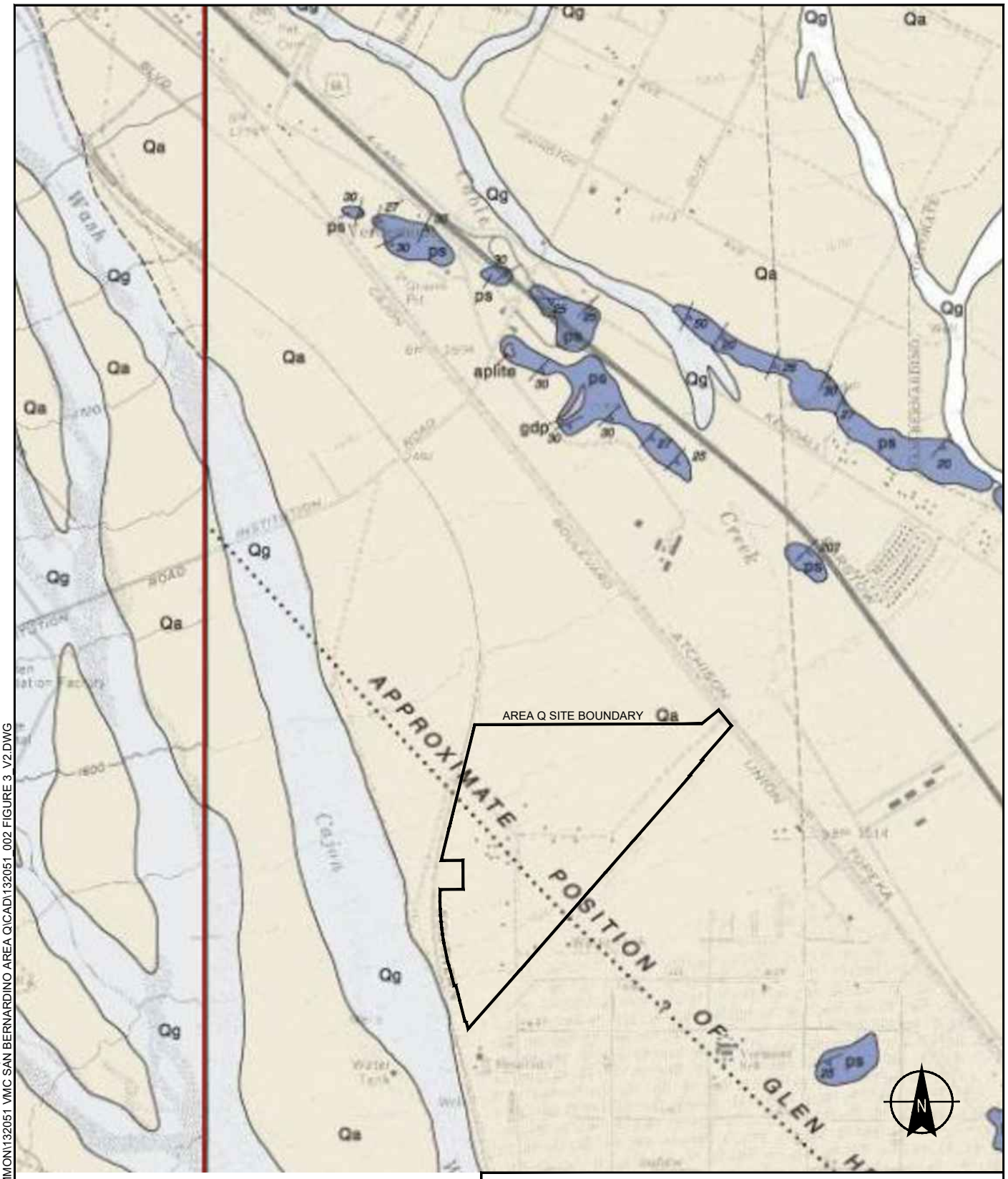
VULCAN MATERIALS COMPANY
SAN BERNARDINO MINE - AREA Q EXPANSION
2400 W. HIGHLAND AVENUE
SAN BERNARDINO, CALIFORNIA

SITE MAP WITH BORING LOCATIONS AND PROPOSED MINE LIMITS

SCALE: AS SHOWN
JUNE 2019

FIGURE 2

Saved by: MOBINI, DARIUSH Printed: 6/11/2019 9:21 AM Sheet: FIG-2
\\HALEYALDRICH\SHARE\WNC_COMMON\132051 VMC SAN BERNARDINO AREA Q\CAD\132051_002 FIGURE 2_V2.DWG



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DIBBLEE, T.W., AND MINCH, J.A., 2004, GEOLOGIC MAP OF THE SAN BERNARDINO NORTH/NORTH 1/2 OF SAN BERNARDINO SOUTH QUADRANGLES, SAN BERNARDINO AND RIVERSIDE COUNTY, CALIFORNIA: DIBBLEE GEOLOGICAL FOUNDATION, DIBBLEE FOUNDATION MAP DF-127, SCALE 1:24,000.

HALEY ALDRICH

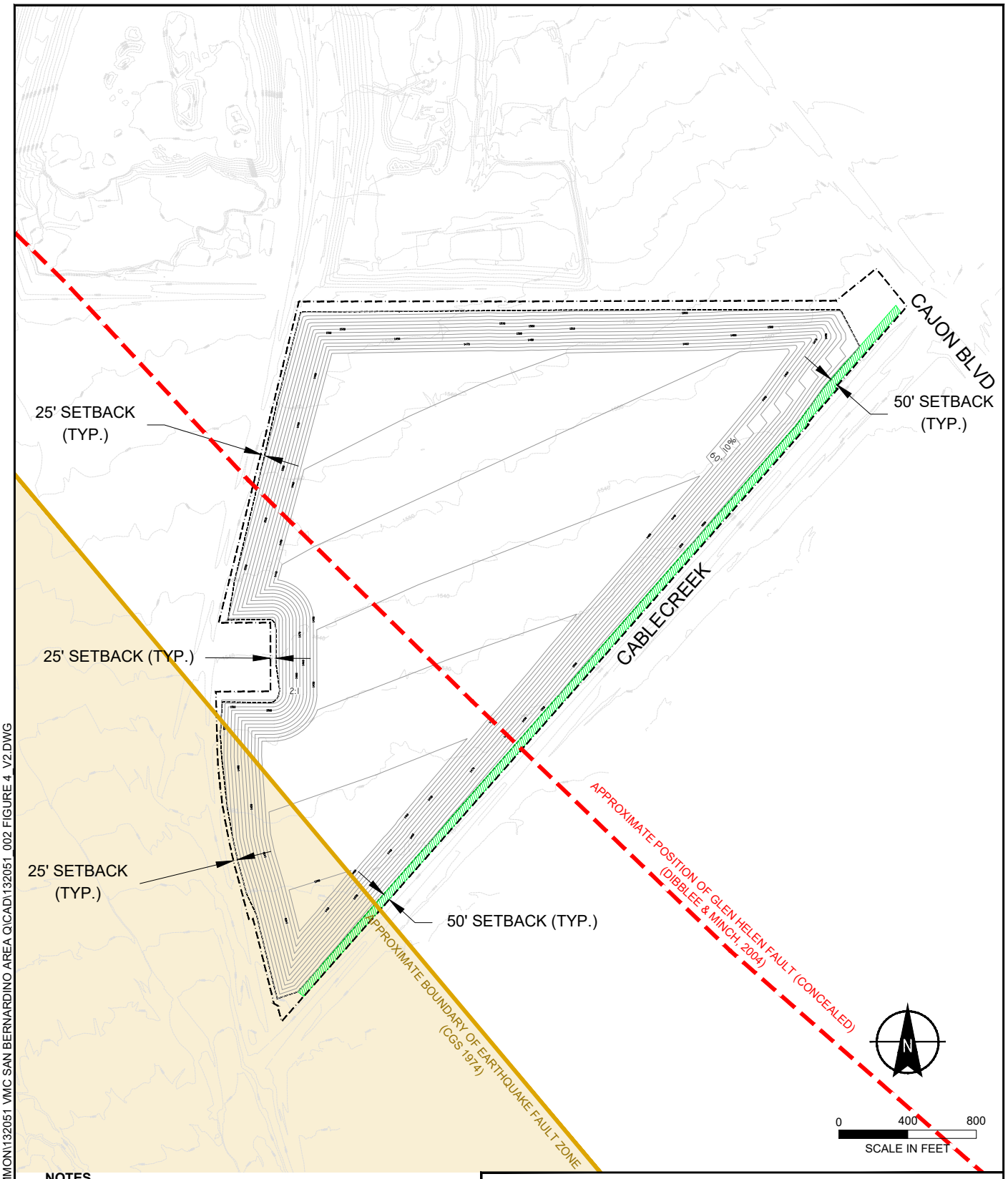
VULCAN MATERIALS COMPANY
SAN BERNARDINO MINE - AREA Q EXPANSION
2400 W. HIGHLAND AVENUE
SAN BERNARDINO, CALIFORNIA

REGIONAL GEOLOGY MAP

SCALE: N.T.S.
MAY 2018

FIGURE 3

MOBINI, DARIUSH Printed: 6/11/2019 2:36 PM Layout: HA-FIG-A-P
\\HALEYALDRICH\SHAREWNC_COMMON\132051 VMC SAN BERNARDINO AREA Q\CAD\132051_002 FIGURE 3_V2.DWG



NOTES

1. BASEMAP SOURCE PROVIDED BY SESPE CONSULTING, INC., JUNE 2019
2. APPROXIMATE POSITION OF GLEN HELEN FAULT REPRODUCED FROM DIBBLEE, T.W., AND MINCH, J.A., 2004, DIBBLEE FOUNDATION MAP DF-127
3. APPROXIMATE BOUNDARY OF EARTHQUAKE FAULT ZONE FROM CGS (FORMERLY CDMG) 1974, "SPECIAL STUDIES ZONES, SAN BERNARDINO NORTH QUADRANGLE, OFFICIAL MAP."

HALEY ALDRICH

VULCAN MATERIALS COMPANY
SAN BERNARDINO MINE - AREA Q EXPANSION
2400 W. HIGHLAND AVENUE
SAN BERNARDINO, CALIFORNIA

RECLAMATION PLAN FOR AREA Q
WITH TOTAL DEPTH OF 120 FEET

SCALE: AS SHOWN
JUNE 2019

FIGURE 4

Saved by: MOBINI, DARIUSH Printed: 6/11/2019 2:38 PM Sheet: FIG-4
\\HALEYALDRICH\SHARE\WNC_COMMON\132051 VMC SAN BERNARDINO AREA Q\CAD\132051_002 FIGURE 4_V2.DWG

APPENDIX A

Geotechnical Logs and Reports by Others

TerraMins Inc.
Consulting Mining/Economic Geologists

November 11, 2004

Ed Elkins
Vulcan Materials Company
2400 W. Highland Ave.
San Bernardino, CA 92407

Re: Drilling project at Area Q, Muscoy, CA: TerraMins Inc. Project # 200409

Dear Ed,

Attached is the report: *Preliminary drilling results for "Area Q", Muscoy, San Bernardino County, California.* The preliminary report was e-mailed to you on Sunday, November 7, 2004. This report includes a location map, areal photograph, drill logs, and photograph of samples.

The project began Monday November 1, with coordination with the bio monitor and the Vulcan Highland plant staff. Drilling commenced at 12:30 on Thursday November 4th with the arrival of the drill crew on site. Drilling progressed through Friday November 5th and was completed on Saturday November 6th at 9:30 AM. Final closure of the site, including burial of the drill sites, was done by Vulcan staff.

I thank you for the opportunity to work on this project. Please call or e-mail if you have any questions or comments.

Sincere regards,

Dinah O. Shumway
Principal Geologist
CA R.G. 5818

14360 St. Andrews Drive, Suite 4 • Victorville, CA 92392 • Phone: 760-285-5801 • Fax: 760-843-3488
E-mail: terramins@earthlink.net

Preliminary drilling results for "Area Q", Muscoy, San Bernardino County, California

TerraMins, Inc.
November 11, 2004

Introduction: This memo is a part of due diligence for a consideration of purchase, Vulcan Material Company (VMC) required subsurface information on the quality of the materials located on property, Identified as "Area Q" in Muscoy. The property is adjacent to the south of "Area M", already acquired by VMC (see photo attached).

TerraMins was engaged to oversee the drilling of three planned holes in the property under the direction of Ed Elkins. VMC hired the drilling contractor, Layne Christensen.

TerraMins geologist Dinah Shumway coordinated with the biological monitor, Highland Plant personnel, and the drilling contractor. Drill sites were selected and road grading proceeded with monitoring by Christine Tischer of eCorps environmental consultants. The location of the drill hole sites was partially restricted by the location of Stephens Kangaroo Rat habitat which was previously identified within Area Q (see attached PowerPoint photograph for location of drill sites).

Directions from VMC limited drilling to a 200' foot depth in all three holes. An AP100 percussion drill with a 6" diameter recovery system was used. Largest material recovered is limited to 6" cobbles

Drilling began on Thursday November 4, 2004 at 12:30 PM and was completed Saturday, November 6, 2004 at 9:30 AM. The holes were logged by Shumway. Samples were collected by Dale Dell of VMC labs.

Conclusions: The drilling results confirmed expectations for Area Q. The material in Area Q is fairly uniform with about 60% 70% of the material clean moderately graded sand, silt and gravel with a coarse gravel bed located about 120 to 150 feet. In the northwest part of Area Q, the sands below the 150 foot depth contain a higher percentage of coarse gravel (up to 50%).

Drilling Results:

The materials in Area Q are fluvial sediments within the Cajon Creek outwash system. Area Q grades gently from a 1510 foot elevation in the southern part to a high of 1586 in the northwest corner. The surface, vegetated with brush and various grasses consists of a fine soil with scattered boulders ranging from over 18" to cobbles of 2 to 3 inches. Several gravel bars are exposed on the surface notably in the northwest part of Area Q. Lithologies consist of gneiss, schist and granitic rocks and more rarely marble clasts.

TERRAMINS
14360 St. Andrews Drive, Suite 4 • Victorville, CA 92392 • Phone: 760-285-5801 • Fax: 760-843-3488
E-mail: terramins@earthlink.net

Upper 120': The logs of the three holes indicate that the stratigraphy in Area Q is uniform over the property. The material in the upper 100 feet of all three holes is a dark brown to dark grayish brown clean sand and silt with very minor clay. The sand and gravel is moderately graded. Sand is estimated to range from 60% to 70% overall in the upper 100 feet. Coarse gravel is rounded to sub-rounded with clast sizes up to 4" and averaging between 1" to 2". Very minor clay in the samples is limited to coatings on the coarse gravel. Preliminary screening of samples from the upper 100 feet of Q-04-1, and Q-04-2 indicate that the sand comprises about 50% to 60% by volume of the sample.

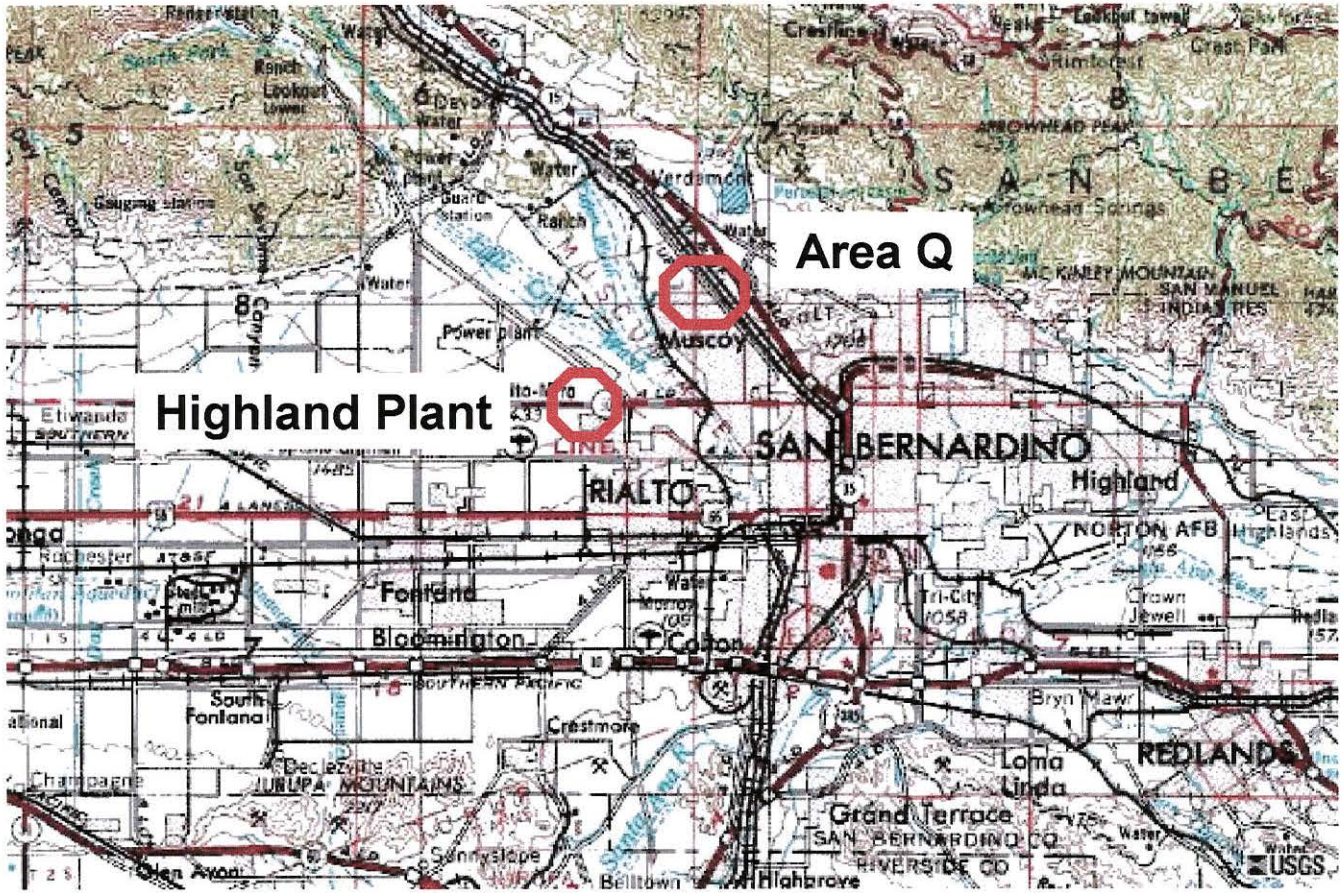
Four samples (about 3 pounds) from the upper 120 feet of drill holes Q-04-2 and Q-04-3 were collected for preliminary screening in TerraMins labs. Screening was limited to > #4 coarse gravel, >#10 fine gravel, < #10 sand and silt. Results of screening indicate that 50% to 60% by volume was < #10 sand and silt. Observation under microscope indicates that the sands are composed of 90% sub angular quartz grains. Only trace clay is present, mostly on coarse gravel clasts.

Lower 80': In all three holes the material from the 120' to 150 foot depths is gravel and sand and silt with coarse gravel comprising 50% to 60% of the material. Very minor clay is limited to coatings on clasts. Coarse gravel ranges in size from 1/2 inch to over 6". Gravels exhibit subrounded to angular textures. The samples below 120' included more broken rock chips. Some broken clasts exhibited moderate weathering. The sand lenses interbedded within these gravel beds was very clean and moderately graded.

The gravels between the 120' and 130' depths slowed drilling but the first hole (Q-01-1) was completed to the planned 200 foot depth in 3 hours. In holes 2 and 3 however, the gravel bed slowed drilling considerably and the higher presence of coarse gravel and cobbles in holes 2 (Q-01-2) and 3 (Q-01-3) required 6 hours each to complete drilling to the planned 200 foot depth. This likely indicates that the gravel bar thins or lenses out to the south.

Below 145' to 150' feet depths the logs indicate that the material is composed sand and gravels with 60% to 70% clean sand and silt and clay limited to coatings on the large clasts. The samples collected from the 2nd and 3rd holes (Q-04-2 and Q-01-3), contain a higher percentage of coarse gravel, cobbles and broken material (e.g. see photos of samples 180' to 190' attached).

Three samples (about 3 pounds) from the lower 80 feet of drill holes Q-04-2 and Q-04-3 were collected for preliminary screening in TerraMins labs. Screening was limited to > #4 coarse gravel, >#10 fine gravel, < #10 sand and silt. Results of screening indicate that 50% to 70% by volume was < #10 sand and silt. Observation under microscope indicates that the sands are composed of 90% sub angular quartz grains. Only trace clay is present, mostly on coarse gravel clasts.



Area Q, Muscoy, California

TerraMins Inc.

Consulting Mining/Economic Geologists
14360 St. Andrews Drive, Suite 4
Victorville, CA 92392

Drill Hole Log Q-04-1

Project:	Area Q	34° 10' 20.4"	Terramins Project No.: 200409
Location:	Muscoy, San Bernardino County	117° 21' 19.1"	1,885,722 N 6,756,670 E NAD 83
Client:	Vulcan Materials		

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1544
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started: 11-04-04 12:30PM	
Drilling Contractor:	Layne Christensen			Date Completed: 11-04-04 4:30 PM	
Borehole Diameter:	6"	Logged by: D. Shumway		Checked by:	

LAB: Dale Dell

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon .	Material Description / Comments	CRS Gravel = > #4 Gravel = > #10 Sand / silt = < #10
1544						0' SW 10 YR 4 / 3	Lt Brn clean sand and silt (75%) and gravel (25%); sand crs to medium grained, some fine; coarse gravel (mostly 1/2", ranging 1" to 4"); minor clay on coarse gravel clasts; sub-rounded to sub-angular	
1534						10'	As Above	
1524			easy drilling		moist	20' SW 10 YR 4/2	Grayish Brn clean Sand and silt (70%) and Gravel (20% to 30%); Crs Gravel; Minor clay on gravel clasts; Crs gravel sub-rounded to sub-angular ; minor clay on coarse gravel clasts.	
1214						30'	As Above	
1504						40' SW 10YR 5/2	Grayish Brn clean sand (60%) and Gravel (30%-40%); sand crs to medium, some silt; Gravel ranges 1.2" to 6"; some elongate clasts	

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Drill Hole Log Q-04-1

Project:	Area Q		Terramins Project No.: 200409
Location:	Muscoy, San Bernardino County		
Client:	Vulcan Materials		

Location:	NW Corner 5th Avenue and Cajon Blvd.				Collar Elevation and Datum: 1544
Coordinates:	Lat:	Long:	Depth to Groundwater (ft)	First:	Total Depth (ft): 200
Drilling Equipment/Method:	AP 1000 Percussion			Static:	Date Started: 11-04-04 12:30PM
Drilling Contractor:	Layne Christensen				Date Completed: 11-04-04 4:30 PM
Borehole Diameter:	6"		Logged by: D. Shumway		Checked by:
LAB: Dale Dell					

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon .	Material Description / Comments
1494						50' SW 10yr 4/2	Drk Brn clean sand and silt (60%) and Gravel (30%); clasts to 6"; sand crs to medium, some silt; clasts sub-rounded to sub angular; minor clay on clasts.
1484						60' SW 10yr 4/2	As above: Gravel about 30% ; crs gravel to 2"
1474			easy drilling		moist	70' SW - GW 10yr 4/2	Drk brown clean sand (50%) and Gravle (40% to 50%); crs gravel to 4"; minor clay on clasts; moderately to poorly graded; gravel sub-rounded to sub angular
1464						80' SW	Clean gravel (50% to 60% and sand and silt (50%); crs gravel clasts to 6"; sub-rounded ; minor clay on clasts; clasts sub-rounded; sand mostly crs.
1454						90' SW	AS above: Note: no apprecdiable weathering 0-90'.

CRS Gravel = > #4
Gravel = > #10
Sand / silt = < #10

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Victorville, CA 92392

Drill Hole Log Q-04-1

Project:	Area Q	Terramins Project No.:	200409
Location:	Muscoy, San Bernardino County		
Client:	Vulcan Materials		

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1544
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-04-04 12:30PM
Drilling Contractor:	Layne Christensen			Date Completed:	11-04-04 4:30 PM
Borehole Diameter:	6"	Logged by: D. Shumway		Checked by:	
LAB: Dale Dell					

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon .	Material Description / Comments	CRS Gravel = > #4 Gravel = > #10 Sand / silt = < #10
1444			Slow drilling		moist	**100'** GW / SW 10YR 5/3	Drk Brn clean gravel (50% - 60%) and Sand; clasts to 6"; clasts sub-rounded to sub-angular; sand crs to medium, some silt; moderately to poorly graded; minor clay on clasts	
1434						**110'** GW / SW	Brn clean sand, silt (50%) and gravel (50%); crs gravel rounded to sub-rounded; clasts to 2"; sand mostly coarse, some silt. Moderately graded.	
1424					slightly moist	**120'** SW 10 YR 4 / 2	Drk grayish Brn gravel (+60%) and sand (40%); gravel sub-rounded to sub-angular; clasts to >6"; abundant broken clasts in sample; some flat and elongated clasts;	
1414						**130'** GW / SW 10 YR 4/2	Drk Brn Gravel (50%) and sand; clasts sub-rounded to sub-angular ; minor clay on clasts; silt 5%?; abundant borken clasts in sample.	
1404						**140'**	As above: Note: some large broken clasts show moderate weathering	

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Drill Hole Log Q-04-1

Project:	Area Q	Terramins Project No.:	200409
Location:	Muscoy, San Bernardino County		
Client:	Vulcan Materials		

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1544
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-04-04 12:30PM
Drilling Contractor:	Layne Christensen			Date Completed:	11-04-04 4:30 PM
Borehole Diameter:	6"	Logged by: D. Shumway		Checked by:	
LAB: Dale Dell					

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon . Material Description / Comments	CRS Gravel = > #4 Gravel = > #10 Sand / silt = < #10
1394						**150'** SW	Drk Brn sand (60% to 70%) and gravel (20% -30%); clasts to 2" rounded to sub-rounded; sand medium to crs; some silt (5%)?; minor clay on clasts
1384						**160'** SW-SP 10YR 5/3	Drk Brn clean sand (60% to 70%) and gravel (30%); sand crs to fine; some silt; clay on clasts; clasts to 6"; some elongae; sub-rounded to sub-angular
1374			easy drilling		slightly moist	**170'**	As above: clasts to 2"
1364						**180'** GW - SP 10YR 5/3	Drk Brn clean sand (60% to 70%) and gravel (30%); sand crs to fine; some silt; clay on clasts; clasts to 6"; some elongate; sub-rounded to sub-angular

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14360 St. Andrews Drive, Suite 4
Victorville, CA 92392

Drill Hole Log Q-04-1

Project:	Area Q	Terramins Project No.:	200409
Location:	Muscoy, San Bernardino County		
Client:	Vulcan Materials		

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1544
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-04-04 12:30PM
Drilling Contractor:	Layne Christensen			Date Completed:	11-04-04 4:30 PM
Borehole Diameter:	6"	Logged by: D. Shumway		Checked by:	
LAB: Dale Dell					

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon . Material Description / Comments	CRS Gravel = > #4 Gravel = > #10 Sand / silt = < #10
1354			easy drilling		slightly moist	190'	
						SW 10YR 5/3 Drk Brnsand (70% - 80%) and gravel (20%); clasts to 4" rounded to sub-rounede; minor clay on clasts	
1344						200'	
						TD = 200'	

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Drill Hole Log Q-04-2

Project:	Area Q	34° 10' 26.5"	Terramins Project No.: 200409
Location:	Muscoy, San Bernardino County	117° 21' 19.5"	1,886,339N
Client:	Vulcan Materials		6,756,633E

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1557
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-05-04 7:30 AM
Drilling Contractor:	Layne Christensen			Date Completed:	11-06-04 1:30 AM
Borehole Diameter:	6"		Logged by: D. Shumway	Checked by:	

LAB: Dale Dell

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon .	Material Description / Comments	CRS Gravel = > #4 Gravel = > #10 Sand / silt = < #10
1557						0		
					moist	SW 10YR 4/3	Drk brn very clean sand (70% - 80%) and gravel (20%); clasts to 2", rounded to sub-angular; minor clay o	
1547						10'		
							As Above	
1537			easy drilling			20'		
						SW 10YR 4/3	very clean sand (70% - 80%) and gravel (20%) crs gravel clasts to 4"(1%), sub-rounded to sub-angular; minor clay on clasts	
1527					moist	30'		
						SW	As Above: crs gravel 5% - 10%	
1517						40' SW 10yr 5/3	Drk Brn clean sand (60%-70%) and gravel (30%-40%); moderate well sorted; clasts to 4"; sub-rounede to sub-angular; minor clay on clasts; some elongate clasts.	

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Drill Hole Log Q-04-2

Project:	Area Q
Location:	Muscoy, San Bernardino County
Client:	Vulcan Materials
Terramins Project No.:	200409

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1557
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-05-04 7:30AM
Drilling Contractor:	Layne Christensen			Date Completed:	11-06-04 1:30 PM
Borehole Diameter:	6"	Logged by: D. Shumway		Checked by:	

LAB: Dale Dell

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon .	Material Description / Comments	CRS Gravel = > #4 Gravel = > #10 Sand / silt = < #10
1507				screened; see photo		50' SW 10YR 5/3	Drk Brown clean sand and silt (60% - 70%) and gravel (30% - 40%); crs gravel to 6" (1%); pea gravel (10%); minor clay on clasts	
1497						60' SW 10yr 5/3	As above	
1487			easy drilling		moist	70' SW	Drk Brown sand and silt (60%) and gravel (50%); crs gravel to 4"; sub-rounded to sub-angular; minor clay on clasts	
1477						80' SW	Drk Brown sand and silt (60%) and gravel (50%); crs gravel to 4"; crs gravel (10%?); sub-rounded to sub-angular; crs gravel to 8"; some elongate; crs gravel exhibits some minor weathering; minor clay on clasts.	
1467				screened		90' GW/SW 10YR 5/2	Drk gry Brn clean sand (60%) and gravel (40%); crs gravel (10%) sub-roundd to sub-angular; minor clay on clasts; clasts include marbel and hornfels;	

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Drill Hole Log Q-04-2

Project:	Area Q	Terramins Project No.:	200409
Location:	Muscoy, San Bernardino County		
Client:	Vulcan Materials		

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1557
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-05-04 7:30 PM
Drilling Contractor:	Layne Christensen			Date Completed:	11-05-04 1:30 PM
Borehole Diameter:	6"	Logged by: D. Shumway		Checked by:	
LAB: Dale Dell					

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon .	Material Description / Comments
1457						100' SW	Clean sand, silt (70%) and gravel 30%); crs gravel (5%-10%); clasts to 3", sub-rounded to sub-angular
1447					moist	110' SW	Drk Brn sand (60%) and gravel (30%-40%); crs gravel to 2", some flat clasts; minor clay on clasts; crs gravel sub-rounded to sub-rounded; some broken clasts in sample.
1437			slow drilling			120' GW 10YR 5/2	Grayish brn gravel (50%) and sand/silt (50%); moderately poor graded; clasts to 4"; sub-rounded to sub-angular; crs gravel slightly weathered; marble clasts common.
1427					slightly moist	130' GW/SW 10YR 6/1	grayish brn gravel (50%) and sand/silt (40%); clasts to 6"; sub-rounded to sub-angular; minor clay on clasts; abundant marble clasts; broken clasts in sample.
1417						140'	As above

CRS Gravel = > #4
Gravel = > #10
Sand / silt = < #10

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Drill Hole Log Q-04-2

Project:	Area Q	Terramins Project No.:	200409
Location:	Muscoy, San Bernardino County		
Client:	Vulcan Materials		

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1557
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-05-04 7:30 AM
Drilling Contractor:	Layne Christensen			Date Completed:	11-05-04 1:30 PM
Borehole Diameter:	6"	Logged by: D. Shumway		Checked by:	

LAB: Dale Dell

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon . Material Description / Comments	CRS Gravel = > #4 Gravel = > #10 Sand / silt = < #10
1407						**150'** GW/SW	drk brn Clean sand and silt (50%) and gravel (40%-50%); crs gravel to 6"; sub-rounded to sub-angular; minor clay on clasts; crs gravel slightly weathered
1397						**160'** GW/SW	Drk Brn; sand and silt (50%) and gravel (40%-50%); crs gravel (10%); crs gravel clasts to 3"; sub-rounded to sub-angular; minor lay on clasts; broken crs gravel slightly weathered
1387			slow drilling		slightly moist	**170'** GW	Brownish gray gravels (50%) and sand and silt (50%); clasts to 1"; sub-rounded to sub-angular; minor clay on clasts.
1377						**180'**	Drk Brn Clean sand and silt (80%) and gravel (20%); crs gravel to 1"; sub-rounded to sub-angular; minor clay on clasts; some flat clasts.

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Drill Hole Log Q-04-2

Project:	Area Q
Location:	Muscoy, San Bernardino County
Client:	Vulcan Materials
Terramins Project No.:	200409

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1557
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-05-04 7:30 AM
Drilling Contractor:	Layne Christensen			Date Completed:	11-05-04 1:30 PM
Borehole Diameter:	6"	Logged by: D. Shumway		Checked by:	
LAB: Dale Dell					

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon .	Material Description / Comments	CRS Gravel = > #4 Gravel = > #10 Sand / silt = < #10
1367			slow drilling		slightly moist	190'	Drk Brn Sand and silt (60%) and gravel (30%); clasts fub-rounded to sub-angular; minor clay on clasts	
1377						200'	TD = 200'	

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Drill Hole Log Q-04-3

Project:	Area Q	34° 10' 26.2"	Terramins Project No.: 200409
Location:	Muscoy, San Bernardino County	117° 21' 45.3"	1,886,295 N
Client:	Vulcan Materials		6,754,465 E

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1573
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-05-04 2:30 PM
Drilling Contractor:	Layne Christensen			Date Completed:	11-06-04 9:30 AM
Borehole Diameter:	6"	Logged by: D. Shumway		Checked by:	

LAB: Dale Dell

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon .	Material Description / Comments
1573						0	
						SW 10YR 4/3	Drk Brn clean sand and silt (80%) and gravel (20%); crs gravel to 6" but average 4" (1%) rounded to sub-rounded; minor clay on clasts
1563						10'	
							As above
1553			easy drilling		moist	20'	
						SW 10YR 4/3	Drk brown clean sand and silt (70%) and gravel (30%); crs gravel to 3" (10%); minor clay on clasts;
1543						30'	
						SW	
							As above
1533						40'	
							Drk Brown clean sand and silt (70%) and gravel (30%); crs gravel to 2" mostly 1"(10%); minor clay on clasts;

CRS Gravel = > #4
Gravel = > #10
Sand / silt = < #10

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14360 St. Andrews Drive, Suite 4
Victorville, CA 92392

Drill Hole Log Q-04-3

Project:	Area Q	Terramins Project No.:	200409
Location:	Muscoy, San Bernardino County		
Client:	Vulcan Materials		

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1573
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-05-04 2:30PM
Drilling Contractor:	Layne Christensen			Date Completed:	11-06-04 9:30 PM
Borehole Diameter:	6"	Logged by:	D. Shumway	Checked by:	

LAB: Dale Dell

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon .	Material Description / Comments
1523				screened	moist	50' SW 10yr 4/2	drk grayish brn Clean sand silt (60%) gravel (30%); crs gravel sub-rounded to sub-angular (10%); clasts to 6"; moderately graded; minor clay on clasts;
1513			slow drilling			60' SW 10YR 5/3	Drk grayish Brn sand silt (60%) gravel (30%); crs gravel sub-rounded to sub-angular (5%); clasts to 6"; moderately graded; minor clay on clasts;
1503					slightly moist	70' SW	drk brn: sand and gravel; sand (80%) crs gravel 10%; some silt; crs gravel to 8" mostly 2"; rounded to sub-rounded; minor clay on clasts.
1493						80' GW	Drk brn Sand (80%) and Gravel (10%); crs gravel sub-rounded to sub-angular; soe large clasts weathered; some flat and elongated; clasts to 6"; most 2".
1483				scrn		90' SW 10YR 5/2	Grayish brn clean sand (80%) and gravel (20%); crs gravel mostly 2"; sub-rounded to sub-angular; sand medium to fine; minor clay on clasts

CRS Gravel = > #4
Gravel = > #10
Sand / silt = < #10

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Victorville, CA 92392

Drill Hole Log Q-04-3

Project:	Area Q	Terramins Project No.:	200409
Location:	Muscoy, San Bernardino County		
Client:	Vulcan Materials		

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1573
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-05-04 2:30 PM
Drilling Contractor:	Layne Christensen			Date Completed:	11-06-04 9:30 AM
Borehole Diameter:	6"	Logged by: D. Shumway		Checked by:	
LAB: Dale Dell					

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon .	Material Description / Comments	CRS Gravel = > #4 Gravel = > #10 Sand / silt = < #10
1473			fast drilling	screened	slightly moist	100' SW 10YR 5/3	Drk brn sand (80%) and gravel (20%); moderately poorly graded; crs gravel to 3"; rounded to sub-angular; some fine sand; fine gravel 20%?; minor clay on clasts;	
1463						110'	as above: more broken clasts in sample	
1453			slow drilling		dry	120' SW/GW 10YR 5/2	grayish drk brn gravel (40%) and sand (50%); crs gravel rounded to sub-angular; clasts to 3"; abundant broken clasts in sample; sand medium to fine; some fine sand; fine gravel 20%?; minor clay on clasts; clasts slightly weathred; some elongate	
1443						130' GW 10YR 5/2	drk grayish brn sand (30%)and gravel (70%) crs clasts to 6", abundant broken clasts in sample; lg clasts slightly weathered; sub-rounded to sub-angular	
1433						140'	grayish brn gravel (70%) and clean sand (30%) silt (10%)?; crs gravel clasts to 6", sub-angular; minor clay on clasts. (note; sand mostly quartz with minor feldspar)	

TerraMins Inc.

Consulting Mining/Economic Geologists
14360 St. Andrews Drive, Suite 4
Victorville, CA 92392

Drill Hole Log Q-04-3

Project:	Area Q	Terramins Project No.:	200409
Location:	Muscoy, San Bernardino County		
Client:	Vulcan Materials		

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1573
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-05-04 2:30 PM
Drilling Contractor:	Layne Christensen			Date Completed:	11-06-04 9:30 AM
Borehole Diameter:	6"	Logged by: D. Shumway		Checked by:	

LAB: Dale Dell

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon .	Material Description / Comments	CRS Gravel = > #4 Gravel = > #10 Sand / silt = < #10
1423						**150'** SW/GW 10YR 5/2	Drk brn sand (60%)and gravel (40%) ; crs gravel to 3"; sub-rounded to sub-angular; marble clasts; some clay on clasts.	
1413			slow drilling	screened	slightly moist	**160'** SW 10YR 4/3	drk brn clean sand (70%)and gravel (20%) ; crs gravel to 6" but mostly 3"; sub-rounded ; some flat and elongated clasts; marble clasts; some clay mostly on clasts (1%)?; (note: very slow drilling- but doesn't seem to be the material)	
1403						**170'** SW	Drk Brn clean sand (70%) and gravel (30%); crs gravel clasts to 1" most 1/2"; sub-rounded; moderately graded; clay on clasts	
1393				screened		**180'** SW	Drk brn clean sand (70%) and gravel (30%); crs gravel to 1" (<10%); sand medium, some silt; crs gravel sub-rounded to sub-angular; crs gravel slightly weathered;	

TerraMins Inc.

Consulting Mining/Economic Geologists
14360 St. Andrews Drive, Suite 4
Victorville, CA 92392

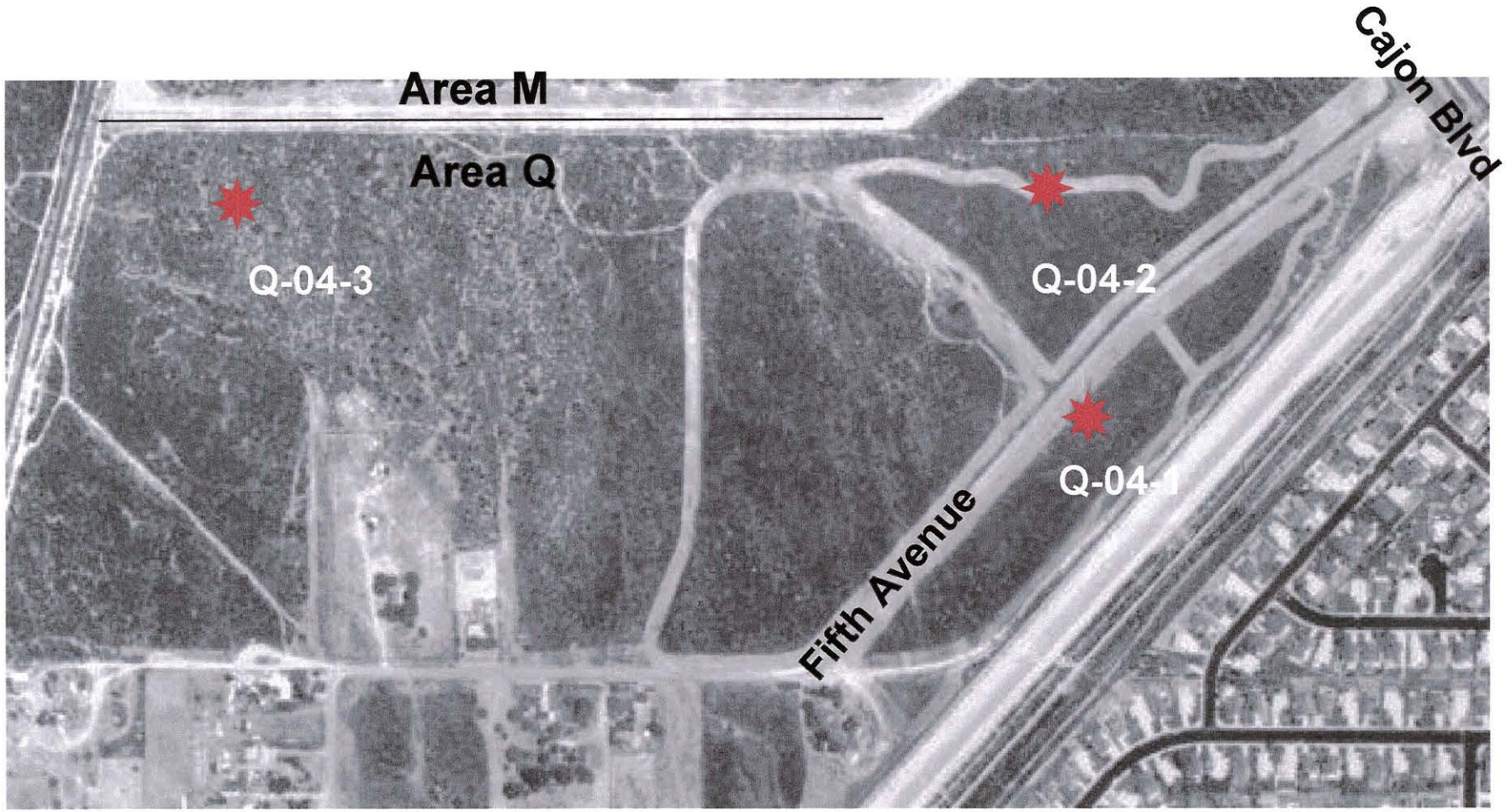
Drill Hole Log Q-04-3

Project:	Area Q
Location:	Muscoy, San Bernardino County
Client:	Vulcan Materials
Terramins Project No.:	200409

Location:	NW Corner 5th Avenue and Cajon Blvd.			Collar Elevation and Datum:	1573
Coordinates:	Lat:	Long:	Depth to Groundwater (ft) First:	Total Depth (ft):	200
Drilling Equipment/Method:	AP 1000 Percussion		Static:	Date Started:	11-05-04 2:30 PM
Drilling Contractor:	Layne Christensen			Date Completed:	11-06-04 9:30 AM
Borehole Diameter:	6"		Logged by: D. Shumway	Checked by:	

LAB: Dale Dell

Elevation (feet MSL)	Depth (feet)	Sample No.	Recovery (%)	Bag Sample	Moisture Content (%)	Lithology, primarily gneiss and schist, with secondary granitic clasts. Marbel and hornfels less comon . Material Description / Comments	CRS Gravel = > #4 Gravel = > #10 Sand / silt = < #10
1383				screened		190'	
						Drk brn sand (60%) and gravel (40%) coarse gravel 1" ; sub-rounded to sub-angular; minor clay on clasts;	
1373						200'	
						TD = 200'	



Area Q, Muscoy, California

Scale

.25 Mile

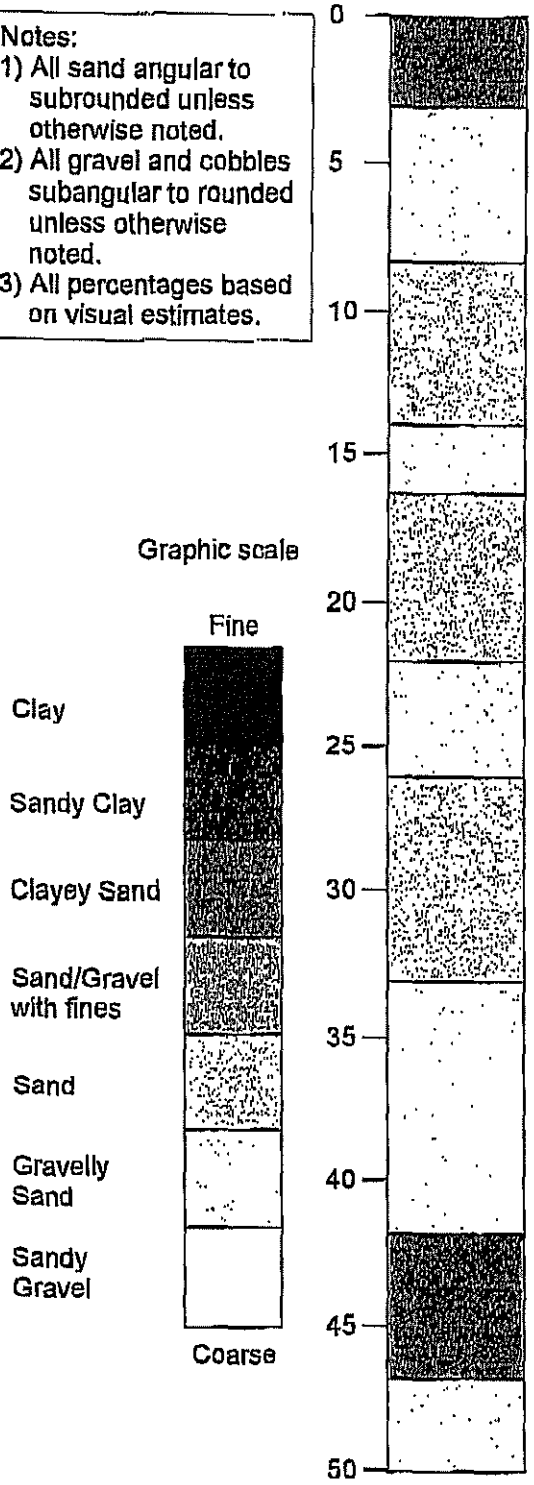
Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,772 N
6,753,424 E

Ground elevation: 1,546'

Hole: SB-04-01
Date drilled: 2/17/04
Page: 1 of 3

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



0-3' **Silty Sand (SM);** light yellowish brown (10YR 6/4); 80% fine to medium sand, 15% silt, 5% gravel, humid.

3-8' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 15% gravel and cobbles, trace silt. Gravel subangular to rounded clasts, fresh to slightly weathered medium to coarse grained granitics, humid.

8-14' **Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, trace gravel, humid.

14-16' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 30% gravel with trace cobbles. Mostly slightly weathered granitics and gneiss with some moderately to highly weathered coarse grained, orthoclase-rich granitics, humid.

16-22' **Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 10% gravel, trace cobbles to 6", humid.

22-26' **Gravelly Sand (SW);** light olive brown (2.5YR 5/6); fine to coarse sand, 30% gravel with trace cobbles, gneiss boulder at 25 feet, trace silt, humid.

26-33' **Sand (SW);** light olive brown (2.5YR 5/6); fine to coarse sand, 15% gravel, trace silt, humid. Gravel clasts include schists and pegmatite that are only slightly weathered but are not resistant to hammer blows.

33-42' **Gravelly Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 30% gravel with trace cobbles, gneiss boulder at 40 feet, also schist, fine grained mafics, and coarse grained granitics, damp.

42-47' **Silty Sand (SM);** brown (10YR 5/3); mostly fine to medium sand, 10% gravel, 20% silt, damp.

47-55' **Gravelly Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 35% gravel with cobbles to 8", trace silt. Gravel angular to subrounded granitics and schist, fine to medium grained mafics and plagioclase pegmatite, damp.

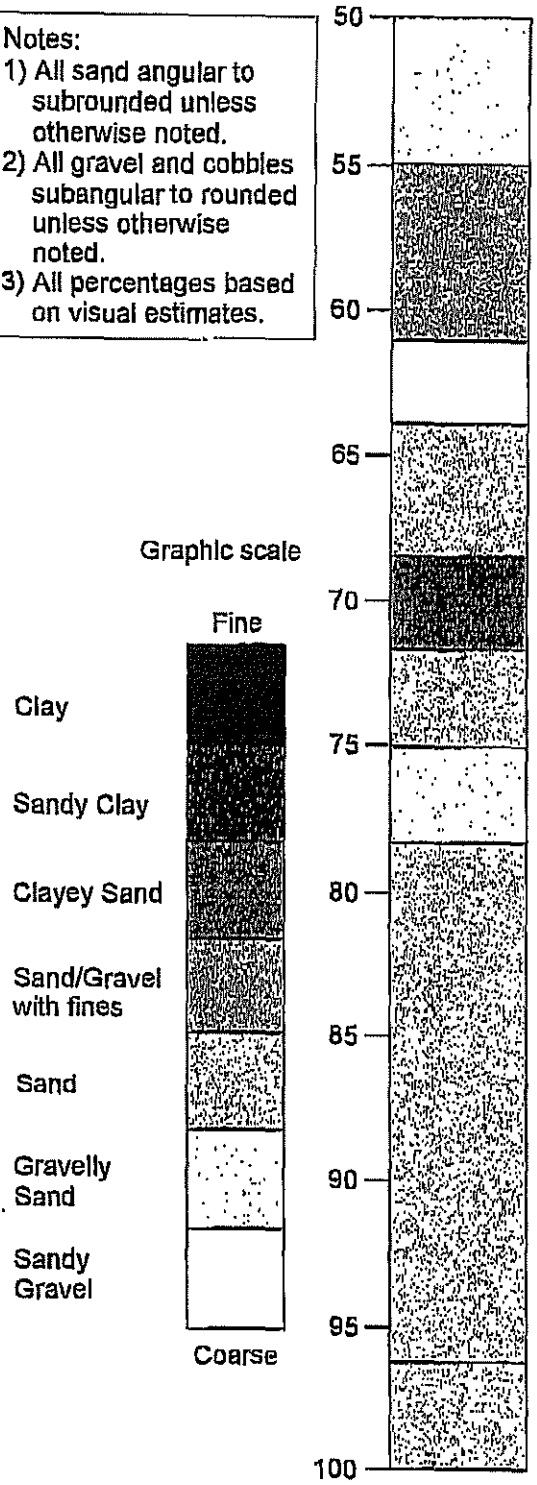
Vulcan Materials Company	Rig: Foremost AP 1000 Method: Reverse circulation air Outside Pipe: 9-inch nominal diameter Inside Pipe: 6-inch nominal diameter	**Log of boring: SB-04-01** Site: Highland Avenue Plant, San Bernardino, CA
Recorder: S. Harris, Cleath & Associates		Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,772 N
6,753424 E
Ground elevation: 1,546'

Hole: SB-04-01
Date drilled: 2/17/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



47-55' **Gravelly Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 35% gravel with cobbles to 8", trace silt. Gravel angular to subrounded granitics and schist, fine to medium grained mafics and plagioclase pegmatite, damp.

55-61' **Sand with Silt (SW- SM);** yellowish brown (10YR 5/4); fine to coarse sand, 10% silt, 10% gravel, damp.

61-64' **Sandy Gravel (GW);** strong brown (7.5YR 5/6); 40% fine to coarse sand, 55% gravel and cobbles to 8", 5% silt. Quartz diorite, schist, fine to medium grained mafics, damp.

64-68' **Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 10% gravel, damp.

68-72' **Silty Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 35% gravel and cobbles, granite boulder at 71 feet, 20% silt, damp.

72-75' **Sand (SW);** dark yellowish brown (10YR 4/4); fine to coarse sand, trace silt, damp.

75-78' **Gravelly Sand with Silt (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 40% gravel and cobbles, quartz diorite boulder, 5% silt and 5% rock flour (from drilling method), damp. Gravel clasts moderately weathered mica schist, quartzite, fine grained mafics, and quartz diorite.

78-96' **Sand (SW);** dark yellowish brown (10YR 4/4); fine to coarse sand, micaceous, trace gravel, trace silt, damp.

96-104' **Sand with Gravel (SW);** dark yellowish brown (10YR 4/4); fine to coarse sand, 15% gravel, trace silt, damp.

Vulcan Materials Company

Rig: Foremost AP 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-01
Site: Highland Avenue Plant, San Bernardino, CA

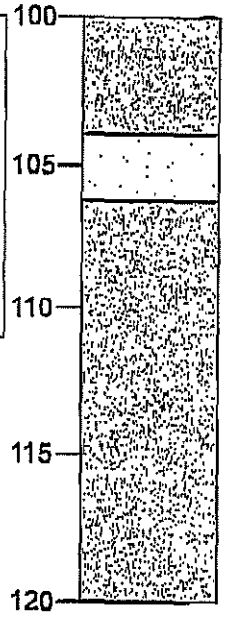
Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,772 N
6,753,424 E
Ground elevation: 1,546'

Hole: SB-04-01
Date drilled: 2/17/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



End of hole
No ground water

96-104' **Sand with Gravel (SW);** dark yellowish brown (10YR 4/4); fine to coarse sand, 15% gravel, trace silt, damp.

104-106' **Gravelly Sand (SW);** dark yellowish brown (10YR 4/4); fine to coarse sand, 30% gravel, trace silt, damp.

106-120' **Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, trace gravel, damp.

Graphic scale

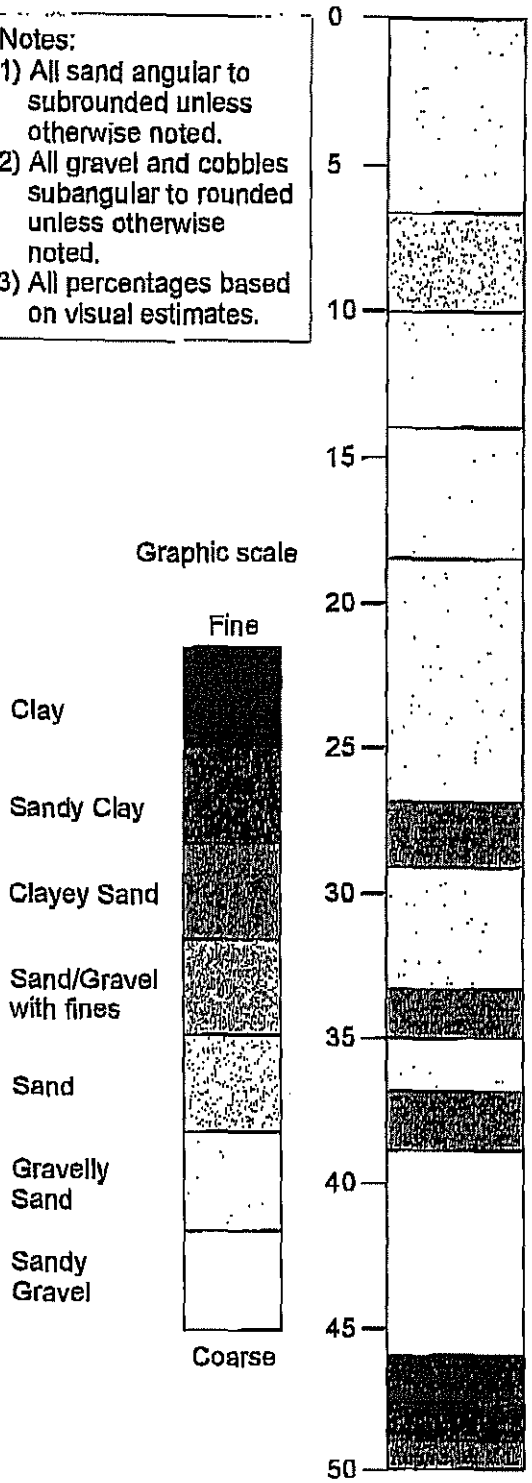
Vulcan Materials Company	Rig: Foremost AP-1000 Method: Reverse circulation air Outside Pipe: 9-inch nominal diameter Inside Pipe: 6-inch nominal diameter	**Log of boring: SB-04-01** Site: Highland Avenue Plant, San Bernardino, CA
Recorder: S. Harris, Cleath & Associates		Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,066 N
6,752,926 E
Ground elevation: 1,511'

Hole: SB-04-02
Date drilled: 2/17/04
Page: 1 of 3

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



0-7' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 30% gravel to 3", trace silt. Abundant slightly weathered but relatively weak mica schist, with resistant quartzite and gneiss, humid.

7-10' **Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, trace gravel, trace silt, humid.

10-14' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 40% gravel with cobbles and boulders. Slightly weathered quartzite, gneiss, quartz diorite and fine grained mafics, humid.

14-18' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 20% gravel to 3", humid.

18-27' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 35% gravel with cobbles and boulders. Trace silt as rock flour. Moderately to highly weathered clasts of coarse grained granitics and weak schists. Quartzites and fine grained mafics remain slightly weathered and resistant to hammer blows, humid.

27-29' **Silty Sand with Gravel (SM);** yellowish brown (10YR 5/4); fine to coarse sand, 15% gravel, 20% silt, humid.

29-33' **Gravelly Sand (SW);** dark yellowish brown (10YR 4/4); fine to coarse sand, 35% gravel with cobbles to 8". Larger clasts (>1.5") slightly to moderately weathered, with finer gravels (<1.5") mostly moderately to highly weathered, humid.

33-35' **Silty Sand (SM);** dark yellowish brown (10YR 4/6); fine to medium sand, 15% silt, damp.

35-37' **Sand with Gravel (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 20% gravel with cobbles, trace silt. Gravel clasts subangular to subrounded, mostly moderately to highly weathered, some resistant quartzite, humid.

37-39' **Silty Sand (SM);** dark yellowish brown (10YR 4/6); mostly fine to medium sand, 15% silt, damp.

39-46' **Sand and Gravel (SW-GW);** pinkish gray (7.5YR 6/2); 50% fine to coarse sand, 50% gravel with cobbles and boulders, trace silt as rock flour. Finer gravel clasts (<1.5") are mostly moderately to highly weathered schists and coarse grained granitics. Large clasts slightly to moderately weathered fine to medium grained mafics and gneiss, humid.

46-49' **Sandy Silt (ML);** dark yellowish brown (10YR 4/6); fine to medium sand, 60% silt, damp.

49-52' **Silty Sand with Gravel (SM);** dark yellowish brown (10YR 4/6); mostly fine to medium, micaceous sand, 20% silt, 15% gravel, damp.

Vulcan Materials Company	Rig: Foremost AP 1000 Method: Reverse circulation air Outside Pipe: 9-inch nominal diameter Inside Pipe: 6-inch nominal diameter	**Log of boring: SB-04-02** Site: Highland Avenue Plant, San Bernardino, CA
Recorder: S. Harris, Cleath & Associates		Driller: Layne Christensen

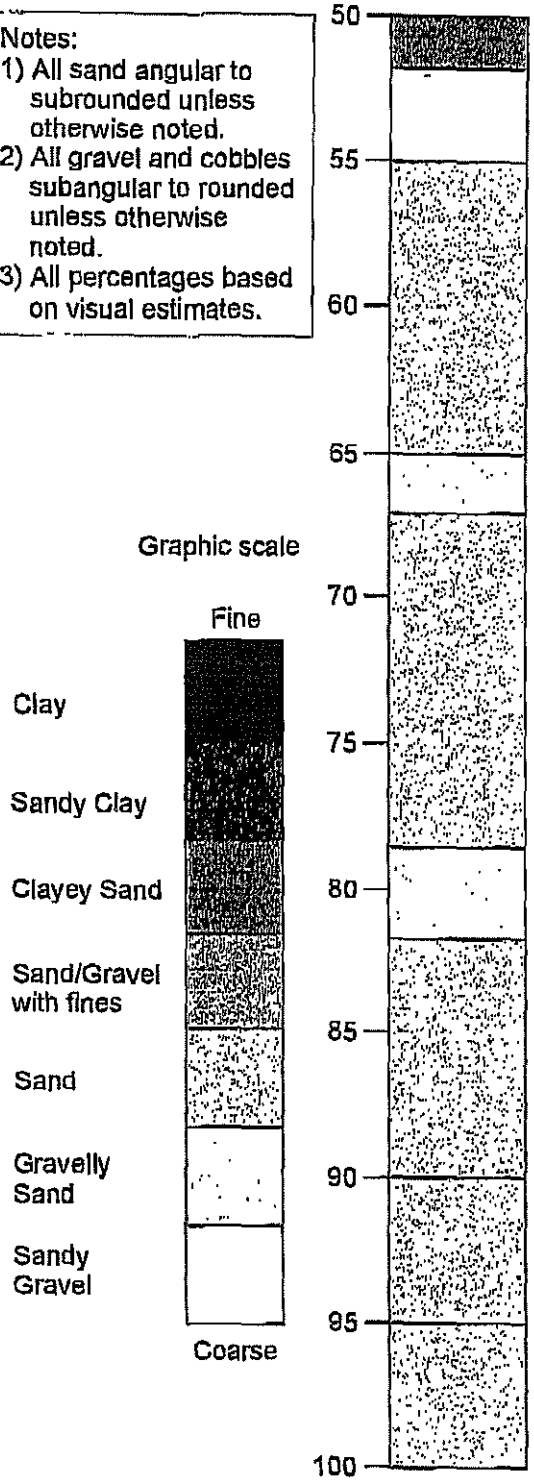
Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,066 N (northeast pit)
6,752,926 E

Ground elevation: 1,511'

Hole: R-04-02
Date drilled: 2/4/04
Page: 2 of 3

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



49-52' **Silty Sand with Gravel (SM);** dark yellowish brown (10YR 4/6); mostly fine to medium, micaceous sand, 20% silt, 15% gravel, damp.

52-55' **Gravel with Sand (GW);** dark yellowish brown (10YR 4/6); 80% gravel with gneiss boulder, trace silt as rock flour, humid.

55-65' **Sand with Gravel (SW);** light olive brown (2.5Y 5/3); fine to coarse sand, 15% gravel, mostly moderately to highly weathered clasts, moist.

65-67' **Gravelly Sand (SW);** light olive brown (2.5Y 5/4); fine to coarse sand, 40% gravel with cobbles and gneiss boulder, feldspar pegmatite and quartzite, damp.

67-78' **Sand with Gravel (SW);** olive brown (2.5Y 4/4); fine to coarse sand, 15% fine gravel, mostly subangular to rounded, moderately to highly weathered clasts of schist and coarse grained granitics, moist.

78-82' **Gravelly Sand (SW);** light olive brown (2.5Y 5/4); fine to coarse sand, 40% gravel with cobbles, damp.

82-90' **Sand with Gravel (SW);** light olive brown (2.5Y 5/4); fine to coarse sand, 15% gravel, trace cobbles, trace silt, mostly moderately to highly weathered clasts of mica schist, moist.

90-95' **Sand (SW);** light olive brown (2.5Y 5/4); fine to coarse sand, trace gravel, damp.

95-102' **Sand with Gravel (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 15% gravel, trace cobbles, mostly moderately weathered clasts of schist and granitics, moist.

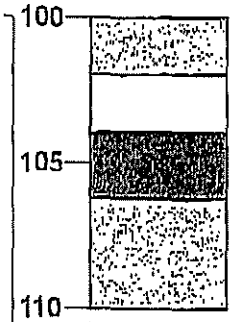
Vulcan Materials Company	Rig: Foremost AP 1000 Method: Reverse circulation air. Outside Pipe: 9-inch nominal diameter Inside Pipe: 6-inch nominal diameter	**Log of boring: SB-04-02** Site: Highland Avenue Plant, San Bernardino, CA
Recorder: S. Harris, Cleath & Associates		Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,066 N
6,752,926 E
Ground elevation: 1,511'

Hole: SB-04-02
Date drilled: 2/17/04
Page: 3 of 3

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



End of hole
No ground water

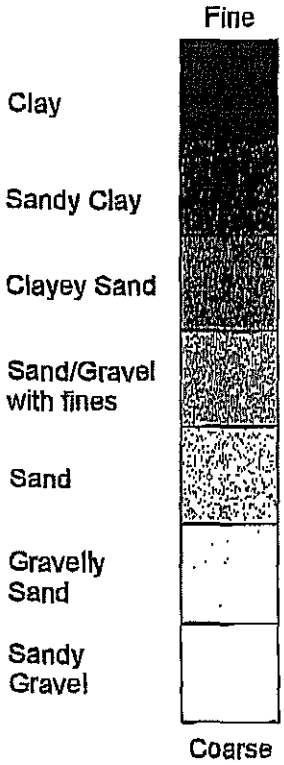
95-102' **Sand with Gravel (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 15% gravel, trace cobbles, mostly moderately weathered clasts of schist and granitics, moist.

102-104' **Sandy Gravel (GW);** yellowish brown (10YR 5/6); fine to coarse sand, 60% gravel with cobbles. Slightly to moderately weathered quartzite and fine grained mafics, with moderately to highly weathered schist and coarse grained granitics, damp.

104-106' **Silty Sand (SM);** dark yellowish brown (10YR 4/6); mostly fine to medium, micaceous sand, 15% silt, trace gravel, damp.

106-110' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 15% gravel, trace silt, moist.

Graphic scale



Vulcan Materials Company

Rig: Foremost AP 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-02
Site: Highland Avenue Plant, San Bernardino, CA

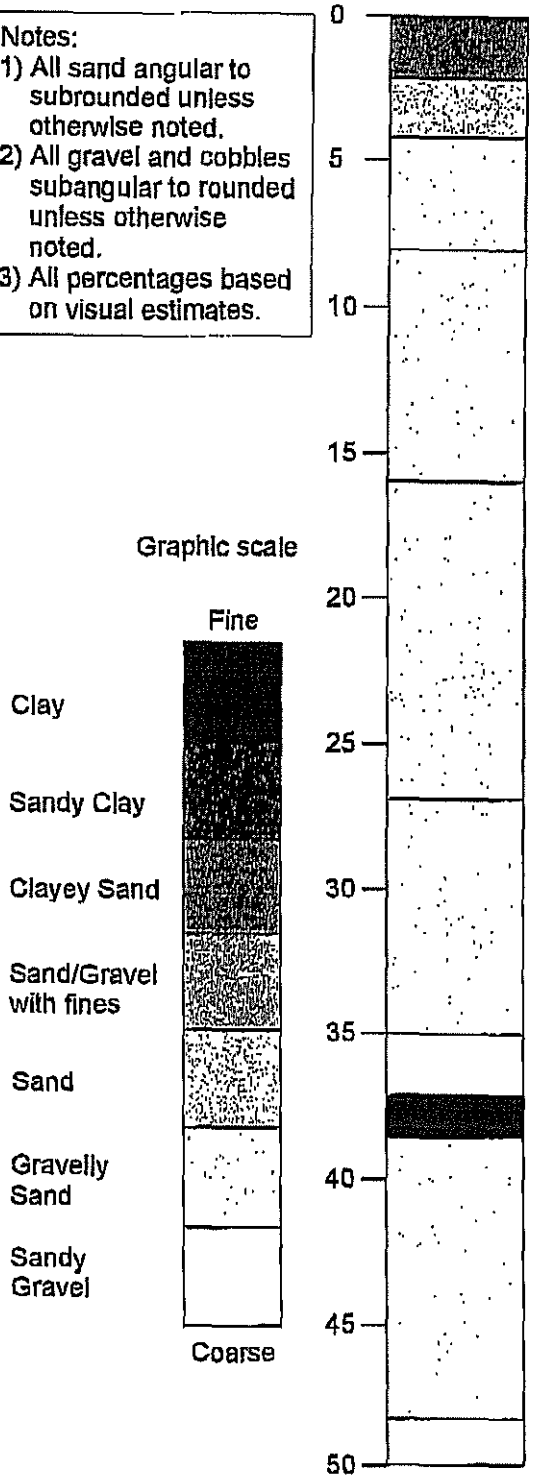
Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,887,579 N
6,753,458 E
Ground elevation: 1,496'

Hole: SB-04-03
Date drilled: 2/17-18/04
Page: 1 of 3

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



0-2' **Silty Gravelly Sand (SM);** light gray (10YR 7/2); fine to coarse sand, 30% gravel, 15% silt, humid.

2-4' **Sand (SW);** yellowish brown (10YR 5/6); fine to coarse sand, humid.

4-8' **Sand with Gravel (SW);** light yellowish brown (10YR 6/4); fine to coarse sand, 20% gravel with trace cobbles, slightly to moderately weathered quartzite and fine grained mafics with moderately to highly weathered schist and coarse grained granitics, humid.

8-16' **Sand with Gravel (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 15% gravel, humid.

16-27' **Gravelly Sand (SW);** light yellowish brown (10YR 6/4); fine to coarse sand, 35% gravel with cobbles and gneiss boulder. Trace silt as rock flour. Mostly slightly to moderately weathered clasts of granitics, schist, gneiss, and fine grained mafics, humid.

27-35' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 20% gravel and cobbles to 6", humid. Slightly to moderately weathered granitics, feldspar pegmatite, and fine grained mafics.

35-37' **Sandy Gravel (GW);** yellowish brown (10YR 5/4); fine to coarse sand, 60% gravel and cobbles with quartz monzonite boulder, humid.

37-38' **Sandy Silt (ML);** pale brown (10YR 6/3); 40% fine to medium sand, 60% silt, humid.

38-48' **Gravelly Sand (SW);** light olive brown (2.5Y 5/6); fine to coarse sand, 35% gravel with cobbles, mostly slightly to moderately weathered clasts of quartzite, schist, and othoclase-rich coarse grained granitics, humid.

48-54' **Sandy Gravel (GW);** light brownish gray (10YR 6/2); fine to coarse sand, 60% gravel and cobbles with diorite boulder, trace silt as rock flour, humid.

Vulcan Materials Company

Rig: Foremost AP 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-03
Site: Highland Avenue Plant, San Bernardino, CA

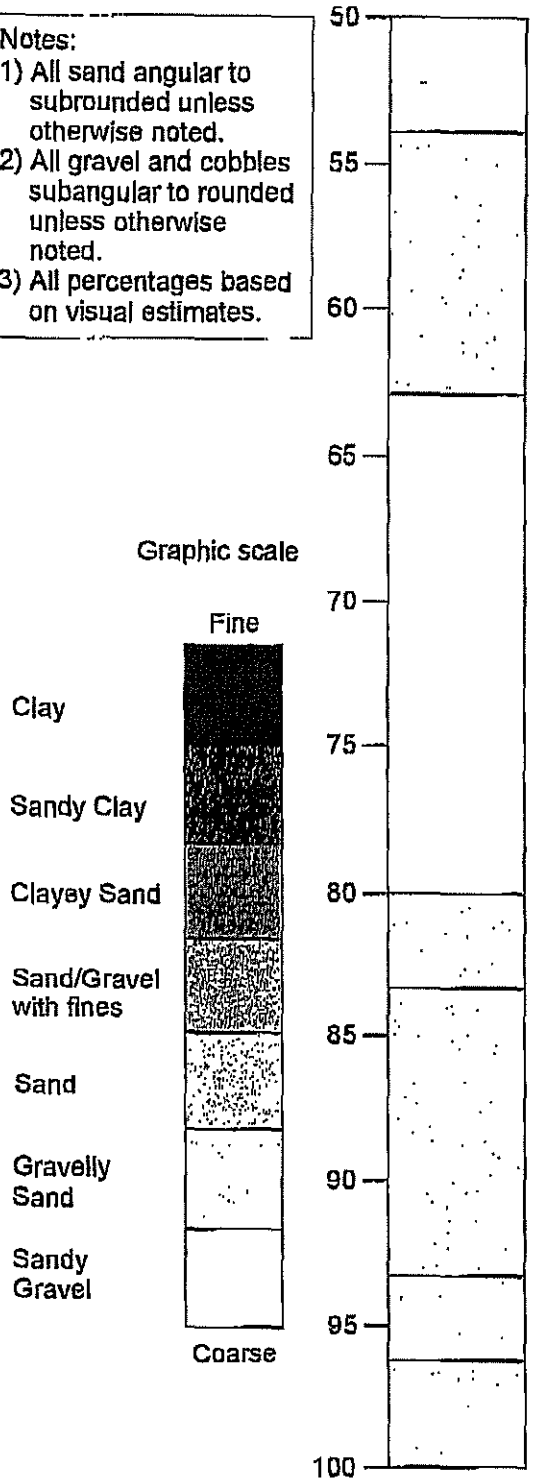
Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,887,579 N
6,753,458 E
Ground elevation: 1,496'

Hole: SB-04-03
Date drilled: 2/17-18/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



48-54' **Sandy Gravel (GW);** light brownish gray (10YR 6/2); fine to coarse sand, 60% gravel and cobbles with diorite boulder, trace silt as rock flour, humid.

54-63' **Sand (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 10% gravel, trace cobbles, damp.

63-80' **Sand with Gravel (SW-GW);** light olive brown (2.5Y 5/3); fine to coarse sand, 15% gravel, trace cobbles, trace silt, damp.

80-83' **Sandy Gravel (GW);** light brownish gray (10YR 6/2); fine to coarse sand, 60% gravel and cobbles with quartzite boulder, trace silt as rock flour, humid.

83-93' **Sand with Gravel (SW);** light olive brown (2.5Y 5/4); fine to coarse sand, 10% gravel, mostly moderately to highly weathered clasts <1.5", damp.

93-96' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 30% gravel with trace cobbles, trace silt. Finer gravel moderately to highly weathered clasts, larger clasts mostly slightly to moderately weathered, damp.

96-104' **Sand with Gravel (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 15% gravel, trace cobbles, damp.

Vulcan Materials Company

Rig: Foremost AP 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-03
Site: Highland Avenue Plant, San Bernardino, CA

Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

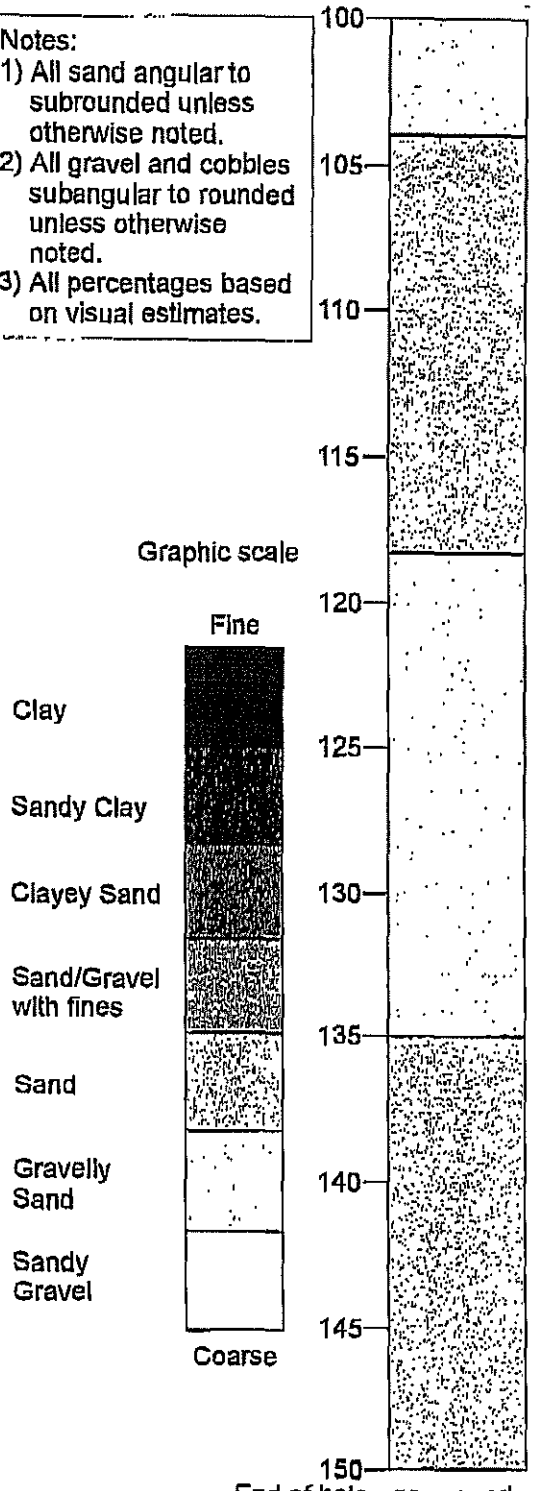
Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,887,579 N
6,753,458 E

Ground elevation: 1,496'

Hole: SB-04-03
Date drilled: 2/17-18/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



96-104' **Sand with Gravel (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 15% gravel, trace cobbles, damp.

104-118' **Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, trace gravel, trace cobbles, damp.

118-135' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 15% gravel, trace cobbles, trace weakly cemented conglomerate, damp.

135-150' **Sand (SW);** light olive brown (2.5Y 5/4); fine to coarse sand, trace gravel, damp to moist.

End of hole - no ground water

Vulcan Materials Company

Rig: Foremost AP 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-03
Site: Highland Avenue Plant, San Bernardino, CA

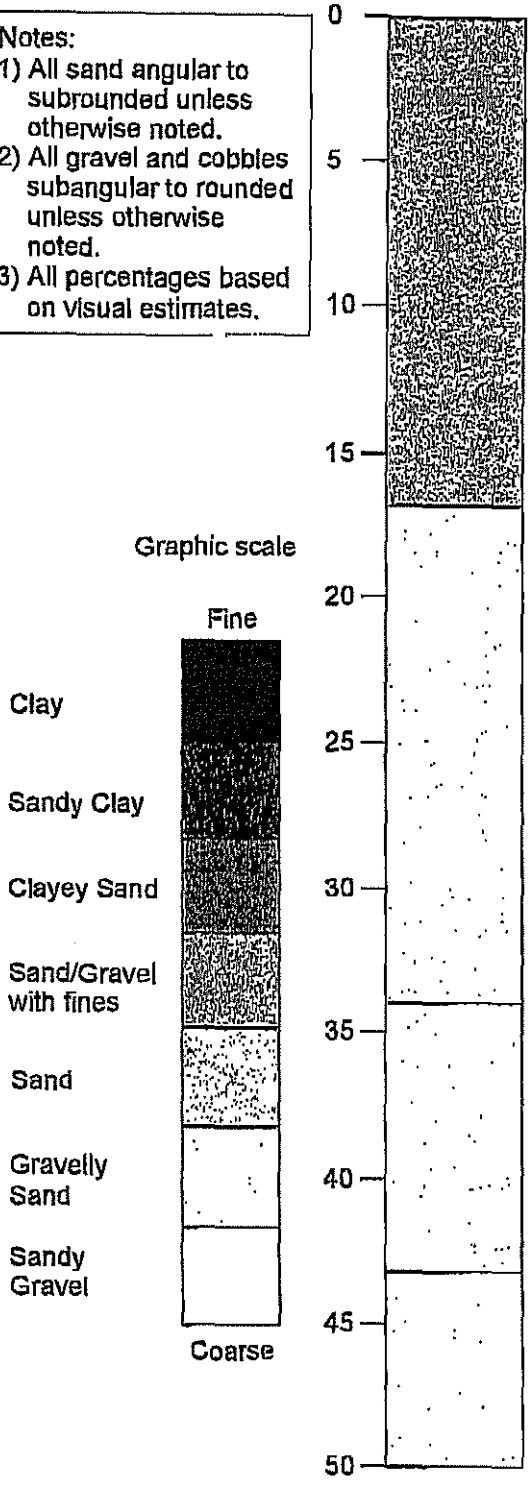
Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,978 N
6,755,221 E
Ground elevation: 1,622'

Hole: SB-04-04
Date drilled: 2/18/04
Page: 1 of 4

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



0-17' **Sand with Silt (SW-SM);** dark yellowish brown (10YR 4/6); fine to coarse sand, 10% silt, trace gravel, damp.

17-34' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 15% gravel, slightly to moderately weathered clasts of schist and quartz monzonite, zone of increased weathering from 20-30 feet, humid.

34-43' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 35% gravel with cobbles and quartzite boulder. Mostly slightly to moderately weathered clasts of quartzite, schist, granitics, and fine grained mafics, humid.

43-53' **Sand (SW);** light olive brown (2.5Y 5/4); fine to coarse sand, 10% gravel, humid.

Vulcan Materials Company

Rig: Foremost AR 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-04
Site: Highland Avenue Plant, San Bernardino, CA

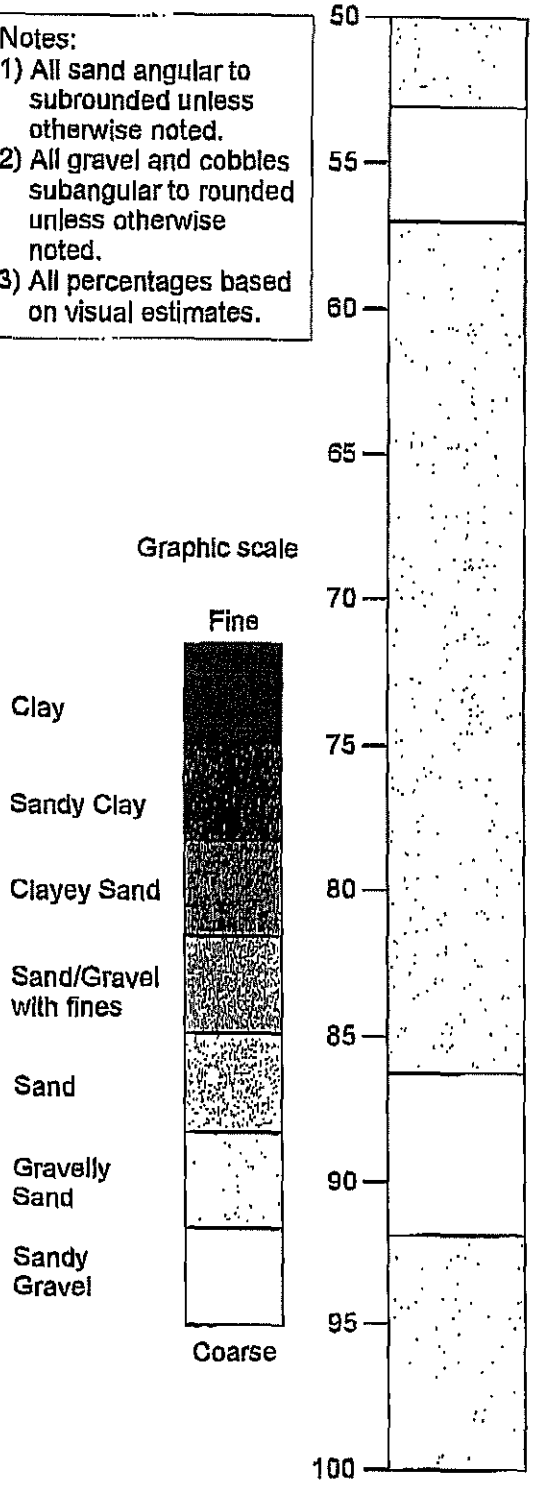
Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,978 N
6,755,221 E
Ground elevation: 1,622'

Hole: SB-04-04
Date drilled: 2/18/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



43-53' **Sand (SW);** light olive brown (2.5Y 5/4); fine to coarse sand, 10% gravel, humid.

53-57' **Sandy Gravel (GW);** light olive brown (2.5Y 5/4); 40% fine to coarse sand, 55% gravel and cobbles, 5% silt. Gravel clasts subangular to subrounded, slightly to moderately weathered quartzite, schist, coarse grained granitics and fine grained mafics, humid.

57-86' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); 60% fine to coarse sand, 35% gravel and cobbles, 5% silt. Mostly slightly to moderately weathered clasts of quartzite and granitics, with some highly weathered schist, humid.

86-92' **Sand and Gravel (SW-GW);** light olive brown (2.5Y 5/4); 50% fine to coarse sand, 50% gravel and cobbles to 8", trace silt, humid.

92-105' **Gravelly Sand (SW);** yellowish brown (10YR 5/6); 60% fine to coarse sand, 35% gravel and cobbles, 5% silt. Mostly slightly to moderately weathered clasts, humid.

Vulcan Materials Company	Rig: Foremost AP 1000 Method: Reverse circulation air Outside Pipe: 9-inch nominal diameter Inside Pipe: 6-inch nominal diameter	**Log of boring: SB-04-04** Site: Highland Avenue Plant, San Bernardino, CA
Recorder: S. Harris, Cleath & Associates		Driller: Layne Christensen

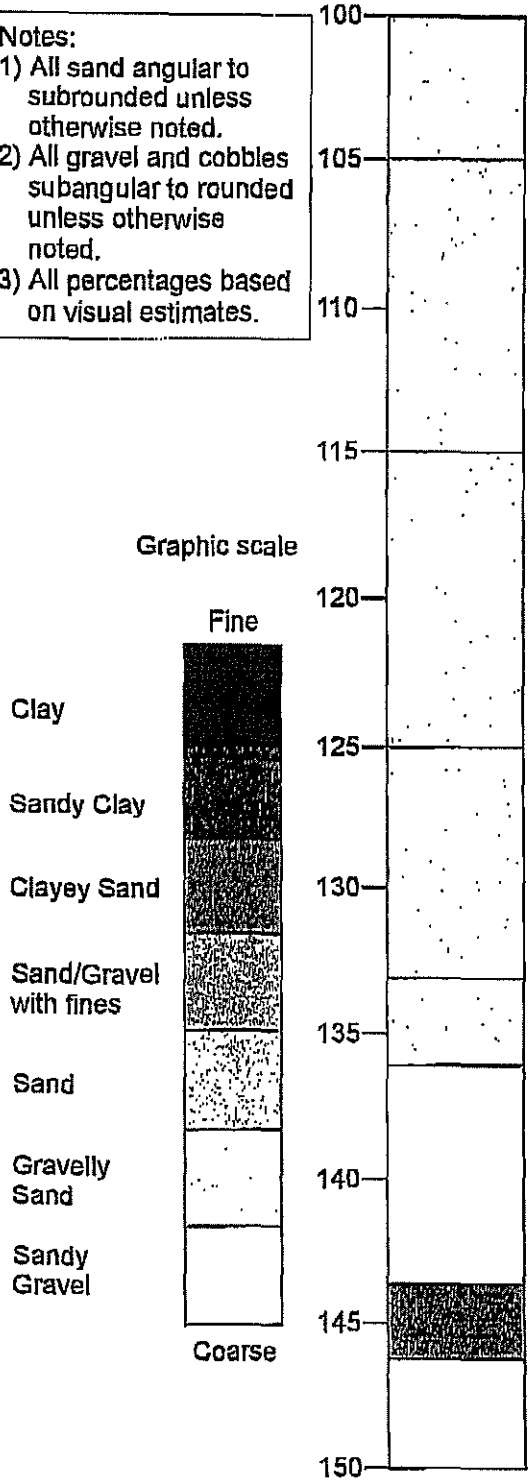
Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,978 N
6,756,221 E

Ground elevation: 1,622'

Hole: SB-04-04
Date drilled: 2/18/04
Page: 3 of 4

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



92-105' **Gravelly Sand (SW);** yellowish brown (10YR 5/6); 60% fine to coarse sand, 35% gravel and cobbles, 5% silt. Mostly slightly to moderately weathered clasts, humid.

105-115' **Sand with Gravel (SW);** dark yellowish brown (10YR 4/6); 60% fine to coarse sand, 35% gravel and cobbles, 5% silt. Slightly to moderately weathered clasts of quartzite, with moderately to highly weathered schist, humid.

115-125' **Gravelly Sand (SW);** yellowish brown (10YR 5/6); 65% fine to coarse sand, 30% gravel and cobbles, 5% silt. Mostly slightly to moderately weathered clasts, humid.

125-133' **Sand (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 10% gravel.

133-136' **Gravelly Sand (SW);** yellowish brown (10YR 5/6); 60% fine to coarse sand, 35% gravel and cobbles, 5% silt. Mostly moderately weathered clasts, humid.

136-144' **Sandy Gravel (GW);** yellowish brown (10YR 5/6); 40% fine to coarse sand, 50% gravel, cobbles, and boulders 10% silt (5% as rock flour). Mostly moderately weathered clasts, humid.

144-146' **Silty Sand with Gravel (SM);** dark yellowish brown (10YR 4/6); fine to coarse sand, 20% silt, 15% gravel, damp.

146-152' **Sandy Gravel (GW);** yellowish brown (10YR 5/4); 45% fine to coarse sand, 50% gravel, cobbles, and boulders 5% silt as rock flour. Mostly moderately weathered clasts, humid.

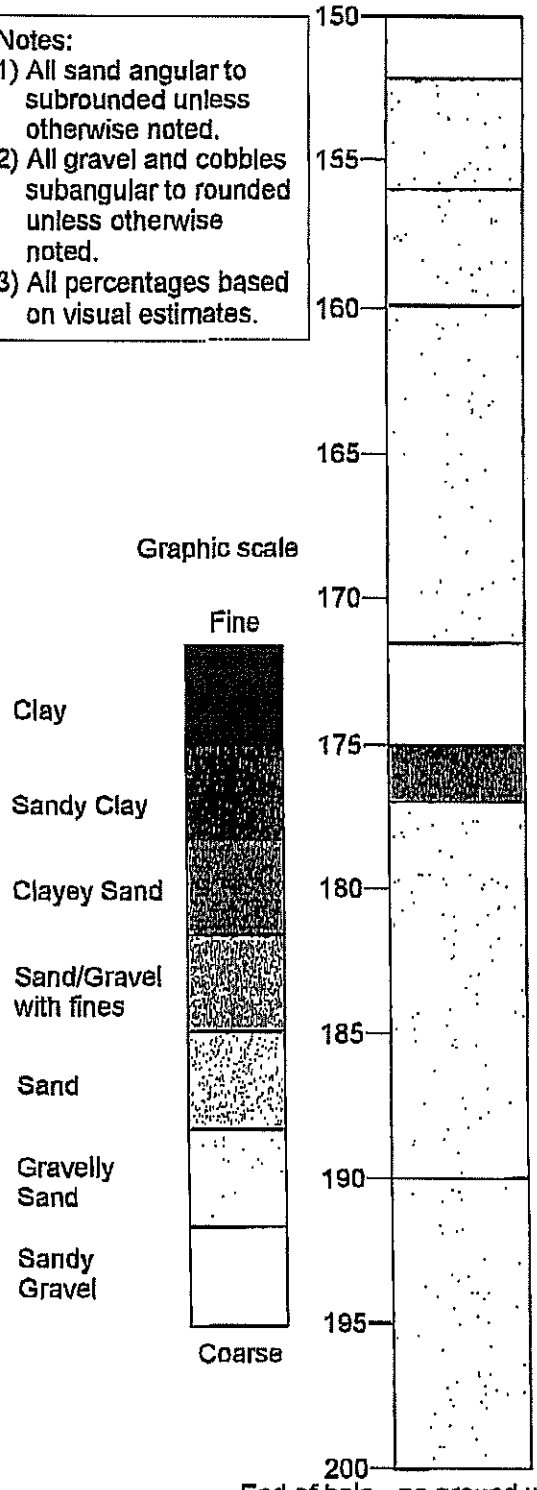
Vulcan Materials Company	Rig: Foremost AP 1000 Method: Reverse circulation air Outside Pipe: 9-inch nominal diameter Inside Pipe: 6-inch nominal diameter	**Log of boring: SB-04-04** Site: Highland Avenue Plant, San Bernardino, CA
Recorder: S. Harris, Cleath & Associates		Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,978 N
6,755,221 E
Ground elevation: 1,622'

Hole: SB-04-04
Date drilled: 2/18/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



146-152' **Sandy Gravel (GW);** yellowish brown (10YR 5/4); 45% fine to coarse sand, 50% gravel, cobbles, and boulders, 5% silt as rock flour. Mostly moderately weathered clasts, humid.

152-156' **Sand with Gravel (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 15% gravel, damp.

156-160' **Gravelly Sand (SW);** dark yellowish brown (10YR 4/6); 65% fine to coarse sand, 30% gravel and cobbles, 5% silt. Mostly moderately weathered clasts, humid.

160-172' **Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 10% gravel, trace silt, damp.

172-175' **Sandy Gravel with Silt (GW-GC);** light olive brown (2.5Y 5/4); 40% fine to coarse sand, 55% gravel, 5% silt. Moderately weathered quartzite and fine grained mafics, with some highly weathered coarse grained granitics and schist, humid.

175-177' **Silty Sand (SM);** light olive brown (2.5Y 5/4); fine to medium sand, 30% silt, trace gravel, damp.

177-190' **Sand with Gravel (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 20% gravel and cobbles, damp.

190-200' **Sand (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 10% gravel, trace cobbles, damp.

End of hole - no ground water

Vulcan Materials Company

Rig: Foremost AP 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-04
Site: Highland Avenue Plant, San Bernardino, CA

Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

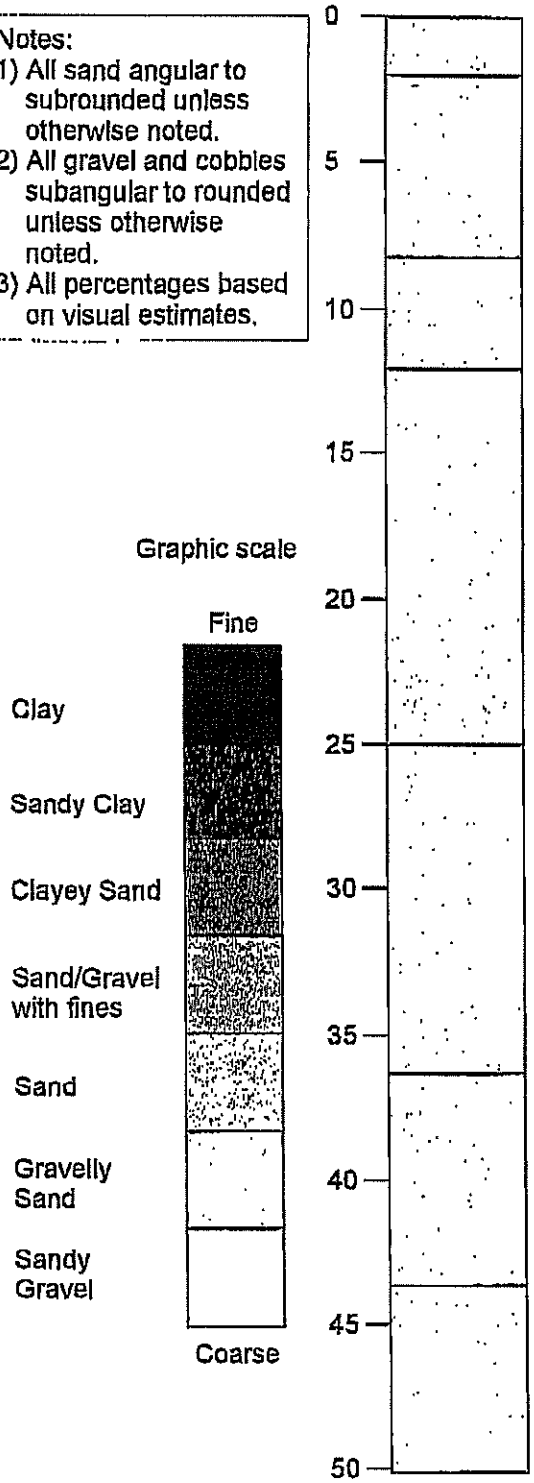
Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,169 N
6,754,243 E

Ground elevation: 1,612'

Hole: SB-04-05
Date drilled: 2/19/04
Page: 1 of 5

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



0-2' **Gravelly Sand (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 20% gravel, trace cobbles, damp.

2-8' **Sand with Gravel (SW);** yellowish brown (10YR 5/8); fine to coarse sand, 15% gravel to 2", damp.

8-12' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 30% gravel to 3", trace silt. Mostly slightly to moderately weathered clasts of quartzite, schist, and granitics, humid.

12-25' **Sand with Gravel (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 10% fine gravel, subangular to subrounded clasts, humid.

25-36' **Sand with Gravel (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 25% gravel and cobbles, subangular to subrounded clasts, mostly slightly to moderately weathered quartzite, schist, and granitics, humid.

36-44' **Gravelly Sand (SW);** yellowish brown (10YR 5/6) to olive yellow (2.5Y 4/4); fine to coarse sand, 30% gravel and cobbles, trace silt. Mostly slightly to moderately weathered clasts of quartzite, schist, and granitics, humid.

44-61' **Sand with Gravel (SW);** light yellowish brown (2.5Y 6/4); fine to coarse sand, 15% gravel, trace cobbles at 56 feet, humid.

Vulcan Materials Company

Rig: Foremost AP 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-05
Site: Highland Avenue Plant, San Bernardino, CA

Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

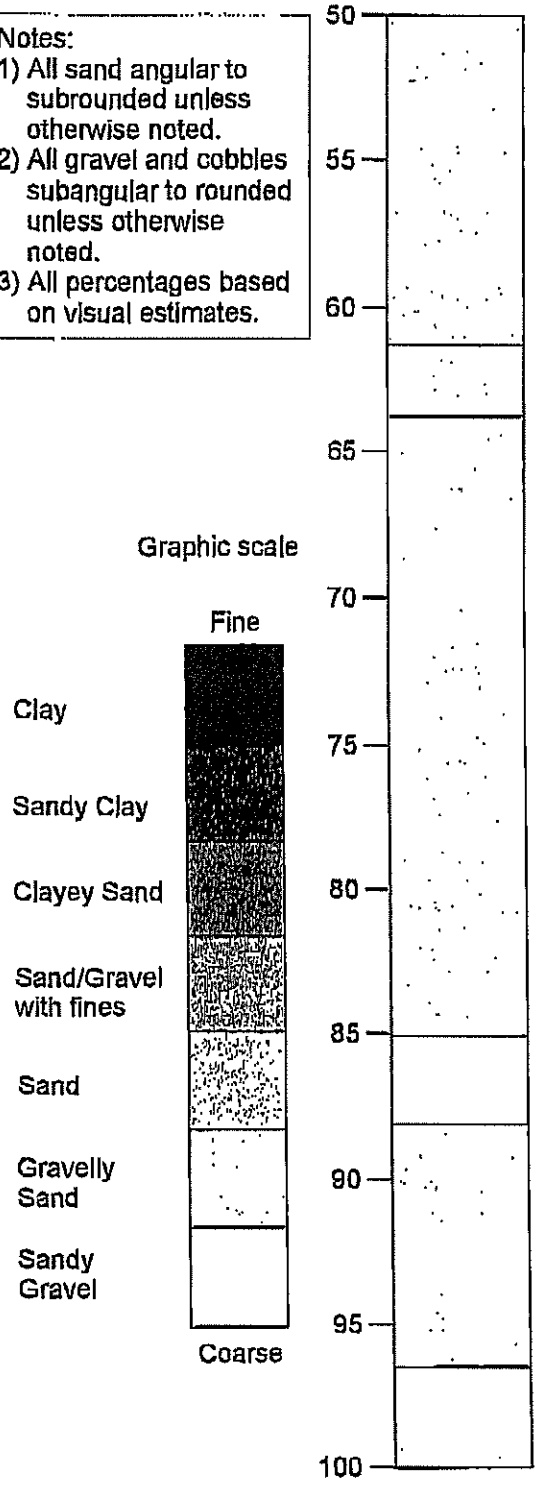
Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,169 N
6,754,243 E

Ground elevation: 1,612'

Hole: SB-04-05
Date drilled: 2/19/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



44-61' **Sand with Gravel (SW);** light yellowish brown (2.5Y 6/4); fine to coarse sand, 15% gravel, trace cobbles at 56 feet, humid.

61-64' **Gravelly Sand (SW);** light yellowish brown (2.5Y 6/4); fine to coarse sand, 30% gravel and cobbles to 6", trace silt, humid.

64-85' **Sand with Gravel (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 20% gravel, trace cobbles, trace silt, humid. Subangular to subrounded clasts, mostly slightly to moderately weathered quartzite, fine grained mafics and gneiss, with some moderately to highly weathered schist and coarse grained granitics. Finer gravel (<1.5") more weathered than larger clasts.

85-88' **Sandy Gravel (GW);** light yellowish brown (2.5Y 6/4); fine to coarse sand, 50% gravel and cobbles, schist boulder, trace silt, humid.

88-96' **Sand with Gravel (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 15% gravel, trace silt, humid.

96-103' **Gravelly Sand (SW);** light yellowish brown (2.5Y 6/4); fine to coarse sand, 40% gravel, cobbles, and boulders, trace silt slightly to moderately weathered clasts >1.5", moderately to highly weathered clasts <1.5", humid.

Vulcan Materials Company

Rig: Foremost AP 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-05
Site: Highland Avenue Plant, San Bernardino, CA

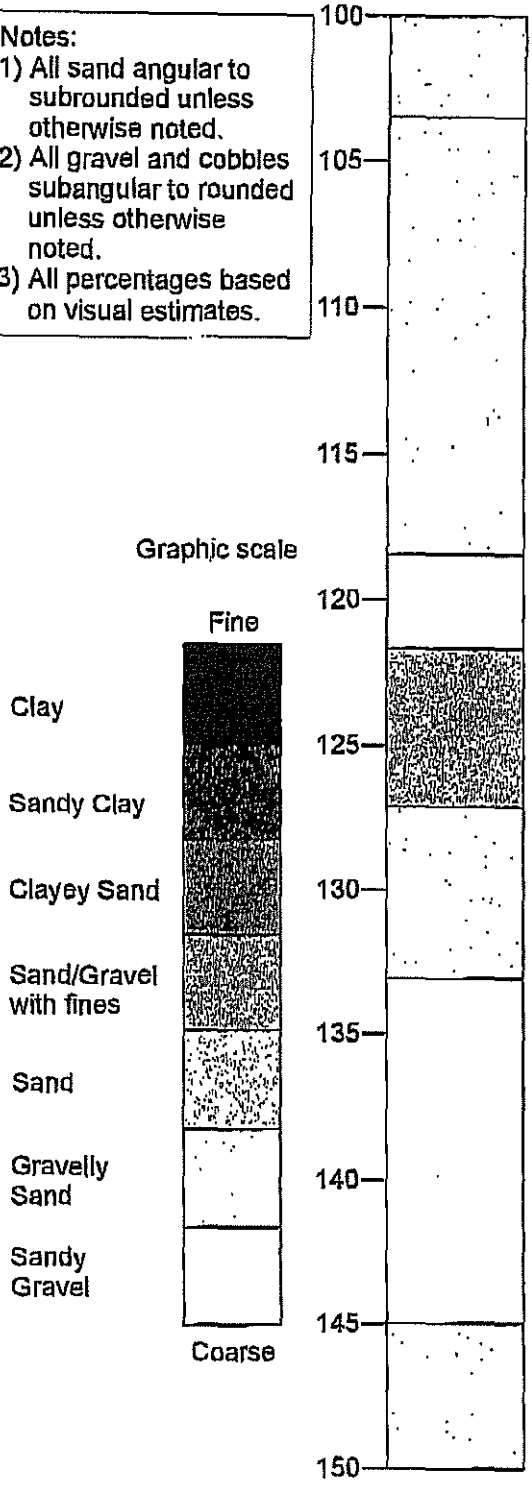
Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,169 N
6,754,243 E
Ground elevation: 1,612'

Hole: SB-04-05
Date drilled: 2/19/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



96-103' **Gravelly Sand (SW);** light yellowish brown (2.5Y 6/4); fine to coarse sand, 40% gravel, cobbles, and boulders, trace silt slightly to moderately weathered clasts >1.5", moderately to highly weathered clasts <1.5", humid.

103-118' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 20% gravel, trace silt, humid.

118-122' **Sandy Gravel (GW);** yellowish brown (10YR 5/6); fine to coarse sand, 50% gravel and cobbles, quartzite boulder, trace silt. Slightly to moderately weathered coarse grained granitics and gneiss, some highly weathered coarse grained gneiss, humid.

122-126' **Sand (SW);** yellowish brown (10YR 5/6); fine to coarse sand, trace gravel, humid.

126-133' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 20% gravel, trace cobbles, humid.

133-145' **Sandy Gravel (GW);** yellowish brown (10YR 5/4) to light yellowish brown (2.5Y 6/4); 40% fine to coarse sand, 60% gravel and cobbles, granite boulder, trace silt as rock flour. Slightly to moderately weathered granitics and gneiss, humid.

145-153' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 40% gravel, cobbles, and boulders, trace silt. Fine grained mafic and gneiss boulders, with mostly slightly to moderately weathered gravel clasts, humid.

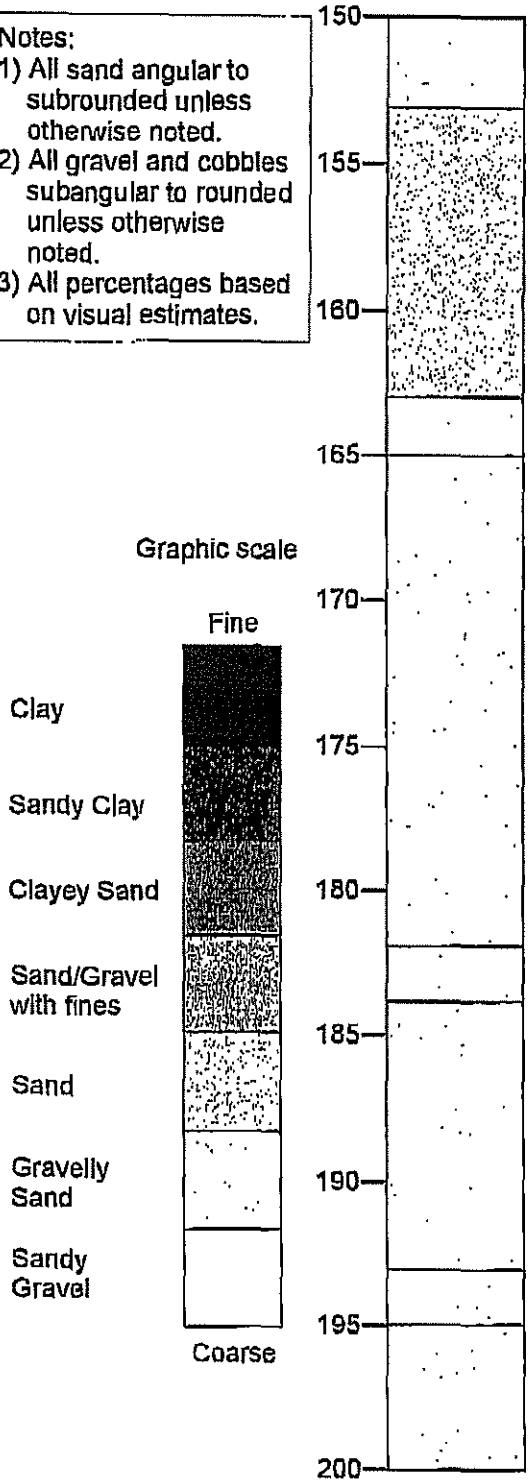
Vulcan Materials Company	Rig: Foremost AP 1000 Method: Reverse circulation air Outside Pipe: 9-inch nominal diameter Inside Pipe: 6-inch nominal diameter	**Log of boring: SB-04-05** Site: Highland Avenue Plant, San Bernardino, CA
Recorder: S. Harris, Cleath & Associates		Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,169 N
6,754,243 E
Ground elevation: 1,612'

Hole: SB-04-05
Date drilled: 2/19/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



145-153' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 40% gravel, cobbles, and boulders, trace silt. Fine grained mafic and gneiss boulders, with mostly slightly to moderately weathered gravel clasts, humid.

153-163' **Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, trace gravel to 3", humid.

163-165' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 35% gravel and cobbles to 8", subangular to subrounded clasts, humid.

165-182' **Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 10% gravel, trace cobbles, humid. Sand angular to subrounded, mostly quartz with lesser feldspar (c. 30%), c. 20% mafics.

182-184' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 20% gravel, trace silt, damp.

184-193' **Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 10% gravel, trace cobbles, damp.

193-195' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 30% gravel, trace silt, damp.

195-220' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 15% gravel, damp.

Vulcan Materials Company	Rig: Foremost AP 1000 Method: Reverse circulation air Outside Pipe: 9-inch nominal diameter Inside Pipe: 6-inch nominal diameter	**Log of boring: SB-04-05** Site: Highland Avenue Plant, San Bernardino, CA
Recorder: S. Harris, Cleath & Associates		Driller: Layne Christensen

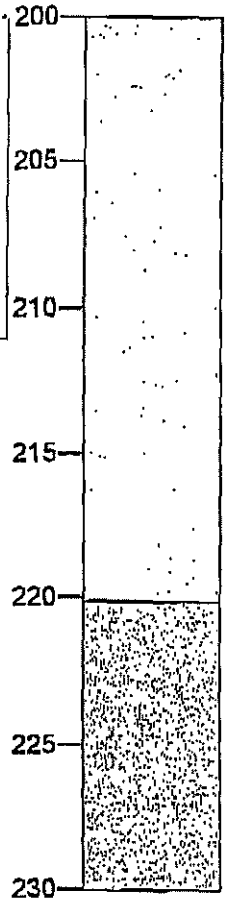
Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,888,169 N
6,754,243 E

Ground elevation: 1,612'

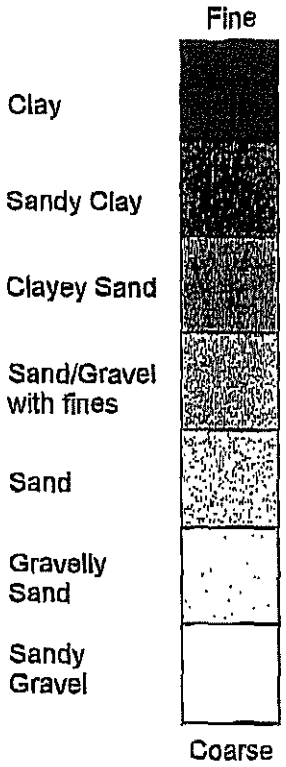
Hole: SB-04-05
Date drilled: 2/19/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



End of hole
No ground water

Graphic scale



195-220' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 10% gravel, damp. Sand angular to subrounded mostly quartz with lesser feldspar (c. 30%), 20% mafics.

220-230' **Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, trace gravel, damp.

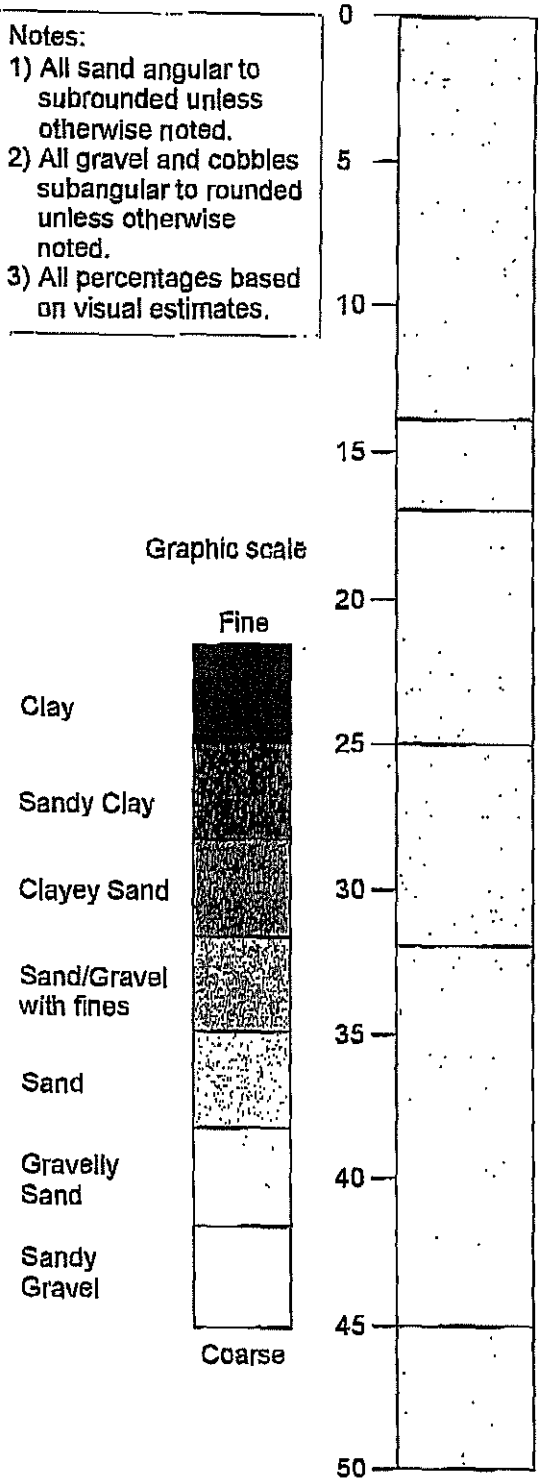
Vulcan Materials Company	Rig: Foremost AP 1000 Method: Reverse circulation air Outside Pipe: 9-inch nominal diameter Inside Pipe: 6-inch nominal diameter	**Log of boring: SB-04-05** Site: Highland Avenue Plant, San Bernardino, CA
Recorder: S. Harris, Cleath & Associates		Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,886,553 N
6,755,925 E
Ground elevation: 1,566'

Hole: SB-04-06
Date drilled: 2/19/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



0-14' **Sand with Gravel (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 15% gravel, trace cobbles, trace silt, damp.

14-17' **Gravelly Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 30% gravel, trace cobbles. Mostly slightly to moderately weathered clasts of gneiss, quartzite, and schist, humid

17-25' **Sand with Gravel (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 15% fine gravel, humid.

25-32' **Gravelly Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 35% gravel, trace cobbles. Mostly subangular to subrounded, slightly to moderately weathered clasts of gneiss and quartzite, with moderately to highly weathered schist, humid.

32-45' **Sand with Gravel (SW);** olive brown (2.5Y 4/4); fine to coarse sand, 15% gravel, humid.

45-56' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 35% gravel, trace cobbles, trace silt; Mostly moderately weathered clasts of coarse grained granitics and schist, humid.

Vulcan Materials Company

Rig: Foremost AP 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-06
Site: Highland Avenue Plant, San Bernardino, CA

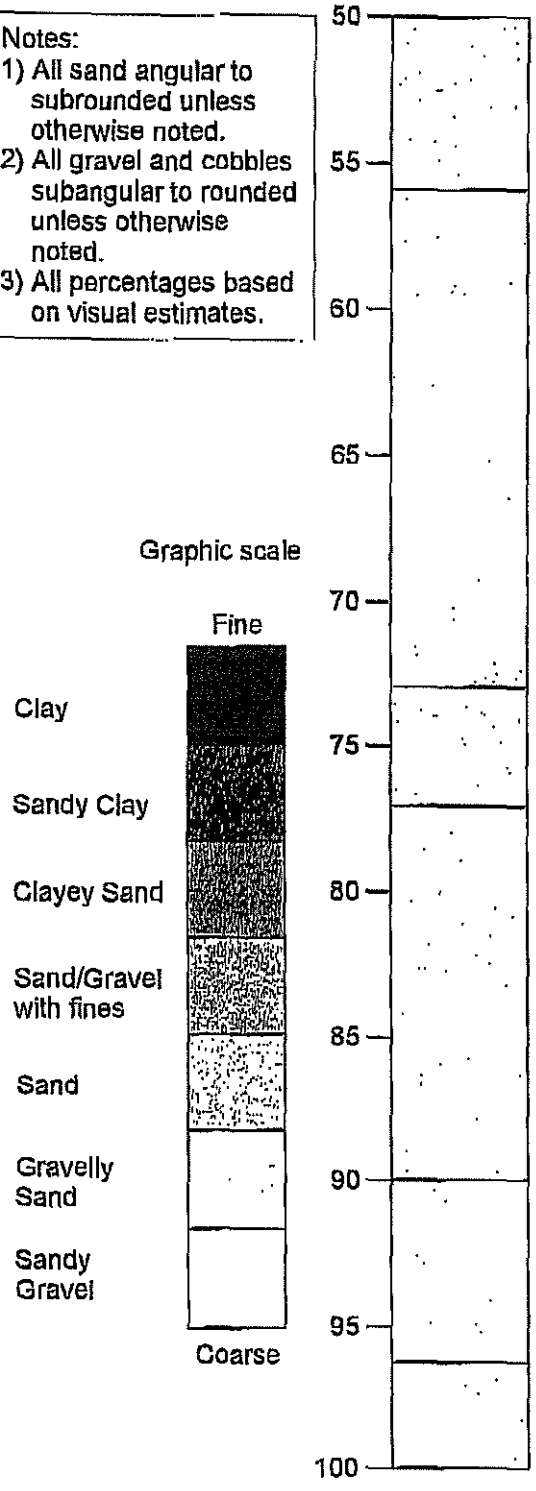
Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,886,553 N
6,755,925 E
Ground elevation: 1,566'

Hole: SB-04-06
Date drilled: 2/19/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



45-56' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 35% gravel, trace cobbles, trace silt. Mostly moderately weathered clasts of coarse grained granitics and schist, humid.

56-73' **Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 10% fine gravel, mostly humid.

73-77' **Gravelly Sand (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 30% gravel, trace cobbles, trace silt, humid.

77-90' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 15% gravel to 3", damp.

90-96' **Gravelly Sand (SW);** yellowish brown (10YR 5/4 to 5/6); fine to coarse sand, 30% gravel, trace cobbles, mostly moderately weathered clasts, damp.

96-108' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 20% gravel, trace cobbles, trace silt, damp.

Vulcan Materials Company

Rig: Foremost AP 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-06
Site: Highland Avenue Plant, San Bernardino, CA

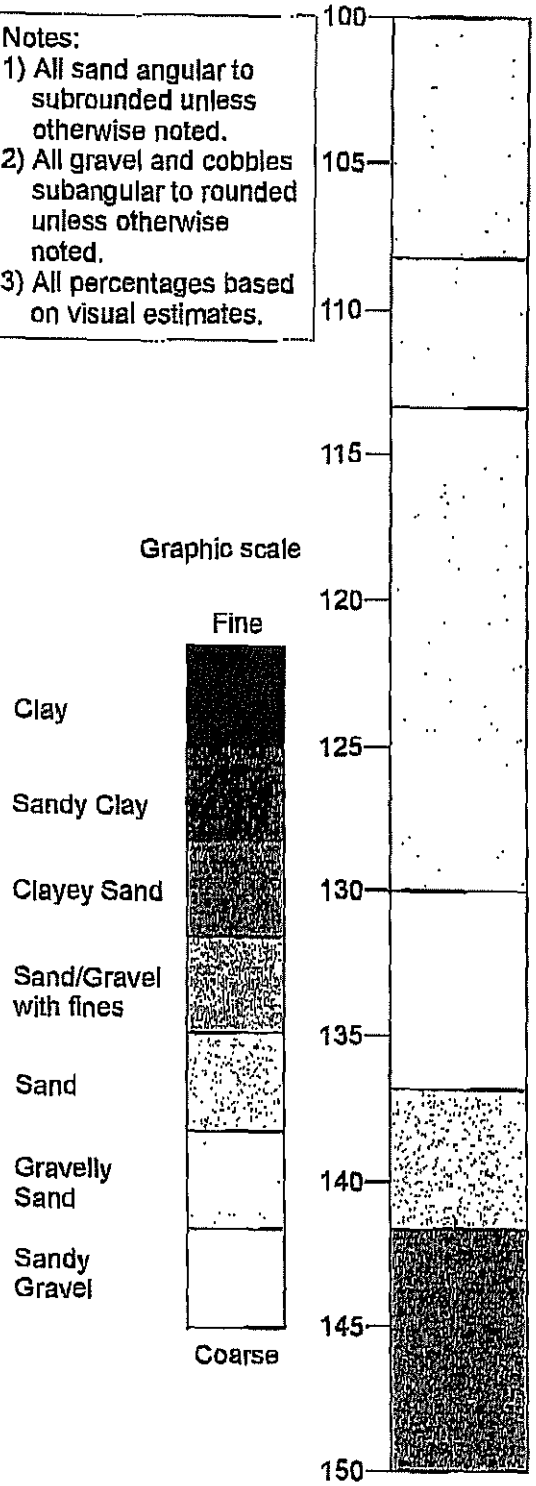
Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,886,553 N
6,755,925 E
Ground elevation: 1,566'

Hole: SB-04-06
Date drilled: 2/19/04
Page: 3 of 4

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



96-108' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 20% gravel, trace cobbles, trace silt, damp.

108-113' **Sand with Gravel (SW);** yellowish brown (10YR 5/4); fine to coarse sand, 15% gravel, damp.

113-130' **Gravelly Sand (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 30% gravel, trace cobbles, trace silt. Subangular to subrounded clasts, mostly slightly to moderately weathered diorite and gneiss with some moderately to highly weathered schist and coarse grained granitics, damp.

130-137' **Sandy Gravel (GW);** brown (10YR 5/3); fine to coarse sand, 60% gravel and cobbles, trace boulders, mostly slightly to moderately weathered schist and gneiss, damp.

137-142' **Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, trace gravel, damp.

142-150' **Silty Gravelly Sand (SM);** dark yellowish brown (10YR 4/6); fine to coarse sand, 30% gravel, trace cobbles , 15% silt. Slightly to moderately weathered clasts, damp.

Vulcan Materials Company	Rig: Foremost AP 1000 Method: Reverse circulation air Outside Pipe: 9-inch nominal diameter Inside Pipe: 6-inch nominal diameter	**Log of boring: SB-04-06** Site: Highland Avenue Plant, San Bernardino, CA
Recorder: S. Harris, Cleath & Associates		Driller: Layne Christensen

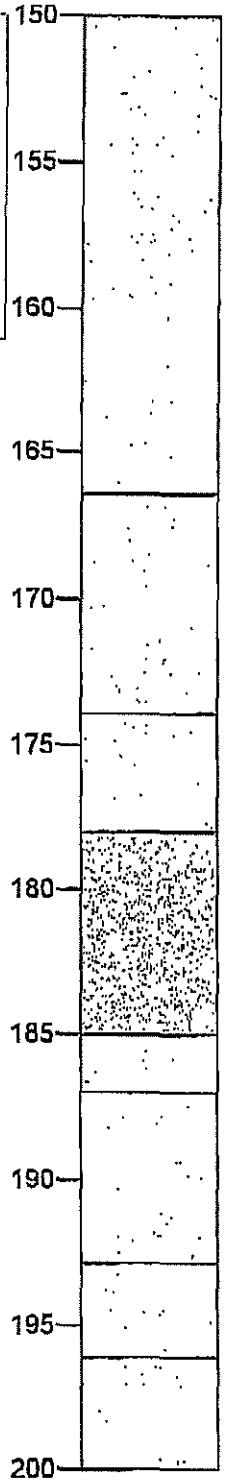
Project: Highland Avenue Plant, San Bernardino, California

Coordinates: 1,886,553 N
6,755,925 E

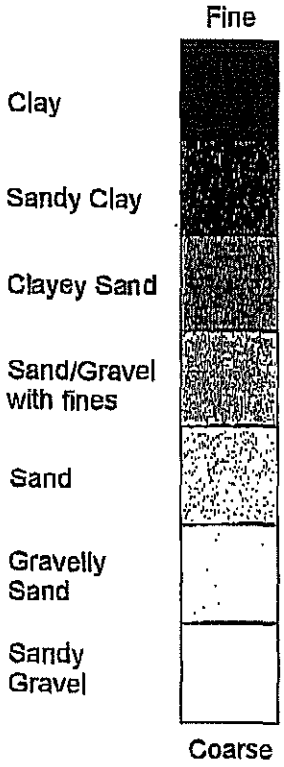
Ground elevation: 1,566'

Hole: SB-04-06
Date drilled: 2/19/04

Notes:
1) All sand angular to subrounded unless otherwise noted.
2) All gravel and cobbles subangular to rounded unless otherwise noted.
3) All percentages based on visual estimates.



Graphic scale



150-166' **Sand (SM);** yellowish brown (10YR 5/6); fine to coarse sand, 10% gravel, damp.

166-174' **Sand with Gravel (SM);** yellowish brown (10YR 5/6); fine to coarse sand, 20% gravel to 2", mostly moderately weathered quartz pegmatite, gneiss, and schist, some highly weathered finer gravels (<1"), damp.

174-178' **Gravelly Sand (SW);** dark yellowish brown (10YR 4/6); fine to coarse sand, 30% gravel, trace cobbles, damp.

178-185' **Sand (SW);** yellowish brown (10YR 5/6); fine to coarse sand, trace gravel, damp.

185-187' **Gravelly Sand (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 30% gravel, slightly to moderately weathered gneiss and quartz pegmatite, with moderately to highly weathered schist and coarse grained granitics, damp.

187-193' **Sand (SM);** yellowish brown (10YR 5/6); fine to coarse sand, 10% gravel, damp.

193-196' **Gravelly Sand (SW);** yellowish brown (10YR 5/6); fine to coarse sand, 30% gravel, slightly to moderately weathered gneiss and fine grained mafics, with moderately to highly weathered schist and coarse grained granitics, damp.

196-200' **Sand with Gravel (SM);** yellowish brown (10YR 5/6); fine to coarse sand, 15% gravel, damp.

Vulcan Materials Company

Rig: Foremost AP 1000
Method: Reverse circulation air
Outside Pipe: 9-inch nominal diameter
Inside Pipe: 6-inch nominal diameter

Log of boring: SB-04-06
Site: Highland Avenue Plant, San Bernardino, CA

Recorder: S. Harris, Cleath & Associates
Driller: Layne Christensen

APPENDIX B

Laboratory Test Results

LARGE SCALE DIRECT SHEAR REPORT

Internal Shear D-3080 Modified

Geo-Logic ASSOCIATES

Report Date: May 3, 2018

Client / Project Name: HALEY & ALDRICH, INC. / VMC SAN BERNARDINO AREA Q, 132051-002

Project No: AU18.1138.00

Superstrate: ⇦ Spacers

Material 1: ⇦ 132051 Sample 1, Sand w/ Gravel LSN: 4353A Remolded

Material 2: ⇨ 132051 Sample 1, Sand w/ Gravel LSN: 4353A Remolded

Substrate: ⇨ Spacers

PEAK STRENGTH

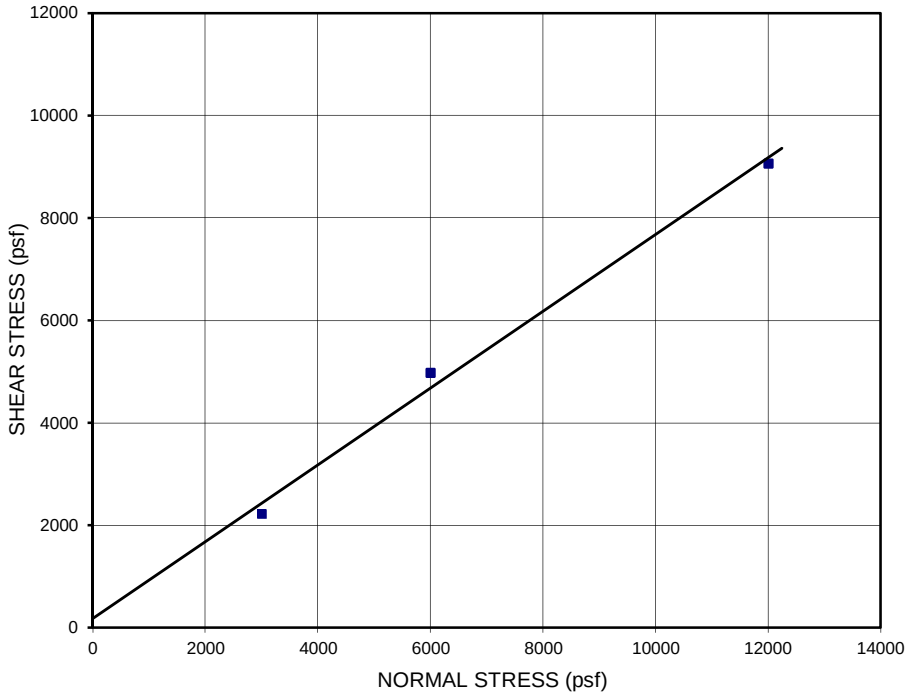
Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	20.8	3000	2230	37
2.	41.7	6000	4980	40
3.	83.3	12000	9070	37

Adhesion: 180 psf

Friction Angle: 37 degrees

Coefficient of Friction: 0.75

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 3.0 in. displacement)

Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	20.8	3000	1700	30
2.	41.7	6000	4400	36
3.	83.3	12000	8540	35

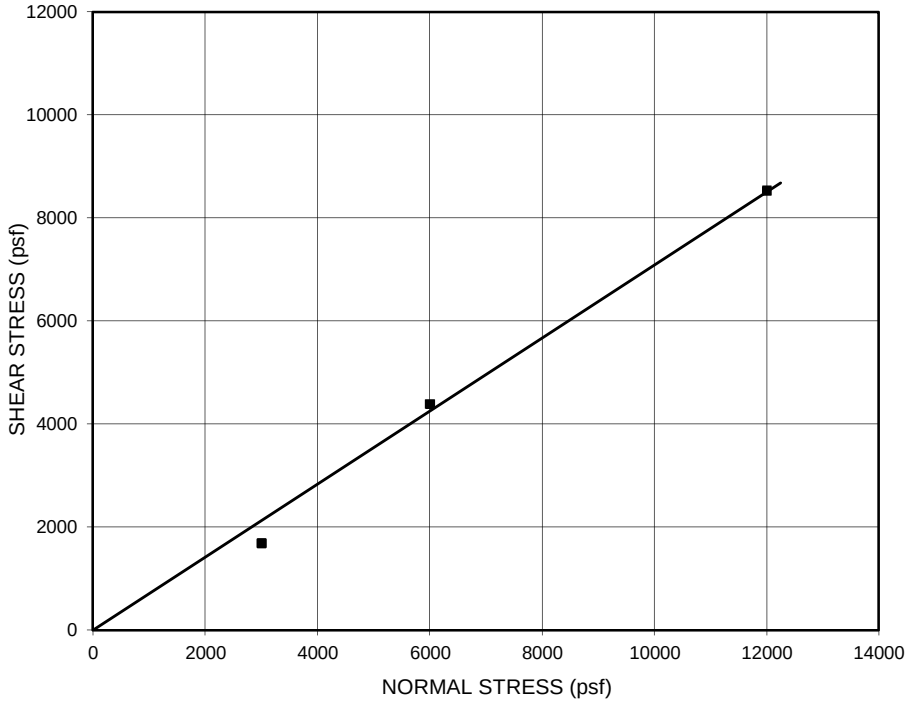
Adhesion: 0 psf

Friction Angle: 35 degrees

Coefficient of Friction: 0.71

Note: Intercept set to zero

NOTE: GRAPH NOT TO SCALE



This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

LARGE SCALE DIRECT SHEAR REPORT

Internal Shear D-3080 Modified

Geo-Logic ASSOCIATES

Report Date: May 3, 2018

Client / Project Name: HALEY & ALDRICH, INC. / VMC SAN BERNARDINO AREA Q, 132051-002

Project No: AU18.1138.00

Superstrate: ⇦ Spacers

Material 1: ⇦ 132051 Sample 1, Sand w/ Gravel LSN: 4353A Remolded

Material 2: ⇨ 132051 Sample 1, Sand w/ Gravel LSN: 4353A Remolded

Substrate: ⇨ Spacers

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	20.8	3000
2.	41.7	6000
3.	83.3	12000

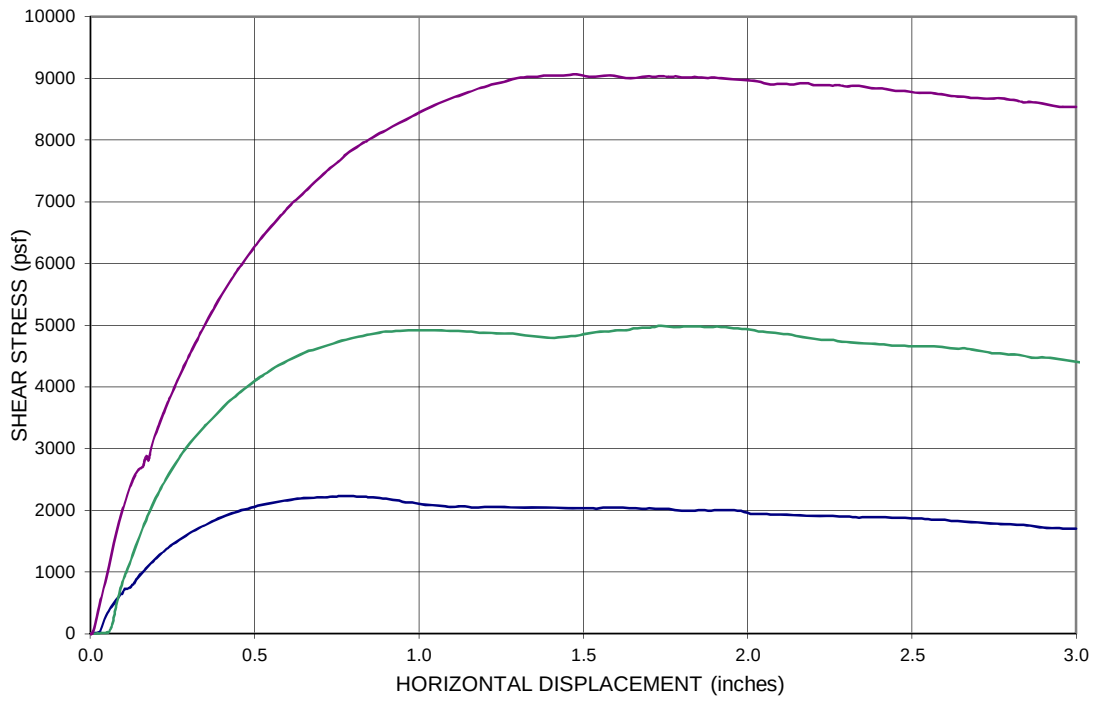
MOISTURE DATA:

(Gravel)

Initial Water Content: 5%

Initial Dry Density: 113.8 pcf

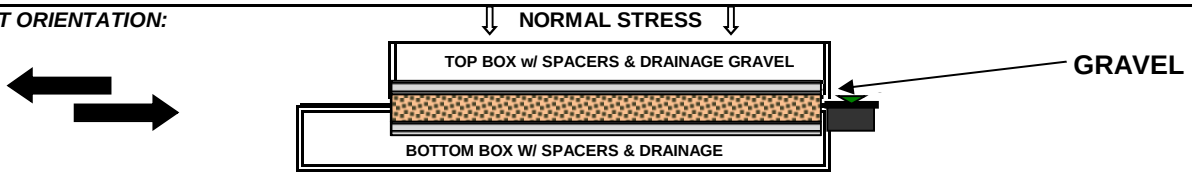
Final Water Content:(%)
1) 15.1 2) 13.9 3) 12.3



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.04 in/min**

1. The "gap" between shear boxes was set at 0.5 inches.
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-3080 - Modified using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. The test method was modified to measure the internal shear characteristics of the gravel.
2. The gravel was remolded into both the upper and lower box.
3. Each test point was consolidated under specified normal stress for approximately 1 hour, then sheared.
4. The test was performed in a "wet" or "flooded" condition.
5. Shearing occurred internally within the gravel.
6. The Peak Friction Angle and Adhesion (or Cohesion) results given here are based on a mathematically determined best fit line.
7. The Residual Friction Angle and Adhesion (or Cohesion) results given here are based on an intercept through zero.
8. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

LARGE SCALE DIRECT SHEAR REPORT

Internal Shear D-3080 Modified

Geo-Logic ASSOCIATES

Report Date: May 3, 2018

Client / Project Name: HALEY & ALDRICH, INC. / VMC SAN BERNARDINO AREA Q, 132051-002

Project No: AU18.1138.00

Superstrate: ⇦ Spacers

Material 1: ⇦ 132051 Sample 3, Gravelly Sand LSN: 4353B Remolded

Material 2: ⇨ 132051 Sample 3, Gravelly Sand LSN: 4353B Remolded

Substrate: ⇨ Spacers

PEAK STRENGTH

Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	20.8	3000	2150	36
2.	41.7	6000	4880	39
3.	83.3	12000	10650	42

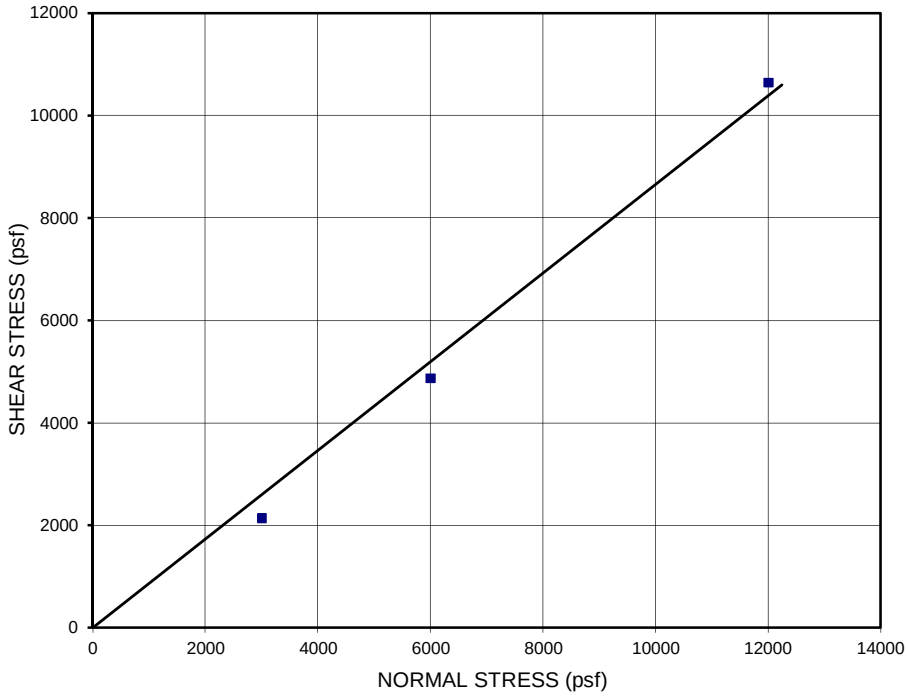
Adhesion: 0 psf

Friction Angle: 41 degrees

Coefficient of Friction: 0.87

Note: Intercept set to zero

NOTE: GRAPH NOT TO SCALE



STRENGTH ENVELOPE

(at 3.0 in. displacement)

Test Point	Normal Stress psi	Normal Stress psf	Shear Stress psf	Secant Friction Angle
1.	20.8	3000	2080	35
2.	41.7	6000	4450	37
3.	83.3	12000	10520	41

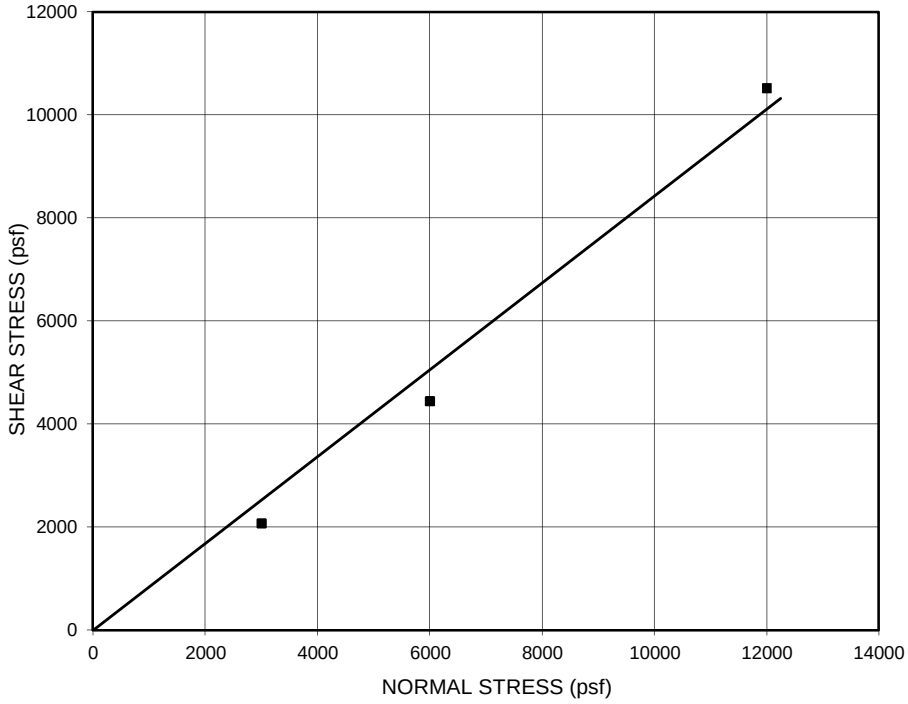
Adhesion: 0 psf

Friction Angle: 40 degrees

Coefficient of Friction: 0.84

Note: Intercept set to zero

NOTE: GRAPH NOT TO SCALE



This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

LARGE SCALE DIRECT SHEAR REPORT

Internal Shear D-3080 Modified

Geo-Logic ASSOCIATES

Report Date: May 3, 2018

Client / Project Name: HALEY & ALDRICH, INC. / VMC SAN BERNARDINO AREA Q, 132051-002

Project No: AU18.1138.00

Superstrate: ⇦ Spacers

Material 1: ⇦ 132051 Sample 3, Gravelly Sand LSN: 4353B Remolded

Material 2: ⇨ 132051 Sample 3, Gravelly Sand LSN: 4353B Remolded

Substrate: ⇨ Spacers

DISPLACEMENT vs. SHEAR STRESS

Test Point	Normal Stress psi	Normal Stress psf
1.	20.8	3000
2.	41.7	6000
3.	83.3	12000

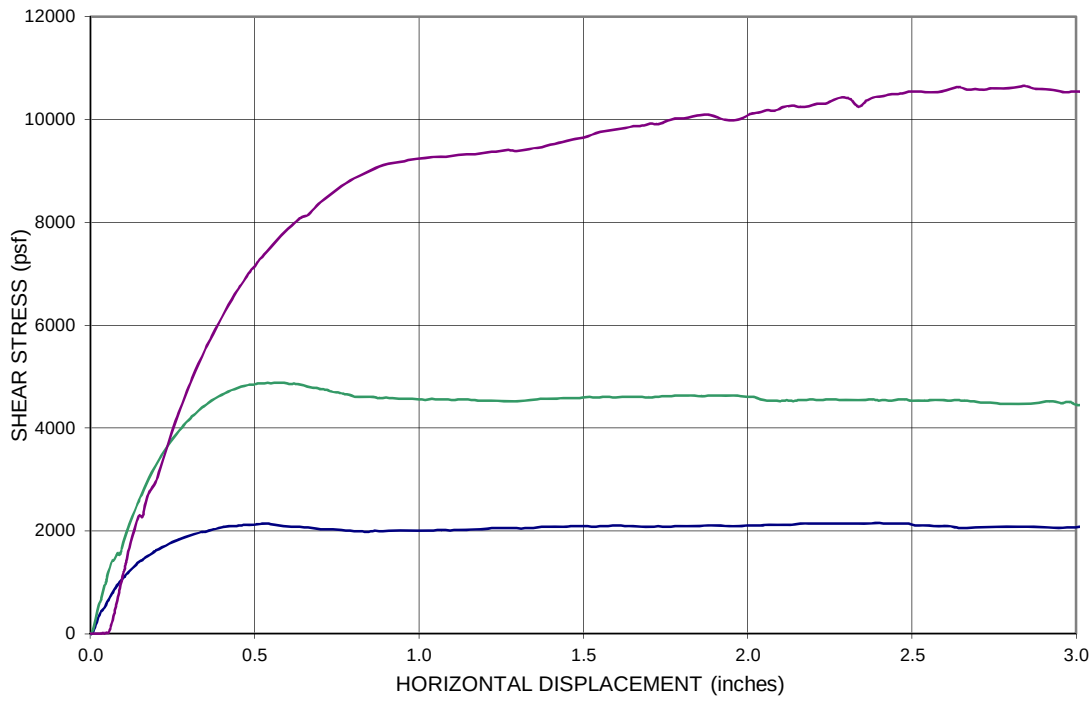
MOISTURE DATA:

(Gravel)

Initial Water Content: 5%

Initial Dry Density: 119.7 pcf

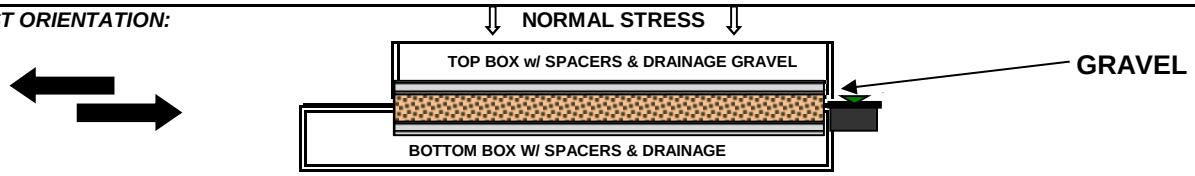
Final Water Content:(%)
1) 9.6 2) 12.9 3) 11.4



STANDARD CONDITIONS: **SHEAR DISPLACEMENT RATE: 0.04 in/min**

1. The "gap" between shear boxes was set at 0.5 inches.
2. The test specimens were flooded during testing unless otherwise noted.
3. High Normal Stresses, >5psi (35 kPa) was applied using air pressure.
4. Low Normal Stresses, <5psi (35 kPa) was applied using dead weights.
5. The tests were terminated after 3.0"(75 mm) of displacement unless otherwise noted.
6. Tests were performed in general accordance with ASTM procedure D-3080 - Modified using a Brainard-Killman LG-112 direct shear machine with an effective area of 12" x 12" (300 x300 mm).

TEST ORIENTATION:



SPECIAL TEST NOTES:

1. The test method was modified to measure the internal shear characteristics of the gravel.
2. The gravel was remolded into both the upper and lower box.
3. Each test point was consolidated under specified normal stress for approximately 1 hour, then sheared.
4. The test was performed in a "wet" or "flooded" condition.
5. Shearing occurred internally within the gravel.
6. The Friction Angle and Adhesion (or Cohesion) results given here are based on an intercept through zero.
7. Further interpretation should be conducted by a qualified professional experienced in geosynthetic and geotechnical engineering.

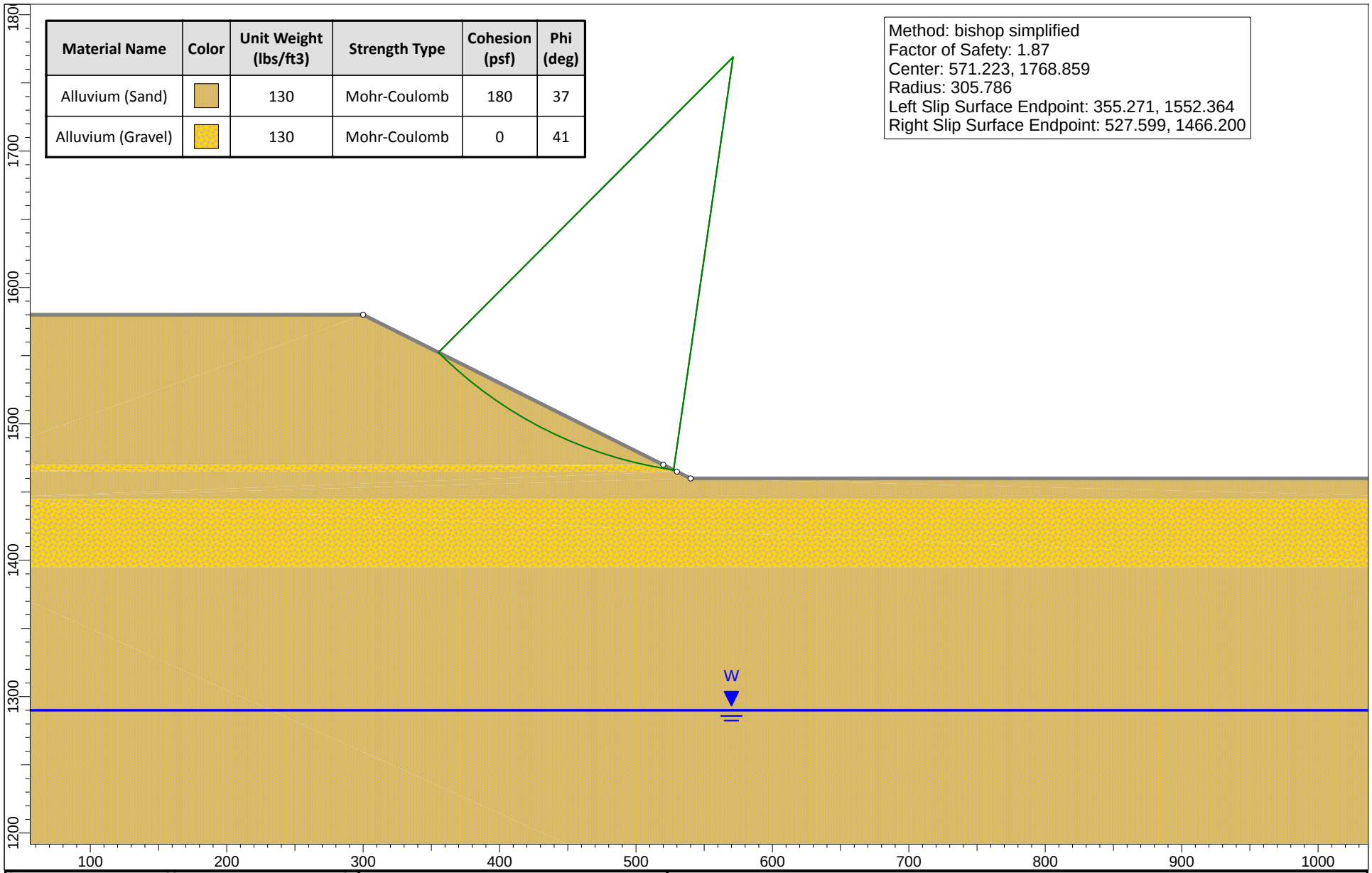
This testing is based upon accepted industry practice as well as the test method listed. These results apply only to the samples supplied and tested for the above referenced job.

APPENDIX C

Slope Stability Analysis

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvium (Sand)		130	Mohr-Coulomb	180	37
Alluvium (Gravel)		130	Mohr-Coulomb	0	41

Method: bishop simplified
Factor of Safety: 1.87
Center: 571.223, 1768.859
Radius: 305.786
Left Slip Surface Endpoint: 355.271, 1552.364
Right Slip Surface Endpoint: 527.599, 1466.200



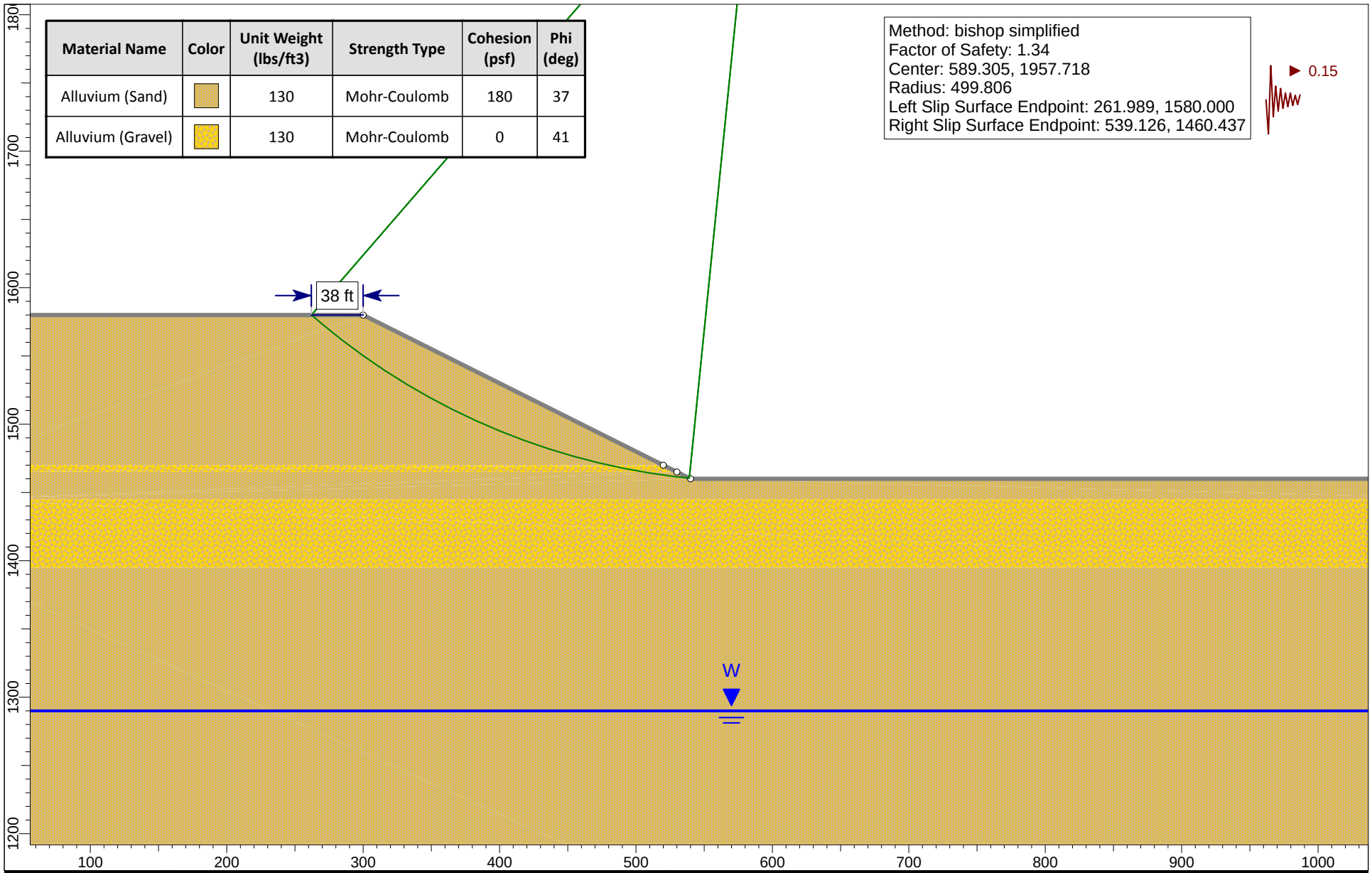
HALEY ALDRICH

Vulcan Materials Company Western Division

San Bernardino Quarry - Area Q Mine

Section and Analysis Description: Proposed Mine Slope (2H:1V; 120-ft-deep) // 132051 Section A 120.slim			
Project Number: 132051-002	*Note 1:* Static Condition	*Date* 5/8/2018	
Analysis By: M. Hintz	*Note 2:*	*Scale* 1:1200	
App. Version: SLIDEINTERPRET 7.025	*Note 3:*	FIGURE C-1	

G:\132051 VMC San Bernardino Area Q\Analysis\Slide\132051 Section A 120.slim Scenario: 132051 Section A 120.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvium (Sand)		130	Mohr-Coulomb	180	37
Alluvium (Gravel)		130	Mohr-Coulomb	0	41

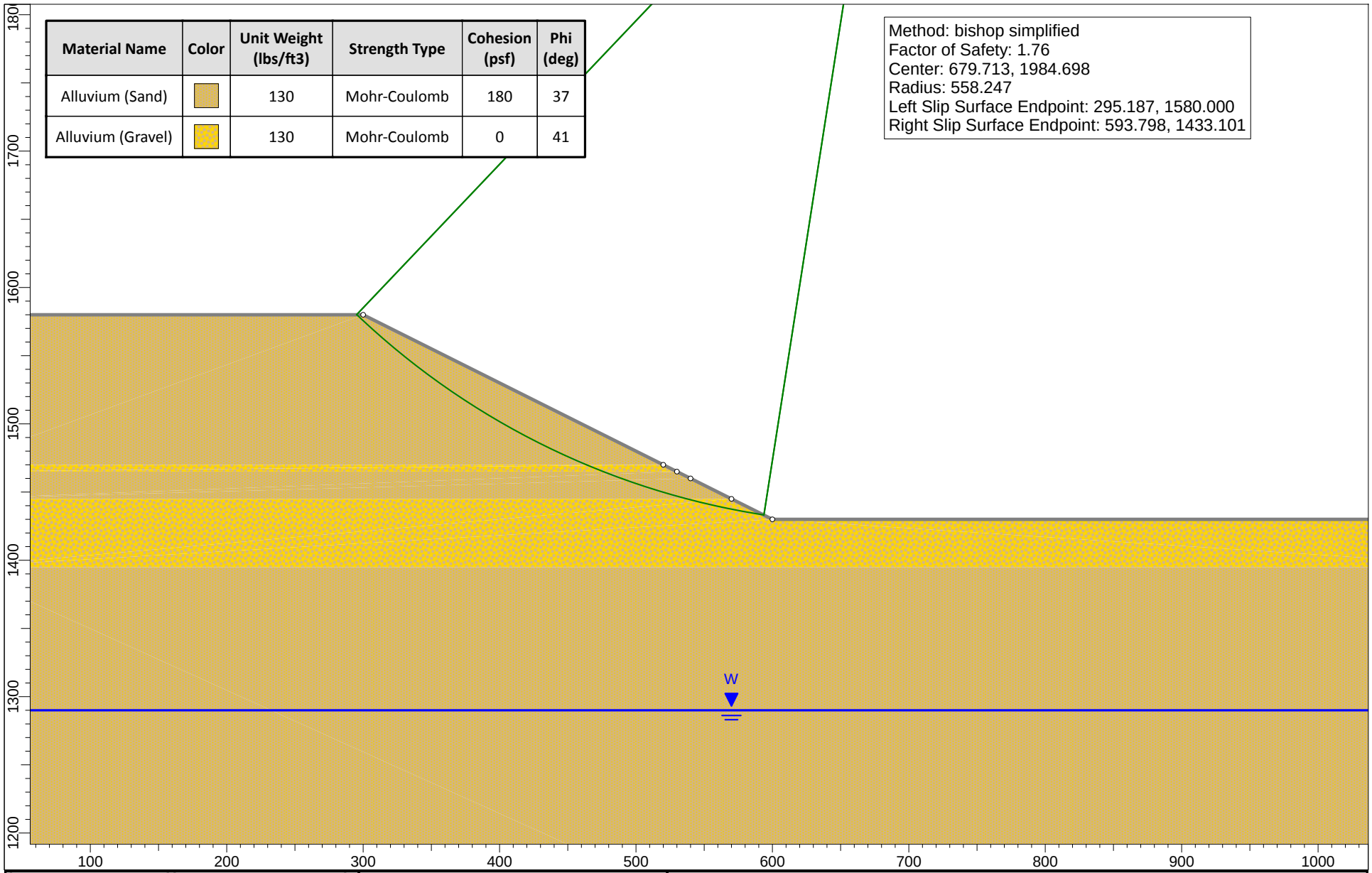
HALEY ALDRICH

Vulcan Materials Company Western Division

San Bernardino Quarry - Area Q Mine

Section and Analysis Description: Proposed Mine Slope (2H:1V; 120-ft-deep) // 132051 Section A 120 Seismic SeedMethod.slim			
Project Number: 132051-002	*Note 1:* Pseudo-Static Case	*Date* 5/8/2018	
Analysis By: M. Hintz	*Note 2:* SP-117 Seed Method	*Scale* 1:1200	
App. Version: SLIDEINTERPRET 7.025	*Note 3:*	FIGURE C-2	

G:\132051 VMC San Bernardino Area Q\Analysis\Slide\132051 Section A 120 Seismic SeedMethod.slim Scenario: 132051 Section A 120 Seismic SeedMethod.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvium (Sand)		130	Mohr-Coulomb	180	37
Alluvium (Gravel)		130	Mohr-Coulomb	0	41

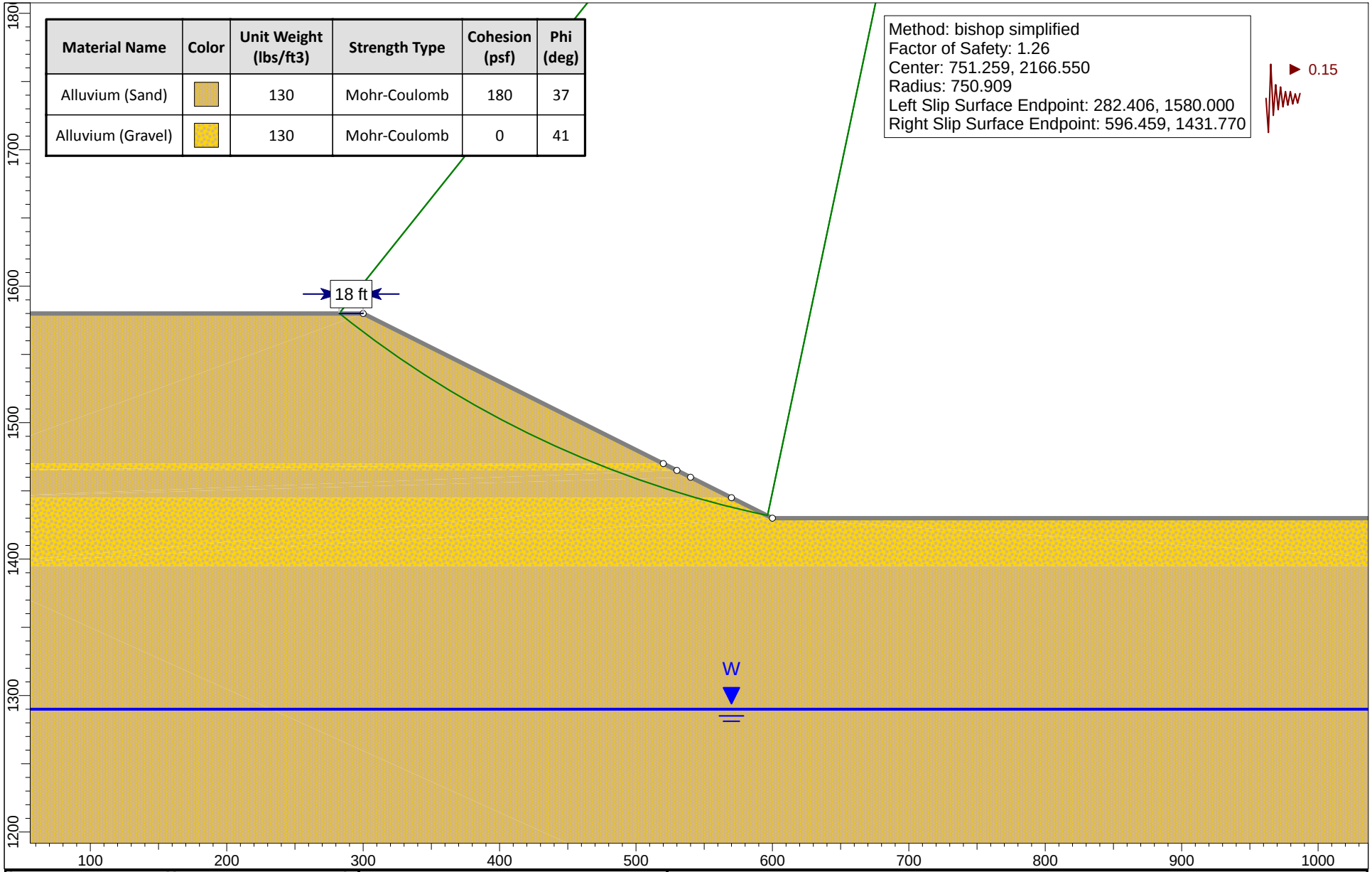
HALEY ALDRICH

Vulcan Materials Company Western Division

San Bernardino Quarry - Area Q Mine

Section and Analysis Description: Proposed Mine Slope (2H:1V; 150-ft-deep) // 132051 Section A 150.slim			
Project Number: 132051-002	*Note 1:* Static Condition	*Date* 5/8/2018	
Analysis By: M. Hintz	*Note 2:*	*Scale* 1:1200	
App. Version: SLIDEINTERPRET 7.025	*Note 3:*	FIGURE C-3	

G:\132051 VMC San Bernardino Area Q\Analysis\Slide\132051 Section A 150.slim Scenario: 132051 Section A 150.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvium (Sand)		130	Mohr-Coulomb	180	37
Alluvium (Gravel)		130	Mohr-Coulomb	0	41

HALEY ALDRICH

Vulcan Materials Company Western Division

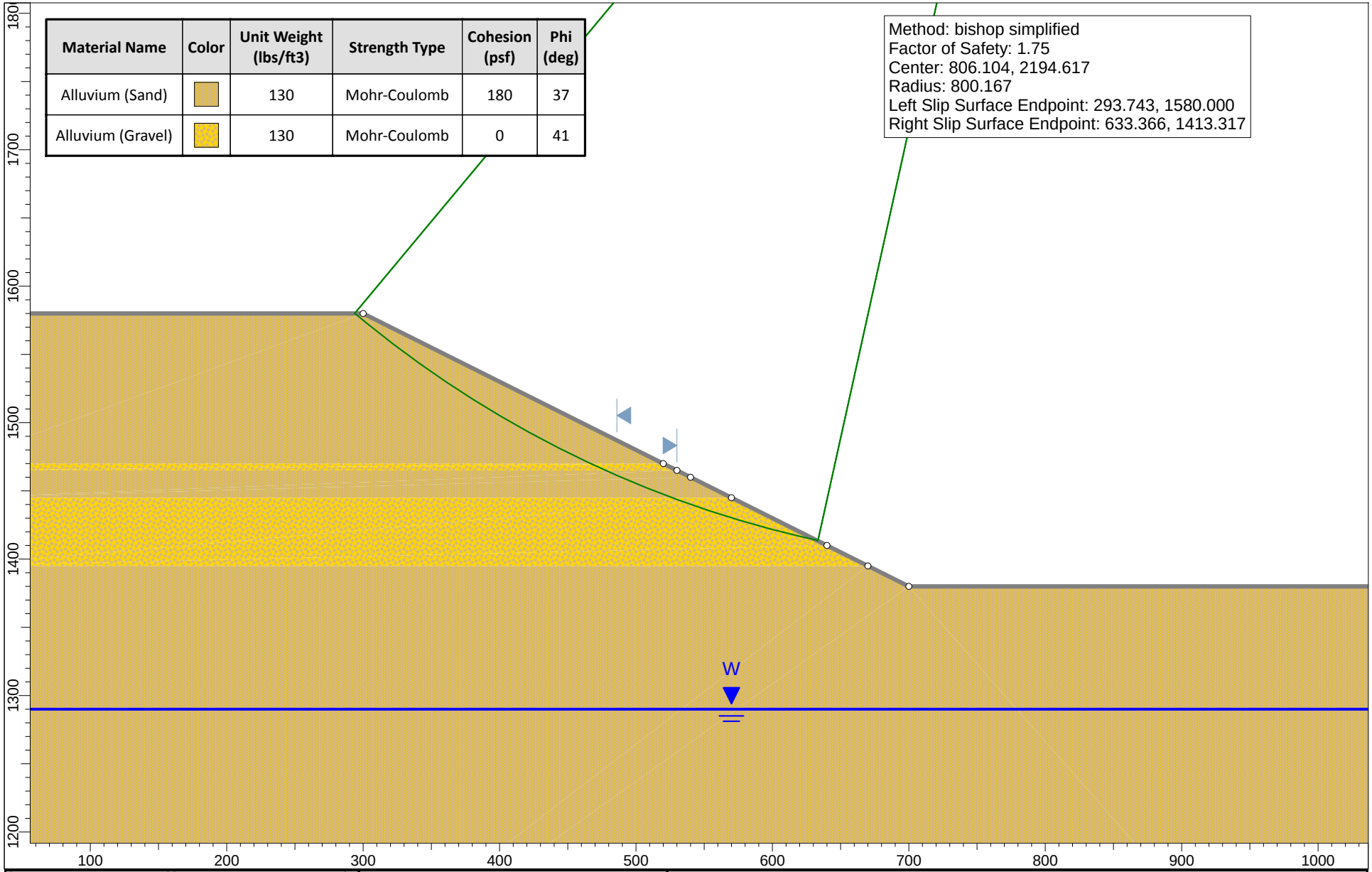
San Bernardino Quarry - Area Q Mine

Section and Analysis Description: Proposed Mine Slope (2H:1V; 150-ft-deep) // 132051 Section A 150 Seismic SeedMethod.slim			
Project Number: 132051-002	*Note 1:* Pseudo-Static Case	*Date* 5/8/2018	
Analysis By: M. Hintz	*Note 2:* SP-117 Seed Method	*Scale* 1:1200	
App. Version: SLIDEINTERPRET 7.025	*Note 3:*	FIGURE C-4	

G:\132051 VMC San Bernardino Area Q\Analysis\Slide\132051 Section A 150 Seismic SeedMethod.slim Scenario: 132051 Section A 150 Seismic SeedMethod.slim

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvium (Sand)		130	Mohr-Coulomb	180	37
Alluvium (Gravel)		130	Mohr-Coulomb	0	41

Method: bishop simplified
Factor of Safety: 1.75
Center: 806.104, 2194.617
Radius: 800.167
Left Slip Surface Endpoint: 293.743, 1580.000
Right Slip Surface Endpoint: 633.366, 1413.317



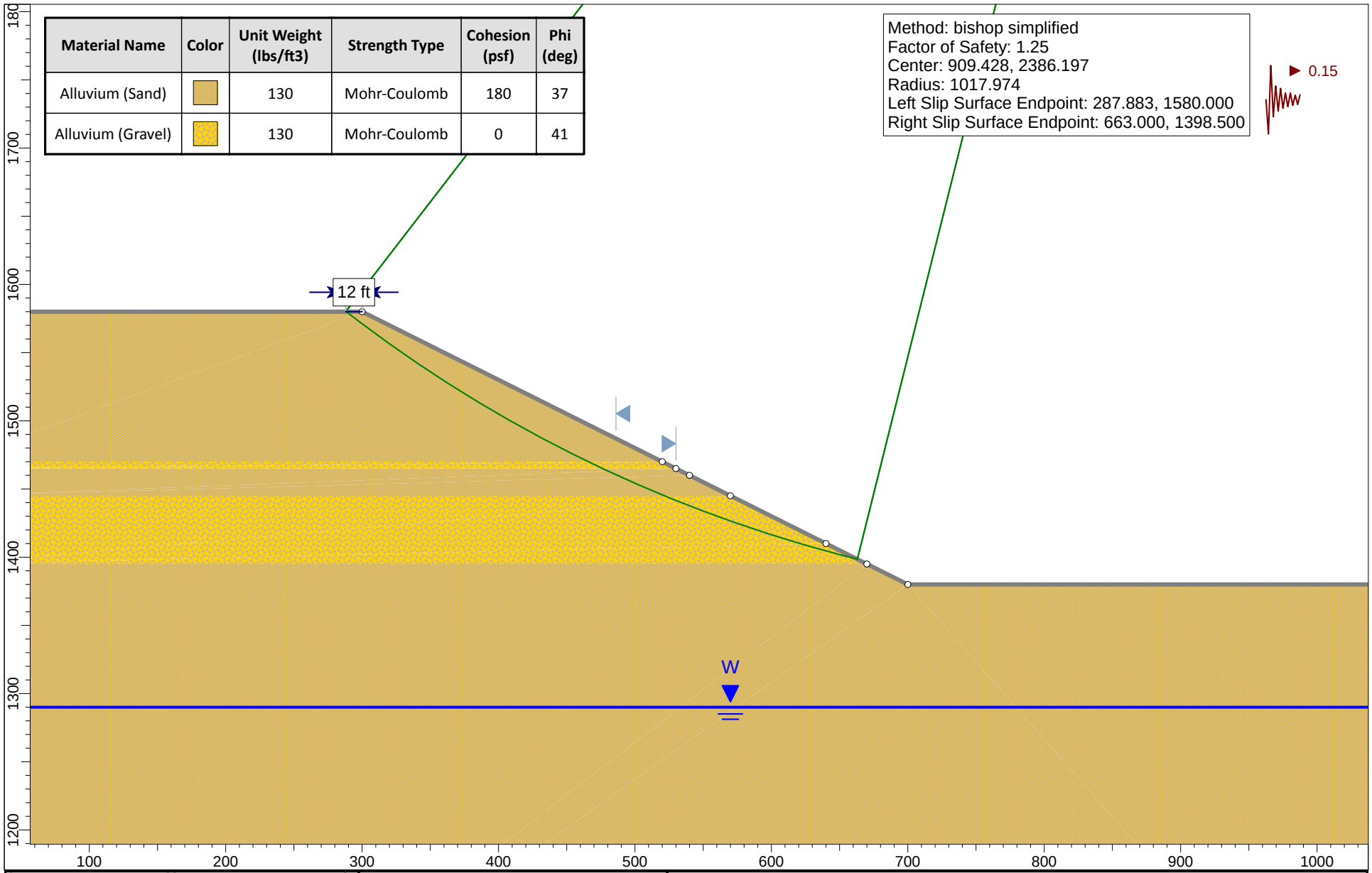
HALEY ALDRICH

Vulcan Materials Company Western Division

San Bernardino Quarry - Area Q Mine

Section and Analysis Description: Proposed Mine Slope (2H:1V; 200-ft-deep) // 132051 Section A 200.slim			
Project Number: 132051-002	*Note 1:* Static Condition	*Date* 5/8/2018	
Analysis By: M. Hintz	*Note 2:*	*Scale* 1:1200	
App. Version: SLIDEINTERPRET 7.025	*Note 3:*	FIGURE C-5	

G:\132051 VMC San Bernardino Area Q\Analysis\Slide\132051 Section A 200.slim Scenario: 132051 Section A 200.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvium (Sand)		130	Mohr-Coulomb	180	37
Alluvium (Gravel)		130	Mohr-Coulomb	0	41

HALEY ALDRICH

Vulcan Materials Company Western Division

San Bernardino Quarry - Area Q Mine

Section and Analysis Description: Proposed Mine Slope (2H:1V; 200-ft-deep) // 132051 Section A 200 Seismic SeedMethod.slim			
Project Number: 132051-002	*Note 1:* Pseudo-Static Case	*Date* 5/8/2018	
Analysis By: M. Hintz	*Note 2:* SP-117 Seed Method	*Scale* 1:1200	
App. Version: SLIDEINTERPRET 7.025	*Note 3:*	FIGURE C-6	

G:\132051 VMC San Bernardino Area Q\Analysis\Slide\132051 Section A 200 Seismic SeedMethod.slim Scenario: 132051 Section A 200 Seismic SeedMethod.slim

HALEY & ALDRICH, INC.
2033 N. Main Street
Suite 309
Walnut Creek, CA 94596
925.949.1012

24 April 2020
File No. 132051-002

Harrison, Temblador, Hungerford & Johnson LLP
2801 T Street
Sacramento, California 95816

Attention: Mr. Adam Guernsey, Esq.
aguernsey@hthjlaw.com

Subject: **Addendum to Geotechnical Evaluation Report**
Vulcan Materials Company Area Q Project
2400 West Highland Avenue
San Bernardino, California

Ladies and Gentlemen:

We are pleased to submit this Addendum to our geotechnical evaluation report dated 17 October 2019 responding to geotechnical peer review comments for Vulcan Materials Company's (Vulcan) proposed Area Q mining project (Project). The peer review was performed on our geotechnical evaluation report dated 17 October 2019, addressing site geology, potential hazards, and engineering recommendations pertaining to the proposed mine project. The purpose of this letter is to respond to comments presented in a Memorandum prepared by Lilburn Corporation (Lilburn) titled, "Review of Geotechnical and Geology Screening Reports for Vulcan Area Q Project" dated 5 March 2020 under file number LC 1380.

Presented below are the comments provided by Lilburn with our responses immediately following.

1. ***The location of the Glen Helen Fault shall be further investigated with respect to the potential for slope stability and potential slope failure, since the geotechnical report concludes the risk of surface faulting and secondary ground failure due to fault rupture to be high especially in the south end of Area Q (page 14). This investigation should include, but not be limited to, subsurface exploration (trenching, CPT), geophysical methods, and/or detailed mapping of adjacent slope exposures. Mitigation measures should be provided if considered appropriate, such as geologic inspections during mining.***

   Response: An observation of faulting in the Quarry's Area L and M south slopes was made during the 5 May 2018 visit. No major faulting was observed in the exposed beds and lenses other than a few small non-tectonic style cracks with insignificant signs of movement in the Area L slopes. The Area M south slope was bladed smooth and planted during a reclamation. Erosion of the slope exposed a few continuous layers of silt and clay with a few overlapping lenses. The Area M south slope was the closest to the inferred Glen Helen Fault trace which is mapped a few hundred feet to

the west (California Division of Mines & Geology, 1974) (Figure 1, Figure 4). A small section of alluvial tabular beds and lens deposits along the south slope above the aggregate conveyor belt in Area M and northwest of Area Q was exposed, so that portion was examined for faulting and none was observed. The potential for surface fault rupture hazard was evaluated initially by conducting geological research consisting of a detailed literature search, analyzing historical topographic maps, soil survey maps for soil types and analyzing available historical aerial photos. These studies are discussed in detail in the referenced Haley & Aldrich evaluation report dated October 2019.

Neither the inferred Glen Helen Fault nor any other major faulting was seen when performing an observation of the Area L and M southern slopes. The upper sediments exposed in the southern slopes were inferred to be Late Holocene in age, while the inferred Glen Helen Fault was considered to be a Fault that moved or had a seismic event during the Holocene. The return interval of, or whether the inferred Glen Helen Fault could have a future seismic event, is not known at this time, but the inferred Fault will be considered active. If a seismic event developed on the inferred Glen Helen Fault, movement on the Fault would be expected to have dextral movement. If seismic offset did occur on the inferred Glen Helen Fault, the displacement transfer to the surface should be minimal because the very young fanglomerate sediments filling the basin and deposited in the area of Area Q are less brittle than bedrock. Our literature review did not identify a maximum amount of energy that could be released during a seismic event associated with the inferred Glen Helen Fault trace. It was estimated by Wesnousky, 1986, that the Glen Helen/Lytle Creek Faults have a slip rate of 10 millimeters per year (mm/yr). The amount of dextral movement in the area of the quarry cannot be predicted at this time. As future information is collected, the amount of dextral movement on the inferred Glen Helen Fault during an earthquake event in the quarry could be assessed more accurately.

As published in the Haley & Aldrich report dated October 2019 and evaluated in this letter response, the sediments and stratigraphy consist of sand and gravels beds that are parallel and have no evident tectonic or depositional deformation. The Glen Helen Fault trace as inferred by Dibblee 2003 and 2004 (Figure 4), or any sympathetic and or antithetic faulting from offset associated with the inferred Glen Helen Fault trace as published on the AP map sheets, was not evident in the southern slopes of Area L or Area M.

Although the inferred fault trace mapped by Dibblee may not be present at ground surface, it could be found at depth, so it is possible that new quarry slopes could expose the Fault during mining at Area Q. Therefore, Haley & Aldrich recommends including the following mitigation as part of the Project: Approximately every 12 to 18 months during active mining, a California Certified Engineering Geologist (CEG) should observe exposed cut faces of the mining operation in Area Q for evidence of the Fault, and if warranted assess the potential for surface rupture and/or slope failure.

2. ***The geotechnical report should include a discussion and evaluation of stratigraphy and structure observed on adjacent existing slopes, including gravel layers, silty, and sandy lenses, and orientation of any observed bedding. Based on the results of this evaluation, geologic cross sections of anticipated structure should be included with the report. The report should include recommendations for mitigation of slope gradients, if considered necessary.***

Response: To better understand stratigraphy and potential for geologic structure two cross-sections were constructed with photographs taken during the site visit on 5 May 2018, which were projected from Areas L/M into Area Q. The cross-sections were schematic representations of the south slopes in Area L (Cross-Section L-L,' Appendix A) and Area M (Cross-Section M-M,' Appendix A. Figure 1 includes locations of the cross-sections. Figure 2 shows an excerpt of the USGS geologic map for the Area Q Area, and Figure 3 shows a chart correlating the stratigraphic units from the USGS map. The camera lens curvature and distortion of the panoramic photos were reduced but were not fully eliminated. To better illustrate the stratigraphy of the cross-sections, close-up photos of slope sections with different colored leader lines pointing out their locations on the cross-section were added. Detailed stratigraphic measurements were not made during the site visit nor was the logging of the borings from others accurate enough to get a precise measurement. However, given the nature and types of lithofacies observed and comparing to alluvial facies models (Miall, 1992), it is our opinion the cross-section projection is an appropriate methodology to interpret the depositional framework for comprising the Area Q stratigraphy.

The following sections will describe the general findings.

Cross-Section L-L'

Cross-Section L-L', consisting of a panoramic photo, illustrates the southern end of Area L. This slope had fresh exposures of the distinct sands, silt and gravel beds that were exposed during the mining process of the aggregate materials. This cross-section is adjacent to the north end of the proposed Area Q and illustrates that the Quarry material was consistent with the boring logs that were drilled in Area Q by others. The black dashed line, as drawn on the cross-section, followed two dominant and continuous grayish brown clayey silt beds. Throughout the slope, the uniform beds that ranged from gravelly sands to cobbly sand were parallel to near parallel Even though the area has undergone continuous loading from sediment deposition and tectonic uplift, these beds were continuous with no noticeable major deformation. Due to the mild to no pedogenic formation of soil in these beds, the estimated age of the beds was Holocene and most likely Late Holocene. If faulting does exist in this area, it is at depth below the slope toes and the bottom of the quarry.

Cross-Section M-M'

Cross-Section M-M', from a panoramic photo, illustrates the southern end of Area M. Though not adjacent to Area Q, this slope is the closest to the trace of the inferred Glen Helen Fault. During the site visit, it was noted that the slope was graded smooth, most of the coarse-grained gravels and cobbles were dislodged and the graded slope was planted with native vegetation. Though the exposures of key traceable beds were not fully exposed, portions were observed cropping out of

the slope due to mild erosion. The uppermost very young beds along the aggregate conveyor belt were continuous. Black dashed lines were drawn along some of the key beds to illustrate that the slope was not deformed where the beds were exposed. As with Cross-Section L-L', the exposed sand, silt, sand and cobble beds did not show faulting. If faulting were present in the area of this slope, the faults would be found below the conveyor belt and in areas where the beds are concealed by grading, below the slope toe, and/or below the bottom of the Quarry.

Based upon our interpretation, additional recommendations for mitigation of slope gradients are not considered necessary.

3. ***The geotechnical report (page 8) indicates that seismogenic faults in the area could create a local earthquake resulting in possible ground lurching on the Site's quarry perimeter where the surface seismic waves meet the quarry slopes. Mitigation measures should be provided to mitigate this potential.***

Response: Ground lurching is the horizontal movement of soil, sediments, or fills located on relatively steep embankments or scarps as a result of seismic activity, forming irregular ground surface cracks. The potential for lateral spreading or lurching is highest in areas underlain by soft, saturated materials, especially where bordered by steep banks or adjacent hard ground.

As presented in our report, known faults including the San Jacinto, San Andreas, and Cucamonga Faults are capable of inducing moderate to strong seismic events and geological seismic hazards, such as ground heave and lurching, ridge shattering, land sliding, and avalanches. These hazards could locally dislodge cobbles and boulders from slopes and could break the matrix bonds between sand grains causing local instabilities. Based on the currently planned excavation depth of the proposed pit and the depth to groundwater conditions, the potential for zones of saturated material is very low. The sands observed in the existing pits were generally clean of fines, with a cemented matrix holding the sand grains in place but were friable. Sands at the bottom of the existing pits effervesced after the application of 10 percent HCl, indicating that a fraction of carbonate was present in the sands. The carbonate cementation provides a hardening effect to the slopes. These factors indicate that the lithofacies are not conducive to significant ground lurching, so no significant impacts are expected, based on the proposed site use. As the potential for these hazards to manifest and associated risk of damage to the proposed site development are low, mitigation measures are not warranted.

4. ***The geotechnical report shall include an analysis of surficial slope stability for the proposed slopes. Based on the results of this analysis, mitigation measures should be recommended if factors of safety are less than normally accepted values.***

Response: The inter-site artificial terracing in Area L, created by mining within the quarry's bottom, was near vertical with a mild carbonate cementation (effervesced with 10% Hydrochloric Acid) forming a crust on the slope faces. This crust was up to a few inches in depth on dry slopes, and the crust prevented surficial crumbling of sand and fines. Where the slopes were moist, the carbonate cementation did not provide the stronger binding properties observed for the dry crust. Though the

clasts could be dislodged in both wet and dry conditions, more effort was required to dislodge large clasts when the crust was dry. The outer slopes had minor carbonate cementation. The inter-site artificial terraces (see Figure 1) created by mining showed erosion from flooding or artificial watering of the slopes. The slopes also showed a degree of grading that may have been performed to keep the slopes from losing their stability and to mitigate any slope material from becoming a fall hazard.

The observed erosion consisted of rills and channels with vertical to near vertical channel walls. Sands and fine gravels washed out, leaving loose deposits of large gravel, cobbles and a few boulders lagging within the erosional slots. The perimeter outer slopes did not show deep channeling, but some minor rilling was present. A pile of sand and gravel talus, which may have been a constructed berm, was noted at the toe of the slopes. A distinction as to whether the sand and gravel piles were talus or artificial berm was not able to be made during the field visit, but the sand and gravel piles did act as a barrier to deaccelerate and cushion dislodged coarse-grained quarry slope materials. The south slope in Area M was bladed smooth, planted, and laid back to about 60 degrees during the reclamation process. The reclaimed slopes were observed to be stable and holding up to erosion. Under static conditions, we anticipate that the same conditions and performance will be present in Area Q, given the similarity in lithofacies.

Since the slopes consisted of horizontal, multi-layered, very young coarse-grained fanglomerate alluvial deposits, shallow debris falls could develop during a local seismic event. Due to the predominance of coarse-grained lithologies, the slopes are expected to exhibit high percolation rates, so a debris flow on the slopes after heavy rains followed by a large seismic event would be rare. In those cases where meteoric water could temporarily and locally perch along top of clayey silt layers, there would be insufficient head to compel extensive saturation and therefore the water should not accumulate, but rather laterally disperse within the sands. Given these physical characteristics and the lack of observed evidence of direct slope failure in the adjoining quarry areas, Haley & Aldrich concludes that the potential for surficial slope stability failures during a seismic event is very low. Consequently, we consider the Project design slope configurations to be sufficiently stable under static conditions, and we do not consider the potential for failure to be significant. Mitigation is therefore not warranted.

5. ***The geotechnical report included a sample for lab testing from one location in the adjacent existing mine area. The geotechnical consultant should consider additional sample locations, preferably, on-site, or provide justification that one sample location is enough to represent slope conditions in Area Q.***

Response: Based on the borings and conclusions by Terramins, the material encountered in Area Q is fairly uniform including sands, silts, and gravels to depths of about 120 feet. This layer was encountered as being underlain by a coarse gravel bed from about 120 to 150 feet. Below a depth of about 150 feet, sands with high percentages of gravel should be anticipated. The site is composed of predominately granular soils to the proposed depth of mining.

The accessibility of the cut face of the adjacent Area L pit readily allowed for collection of samples for the large-scale direct shears. The samples collected along the face were judged to be representative of the materials observed in the cut face, based on the observed lithofacies types. Large-scale shears include testing on an effective area of 12 inches by 12 inches in plan dimension. The samples collected for this testing required a significant volume of material be collected. Based on the volume of material collected for the testing, the material was composited from a wide area. Testing additional large composite samples collected from the same area materials would have produced significantly similar results. The results of the testing were judged to be a reasonable reflection of the matrices exposed in the cut face and logged in the borings advanced by others in previous studies.

A layback of 2:1 for granular soils is considered appropriate without necessitating mitigation measures.

Based on the uniformity of the encountered granular subsurface conditions, the results of the tests performed on large volume samples, and the planned 2:1 layback, we determined that additional sampling and testing was not necessary.

6. ***The geotechnical consultant should re-evaluate the seismic stability of proposed slopes using the calculated seismic displacement method. This method is typically used to quantitatively evaluate the seismic performance of earth slopes in active seismic zones such as the project site. Depending on the results of this analysis, the geotechnical consultant should consider recommendations for mitigation.***

Response: As presented in our report, the slopes were evaluated using procedures outlined in Special Publication 117a (CGS, 2008), Guidelines for Evaluating and Mitigating Seismic Hazards in California. The screening procedures used for seismic slope stability begin with modeling a seismic coefficient (k) applied to a conventional limit equilibrium slope stability calculation. Following the techniques presented in the guideline, we followed the screening procedures outlined (Seed, 1979) including using a seismic coefficient, k_h, of 0.15 for a magnitude 8¼ earthquake. Using these parameters, we calculated Factor of Safety (FOS) of greater than the minimum requirement of 1.15 under a dynamic condition. Seed's approach uses Newmark displacements (Newmark, 1965) calculated with simple methods. The application of the approach is based on acceptable small deformations of 1 meter or less at the crest and is intended for dams and landfills. Based on this analysis with the acceptable deformation of up to 1 meter, the screen was passed and we concluded a seismic stability hazard is not likely at the site. This method is considered to be conservative (Stewart, 2003).

The procedures used include up to 1 meter of movement and would pose little to no risk to the proposed mining development. Additional screening analysis for hillside residential or commercial use (Stewart, 2003) to determine smaller acceptable displacements for these developments, is generally limited to either 5 or 15 centimeters. Based on the proposed site development as a quarry, this displacement criterion was deemed too restrictive for allowable movement and, therefore, the quarry is not an appropriate application of this additional screening. Specifically, it

was not warranted given the level of risk associated with slope displacement for a quarry development. As such, mitigation measures are not required.

7. ***The geotechnical report indicates that seismic shaking hazards could locally dislodge cobbles and boulders from slopes and could break the matrix bonds between sand grains causing local instabilities. Mitigation measures should be provided to address this issue.***

   Response: Materials contained in the slopes of Areas L (steep and near vertical) and M (laid back about 60 degrees and bladed smooth) were observed to stand up well to weathering, and were not showing any broad effects from erosion or mass wasting. Small piles of the slope materials were found along the toe of the south walls. This material was most likely talus in Area L but could be artificial berms in Area M. This material created a good cushion for falling rocks preventing the coarse cobbles and boulders from rolling out into the bottom of the quarries. Should there be areas along slopes where alluvial materials are loose, and/or there is evidence of dislodgement, it is recommended that the operator install a soil catchment berm at least 10 feet from the toe of the slope in those areas, as needed to prevent falling coarse materials from rolling out into the quarry bottom. The steeper the slope, the more the coarse material will fall down and imbed into the quarry bottom or lose energy and stop at the berm. If the slopes were cut at a higher angle, such as 1:1, the coarse materials that dislodge from the slope either from weathering or from a seismic event could start rolling and bouncing down the slope with increasing velocity toward the quarry bottom and could jump over the berm, impacting the mining equipment or human miners on the quarry bottom. However, as called for in the reclamation plan, the final slopes will be at an inclination of 2:1; which meets the prescriptive standard under Public Resources Code §3704.

8. ***The Conclusions section of the geotechnical report indicates if temporary or permanent structures are subsequently planned at the Site, the report recommends that a supplemental study be performed to address geotechnical impacts and provide recommendations for foundation and seismic design, especially if these structures are planned within a State-designated Earthquake Fault Zone. The geotechnical consultant shall provide a specific definition of temporary and permanent structures, relative to human occupancy and temporary types of structures (conveyors, crushers, etc.). If any proposed structures meet the geotechnical consultant's definitions, the supplemental study should be performed at this time.***

   Response: Fixed structures associated with the Project are limited to a conveyor line, which will extend from the base of the northern Area Q slope to top. This conveyor will transport the mined material up and over the cut slope to Area L for further conveyance. A structure is considered as unoccupied and falls under the California Building Code (CBC, 2019) as "U" category for use and occupancy. This category includes "Buildings and structures of an accessory character and miscellaneous structures not classified in any specific occupancy shall be constructed, equipped and maintained to conform to the requirements of this code commensurate with the fire and life hazard incidental to their occupancy." While Haley & Aldrich's report does recommend the evaluation of seismic effects with respect to structures, because the Project only involves a single conveyor line, which does not require occupancy to operate, and which will be constructed in according to applicable CBC standards, no additional study is needed.

We appreciate the opportunity to provide our services to you on this project. If you have any questions, please call.

Sincerely yours,
HALEY & ALDRICH, INC.

Katy Decker, P.G.
Project Manager

PROFESSIONAL GEOLOGIST
KATHRYN DECKER
No. 8805
Exp. 10/30/20
STATE OF CALIFORNIA

Catherine H. Ellis, P.E., G.E.
Senior Associate, Geotechnical Engineer

Attachments:
- Figures (4)
- Appendix A (2)
- References

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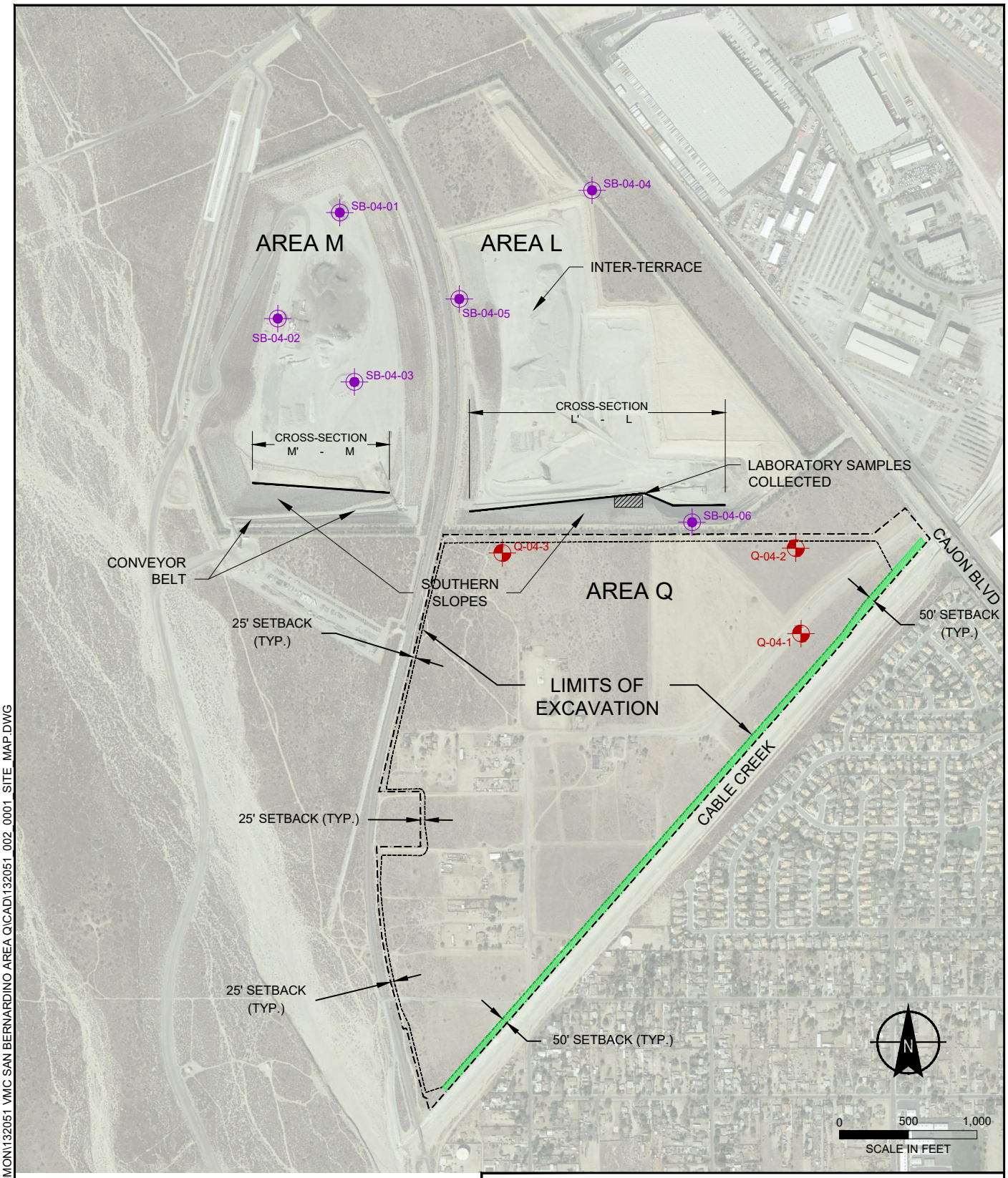
FIGURES



LEGEND

HOLLOW-STEM AUGER BORINGS (CLEATH & ASSOCIATES, 2004)

HOLLOW-STEM AUGER BORINGS (TERRAMINS, INC. 2004)

NOTES

1. BASEMAP SOURCE PROVIDED BY SESPE CONSULTING, INC., JUNE 2019

HALEY ALDRICH

VULCAN MATERIALS COMPANY
SAN BERNARDINO MINE - AREA Q EXPANSION
2400 W. HIGHLAND AVENUE
SAN BERNARDINO, CALIFORNIA

SITE MAP

SCALE: AS SHOWN
APRIL 2020

FIGURE 1

Saved by: MOBINI, DARIUSH Printed: 4/19/2020 2:11 PM Sheet: FIG-1
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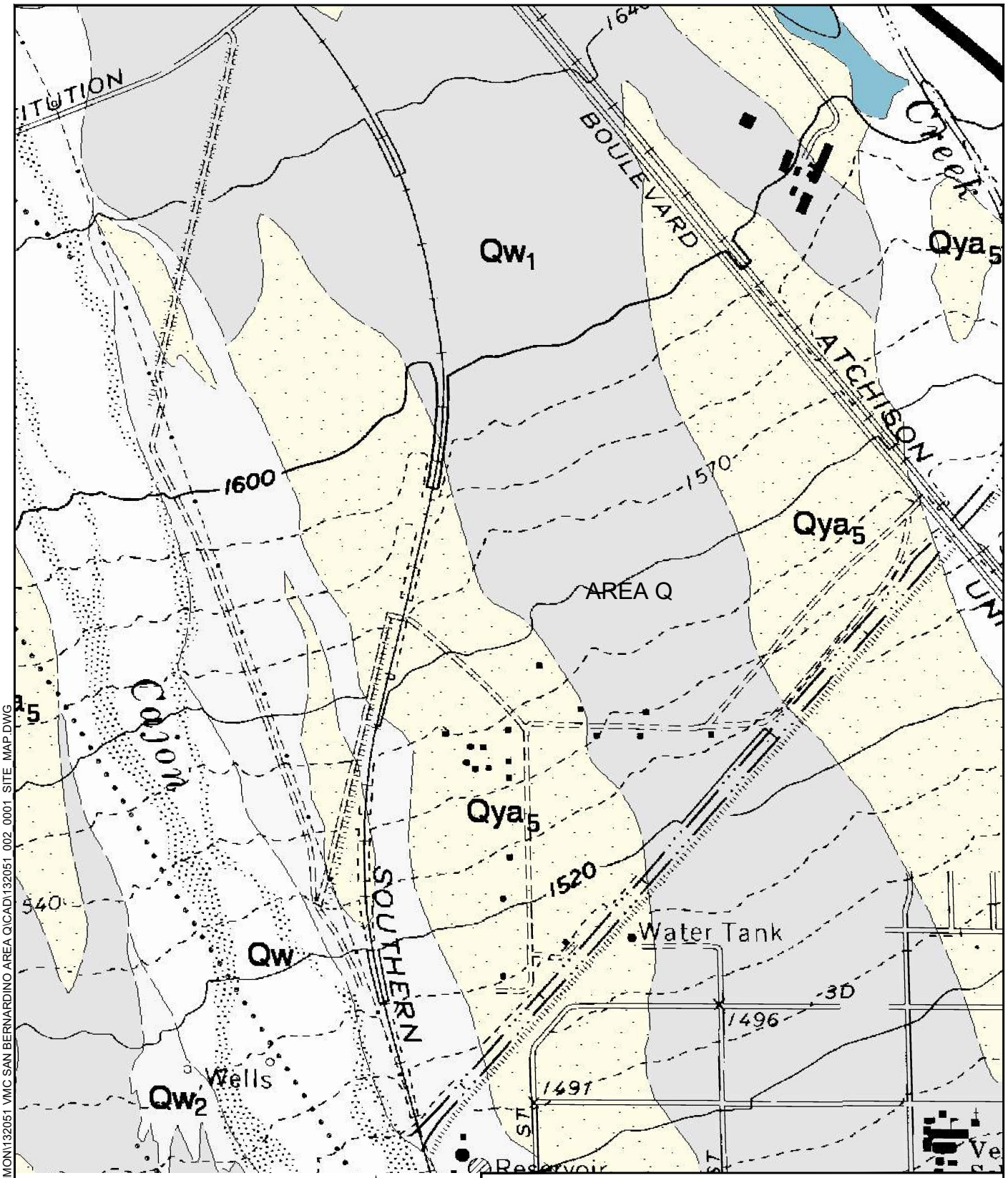

NOTES

SOURCE: MILLER, F.K., MATTI, J.C., CARSON, S.E., AND COSSETTE, P.M., 2001, GEOLOGIC MAP OF THE SAN BERNARDINO NORTH 7.5' QUADRANGLE, SAN BERNARDINO COUNTY, CALIFORNIA: U.S. GEOLOGICAL SURVEY, OPEN-FILE REPORT OF-2001-131

N

0 500 1,000
APPROXIMATE SCALE IN FEET

HALEY ALDRICH

VULCAN MATERIALS COMPANY
SAN BERNARDINO MINE - AREA Q EXPANSION
2400 W. HIGHLAND AVENUE
SAN BERNARDINO, CALIFORNIA

GEOLOGY MAP OF AREA Q

SCALE: AS SHOWN
APRIL 2020

FIGURE 2

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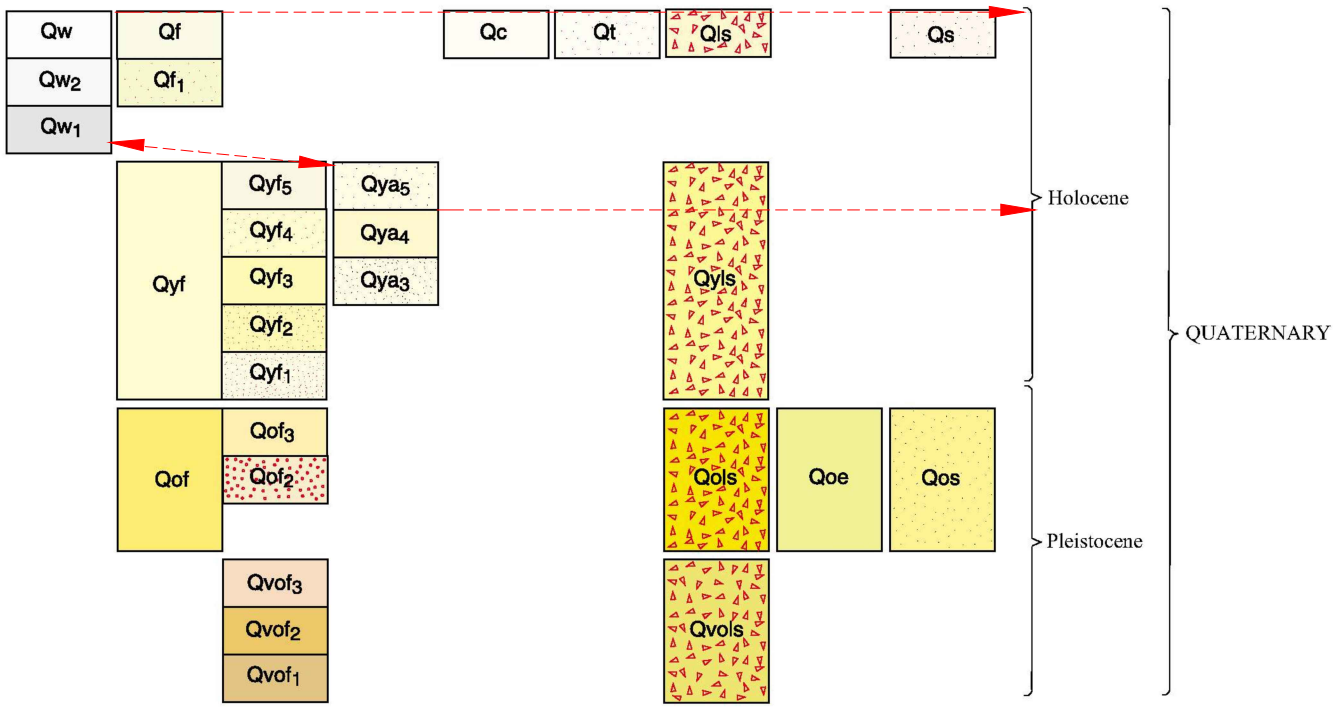
\\HALEYALDRICH\SHARE\WNC_COMMON\132051 VMC SAN BERNARDINO AREA Q\CAD\132051_002_0001_SITE_MAP.DWG

CORRELATION OF MAP UNITS



NOTES

SOURCE: MILLER, F.K., MATTI, J.C., CARSON, S.E., AND COSSETTE, P.M., 2001, GEOLOGIC MAP OF THE SAN BERNARDINO NORTH 7.5' QUADRANGLE, SAN BERNARDINO COUNTY, CALIFORNIA: U.S. GEOLOGICAL SURVEY, OPEN-FILE REPORT OF-2001-131

HALEY ALDRICH

VULCAN MATERIALS COMPANY
SAN BERNARDINO MINE - AREA Q EXPANSION
2400 W. HIGHLAND AVENUE
SAN BERNARDINO, CALIFORNIA

CORRELATION CHART OF THE QUATERNARY STRATIGRAPHIC UNITS

APRIL 2020

FIGURE 3

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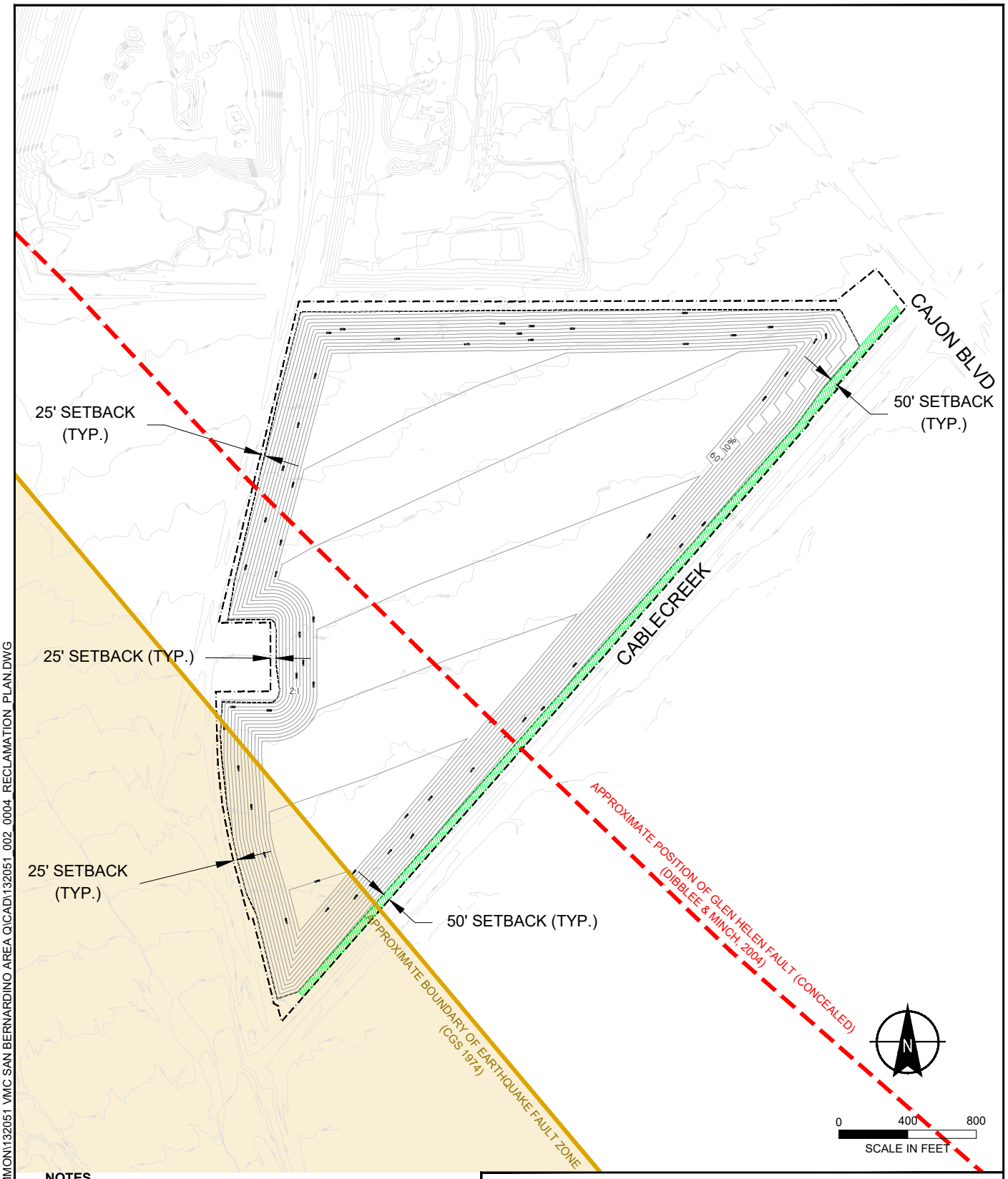
\\HALEYALDRICH\SHARE\WNC_COMMON\132051 VMC SAN BERNARDINO AREA Q\CAD\132051_002_0001_SITE_MAP.DWG



NOTES

1. BASEMAP SOURCE PROVIDED BY SESPE CONSULTING, INC., JUNE 2019
2. APPROXIMATE POSITION OF GLEN HELEN FAULT REPRODUCED FROM DIBBLEE, T.W., AND MINCH, J.A., 2004, DIBBLEE FOUNDATION MAP DF-127
3. APPROXIMATE BOUNDARY OF EARTHQUAKE FAULT ZONE FROM CGS (FORMERLY CDMG) 1974, "SPECIAL STUDIES ZONES, SAN BERNARDINO NORTH QUADRANGLE, OFFICIAL MAP."

HALEY ALDRICH

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SAN BERNARDINO MINE - AREA Q EXPANSION
2400 W. HIGHLAND AVENUE
SAN BERNARDINO, CALIFORNIA

RECLAMATION PLAN FOR AREA Q
WITH TOTAL DEPTH OF 120 FEET

SCALE: AS SHOWN
APRIL 2020

FIGURE 4

Saved by: MOBINI, DARIUSH Printed: 4/19/2020 3:13 PM Sheet: FIG-4
\\HALEYALDRICH\SHARE\WNC_COMMON\132051 VMC SAN BERNARDINO AREA Q\CAD\132051_002_0004_RECLAMATION_PLAN.DWG

APPENDIX A

Cross-Sections

CROSS SECTION L-L' NOTES

Looking south at the southern slope in Area L.

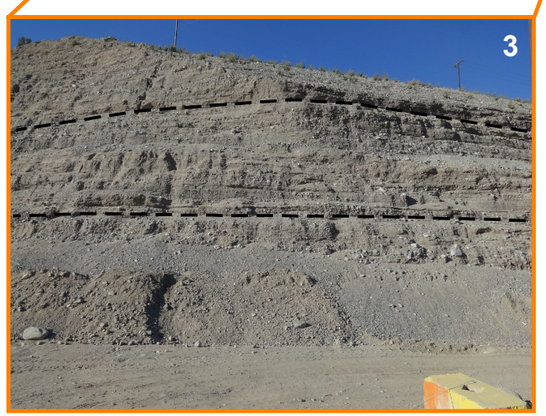
Note the black dashed lines, which represent continuous horizontal beds outcropping on the slope.

Photo 1 is a view from the artifcial Inter-Terrace complex, which are in the process of being cut down during the mining of aggregate.

Refer to Figure 1 for the location of Cross Section L-L', which is looking to the north so the cross-section seems to be reversed.

L

L'



HALEY ALDRICH

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SAN BERNARDINO MINE - AREA Q EXPANASION
2400 W. HIGHLAND AVENUE
SAN BERNARDINO, CALIFORNIA

CROSS SECTION L-L'

APRIL 2020

FIGURE A-1

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M

M'

CROSS SECTION M-M' NOTES

Looking south at the southern slope in Area M.

Note the black dashed lines, which represent continuous horizontal beds outcropping on the slope.

Refer to Figure 1 for the location of Cross Section M-M', which is looking to the north so the cross section seems to be reversed.

Note the slopes are smooth and slope at a less angle than seen on Cross Section L-L'. There was less coarse-grained aggregate exposed below the conveyor belt with smoother planted slope surface. Erosion seemed to be less on the south slope in Area M than in Area L due to the reclamation.

HALEY ALDRICH

VULCAN MATERIALS COMPANY
SAN BERNARDINO MINE - AREA Q EXPANASION
2400 W. HIGHLAND AVENUE
SAN BERNARDINO, CALIFORNIA

CROSS SECTION M-M'

APRIL 2020

FIGURE A-2

GIS FILE PATH: C:\Users\craumann\Desktop\LOCAL_DATA\VULCAN_SAN_BERNARDINO\2020_04_PHOTO_XSECTION\132051_002_A-2_CROSS_SECTION_M.mxd — USER: craumann — LAST SAVED: 4/23/2020 11:51:53 AM

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APPENDIX B

Drainage Report – Area Q Mine
(Sespe Consulting, Inc. – November 2019)

SESPE
CONSULTING, INC.

374 Poli Street, Suite 200 • Ventura, California 93001

DRAINAGE REPORT
AREA Q MINE

Vulcan Materials Company – Western Division
San Bernardino County, California

November 2019

Prepared for: Vulcan Materials Company – Western Division
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REGISTERED PROFESSIONAL ENGINEER
A. PEARCE SWERDFEGER
NO. 87466
CIVIL
STATE OF CALIFORNIA

DRAINAGE REPORT
AREA Q MINE

Vulcan Materials Company
San Bernardino County, California

November 2019

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1.0 INTRODUCTION 1

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2 Flood Insurance Rate Map (FIRM)
3 Supporting Documentation
4 Devil Creek Diversion Channel Flood Analysis (Chang Consultants)
5 CASQA Best Management Handbook Details

SESPE CONSULTING, INC.

374 Poli Street, Suite 200 • Ventura, California 93001

DRAINAGE REPORT
AREA Q MINE

Vulcan Materials Company
San Bernardino County, California

November 2019

1.0 INTRODUCTION

CalMat Co., dba Vulcan Materials Company – Western Division (Vulcan) owns and operates the Cajon Creek Quarry, located on the northwest side of the City of San Bernardino. The Cajon Creek Quarry is currently providing high-quality aggregates (sand and gravel) to Vulcan's San Bernardino processing facility to the south. Upon depletion of the aggregate resources currently extracted from the Cajon Creek Quarry (referred to as Area L), Vulcan is proposing to relocate the mining operation to an adjacent site, referred to as Area Q. In preparation for transferring the mining operation to the adjacent site, Vulcan has submitted an application to the County of San Bernardino (County) to conduct aggregate material extraction and ancillary activities on the 196.0-acre Area Q property located adjacent to the Cajon Creek Quarry (Project).

1.1 Purpose and Scope

This report has been prepared to satisfy the County of San Bernardino hydrology requirements and the requirements of the Surface Mining and Reclamation Act (SMARA). The scope of this report is as follows:

- Identification of the tributary watershed to the Project site.
- Identification of floodplain(s) impacting the site.
- Identification and calculation of existing conditions (prior to mining activity) on-site total peak flow rates and runoff volumes.
- Calculation of final conditions (reclamation) on-site runoff volumes and pit inundation depth.
- Summary of impacts and conclusions.

Note that the existing operations at the Cajon Creek Quarry are not part of the Project and have not been evaluated in this report.

2.0 PROJECT DETAILS

2.1 Project Location

The Area Q site is located in unincorporated San Bernardino County, east of Cajon Creek and north of the community of Muscoy (Exhibit 1). The Project site is bounded by the Devil Creek Diversion Channel and residential neighborhoods to the south, the Southern Pacific Railroad (SPRR) to the west, Cajon Boulevard to the east, and Vulcan's existing Cajon Creek Quarry—specifically Area L—to the north. The Area Q site is located approximately 2.5 miles away from Vulcan's existing San Bernardino facility, which is located

directly north of State Route 210 and Highland Avenue. Nearby communities include Muscoy, the City of San Bernardino (adjacent to the east/north), and the City of Rialto (1.25 miles west).

2.2 Project Overview

Vulcan currently operates two distinct yet integrated operations adjacent to the site. Vulcan transports material from its Cajon Creek extraction site to the San Bernardino facility for processing. The Area Q Project will provide a high-quality source of local aggregate and allow for the continued operation of Vulcan's Cajon Creek and San Bernardino facilities. Aggregate material extraction and ancillary activities will occur on 182.1 acres within the Area Q property and will include:

- Mineral resource extraction activities in one (1) phase to a maximum depth of mining of 120 feet below natural ground surface (bgs). Final reclaimed slope configuration will be 2:1 (horizontal to vertical).
- Construction of a minimum 10-foot tall vegetated earthen berm along the southeastern portion of the site (along the Devil Creek Diversion Channel) using overburden and top soil from the site to extend the existing berm on Area L to the southern end of Area Q.
- Construction and operation of a conveyor system across the site, connecting with Vulcan's existing conveyor system located on the Cajon Creek site.
- Construction and maintenance of onsite roads.
- Operation of haul trucks, loaders, conveyors, and related equipment as necessary to move material from the site to the conveyor system.

2.3 Reclamation

The final, reclaimed condition of the site is a pit with a maximum depth of 120 feet bgs and final reclaimed slope configuration of 2:1 (horizontal to vertical). Revegetation of slopes and the pit bottom will be conducted by hydroseeding and planting of containerized plants. The planned end use of the site is open space.

3.0 EXISTING SETTING

3.1 Description of Existing Area Q Study Area

The Area Q Site includes several single-story residential structures houses and general storage buildings and yards. These structures will be decommissioned prior to the start of mining. The site consists of a low-lying, relatively flat area. The elevations range from approximately 1,574 feet above mean sea level (amsl) to 1,495 feet amsl. The site is located on a broad alluvial fan with a gentle southeastern slope that extends southeast from the base of the San Bernardino Mountains, and is underlain by alluvial fan deposits and older wash deposits. The general direction of the surface slope follows the trend of the Cajon Wash; the site gently slopes to the south-southeast at a gradient of approximately two percent (2%).

The general flow direction of surface water across the site is to the southeast, toward the concrete-lined flood control channel (Devil Creek Diversion Channel) on the southeastern boundary. The confluence of the Cajon Wash and Lytle Creek Wash are just east of the site. The site's western boundary is bordered by the Muscoy Groin No. 3, which has been designed to direct flows from Lytle Creek or Cajon Creek away from the site.

The existing site conditions are shown on Exhibit 1 (Attachment 1).

3.2 Lytle and Cajon Creek Watershed

Area Q lies within the greater Lytle and Cajon Creek watershed, which is located within the midsection of the San Bernardino County valley. Water bodies in the watershed include Lytle Creek, Cajon Creek, Devil Canyon Creek, Macy Storm Drain, Cable Creek, Muscoy Storm Drain, Santa Ana Reach 3 and 4. The watershed is shown in Figure 1.

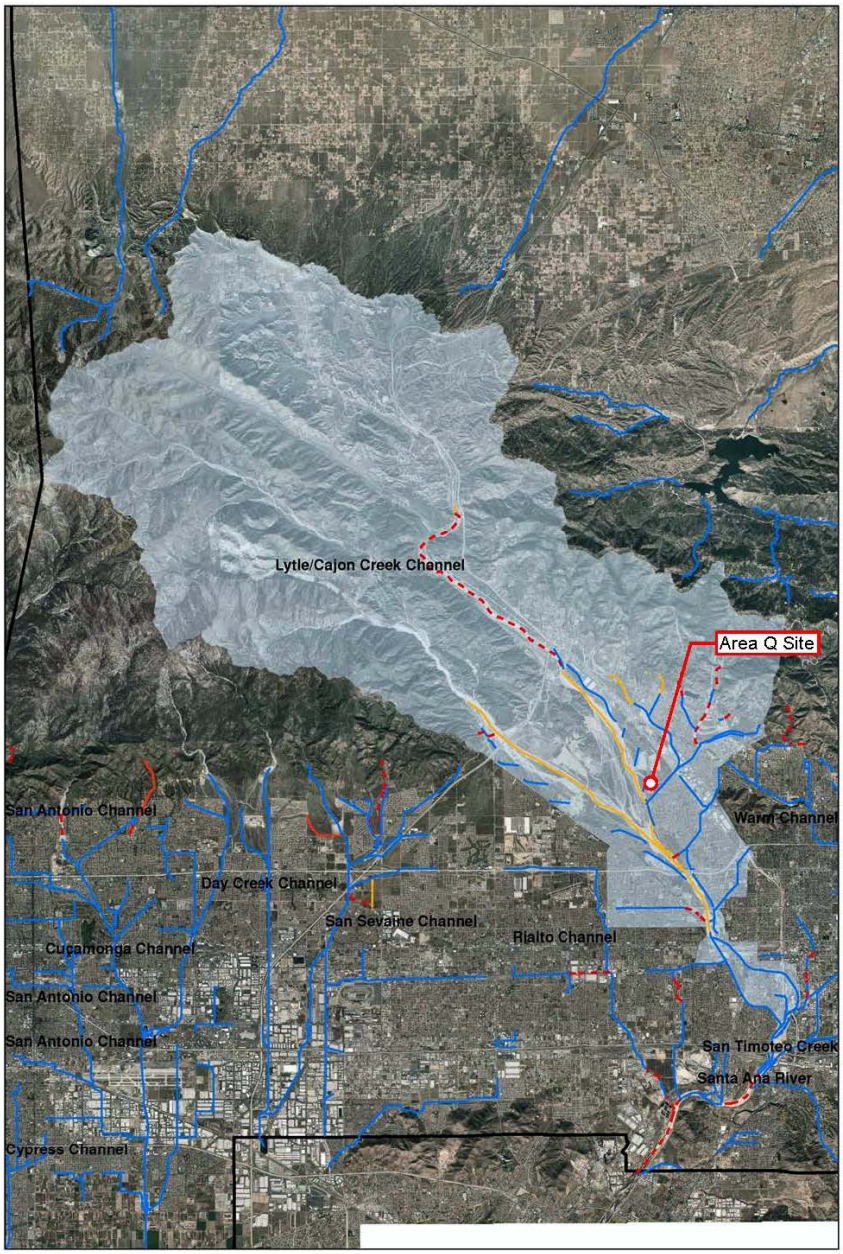


Figure 1: Lytle / Cajon Creek Watershed (source: San Bernardino County Areawide Stormwater Program, Subwatershed Fact Sheets)

3.3 FEMA Floodplain

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) No. 06071C7940J, (Effective Date - September 2, 2016), the project site is impacted by a Zone A and Zone X floodplain. The above referenced FIRM is included in Attachment 2.

Zone A is identified by FEMA as areas subject to inundation by the 1% (100-year) annual chance of flood. Zone X is identified by FEMA as areas of 0.2% (500-year) annual chance of flood; areas of 1% (100-Year) annual chance of flood with depths of less than 1 foot or areas with drainage areas less than 1 square mile; and areas protected by levees from 1% (100-year) annual chance of flood.

However, as identified in the December 26, 2018 letter from Change Consultants, "Zone A floodplain is an *approximate* 100-year floodplain… The FEMA mapping shows the floodplain extending beyond the [Devil Creek Diversion] Channel and into a portion of Area Q. [Chang Consultants] have performed research to assess the accuracy of the FEMA floodplain… 100-year and greater flows will be contained within the Channel and will have no impact on, or be impacted by, Vulcan's future operations in Area Q." The complete analysis from Chang Consultants is provided in Attachment 4.

4.0 METHODOLOGY

As identified in the San Bernardino County Hydrology Manual, the goal of the County of San Bernardino is to provide 100-year return frequency flood protection. This report analyzes the impacts of the Project during the 100-year, 1-hour and 100-year, 24-hour storm events.

The Surface Mining and Reclamation Act (SMARA) regulations require surface mining and reclamation activities to be conducted in such a way to protect both on-site and downstream beneficial uses of water. In addition, erosion and sedimentation control is necessary during all phases of construction, operation, reclamation, and final closure of the mine. Per SMARA requirements, erosion control methods on site must be designed to handle runoff from not less than the 20-year, 1-hour storm.

4.1 General Methodology

The requirements and recommendations found in the San Bernardino County Hydrology Manual were used as the basis for the methodology and calculations found in this report. On-site calculations were performed using the rational and unit hydrograph methods.

For the 20-year storm event, Antecedent Moisture Condition (AMC) II was used. For the 100-year storm event, AMC III was used. Calculations in this report were done using HydroCAD® storm water modeling software which utilizes the TR-20 methodology for watershed modeling developed by the Natural Resources Conservation Service (NRCS).

The TR-20 methodology scales a synthetic rainfall distribution based on a user provided rainfall depth. Precipitation values used in the model were obtained from National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 6, Version 2, Precipitation Frequency Data Server (PFDS). Because the NOAA PFDS does not have a 20-year, 1-hour storm precipitation estimate, the 25-year, 1-hour point precipitation frequency was used in its place.

The NRCS has developed four synthetic rainfall distributions for use in runoff modeling. The western portion of San Bernardino County is within the Type I boundary, as identified in Figure 2.

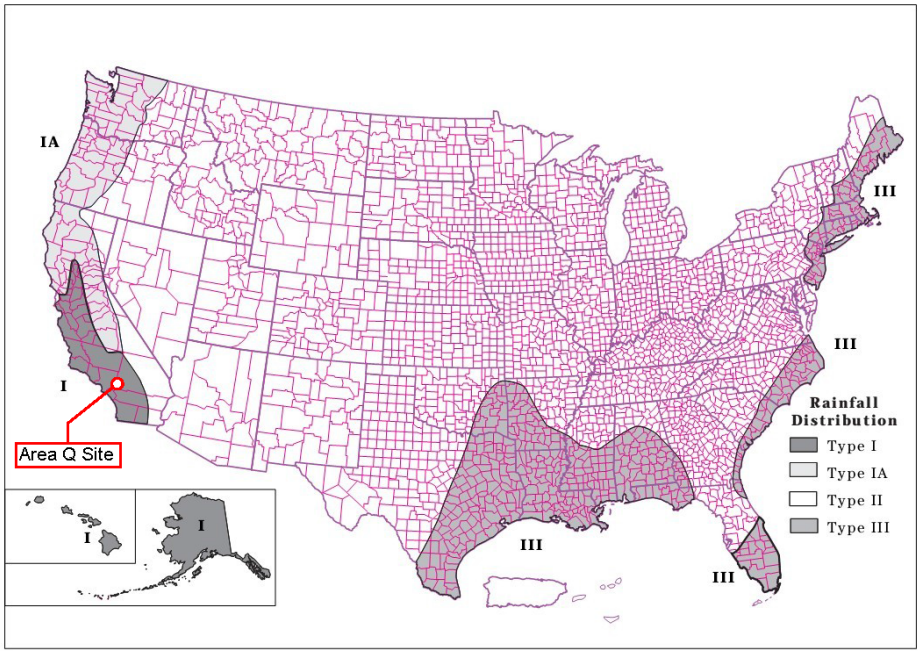


Figure 2: NRCS Synthetic Rainfall Distribution Areas

The TR-20 methodology uses curve numbers, which are parameters used to predict rainfall excess (i.e., runoff). Composite curve numbers were calculated in HydroCAD® based on the site's hydraulic soil group (HSG), the existing ground cover, and reclaimed ground cover conditions.

Time of concentrations (Tc) values, the time it takes for water to flow from the most remote part of a watershed to the outlet, were estimated using HydroCAD® and flowpath characteristics (e.g., length, slope, and groundcover). The contributing drainage area, flowpath lengths, and slope estimated were determined from topographic contours provided by Vulcan and publicly-available aerial photographs.

5.0 HYDROLOGY

The Project site is not expected to receive significant local runoff from the surrounding properties due to the existing topography and surrounding land uses. A small tributary area east of the Cajon Creek Quarry, known as Area K, is expected to contribute to on-site flows during large rain events. As described previously, Muscoy Groin No. 3 has been designed to direct flows from Cajon Creek away from the site. The Cajon Creek Quarry (i.e., Area L) to the north and Cajon Boulevard to the east direct storm flows away from the site. Historical aerial photography suggests that low to moderate rain events rarely discharge to Devil Creek Diversion Channel and are primarily captured in low areas on the site, where water naturally evaporates or infiltrates into the ground.

The mining Project will ultimately result in the reduction of runoff from the study area. A HydroCAD® model for the existing site conditions was prepared to estimate the maximum runoff flow from the site.

At the completion of mining and post-reclamation, the Project area will result in a lowered pit that will retain on-site rainfall.

Table 1: Precipitation Values

Storm Frequency	Duration	Precipitation (inches)
25-year	1-hour	1.44
100-year	1-hour	1.91
	24-hour	7.76

As identified in the analysis by Chang Consultants, the Devil Creek Diversion Channel is sized to contain flows from a 500-year event. Therefore, the 100-year and greater flows will be contained within the Channel and will have no impact on operations in Area Q.

5.1 Existing Condition

The Area Q site includes some houses and general storage buildings and yards. These structures will be decommissioned prior to the start of mining. The site consists of a low-lying, relatively flat area. The general flow direction of surface water across the site appears to be to the southeast, toward the Devil Creek Diversion Channel. The existing condition of the site is shown in Exhibit 1 (Attachment 1).

Composite curve numbers were calculated for the existing condition in HydroCAD® based on the ground cover designations in the Habitat and Jurisdictional Assessment performed by Element Consulting (May 2018) and the site's hydraulic soil group (HSG) as determined by the NRCS web soil survey. The entire site is underlain by gravelly loamy sand (HSG A) based on information gathered from the web soil survey. The existing condition land cover detail is shown in Table 2.

Table 2: Vegetation Communities/Land Cover Types, Existing Condition

Vegetation-Habitat Community / Land Cover*	Corresponding HydroCAD® Land Cover Description Selected	Area (acres)	SCS Curve Number (AMC II)
Non-native grassland	Desert shrub range, fair condition	70.2	55
Disturbed/isolated intermediate riversidean alluvial fan sage scrub	Desert shrub range, poor condition	35.3	63
Developed	Unconnected pavement	31.3	98
Disturbed	Newly graded area	25.1	77
Disturbed/isolated mature riversidean alluvial fan sage scrub	Desert shrub range, fair condition	23.1	55
Buckwheat scrub	Desert shrub range, fair condition	9.9	55
Ornamental	<50% grass cover	1.1	68
Area outside the Biologic Study Area (BSA)	Desert shrub range, poor condition	58.5	63

*As identified in the Habitat and Jurisdictional Assessment

The HydroCAD® model used for the existing site conditions assumes that drainage to Area Q is comprised of one (1) subwatershed that drains to the south toward the Devil Creek Diversion Channel via sheet flow and shallow, concentrated flows. Table 3 displays the model inputs and computed adjusted curve number,

time of concentration, peak flows, and anticipated runoff from the existing site during various storm events. HydroCAD® model output files are included in Attachment 3.

Table 3: Area Q Mine Hydrologic Data, Existing Condition

Drainage Area	Area (acres)	Storm Event	Adjusted CN*	Tc (minutes)	Peak Flow (cfs)	Total Runoff (acre-feet)
AREA Q	254.5	25-year, 1-hour	63	77.2	2.53	0.243
		100-year, 1-hour	80		104.4	10.8
		100-year, 24-hour	80		369.6	114.5

* The adjusted CN is the weighted curve number shown in Table 2 multiplied by an adjustment factor to convert the CN for AMC II to different antecedent moisture conditions.

5.2 Reclaimed Condition

During and post-mining, on-site rainfall will not flow from the site. At the initiation of mining, topsoil and overburden from Area Q will be used to construct a 10-foot tall earthen berm along the entire southern site boundary, adjacent to the Devil Creek Diversion Channel. The mining pit will capture all on-site rainfall and any local runoff from the surrounding properties.

The reclaimed condition land cover detail, as described in the Revegetation Plan (Area Q Mine Reclamation Plan, Sespe Consulting), and subsequent curve numbers are shown in Table 4.

Table 4: Land Cover Type, Reclaimed Condition

Land Cover	Corresponding HydroCAD® Land Cover Description Selected	Area (acres)	SCS Curve Number (AMC II)
Non-native grassland	Desert shrub range, good condition	187.6	49
Disturbed/isolated intermediate riversidean alluvial fan sage scrub	Desert shrub range, poor condition	66.9	63

The HydroCAD® model used for the reclaimed site conditions assumes that drainage to Area Q is comprised of one (1) subwatershed that drains to the mining pit bottom via sheet flow and shallow, concentrated flows. Table 5 displays the model inputs and computed adjusted curve number, time of concentration, anticipated runoff, and pit inundation depth for the reclaimed site during various storm events. HydroCAD® model output files are included in Attachment 3.

Table 5: Area Q Mine Hydrologic Data, Reclaimed Condition

Drainage Area	Area (acres)	Storm Event	Adjusted CN*	Tc (minutes)	Total Runoff (acre-feet)	Pit Inundation Depth (feet)
AREA Q	254.5	25-year, 1-hour	52	165.1	0.0	0.0
		100-year, 1-hour	80		5.4	3.0
		100-year, 24-hour	80		95.1	13.7

* The adjusted CN is the weighted curve number shown in Table 4 multiplied by an adjustment factor to convert the CN for AMC II to different antecedent moisture conditions.

Note that, as modeled, the reclaimed site conditions are not expected to generate any significant runoff during the 25-year storm event. The inundation area for the 100-year storm events are shown on Exhibits 2 and 3 (Attachment 1).

6.0 SUMMARY OF IMPACTS

The implementation of the Area Q mining Project, as described in this report, is not expected to cause any adverse flooding effects on the surrounding properties. In accordance with the San Bernardino County Hydrology Manual, the Project provides sufficient flood control protection for the 100-year return frequency event.

Additionally, as identified below, implementation of the Project is in conformance with SMARA performance standards, which require surface mining and reclamation activities to be conducted in such a way to protect both on-site and downstream beneficial uses of water.

6.1 Potential Impacts to Surrounding Water Bodies

No direct encroachment into the surrounding water bodies (e.g., Cajon Creek or Devil Creek Diversion Channel) or existing floodplain is planned during the Area Q mining project. Local drainage within the mining operation will be collected in the excavated pit and will not be released to the Devil Creek Diversion Channel.

In order to control erosion during the initiation of mining and construction of the earthen berm along the southern boundary of the site, it is recommended that the California Stormwater Quality Association (CASQA) Best Management Handbook's sediment control measures (SE-1, SE-5, or similar) be installed and maintained as needed to eliminate discharge of sediment from the site until vegetation is established on the berm. Erosion control methods implemented at the site must be designed to handle runoff from not less than the 20-year, 1-hour storm.

6.2 Potential Impacts on the Project Site Drainage

As shown on the exhibits in Attachment 1, the bottom of the pit will retain all storm water from the modeled storm events on-site.

After the completion of mining, the proposed mining pit as well as the tributary area to the north will not contribute to off-site flow. The formation of the pit as a result of the mining operation will provide a storage basin capable of capturing the full extents of the modeled storm events. Due to the small tributary area and nature of the soil, debris flows are anticipated to be negligible and to be contained within the pit. As such, the site is not expected to have any significant impacts to downstream areas.

7.0 REFERENCES

California Stormwater Quality Association (CASQA) Best Management Handbook. July 2012.

Custom Soil Resource Report for Vulcan Area Q (San Bernardino County Southwestern Part, California). United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soils Survey (Web). December 1, 2018.

Federal Emergency Management Agency (FEMA) National Flood Insurance Program Flood Insurance Rate Map (FIRM). Flood Map Service Center (Web). Panel 7940 of 9375, effective 09/02/2016.

Letter from Chang Consultants to Adam Guernsey, December 26, 2018.

Report on Geotechnical Evaluation, Vulcan Materials Company Area Q Project. Haley & Aldrich, Inc. July 2018.

Reclamation Plan, Area Q Mine (Draft). Sespe Consulting, Inc., January 2019.

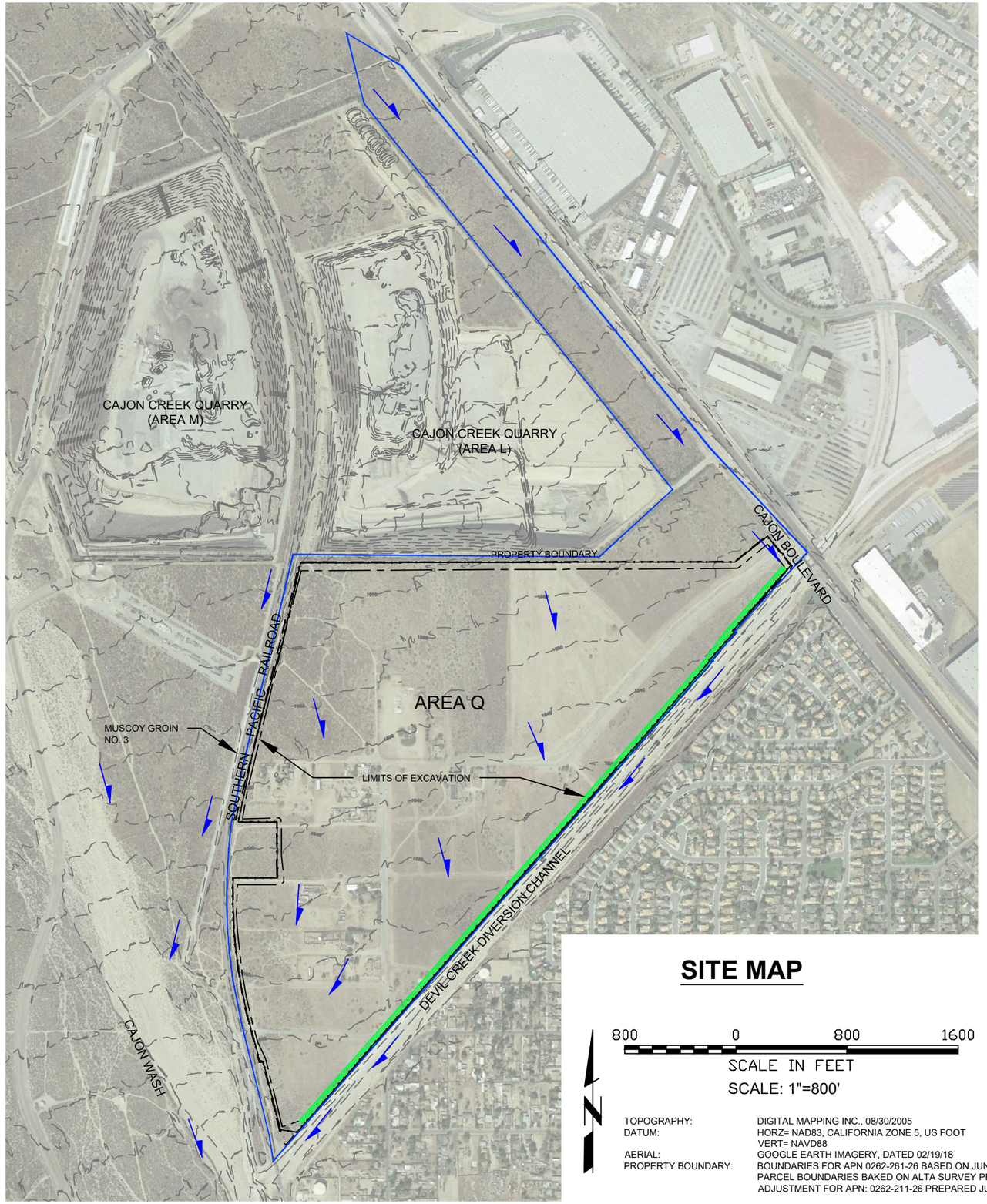
San Bernardino County Areawide Stormwater Program. Watershed Action Plan. Appendix L: San Bernardino County (Santa Ana Watershed Region) Subwatershed Fact Sheets. November 5, 2014.

San Bernardino County Department of Public Works Hydrology Manual. August 1986.

Vulcan Area Q Habitat and Jurisdictional Assessment. ELMT Consulting, Inc. June 2019.

ATTACHMENT 1

FIGURES



SITE MAP

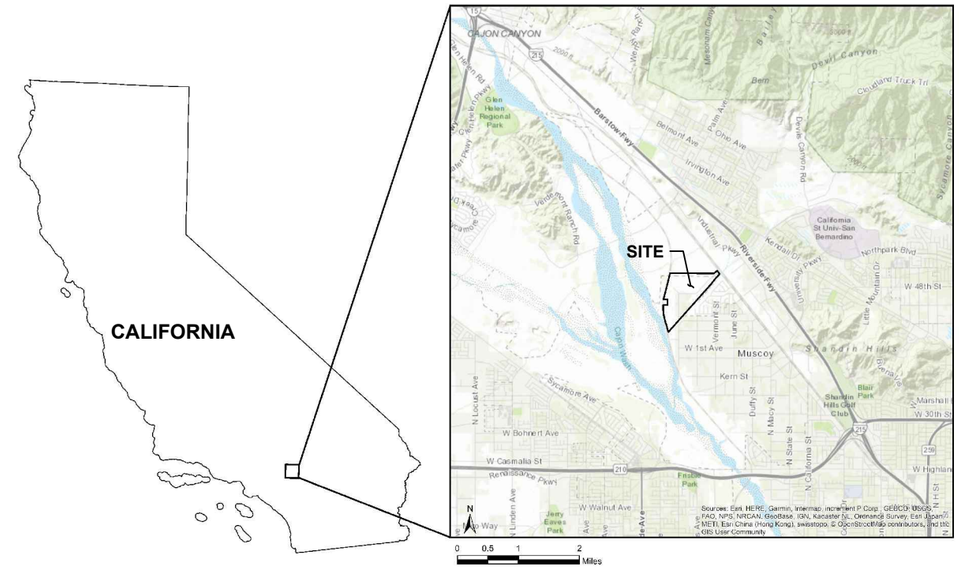
800 0 800 1600

SCALE IN FEET

SCALE: 1"=800'

N

TOPOGRAPHY: DIGITAL MAPPING INC., 08/30/2005
DATUM: HORZ= NAD83, CALIFORNIA ZONE 5, US FOOT
VERT= NAVD88
AERIAL: GOOGLE EARTH IMAGERY, DATED 02/19/18
PROPERTY BOUNDARY: BOUNDARIES FOR APN 0262-261-26 BASED ON JUNE 2008 ALTA SURVEY PREPARED BY GORDON EDWARDS, PLS #6678. PARCEL BOUNDARIES BAKED ON ALTA SURVEY PREPARED APRIL 2006 BY DAWSON SURVEYING, INC. AND LOT LINE ADJUSTMENT FOR APN: 0262-211-26 PREPARED JUNE 2008 BY GORDON EDWARDS, PLS #6678.



VICINITY MAP

N.T.S.

LEGEND

- EXISTING TOPOGRAPHY
- WASTERSHED LIMIT
- FACILITY BOUNDARY
- PROJECT SITE AREA BOUNDARY
- TOP OF PIT
- 45' WIDE BERM LANDSCAPED AREA
- SURFACE DRAINAGE DIRECTION

PROJECT SITE PLAN
DRAINAGE REPORT

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(805) 275-1515 • www.sespeconsulting.com

VULCAN MATERIALS COMPANY
AREA Q
DRAINAGE REPORT - SITE PLAN

SCALE: HORIZ. AS SHOWN
VERT. AS SHOWN
DRAWN BY: G.CAMUS
CHECKED BY: APS
EXHIBIT
1 OF 3
DATE: JUNE 2019

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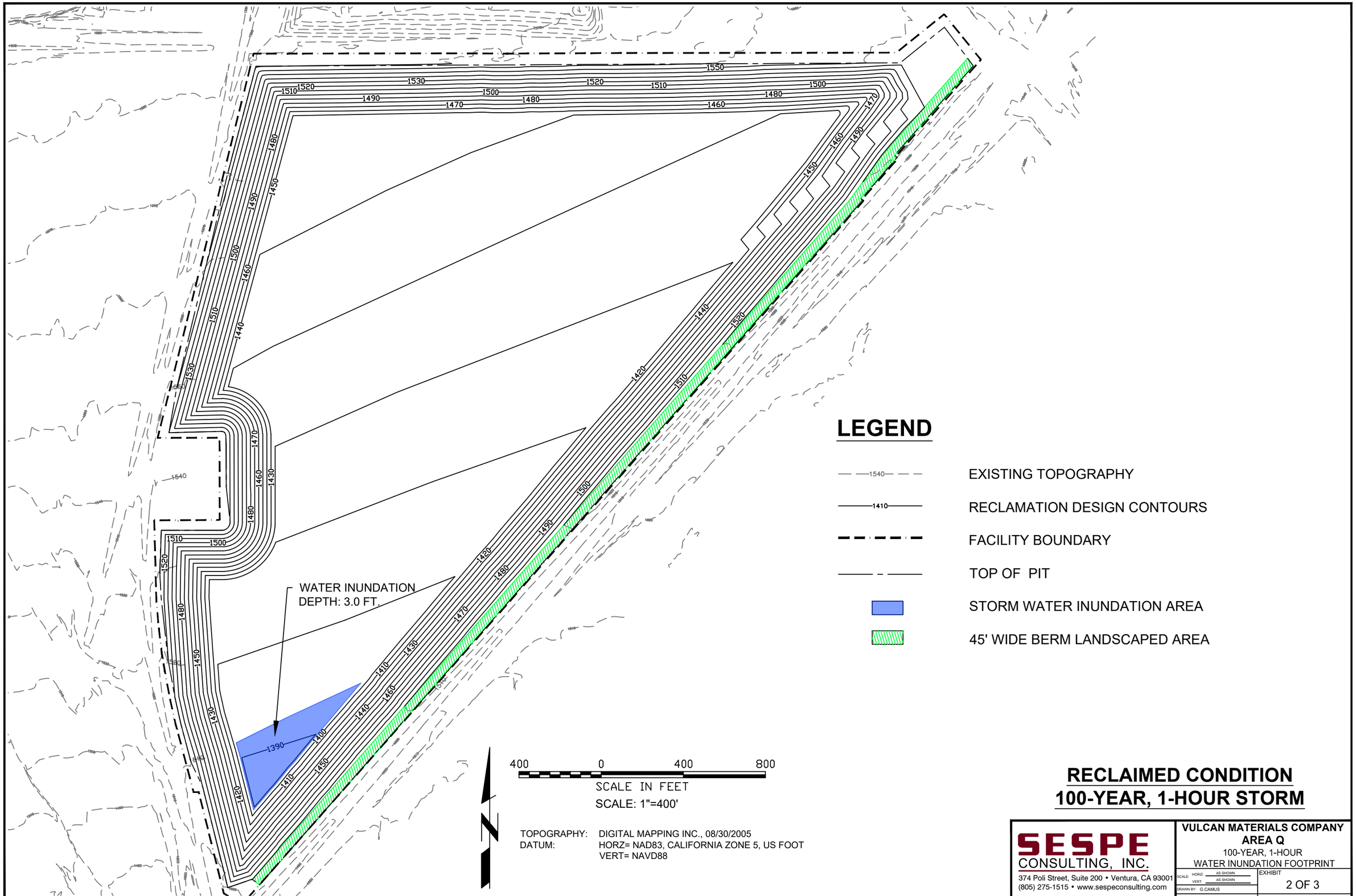

RECLAIMED CONDITION
100-YEAR, 1-HOUR STORM

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VULCAN MATERIALS COMPANY
AREA Q
100-YEAR, 1-HOUR
WATER INUNDATION FOOTPRINT

SCALE: HORIZ. AS SHOWN
VERT. AS SHOWN
DRAWN BY: G.CAMUS
CHECKED BY: APS
EXHIBIT
2 OF 3
DATE: JUNE 2019

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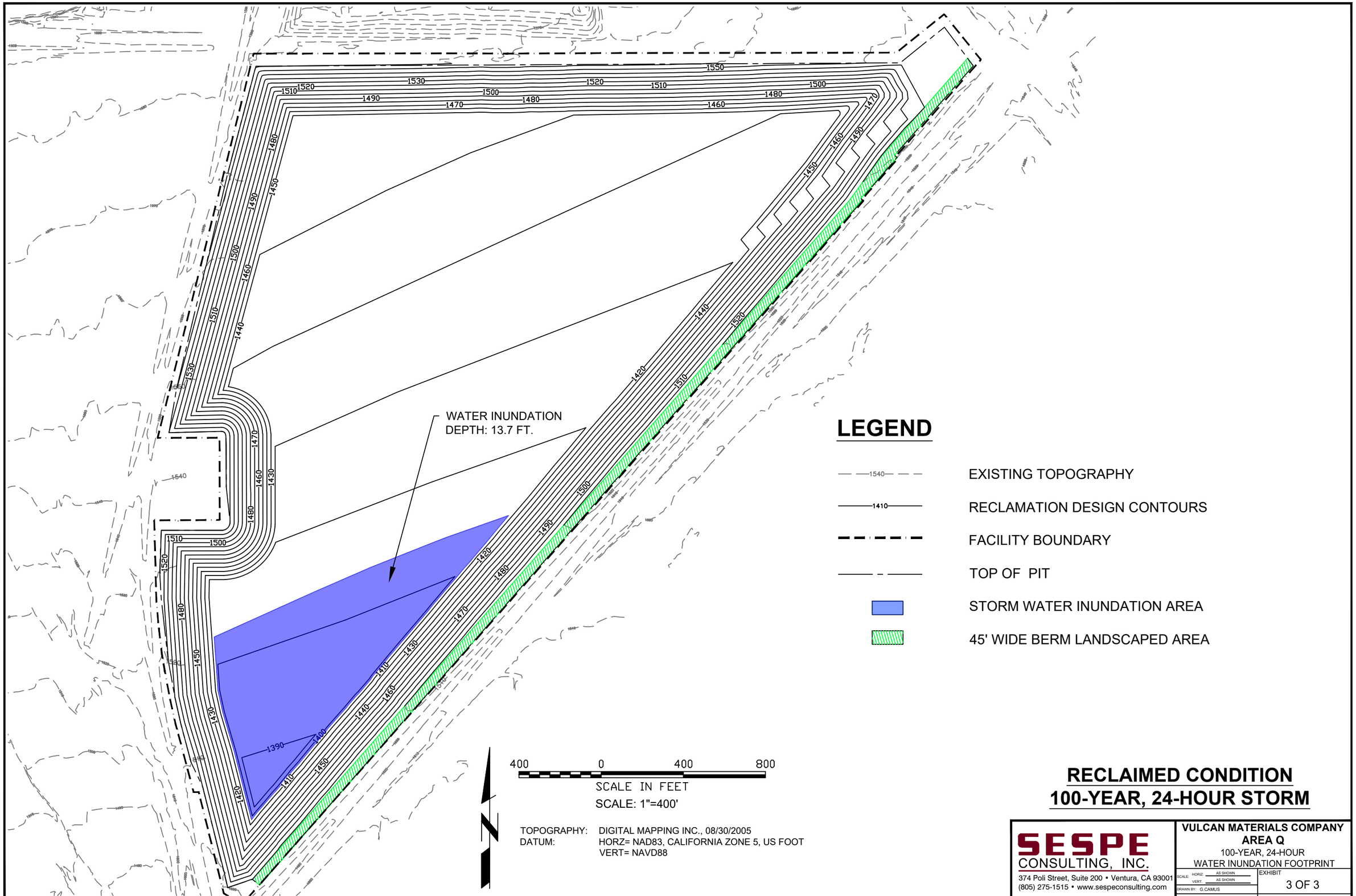

RECLAIMED CONDITION
100-YEAR, 24-HOUR STORM

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VULCAN MATERIALS COMPANY
AREA Q
100-YEAR, 24-HOUR
WATER INUNDATION FOOTPRINT

SCALE: HORIZ. AS SHOWN VERT. AS SHOWN
DRAWN BY: G.CAMUS
CHECKED BY: APS
EXHIBIT 3 OF 3
DATE: JUNE 2019

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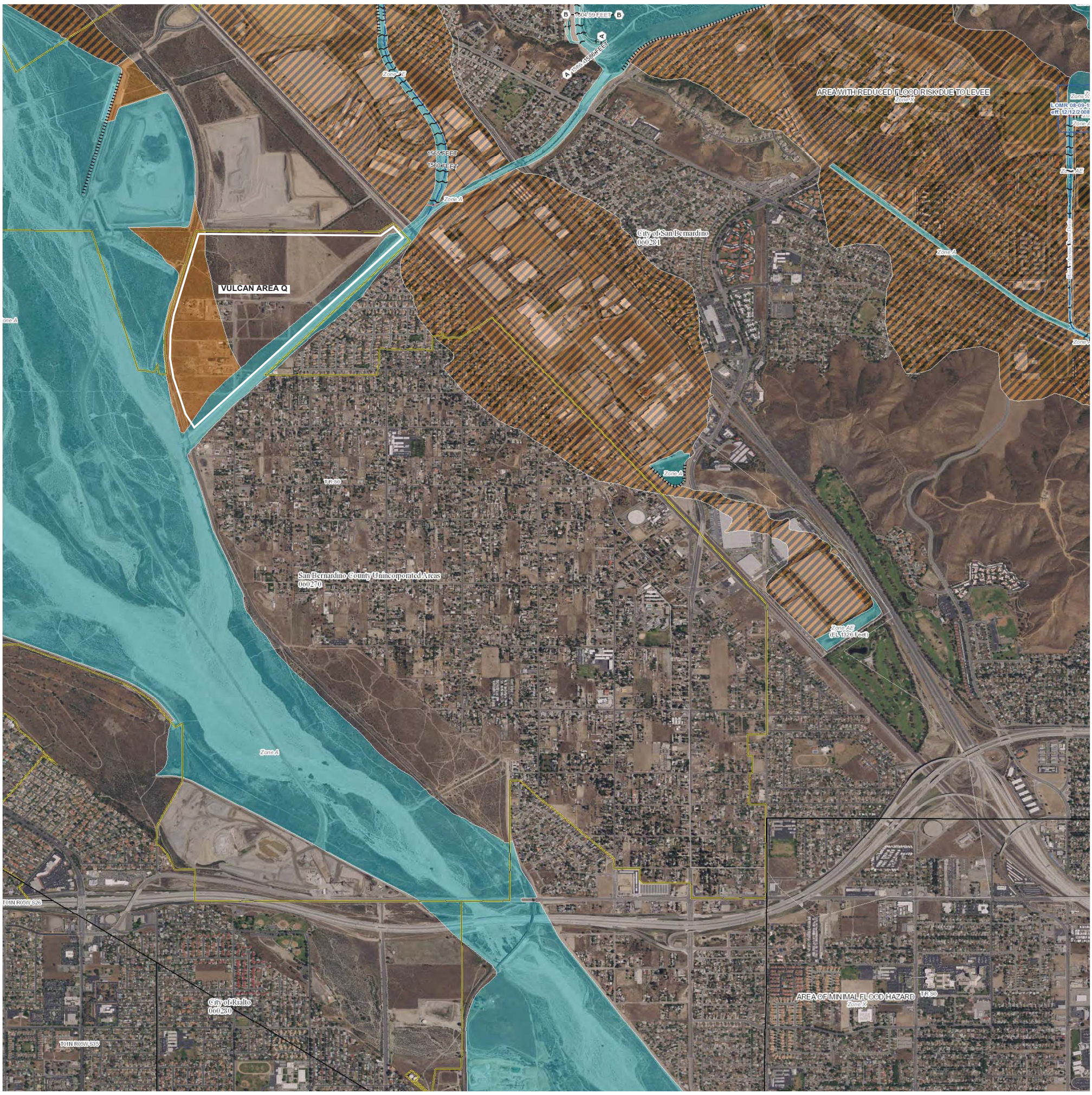
ATTACHMENT 2

FLOOD INSURANCE RATE MAP (FIRM)

34°11'28.34"N

117°22'31.03"W



USGS The National Map: Orthoimagery. Data refreshed October 2017.

117°18'44.06"W

34°7'16.70"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- B 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can beordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to 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.

Basemap information shown on this FIRM was provided in digital format by USDA, Farm Service Agency (FSA). This information was derived from NAIP, dated April 11, 2018.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **8/29/2018 2:16:12 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

ATTENTION: The levee, dike, or other structure that impacts flood hazards inside this boundary has not been shown to comply with Section 65.10 of the NFIP Regulations. As such, this FIRM panel will be revised at a later date to update the flood hazard information associated with this structure. The flood hazard data inside this boundary on the FIRM panel has been republished from the previous effective (historic) FIRM for this area, after being converted from NGVD 29 to NAVD 88.

ACCREDITED LEVEE SYSTEM: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit http://www.fema.gov/national-flood-insurance-program.

SCALE

N

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map please see the Flood Insurance Study(FIS) Report for your community at https://msc.fema.gov

1 inch = 1,000 feet 1:12,000

0 500 1,000 2,000 3,000 4,000 Feet

0 105 210 420 630 840 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

SAN BERNARDINO COUNTY
CALIFORNIA
AND INCORPORATED AREAS

PANEL **7940** OF **9375**

Panel Contains:

COMMUNITY	NUMBER	PANEL
CITY OF SAN BERNARDINO CALIFORNIA	060281	7940
CITY OF RIALTO CALIFORNIA	060280	7940
SAN BERNARDINO COUNTY UNINCORPORATED AREAS CALIFORNIA	060270	7940

MAP NUMBER
06071C7940J
EFFECTIVE DATE
09/02/2016

ATTACHMENT 3

SUPPORTING DOCUMENTATION

HYDROCAD® MODEL OUTPUT FILES
NOAA PRECIPITATION ESTIMATES

Summary for Subcatchment 1S: Area Q Drainage

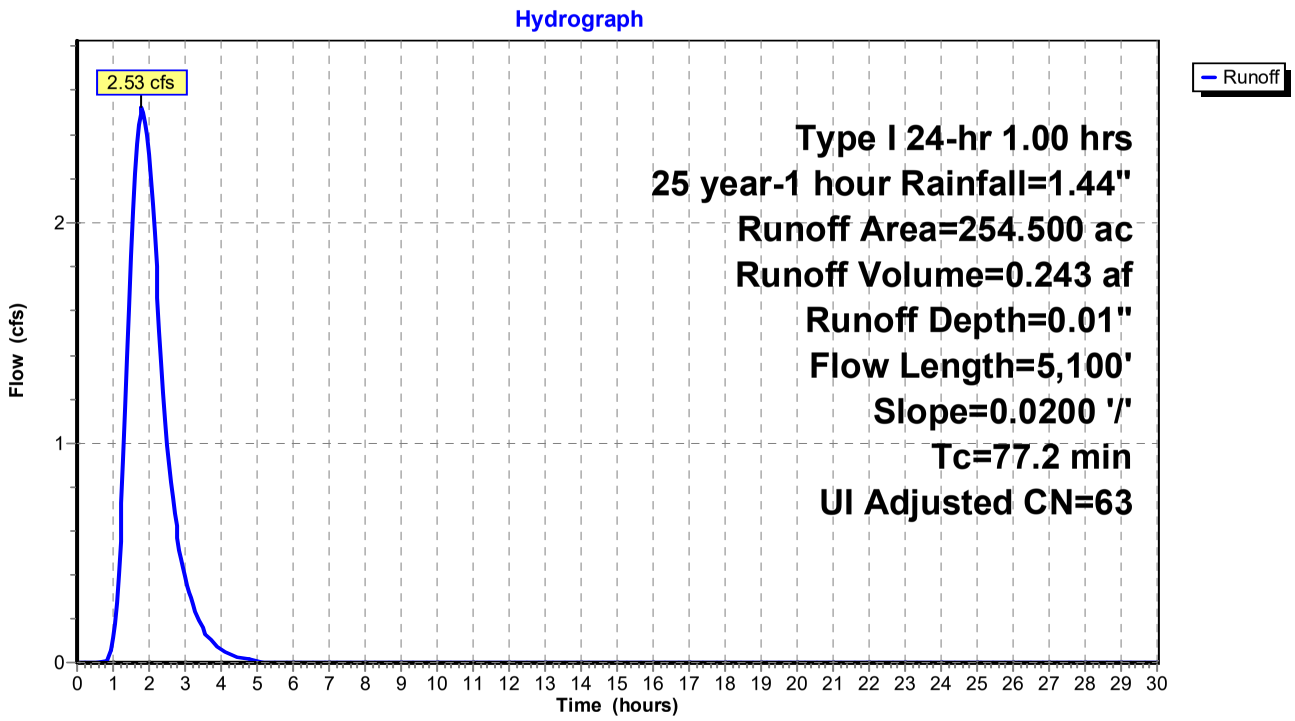
Runoff = 2.53 cfs @ 1.80 hrs, Volume= 0.243 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type I 24-hr 1.00 hrs 25 year-1 hour Rainfall=1.44"

Area (ac)	CN	Adj	Description
70.200	55		Desert shrub range, Fair, HSG A
36.130	63		Desert shrub range, Poor, HSG A
31.300	98		Unconnected pavement, HSG A
25.100	77		Newly graded area, HSG A
23.100	55		Desert shrub range, Fair, HSG A
9.900	55		Desert shrub range, Fair, HSG A
1.100	68		<50% Grass cover, Poor, HSG A
57.670	63		Desert shrub range, Poor, HSG A
254.500	65	63	Weighted Average, UI Adjusted
223.200			87.70% Pervious Area
31.300			12.30% Impervious Area
31.300			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	300	0.0200	0.24		**Sheet Flow, Sheet Flow**
					Range n= 0.130 P2= 3.34"
56.6	4,800	0.0200	1.41		**Shallow Concentrated Flow, Shallow Concentrate Flow**
					Nearly Bare & Untilled Kv= 10.0 fps
77.2	5,100	Total			

Subcatchment 1S: Area Q Drainage



Summary for Subcatchment 1S: Area Q Drainage

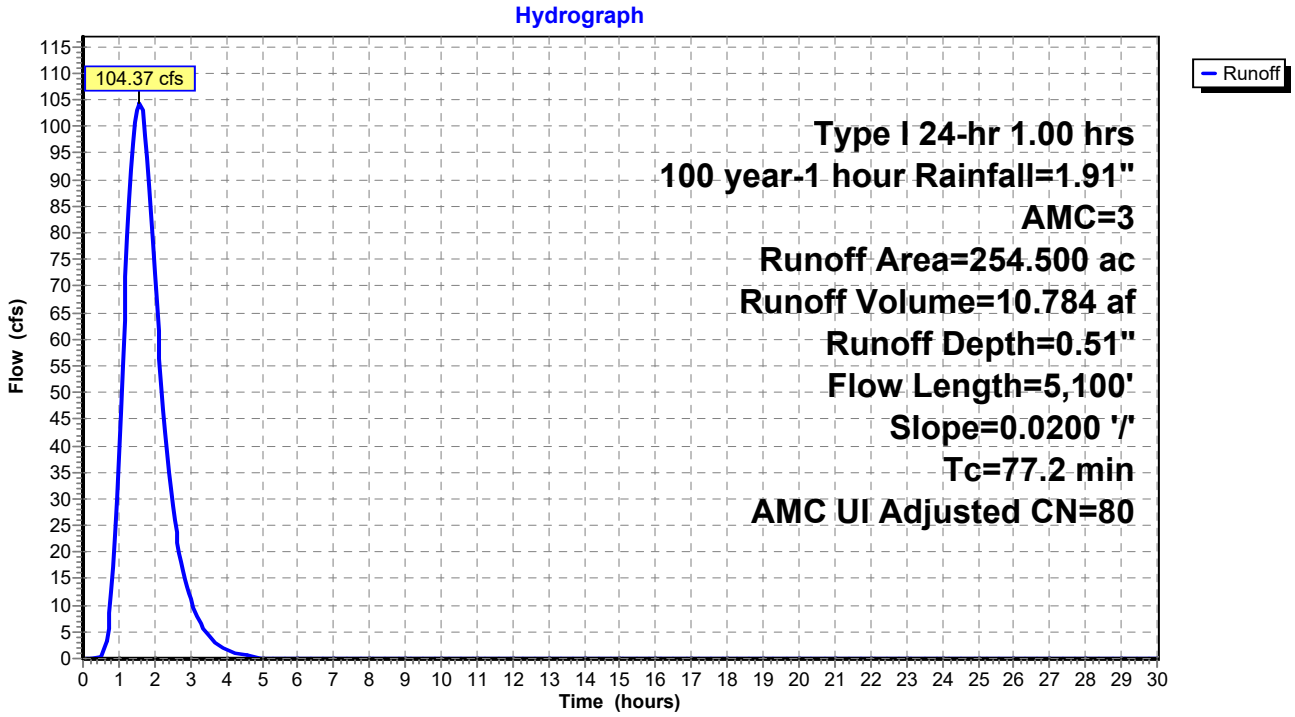
Runoff = 104.37 cfs @ 1.58 hrs, Volume= 10.784 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type I 24-hr 1.00 hrs 100 year-1 hour Rainfall=1.91", AMC=3

Area (ac)	CN	Adj	Description
70.200	55		Desert shrub range, Fair, HSG A
36.130	63		Desert shrub range, Poor, HSG A
31.300	98		Unconnected pavement, HSG A
25.100	77		Newly graded area, HSG A
23.100	55		Desert shrub range, Fair, HSG A
9.900	55		Desert shrub range, Fair, HSG A
1.100	68		<50% Grass cover, Poor, HSG A
57.670	63		Desert shrub range, Poor, HSG A
254.500	65	80	Weighted Average, AMC UI Adjusted
223.200			87.70% Pervious Area
31.300			12.30% Impervious Area
31.300			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	300	0.0200	0.24		**Sheet Flow, Sheet Flow**
					Range n= 0.130 P2= 3.34"
56.6	4,800	0.0200	1.41		**Shallow Concentrated Flow, Shallow Concentrate Flow**
					Nearly Bare & Untilled Kv= 10.0 fps
77.2	5,100	Total			

Subcatchment 1S: Area Q Drainage



Summary for Subcatchment 1S: Area Q Drainage

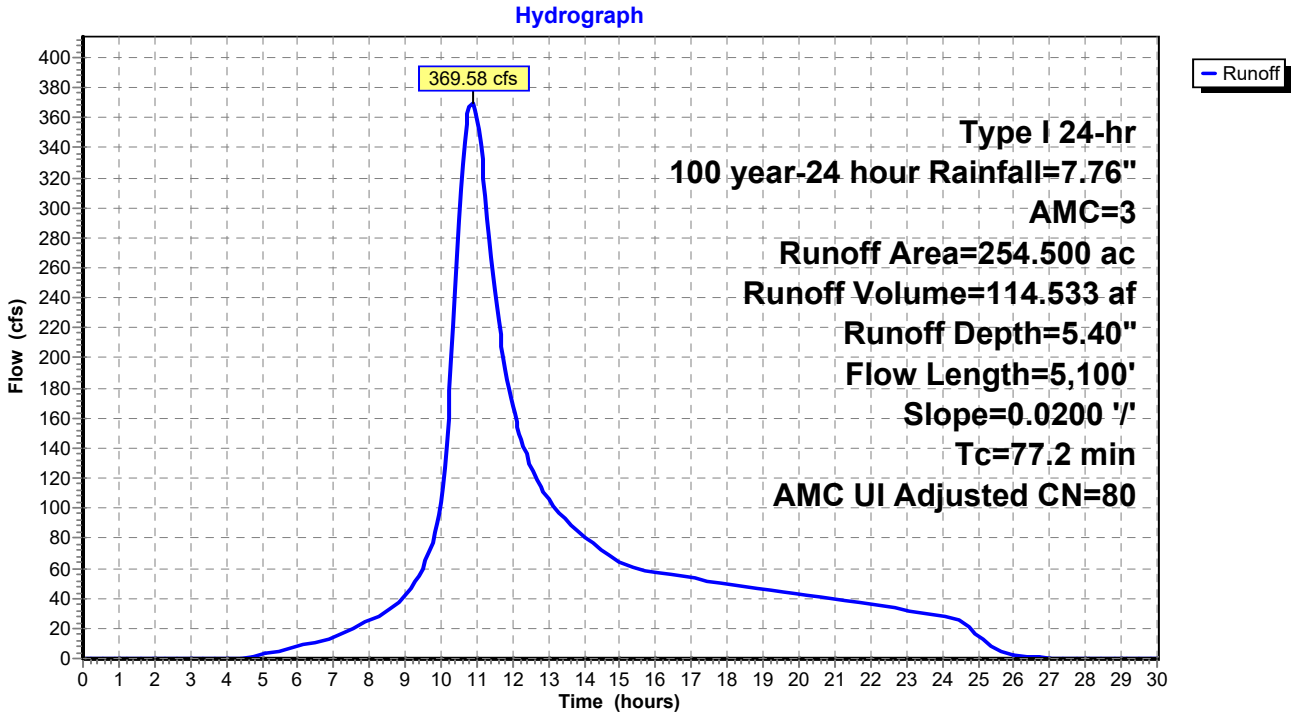
Runoff = 369.58 cfs @ 10.88 hrs, Volume= 114.533 af, Depth= 5.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type I 24-hr 100 year-24 hour Rainfall=7.76", AMC=3

Area (ac)	CN	Adj	Description
70.200	55		Desert shrub range, Fair, HSG A
36.130	63		Desert shrub range, Poor, HSG A
31.300	98		Unconnected pavement, HSG A
25.100	77		Newly graded area, HSG A
23.100	55		Desert shrub range, Fair, HSG A
9.900	55		Desert shrub range, Fair, HSG A
1.100	68		<50% Grass cover, Poor, HSG A
57.670	63		Desert shrub range, Poor, HSG A
254.500	65	80	Weighted Average, AMC UI Adjusted
223.200			87.70% Pervious Area
31.300			12.30% Impervious Area
31.300			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	300	0.0200	0.24		**Sheet Flow, Sheet Flow**
					Range n= 0.130 P2= 3.34"
56.6	4,800	0.0200	1.41		**Shallow Concentrated Flow, Shallow Concentrate Flow**
					Nearly Bare & Untilled Kv= 10.0 fps
77.2	5,100	Total			

Subcatchment 1S: Area Q Drainage



Summary for Subcatchment 1S: Area Q Drainage

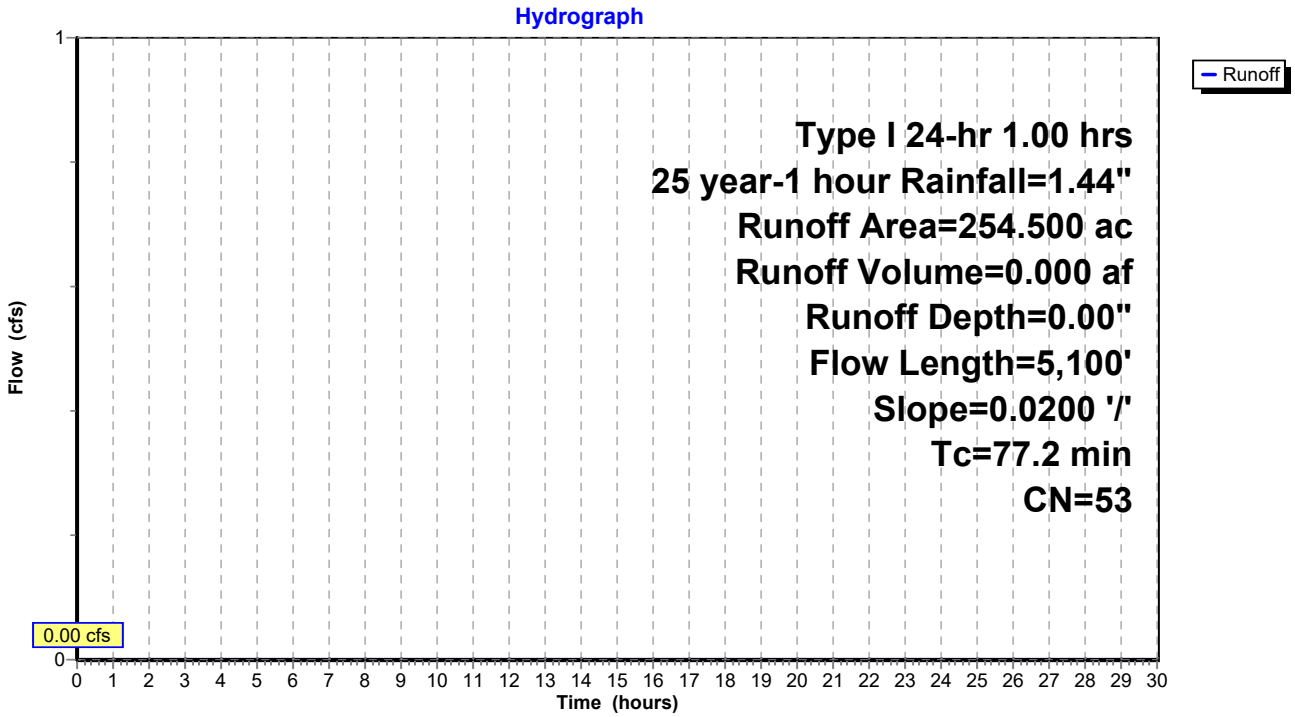
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type I 24-hr 1.00 hrs 25 year-1 hour Rainfall=1.44"

Area (ac)	CN	Description
187.600	49	Desert shrub range, Good, HSG A
66.900	63	Desert shrub range, Poor, HSG A
254.500	53	Weighted Average
254.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	300	0.0200	0.24		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.34"
56.6	4,800	0.0200	1.41		**Shallow Concentrated Flow, Shallow Concentrate Flow** Nearly Bare & Untilled Kv= 10.0 fps
77.2	5,100	Total			

Subcatchment 1S: Area Q Drainage



Summary for Subcatchment 1S: Area Q Drainage

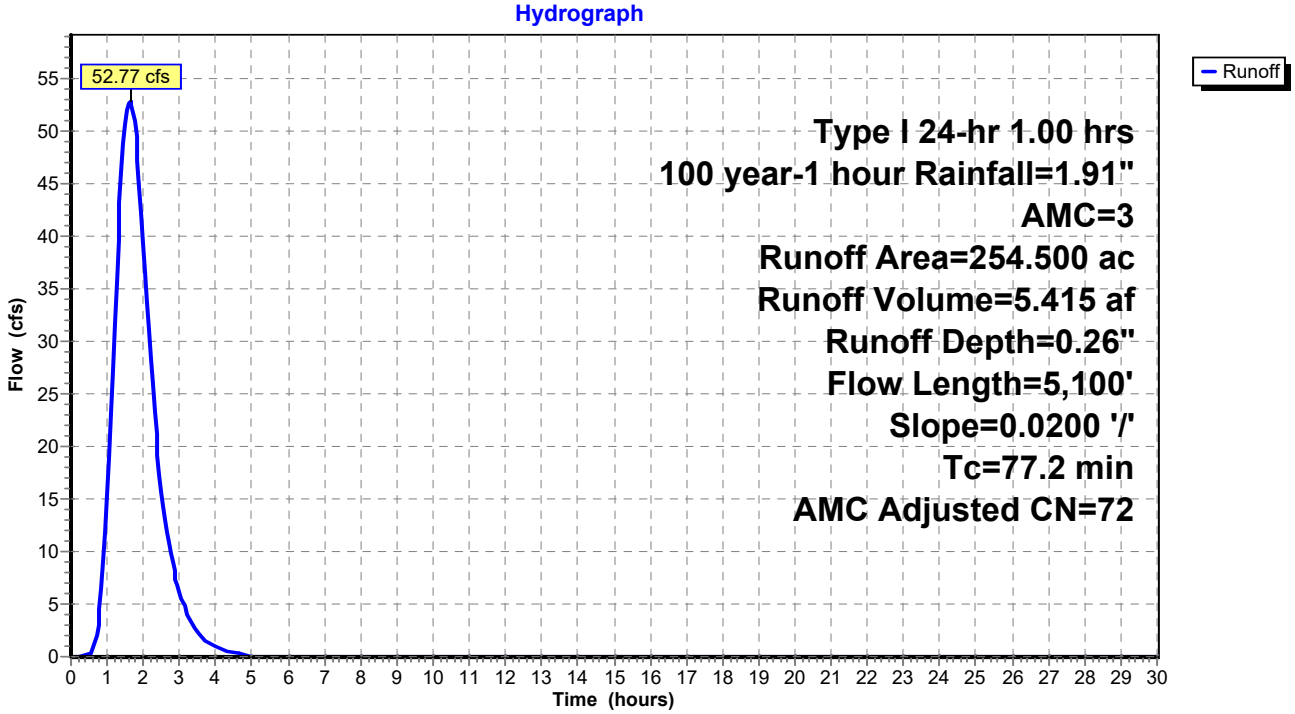
Runoff = 52.77 cfs @ 1.63 hrs, Volume= 5.415 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type I 24-hr 1.00 hrs 100 year-1 hour Rainfall=1.91", AMC=3

Area (ac)	CN	Adj	Description
187.600	49		Desert shrub range, Good, HSG A
66.900	63		Desert shrub range, Poor, HSG A
254.500	53	72	Weighted Average, AMC Adjusted
254.500			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	300	0.0200	0.24		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.34"
56.6	4,800	0.0200	1.41		**Shallow Concentrated Flow, Shallow Concentrate Flow** Nearly Bare & Untilled Kv= 10.0 fps
77.2	5,100	Total			

Subcatchment 1S: Area Q Drainage



Summary for Subcatchment 1S: Area Q Drainage

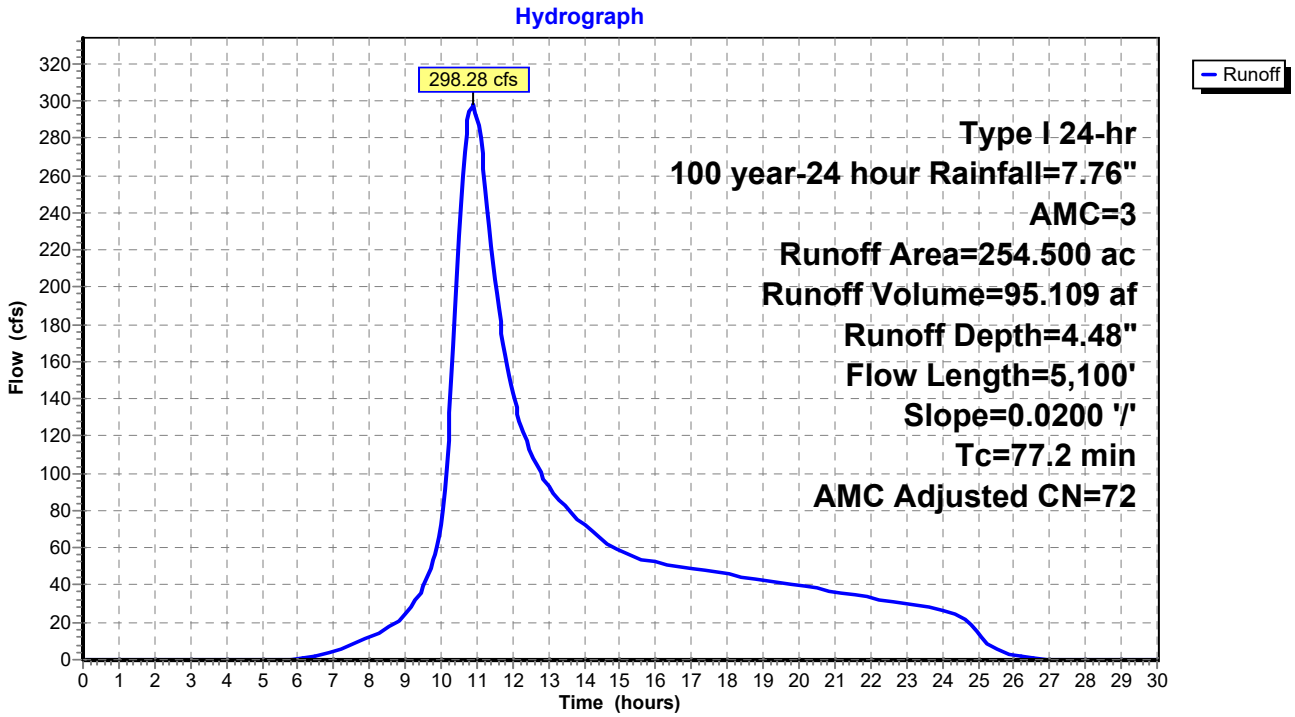
Runoff = 298.28 cfs @ 10.89 hrs, Volume= 95.109 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type I 24-hr 100 year-24 hour Rainfall=7.76", AMC=3

Area (ac)	CN	Adj	Description
187.600	49		Desert shrub range, Good, HSG A
66.900	63		Desert shrub range, Poor, HSG A
254.500	53	72	Weighted Average, AMC Adjusted
254.500			100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	300	0.0200	0.24		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.34"
56.6	4,800	0.0200	1.41		**Shallow Concentrated Flow, Shallow Concentrate Flow** Nearly Bare & Untilled Kv= 10.0 fps
77.2	5,100	Total			

Subcatchment 1S: Area Q Drainage



NOAA Atlas 14, Volume 6, Version 2
Location name: San Bernardino, California, USA*
Latitude: 34.1707°, Longitude: -117.3617°
Elevation: 1551.04 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	0.139 (0.115-0.169)	0.186 (0.154-0.226)	0.249 (0.206-0.303)	0.301 (0.247-0.371)	0.376 (0.298-0.478)	0.435 (0.338-0.566)	0.497 (0.377-0.663)	0.564 (0.415-0.774)	0.659 (0.465-0.943)	0.736 (0.501-1.09)
10-min	0.199 (0.165-0.242)	0.266 (0.221-0.324)	0.356 (0.295-0.435)	0.432 (0.355-0.531)	0.538 (0.427-0.685)	0.623 (0.484-0.811)	0.713 (0.540-0.951)	0.808 (0.595-1.11)	0.944 (0.666-1.35)	1.06 (0.718-1.56)
15-min	0.241 (0.200-0.292)	0.322 (0.267-0.391)	0.431 (0.357-0.526)	0.522 (0.429-0.643)	0.651 (0.517-0.829)	0.754 (0.586-0.980)	0.862 (0.653-1.15)	0.978 (0.720-1.34)	1.14 (0.806-1.64)	1.27 (0.869-1.89)
30-min	0.356 (0.296-0.432)	0.476 (0.395-0.579)	0.637 (0.528-0.777)	0.772 (0.634-0.950)	0.963 (0.764-1.23)	1.12 (0.866-1.45)	1.27 (0.966-1.70)	1.45 (1.06-1.98)	1.69 (1.19-2.42)	1.89 (1.29-2.80)
60-min	0.534 (0.444-0.648)	0.713 (0.592-0.868)	0.956 (0.791-1.17)	1.16 (0.951-1.43)	1.44 (1.15-1.84)	1.67 (1.30-2.17)	1.91 (1.45-2.55)	2.17 (1.60-2.98)	2.53 (1.79-3.63)	2.83 (1.93-4.20)
2-hr	0.790 (0.657-0.960)	1.02 (0.851-1.25)	1.34 (1.11-1.63)	1.60 (1.31-1.97)	1.96 (1.56-2.50)	2.25 (1.75-2.93)	2.55 (1.93-3.40)	2.87 (2.11-3.93)	3.31 (2.34-4.74)	3.67 (2.50-5.44)
3-hr	0.987 (0.820-1.20)	1.27 (1.05-1.54)	1.64 (1.36-2.00)	1.95 (1.60-2.40)	2.37 (1.88-3.02)	2.71 (2.10-3.52)	3.05 (2.31-4.07)	3.42 (2.51-4.69)	3.92 (2.77-5.61)	4.32 (2.94-6.41)
6-hr	1.43 (1.19-1.74)	1.83 (1.52-2.22)	2.34 (1.94-2.86)	2.76 (2.27-3.40)	3.34 (2.65-4.25)	3.78 (2.94-4.92)	4.24 (3.21-5.65)	4.71 (3.47-6.47)	5.36 (3.78-7.68)	5.87 (4.00-8.71)
12-hr	1.91 (1.59-2.32)	2.45 (2.03-2.98)	3.14 (2.60-3.83)	3.70 (3.04-4.55)	4.46 (3.54-5.67)	5.03 (3.91-6.54)	5.61 (4.25-7.48)	6.20 (4.57-8.51)	7.00 (4.94-10.0)	7.62 (5.19-11.3)
24-hr	2.57 (2.28-2.96)	3.34 (2.95-3.85)	4.33 (3.82-5.00)	5.12 (4.48-5.97)	6.17 (5.23-7.43)	6.97 (5.78-8.57)	7.76 (6.29-9.78)	8.57 (6.75-11.1)	9.65 (7.30-13.0)	10.5 (7.66-14.6)
2-day	3.15 (2.79-3.62)	4.17 (3.69-4.81)	5.50 (4.85-6.36)	6.57 (5.75-7.66)	8.02 (6.79-9.66)	9.12 (7.57-11.2)	10.2 (8.29-12.9)	11.4 (8.96-14.7)	12.9 (9.76-17.4)	14.1 (10.3-19.7)
3-day	3.35 (2.97-3.86)	4.52 (4.00-5.21)	6.05 (5.34-7.00)	7.30 (6.39-8.51)	9.01 (7.63-10.9)	10.3 (8.58-12.7)	11.7 (9.47-14.7)	13.1 (10.3-16.9)	15.0 (11.3-20.2)	16.5 (12.1-23.0)
4-day	3.56 (3.16-4.11)	4.86 (4.30-5.60)	6.57 (5.79-7.59)	7.97 (6.98-9.30)	9.91 (8.40-11.9)	11.4 (9.48-14.1)	13.0 (10.5-16.4)	14.6 (11.5-18.9)	16.8 (12.7-22.7)	18.6 (13.6-26.0)
7-day	4.01 (3.55-4.62)	5.55 (4.91-6.40)	7.60 (6.70-8.79)	9.30 (8.14-10.8)	11.7 (9.87-14.0)	13.5 (11.2-16.6)	15.4 (12.5-19.4)	17.4 (13.7-22.6)	20.2 (15.3-27.3)	22.5 (16.4-31.3)
10-day	4.36 (3.86-5.03)	6.09 (5.38-7.02)	8.40 (7.41-9.71)	10.3 (9.04-12.0)	13.0 (11.0-15.7)	15.1 (12.6-18.6)	17.3 (14.0-21.8)	19.7 (15.5-25.5)	22.9 (17.3-30.9)	25.5 (18.6-35.6)
20-day	5.35 (4.74-6.16)	7.56 (6.69-8.72)	10.5 (9.31-12.2)	13.1 (11.4-15.2)	16.6 (14.1-20.0)	19.4 (16.1-23.9)	22.4 (18.1-28.2)	25.5 (20.1-33.1)	30.0 (22.7-40.4)	33.5 (24.5-46.8)
30-day	6.31 (5.58-7.26)	8.91 (7.89-10.3)	12.5 (11.0-14.4)	15.5 (13.5-18.0)	19.7 (16.7-23.8)	23.1 (19.2-28.5)	26.7 (21.7-33.7)	30.6 (24.1-39.6)	36.0 (27.3-48.6)	40.5 (29.6-56.5)
45-day	7.62 (6.75-8.78)	10.7 (9.45-12.3)	14.9 (13.1-17.2)	18.5 (16.2-21.5)	23.5 (19.9-28.4)	27.6 (22.9-34.0)	32.0 (25.9-40.3)	36.6 (28.9-47.4)	43.3 (32.8-58.4)	48.7 (35.6-68.0)
60-day	8.95 (7.92-10.3)	12.4 (11.0-14.3)	17.1 (15.1-19.8)	21.2 (18.5-24.7)	27.0 (22.8-32.5)	31.6 (26.3-38.9)	36.6 (29.7-46.1)	42.0 (33.1-54.4)	49.7 (37.6-67.0)	56.0 (40.9-78.1)

[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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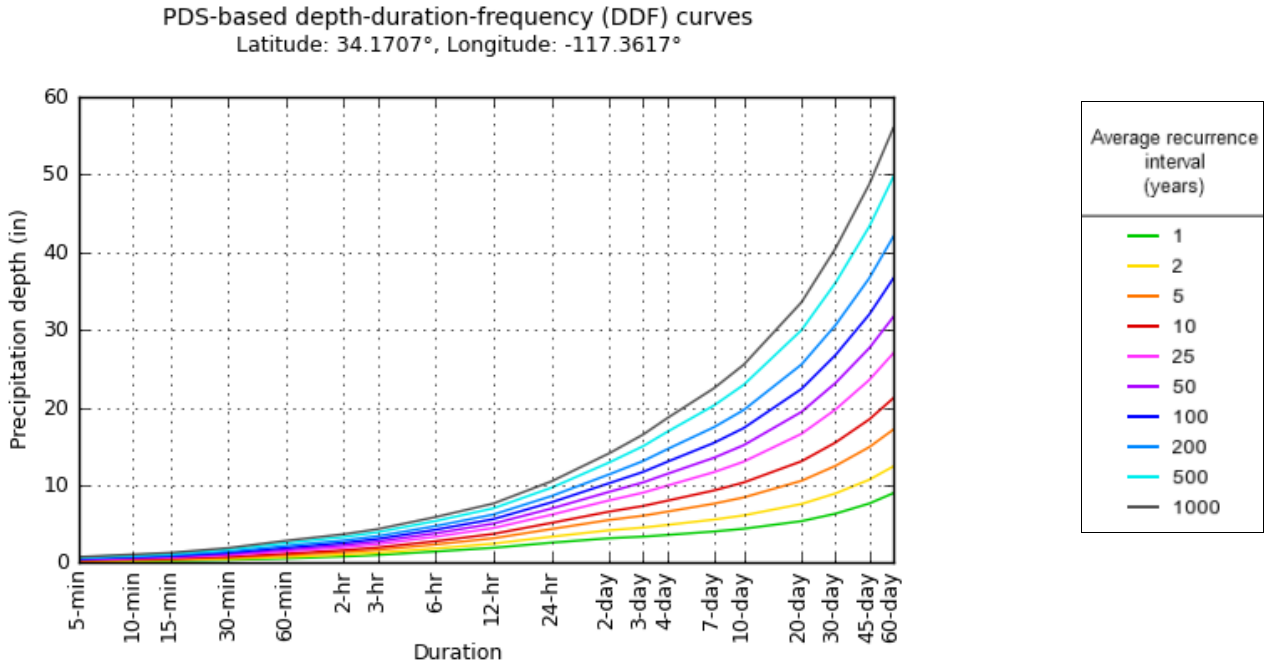
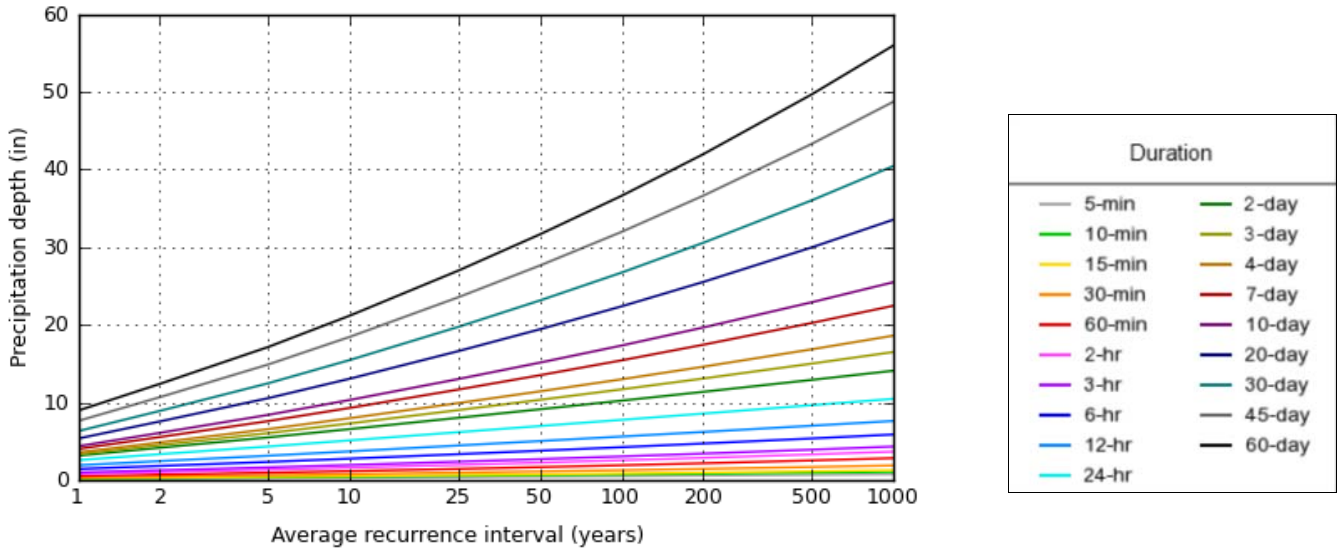
PF graphical





NOAA Atlas 14, Volume 6, Version 2 Created (GMT): Tue Dec 4 19:33:45 2018

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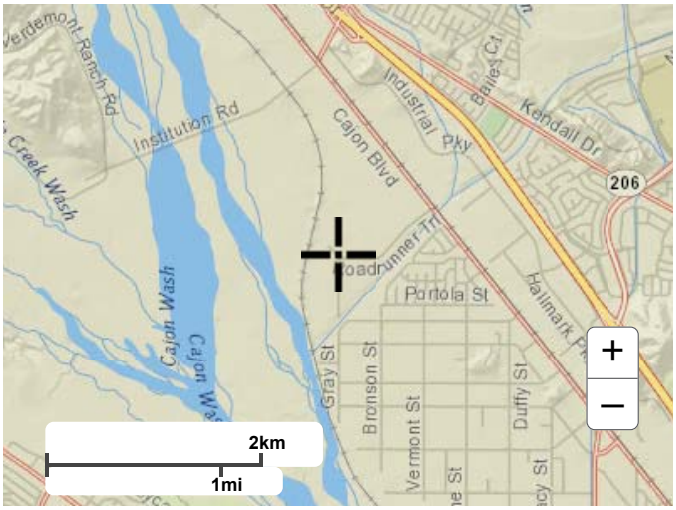
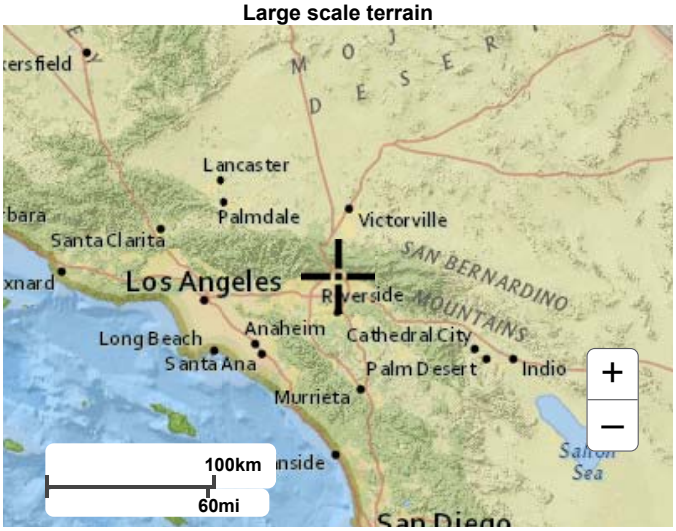
Maps & aerials

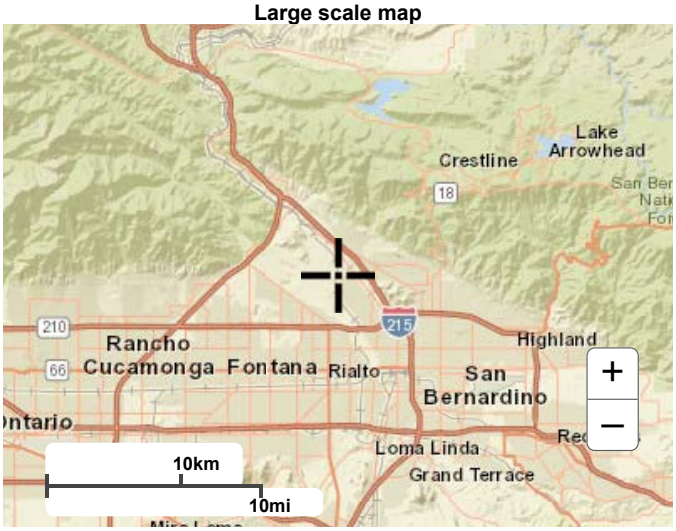
Small scale terrain



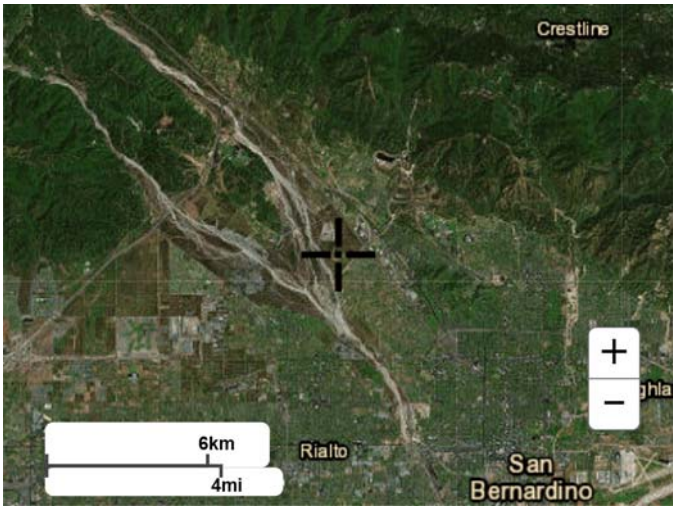
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

ATTACHMENT 4

DEVIL CREEK DIVERSION CHANNEL FLOOD ANALYSIS

ChangConsultants
Civil Engineering◦Hydrology◦Hydraulics◦Sedimentation

P.O. Box 9496
Rancho Santa Fe, CA 92067-4496
T: 858.692.0760
F: 858.832.1402
wayne@changconsultants.com

December 26, 2018

Adam Guernsey
Harrison, Temblador, Hungerford & Johnson LLP
2801 T Street
Sacramento, CA 95816

Subject: Devil Creek Diversion Channel

Dear Adam:

The Devil Creek Diversion Channel (Channel) conveys storm flows in a southwest direction along Vulcan Materials Company's future Cajon Creek Area Q mining site in San Bernardino County. This reach is a concrete trapezoidal channel and confluences with the Cajon Wash near the south end of Area Q. The Federal Emergency Management Agency has mapped a Zone A floodplain along the channel (see the attached floodplain map). A Zone A floodplain is an approximate 100-year floodplain. Detailed engineering analyses were not performed to establish the floodplain, so the water surface elevations are unknown and the delineation is not precise. The FEMA mapping shows the floodplain extending beyond the Channel and into a portion of Area Q. I have performed research to assess the accuracy of the FEMA floodplain. As discussed below, 100-year and greater flows will be contained within the Channel and will have no impact on, or be impacted by, Vulcan's future operations in Area Q.

Tetra Tech prepared two July 2009 reports titled *Devil Creek Diversion Channel, County of San Bernardino, California, Hydrologic Analysis* and *Devil Creek Diversion Channel, County of San Bernardino, California, Hydraulic Analysis.* These reports contain detailed engineering analyses of the Channel and its watershed as part of a levee study. The levee reach is just upstream of the Area Q reach, but the analyses extend into Area Q. The San Bernardino County Flood Control District stated that the reports were approved. Relevant excerpts from the reports are attached.

The *Hydrologic Analysis* report determined the 100-year flow rate in the Channel just upstream of Area Q. The Watershed Map shows that the watershed area tributary to the Channel as it enters Area Q is 9.78 square miles. Table 9 indicates that the 100-year flow rate contributed from this area is 4,380 cubic feet per second (cfs). The flow rate along Area Q will be similar because the additional tributary drainage area added along Area Q is minor compared to the 9.78 square mile watershed area.

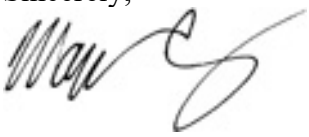
The *Hydraulic Analysis* report contains a HEC-RAS analysis of the Channel from Cajon Creek to upstream of Area Q. The report includes tabulated results, a work map showing cross-section locations, and cross-section plots. Area Q is located along HEC-RAS cross-section -29+35.00 to

27+49.42. The Table 1 results indicate that the 100-year flow depths along Area Q vary between 6.22 to 12.21 feet. The cross-section plots show that the channel has several feet of freeboard over these depths, so the 100-year flow will be contained with excess capacity.

I performed a normal depth analysis based on the average longitudinal slope and channel cross-section along Area Q using topographic mapping provided by Vulcan. The attached results show that the approximate capacity is just over 12,000 cfs. The *Hydrologic Analysis* report determined a 500-year flow rate of 11,800 cfs, so the channel can convey an extreme event above the 100-year design storm.

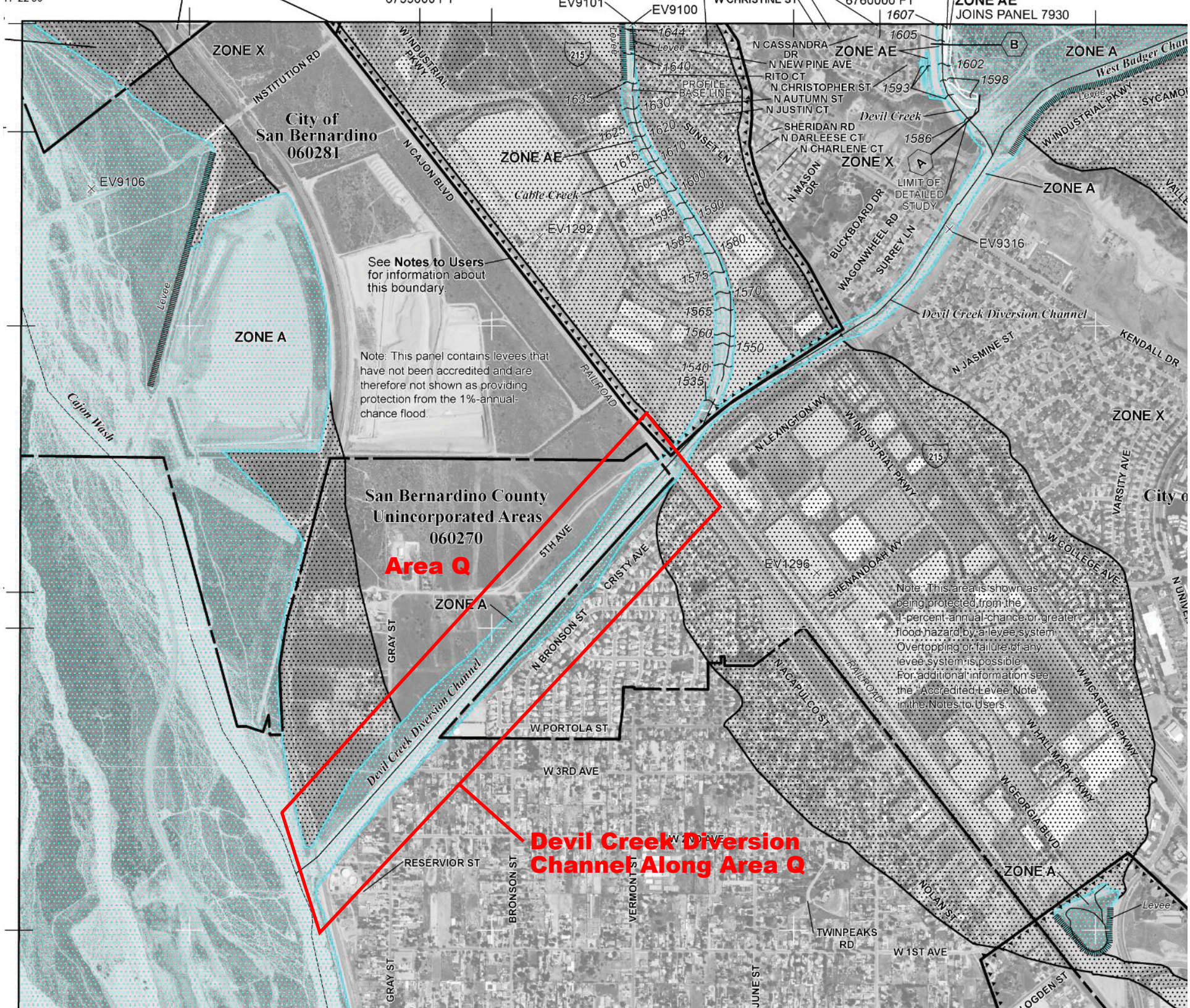
In summary, Tetra Tech's detailed engineering analyses of the Devil Creek Diversion Channel along Area Q are more accurate than FEMA's approximate Zone A floodplain. Tetra Tech's analyses were approved by the San Bernardino County Flood Control District. The Channel and watershed conditions have not changed significantly since the 2009 studies. Based on this, the 100-year and greater flows will be contained within the Channel and will have no impact on, or be impacted by, Vulcan's future operations in Area Q.

Sincerely,



Wayne W. Chang, M.S., P.E.

Enclosures


ZONE X
INSTITUTION RD
City of
San Bernardino
060281
W INDUSTRIAL PKWY
N CAJON BLVD
EV9101
EV9100
ZONE AE
JOINS PANEL 7930
ZONE A
West Badger Chan
Levee
N CASSANDRA DR
N NEW PINE AVE
RITO CT
N CHRISTOPHER ST
N AUTUMN ST
N JUSTIN CT
PROFILE BASE LINE
Devil Creek
SHERIDAN RD
N DARLEESE CT
N CHARLENE CT
N MASON DR
LIMIT OF DETAILED STUDY
SUNSET LN
Cable Creek
EV9106
EV1292
EV9316
BUCKBOARD DR
WAGONWHEEL RD
SURREY LN
See Notes to Users
for information about
this boundary.
Devil Creek Diversion Channel
N JASMINE ST
KENDALL DR
Note: This panel contains levees that
have not been accredited and are
therefore not shown as providing
protection from the 1%-annual-
chance flood.
RAILROAD
Cajon Wash
N LEXINGTON WY
W INDUSTRIAL PKWY
VARSITY AVE
San Bernardino County
Unincorporated Areas
060270
Area Q
5TH AVE
CRISTY AVE
EV1296
SHENANDOAH WY
W COLLEGE AVE
Note: This area is shown as
being protected from the
1-percent-annual-chance or greater
flood hazard by a levee system.
Overtopping or failure of any
levee system is possible.
For additional information see
the "Accredited Levee Note"
in the Notes to Users.
GRAY ST
N BRONSON ST
N ACAPULCO ST
W MCARTHUR PKWY
W PORTOLA ST
W HALLMARK PKWY
W 3RD AVE
W GEORGIA BLVD
Devil Creek Diversion
Channel Along Area Q
RESERVIOR ST
BRONSON ST
VERMONT ST
NOLAN ST
TWINPEAKS RD
W 1ST AVE
JUNE ST
OGDEN ST

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $_____

☒ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Granville M. Bowman	Company: County of San Bernardino	
Mailing Address: 825 E Third Street, Room 101 San Bernardino, CA 92415-0835	Daytime Telephone No.: 909-387-7906	Fax No.: 909-387-7911
	E-Mail Address: gbowman@dpw.sbcounty.gov	
Signature of Requester (required):	Date: 7/23/09	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Granville M. Bowman, Flood Control Engineer	Community Name: County of San Bernardino	
Mailing Address: 825 E Third Street, Room 101 San Bernardino, CA 92415-0835	Daytime Telephone No.: 909-387-7906	Fax No.: 909-387-7911
	E-Mail Address: gbowman@dpw.sbcounty.gov	
Community Official's Signature (required):	Date: 7/23/09	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Yen Hsu Chen	License No.: 37763	Expiration Date: 12-31-2010
Company Name: Tetra Tech Inc.	Telephone No.: (949) 250-6788	Fax No.: (949) 250-6776
Signature:		Date: 07/24/09

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

REGISTERED PROFESSIONAL ENGINEER
YEN-HSU CHEN
No. 37763
Exp. 12/31/10
Seal (Optional)
CIVIL
STATE OF CALIFORNIA

County of San Bernardino Certification of Tetra Tech Studies

Devil Creek Diversion Channel
County of San Bernardino, California

FEMA ID No.: 70
County System No.: 2-307-1A
Flood Source: Devil and Bailey Canyons and West Badger Channel
Communities: City of San Bernardino

Hydrologic Analysis

July 2009

TETRA TECH
17770 CARTWRIGHT ROAD, SUITE 500
IRVINE, CALIFORNIA 92614

streamflow data and the FEMA-approved analytical approach (Bulletin #17B). The Standard Project Flood (SPF) peak discharge documented in design memorandums for Devil Creek Diversion Channel is 16,500 cfs.

Table 9 – Adopted Discharge-Frequency Results for Devil Creek Diversion Channel (D.A. = 9.78 sq. mi.)

Return Frequency (years)	Adopted Discharge-Frequency Results for Devil Creek Diversion Channel[1] (Flow, cfs)
2	125
5	410
10	790
20	1,400
50	2,740
100	4,380
200	6,820
500	11,800

In order to perform a risk based analysis it was necessary to determine the appropriate equivalent record length to describe uncertainty based on the USACE's EM 1110-2-1619 (Risk-Based Analysis for Flood Damage Reduction Studies). Using the equivalent record length guidelines in Table 4-5 of the EM, 60 years should be used as the equivalent record length for the Devil Creek Diversion channel discharge-frequency relationship based on: (1) using 75 percent of the 81 year period of record for the Devil Canyon Creek gage, and (2) the fact that the USGS regional flood frequency analysis results were consistent with the adopted results at the Devil Diversion Channel.

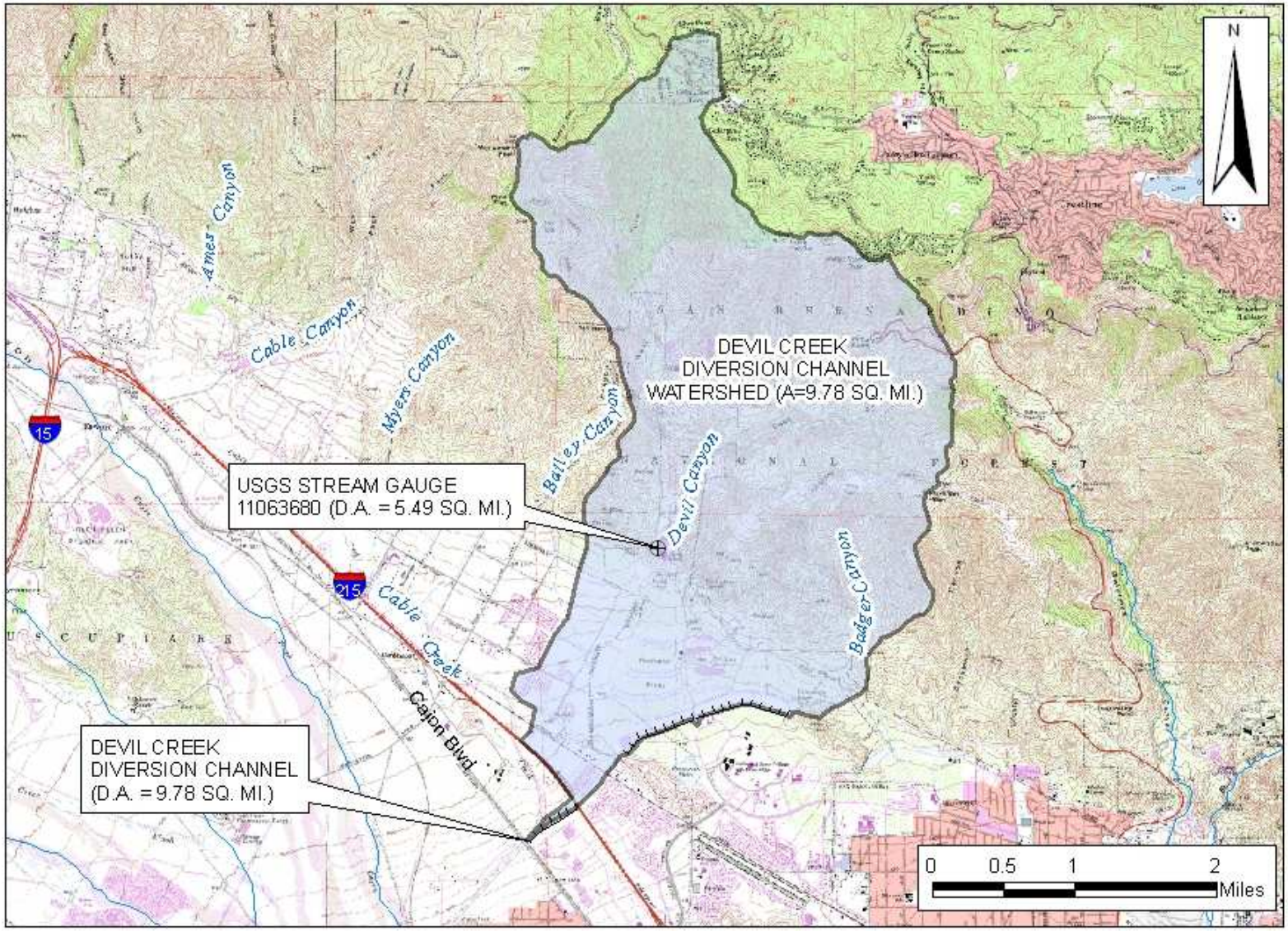


Figure 3 – Devil Creek Diversion Channel Watershed Map

Devil Creek Diversion Channel
County of San Bernardino, California

FEMA ID No.: 70
County System No.: 2-307-1A
Flood Source: Devil and Bailey Canyons and West Badger Channel
Communities: City of San Bernardino

Hydraulic Analysis

July 2009

TETRA TECH
17770 CARTWRIGHT ROAD, SUITE 500
IRVINE, CALIFORNIA 92614

Starting Water Surface Elevations

The critical flow depth elevations for each magnitude flood event were used as the starting upstream water surface elevation for each water surface profile. The computed water surface elevations along Cajon Creek at its confluence with the channel were used as the downstream controlling water surface elevations.

Determination of Stage-Discharge Uncertainty

Corps of Engineers guidelines for certification of levee systems are based on explicit incorporation of risk in assessing levee performance for hydrology and hydraulic engineering aspects. Hence a determination of stage-discharge uncertainty was performed in accordance with Chapter 5 of the Corps Engineering Manual 1110-2-1619 (Risk-Based Analysis for Flood Damage Reduction Studies). The results from the stage-discharge study are included in the Risk and Uncertainty Analysis Report.

HEC-RAS Results

A risk-based analysis of levee performance requires water surface profile determinations for a wide range of flow magnitudes. Water surface profiles were computed for the 2-year through 1000-year flood events using discharge frequency values determined in the Tetra Tech hydrologic analysis. Since FEMA certification requirements are based on the 100-year flood event (one percent chance exceedance flood), hydraulic results summarized below display only the 100-year flood event results. The hydraulic analysis was conducted using the 100-year peak discharges determined in the Tetra Tech hydrologic analysis of 4,380-cfs and 7,690-cfs at beginning of the channel and at the Cable Creek confluence, respectively. Table 1 shows the computed channel hydraulics of the 100-year peak discharge based on the mixed flow regime analysis. The computed water surface profile was plotted on Figure 2. The HEC-RAS computer printouts are presented in Appendix A.

Table 1 100-year Flood Event Computed Channel Hydraulics

HEC-RAS Station	100-Year Discharge (cfs)	Minimum Channel Elevation (ft.)	Estimated Water Surface Elevation (ft.)	Maximum Flow Depth (ft.)	Average Flow Velocity (ft./sec.)	Top Width (ft.)	Froude Number
77+10.77	4,380	1,576.72	1,579.69	2.97	9.83	150.00	1.00
76+31.91	4,380	1,565.47	1,566.63	1.16	27.12	139.50	4.44
75+48.36	4,380	1,555.27	1,556.35	1.08	31.58	128.40	5.35
73+94.91	4,380	1,555.27	1,557.31	2.04	19.93	107.90	2.46
72+49.94	4,380	1,552.28	1,559.29	7.01	7.06	89.27	0.47
70+90.61	4,380	1,551.44	1,558.68	7.24	8.99	67.30	0.59
69+38.99	4,380	1,550.29	1,557.02	6.73	13.01	50.00	0.88
68+81.71	Kendall Drive Bridge						

68+31.02	4,380	1,548.49	1,556.57	8.08	10.84	50.00	0.67
66+38.71	4,380	1,548.74	1,555.63	6.89	12.72	50.00	0.85
64+52.92	4,380	1,548.08	1,555.71	7.63	11.48	50.00	0.73
62+77.38	4,380	1,547.98	1,555.44	7.46	11.74	50.00	0.76
61+09.99	4,380	1,547.84	1,555.19	7.35	11.91	50.00	0.77
59+54.95	4,380	1,547.43	1,555.17	7.74	11.33	50.00	0.72
57+90.35	4,380	1,547.17	1,555.01	7.84	11.17	50.00	0.70
56+44.24	4,380	1,547.22	1,554.61	7.39	11.85	50.00	0.77
54+93.14	4,380	1,547.02	1,554.42	7.40	11.83	50.00	0.77
53+37.31	4,380	1,546.76	1,554.26	7.50	11.69	50.00	0.75
52+82.68	I-215 Freeway Bridge (Upstream end of Levee)						
51+59.66	4,380	1,546.43	1,554.09	7.66	11.44	50.00	0.73
50+25.34	4,380	1,546.20	1,553.97	7.77	11.28	50.00	0.71
48+65.43	4,380	1,546.14	1,553.71	7.57	11.57	50.00	0.74
47+36.18	4,380	1,546.23	1,553.03	6.80	12.87	50.00	0.87
46+79.95	Industrial Pkwy. Bridge						
46+24.43	4,380	1,545.60	1,552.40	6.80	12.89	50.00	0.87
44+75.15	4,380	1,545.35	1,552.17	6.82	12.85	50.00	0.87
43+10.12	4,380	1,545.15	1,551.80	6.65	13.18	50.00	0.90
41+41.01	4,380	1,544.85	1,551.03	6.18	14.17	50.00	1.00
39+89.99	4,380	1,544.06	1,549.94	5.88	14.89	50.00	1.08
38+05.32	4,380	1,541.90	1,546.38	4.48	19.56	50.00	1.63
36+15.66	4,380	1,539.66	1,543.73	4.07	21.52	50.00	1.88
34+42.94	4,380	1,537.69	1,541.59	3.90	22.44	50.00	2.00
32+72.56	4,380	1,536.14	1,540.03	3.89	22.49	50.00	2.01
31+11.43	4,380	1,534.11	1,539.12	5.01	21.85	40.00	1.72
29+64.18	4,380	1,532.47	1,537.25	4.78	22.92	40.00	1.85
29+14.02	BNSF Railroad Bridge (Downstream End of Levee)						
28+74.28	4,380	1,531.42	1,536.13	4.71	23.26	40.00	1.89
28+41.60	4,380	1,530.95	1,535.54	4.59	23.85	40.00	1.96
27+90.49	Cajon Blvd. Bridge						
27+49.42	4,380	1,529.46	1,541.06	11.60	5.03	75.00	0.26
26+91.83	7,690	1,529.38	1,541.05	11.67	8.79	75.00	0.45
26+28.36	7,690	1,528.67	1,534.89	6.22	20.78	79.55	1.70
25+40.42	7,690	1,528.34	1,539.49	11.15	8.66	110.78	0.54
24+34.11	7,690	1,527.65	1,539.35	11.70	8.98	103.42	0.55
23+21.91	7,690	1,527.00	1,538.89	11.89	10.19	92.87	0.63
22+00.73	7,690	1,526.00	1,538.21	12.21	11.75	81.34	0.73
20+81.76	7,690	1,525.20	1,536.50	11.30	15.22	70.66	1.00
19+66.33	7,690	1,525.00	1,535.64	10.64	16.06	69.57	1.07
18+45.60	7,690	1,524.00	1,534.97	10.97	15.80	69.66	1.02
17+21.77	7,690	1,523.56	1,533.90	10.34	16.71	67.75	1.10
15+93.19	7,690	1,523.00	1,533.28	10.28	16.60	69.57	1.09
14+65.63	7,690	1,522.00	1,532.32	10.32	16.82	68.95	1.10
13+31.79	7,690	1,521.00	1,531.13	10.13	17.10	68.55	1.12

Channel along Area Q in red.

11+81.31	7,690	1,519.17	1,529.31	10.14	18.60	65.29	1.24
10+55.47	7,690	1,519.00	1,529.21	10.21	16.56	70.54	1.11
09+42.19	7,690	1,517.87	1,527.14	9.27	19.42	64.68	1.37
08+32.22	7,690	1,517.00	1,525.70	8.70	20.95	62.86	1.53
07+02.70	7,690	1,516.00	1,524.29	8.29	22.10	61.03	1.61
05+83.29	7,690	1,515.00	1,523.29	8.29	22.66	60.61	1.69
04+44.43	7,690	1,513.15	1,521.50	8.35	24.01	58.04	1.80
03+33.02	7,690	1,513.00	1,520.97	7.97	23.81	59.82	1.80
02+13.23	7,690	1,512.00	1,519.84	7.84	24.34	58.75	1.85
00+93.61	7,690	1,510.41	1,518.50	8.09	25.02	57.28	1.90
00+14.84	7,690	1,510.00	1,517.89	7.89	25.14	57.64	1.92
-29+35.00	7,690	1,485.00	1,492.44	7.44	27.45	55.55	2.15

The computed water surface elevations with respect to the top of levee elevations are summarized in Table 2 for the 100-year flood event. Figure 2 depicts the profile of the top of levee, current channel invert, and computed water surface along the channel's leveed reach. The table and figure indicate that the top of levee is a minimum of 10.11-feet higher than the computed water surface for the 100-year flood event.

Table 2 100-year Flood Event Computed Water Surface Elevations versus Top of Levee Elevations

HEC-RAS Station	Top of Levee Elevation (ft.)	Channel Invert Elevation (ft.)	Computed 100-year Water Surface Elevation (ft.)	Freeboard (ft.)	FEMA Required Freeboard (ft.)
52+82.68	I-215 Freeway Bridge (Upstream end of Levee)				
51+59.66	1564.96	1546.43	1554.09	10.87	3.5
50+25.34	1564.09	1546.20	1553.97	10.12	3
48+65.43	1564.32	1546.14	1553.71	10.61	3
47+36.18	1566.44	1546.23	1553.03	13.41	3
46+24.43	1566.05	1545.60	1552.40	13.65	3
44+75.15	1567.29	1545.35	1552.17	15.12	3
43+10.12	1566.84	1545.15	1551.8	15.04	3
41+41.01	1564.89	1544.85	1551.03	13.86	3
39+89.99	1562.82	1544.06	1549.94	12.88	3
38+05.32	1560.45	1541.90	1546.38	14.07	3
36+15.66	1559.59	1539.66	1543.73	15.86	3
34+42.94	1558.24	1537.69	1541.59	16.65	3
32+72.56	1553.86	1536.14	1540.03	13.83	3
31+11.43	1549.23	1534.11	1539.12	10.11	3
29+64.18	1551.59	1532.47	1537.25	14.34	3
29+14.02	BNSF Railroad Bridge (Downstream End of Levee)				

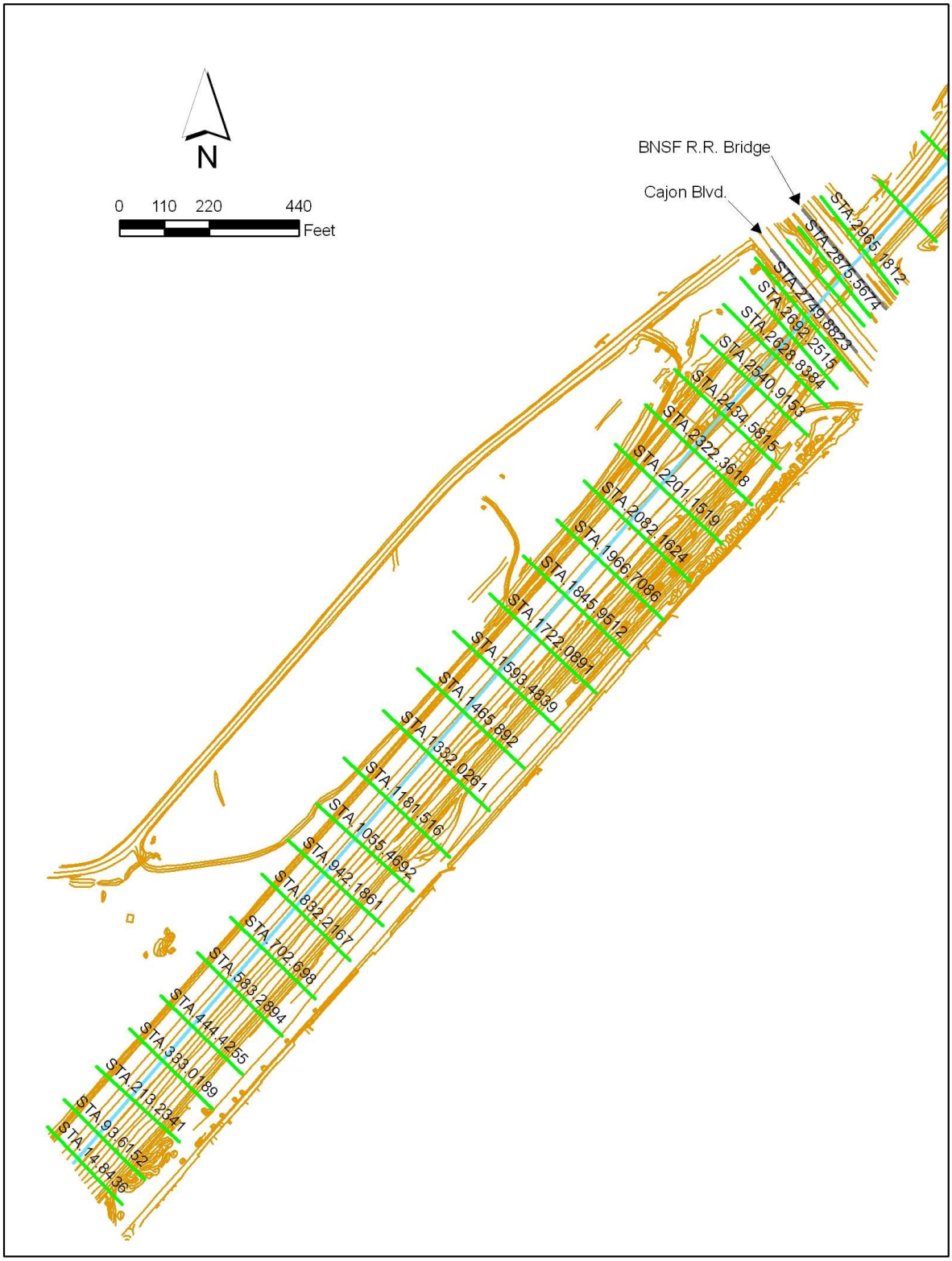
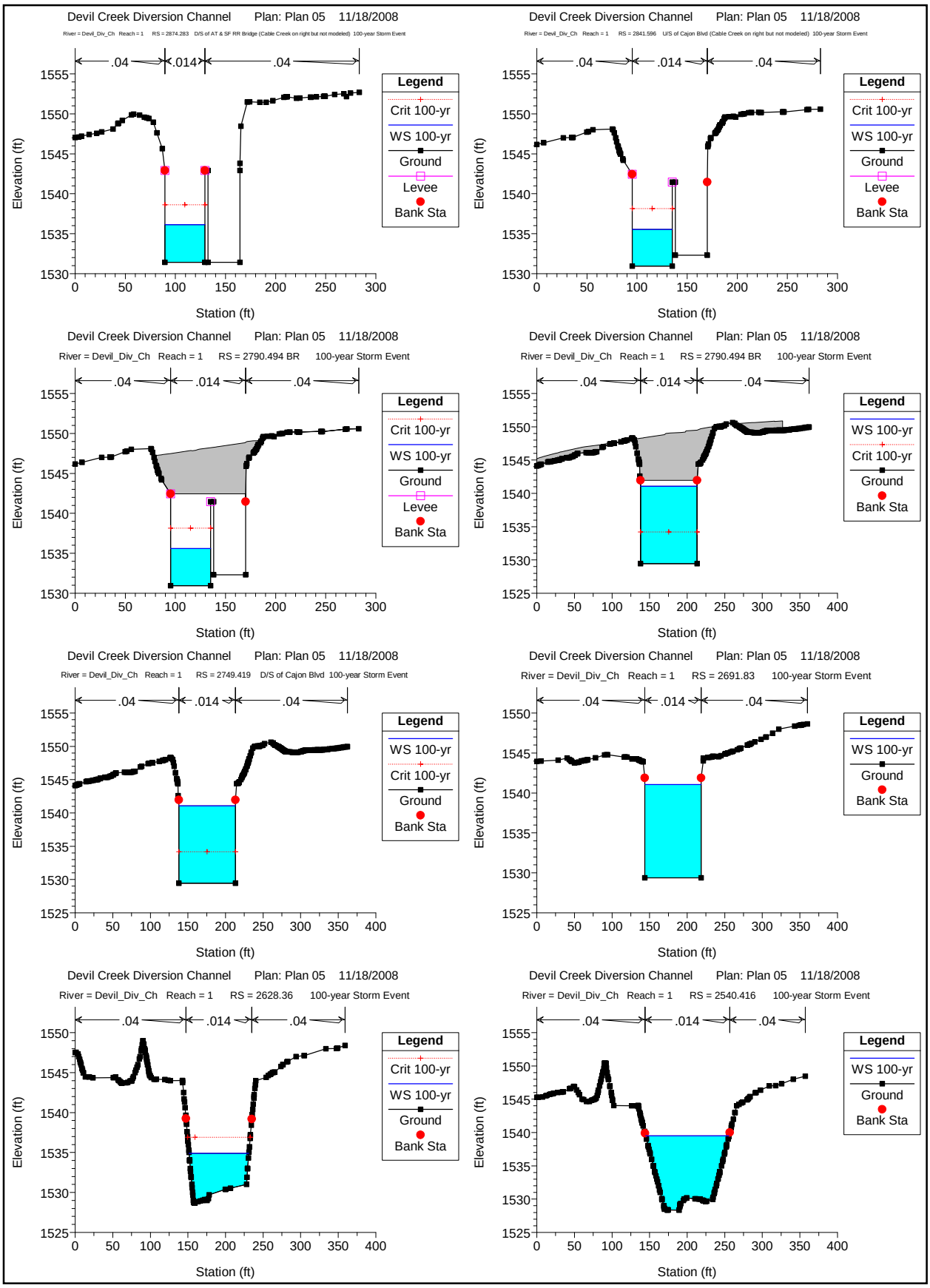


Figure 1 – (Continued)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River = Devil_Div_Ch Reach = 1 RS = 2874.283 D/S of AT & SF RR Bridge (Cable Creek on right but not modeled) 100-year Storm Event
Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
River = Devil_Div_Ch Reach = 1 RS = 2841.596 U/S of Cajon Blvd (Cable Creek on right but not modeled) 100-year Storm Event
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Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
River = Devil_Div_Ch Reach = 1 RS = 2790.494 BR 100-year Storm Event
Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
River = Devil_Div_Ch Reach = 1 RS = 2749.419 D/S of Cajon Blvd 100-year Storm Event
Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
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Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
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Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
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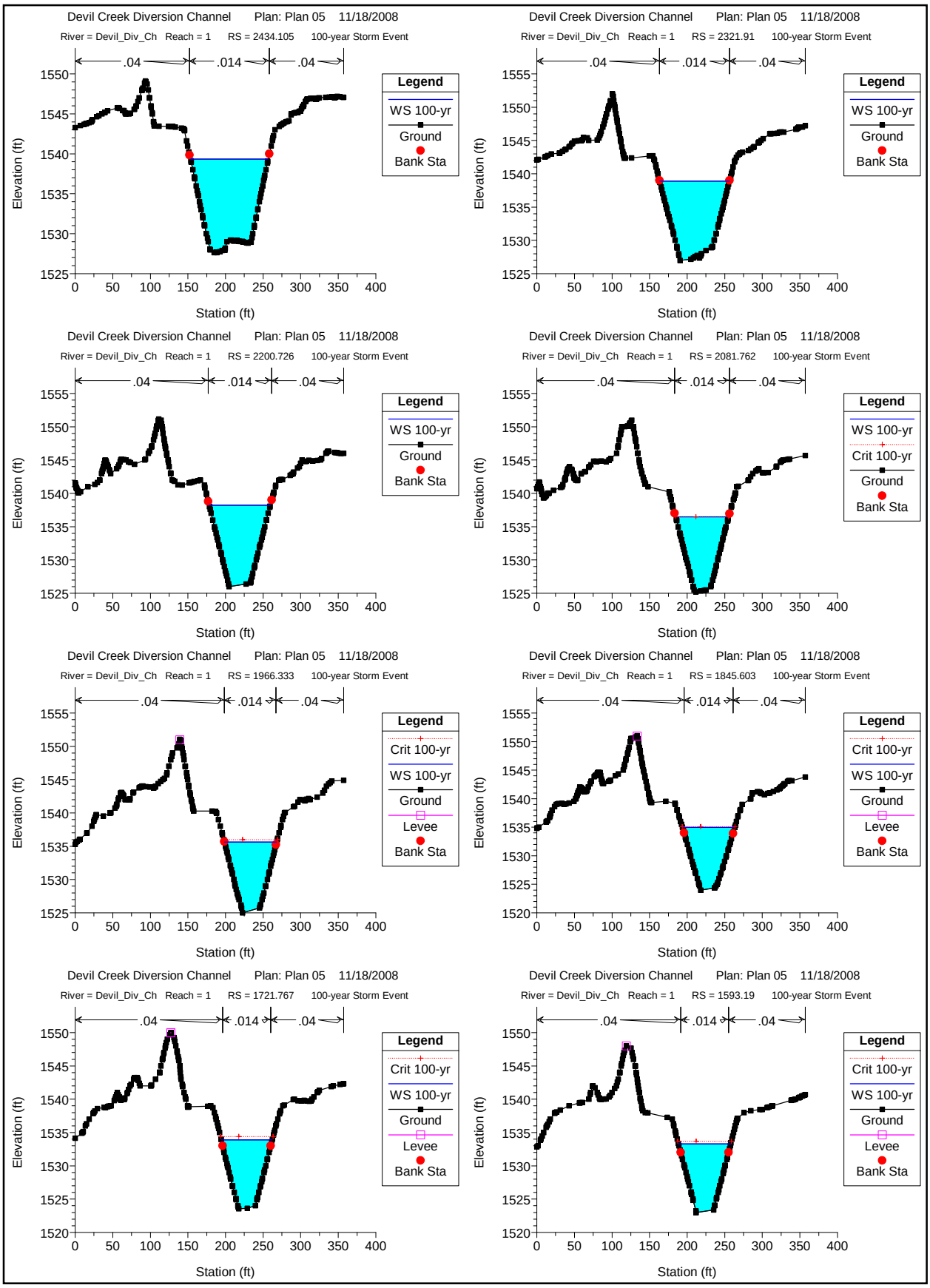
.04
.014
.04
Legend
Crit 100-yr
WS 100-yr
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)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Legend
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
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River = Devil_Div_Ch Reach = 1 RS = 2321.91 100-year Storm Event
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Legend
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Legend
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Legend
WS 100-yr
Crit 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
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WS 100-yr
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
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Legend
Crit 100-yr
WS 100-yr
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
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Legend
Crit 100-yr
WS 100-yr
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
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Bank Sta
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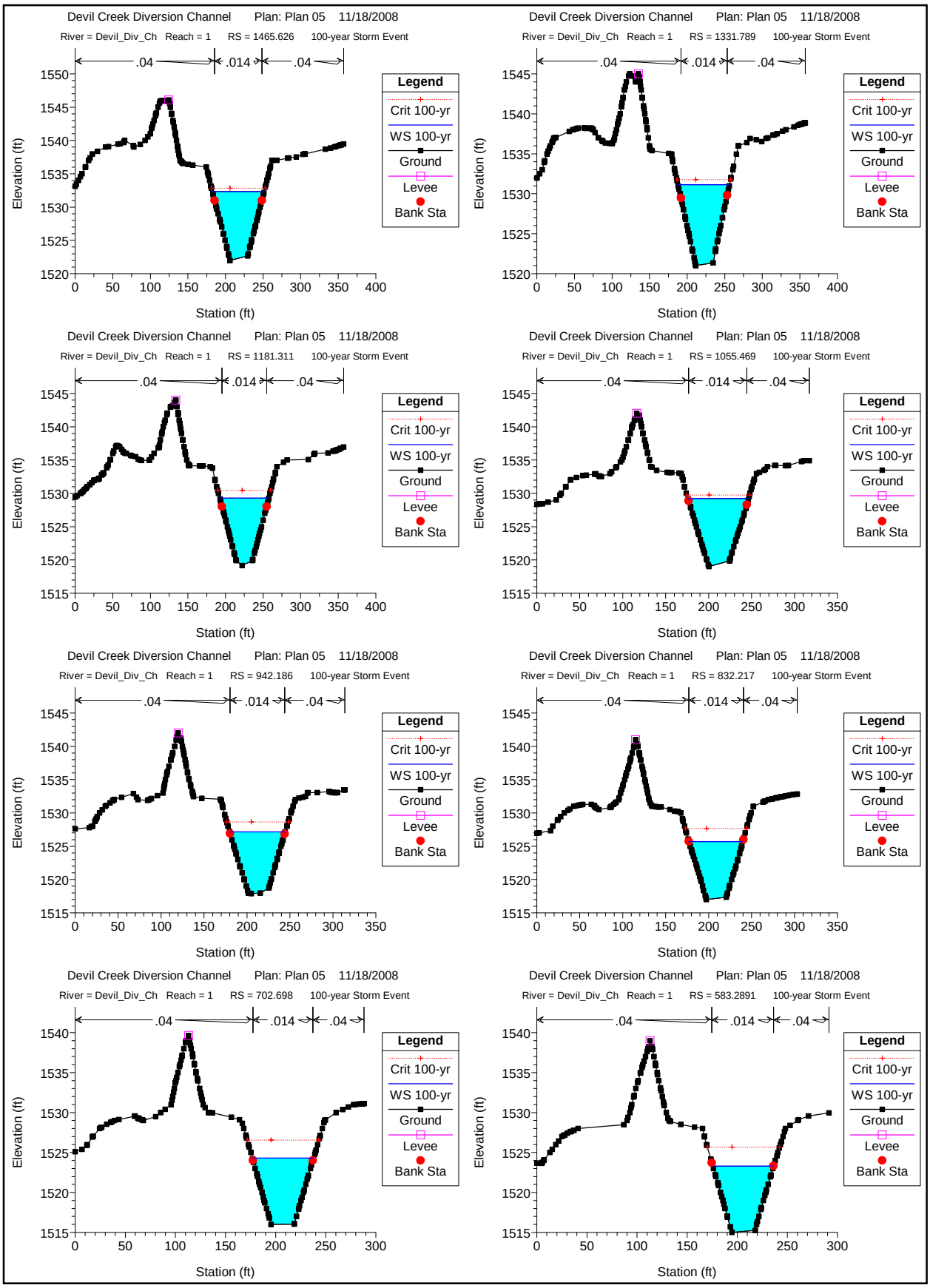
Station (ft)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Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
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Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
River = Devil_Div_Ch Reach = 1 RS = 1055.469 100-year Storm Event
Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
River = Devil_Div_Ch Reach = 1 RS = 942.186 100-year Storm Event
Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
River = Devil_Div_Ch Reach = 1 RS = 832.217 100-year Storm Event
Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
River = Devil_Div_Ch Reach = 1 RS = 702.698 100-year Storm Event
Devil Creek Diversion Channel Plan: Plan 05 11/18/2008
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.014
.04
Legend
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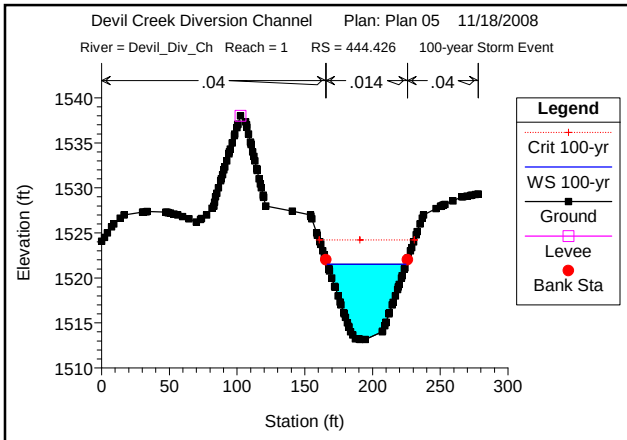
WS 100-yr
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)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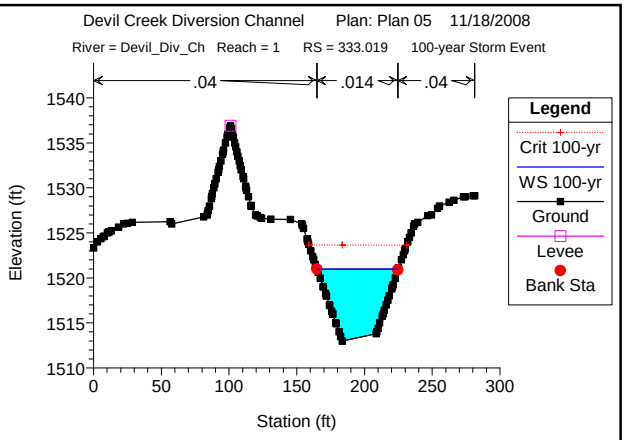
Station (ft)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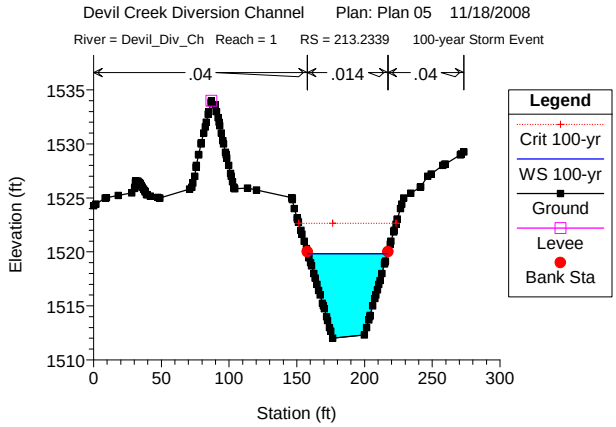
Station (ft)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WS 100-yr
Ground
Levee
Bank Sta
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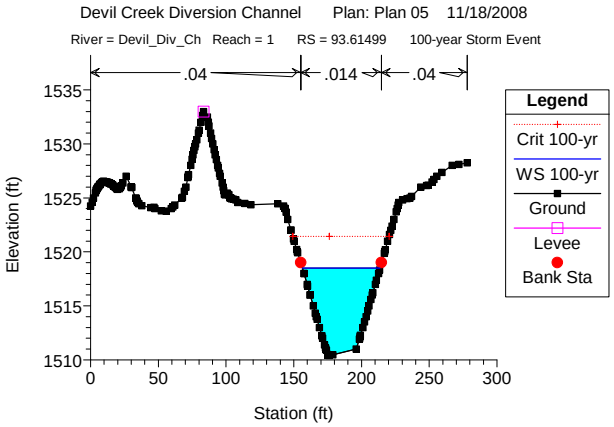
Station (ft)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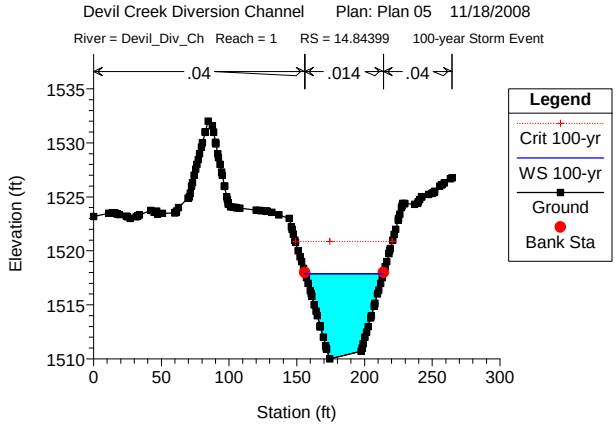
WS 100-yr
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)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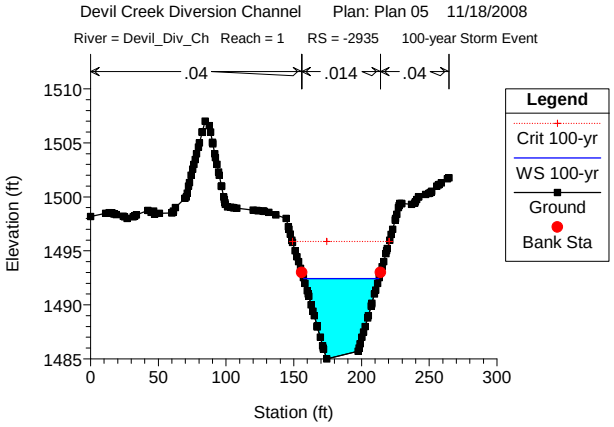
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)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.014
.04
Legend
Crit 100-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

Normal Depth Analysis

Worksheet for Trapezoidal Channel - 1

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.014	
Channel Slope	0.00300	ft/ft
Normal Depth	12.00	ft
Left Side Slope	2.25	ft/ft (H:V)
Right Side Slope	2.25	ft/ft (H:V)
Bottom Width	20.00	ft

Results

Discharge	12146.94	ft^3/s
Flow Area	564.00	ft^2
Wetted Perimeter	79.09	ft
Hydraulic Radius	7.13	ft
Top Width	74.00	ft
Critical Depth	14.05	ft
Critical Slope	0.00152	ft/ft
Velocity	21.54	ft/s
Velocity Head	7.21	ft
Specific Energy	19.21	ft
Froude Number	1.38	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

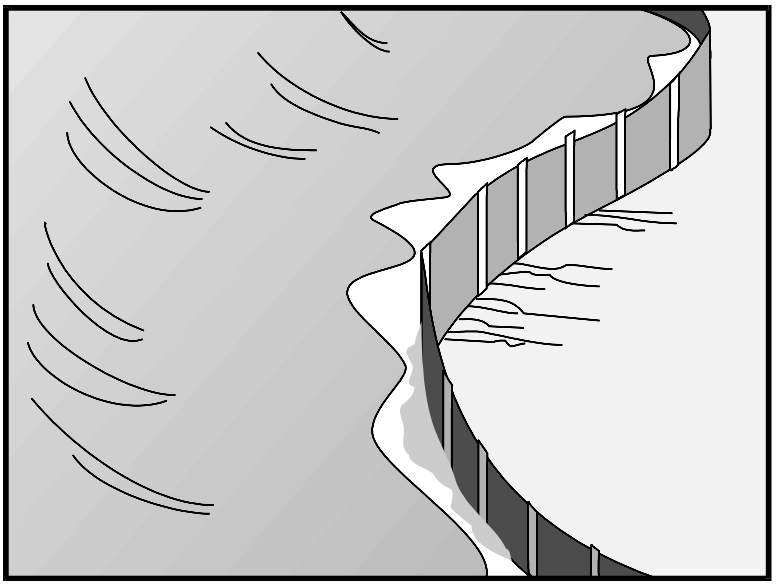
Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	12.00	ft
Critical Depth	14.05	ft
Channel Slope	0.00300	ft/ft

ATTACHMENT 5

CASQA BEST MANAGEMENT HANDBOOK DETAILS

SILT FENCE (SE-1)
FIBER ROLLS (SE-5)

Silt Fence SE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains water, promoting sedimentation of coarse sediment behind the fence. Silt fence does not retain soil fine particles like clays or silts.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences should not be used in locations where the flow is concentrated. Silt fences should always be used in combination with erosion controls. Suitable applications include:

- At perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

Targeted Constituents

Sediment (coarse sediment)	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm SE-12 Manufactured Linear Sediment Controls

SE-13 Compost Socks and Berms

SE-14 Biofilter Bags

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Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard.
- Do not use silt fence to divert water flows or place across any contour line.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Must be trenched and keyed in.
- Not intended for use as a substitute for Fiber Rolls (SE-5), when fiber rolls are being used as a slope interruption device.
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap coarse sediment by intercepting and detaining sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Silt fence should be used in combination with erosion controls up-slope in order to provide the most effective sediment control.
- Silt fence alone is not effective at reducing turbidity. (Barrett and Malina, 2004)
- Designers should consider diverting sediment laden water to a temporary sediment basin or trap. (EPA, 2012)
- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Efficiency of silt fences is primarily dependent on the detention time of the runoff behind the control. (Barrett and Malina, 2004)
- The drainage area above any fence should not exceed a quarter of an acre. (Rule of Thumb-100-feet of silt fence per 10,000 square feet of disturbed area.) (EPA 2012)

- The maximum length of slope draining to any point along the silt fence should be 100 ft per foot of silt fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area draining to the silt fence is permanently stabilized, after which, the silt fence fabric and posts should be removed and properly disposed.
- J-Hooks, which have ends turning up the slope to break up long runs of fence and provide multiple storage areas that work like mini-retention areas, may be used to increase the effectiveness of silt fence.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

In areas where high winds are anticipated the fence should be supported by a plastic or wire mesh. The geotextile fabric of the silt fence should contain ultraviolet inhibitors and stabilizers to provide longevity equivalent to the project life or replacement schedule.

- Layout in accordance with the attached figures.
- For slopes that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to protect silt fence from rocks (e.g., rockfall netting) ensure the integrity of the silt fence installation.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
- Use is generally limited to areas affected by high winds.
- Area draining to fence produces moderate sediment loads.

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. The fabric should conform to the requirements in ASTM designation D6461.
- Wooden stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the

thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts instead of wood stakes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).
- Bottom of the silt fence should be keyed-in a minimum of 12 in.
- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.
- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.
- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.
- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.
- The trench should be backfilled with native material and compacted.
- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of 1/3 and a maximum of ½ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the geotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
  - Ease of installation (most often done with a 2 person crew).
  - Minimal soil disturbance.
  - Better level of compaction along fence, less susceptible to undercutting
  - Uniform installation.
- Limitations:
  - Does not work in shallow or rocky soils.
  - Complete removal of geotextile material after use is difficult.
  - Be cautious when digging near potential underground utilities.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches 1/3 of the barrier height.
- Silt fences should be left in place until the upgradient area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.

- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Monitoring Data on Effectiveness of Sediment Control Techniques, Proceedings of World Water and Environmental Resources Congress, Barrett M. and Malina J. 2004.

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Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991.

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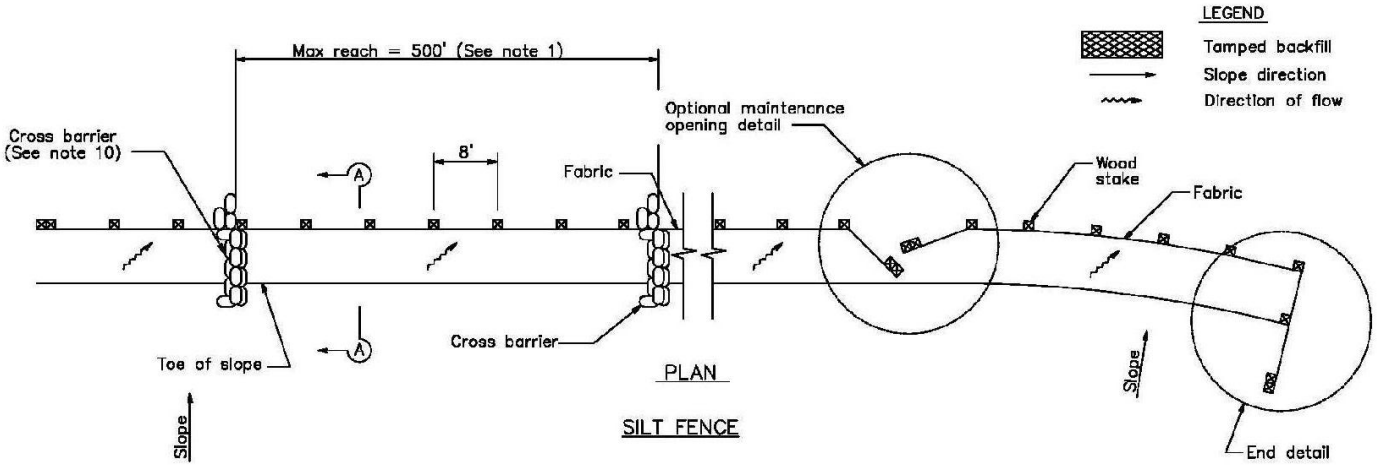
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Silt Fence

SE-1

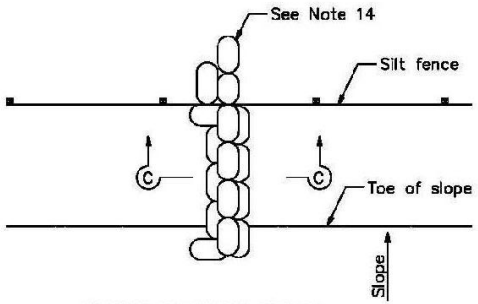


PLAN

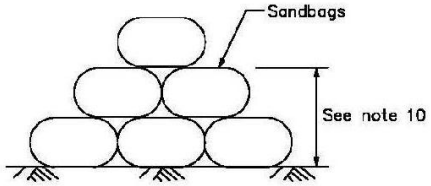
SILT FENCE

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'–0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'–0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow–through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3–4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.



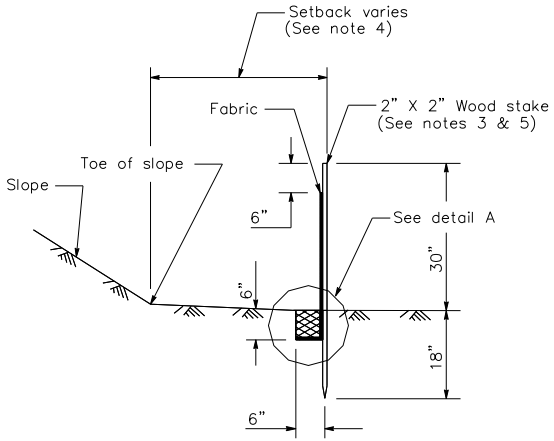
CROSS BARRIER DETAIL



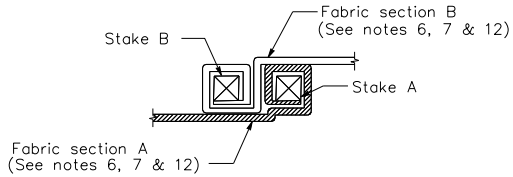
SECTION C–C

Silt Fence

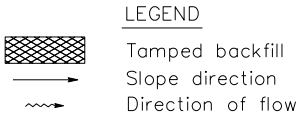
SE-1

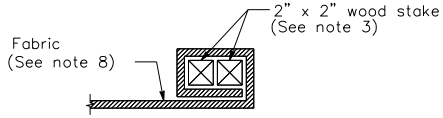


SECTION A–A

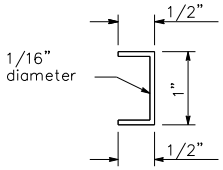


JOINING SECTION DETAIL (TOP VIEW)



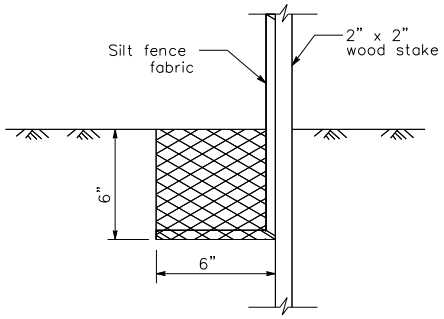


END STAKE DETAIL (TOP VIEW)

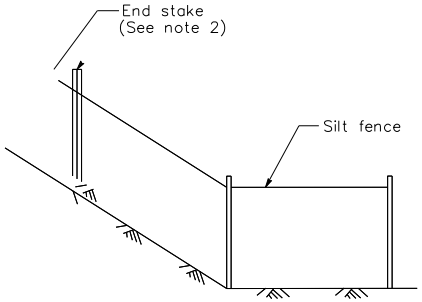


STAPLE DETAIL

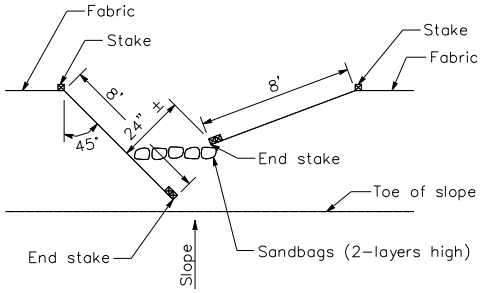
(SEE NOTE 9)



DETAIL A

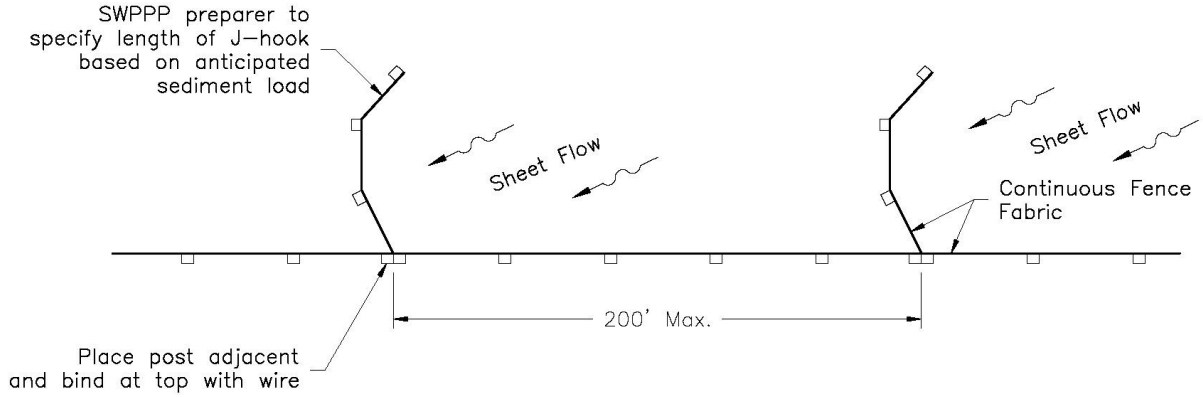


END DETAIL



OPTIONAL MAINTENANCE OPENING DETAIL

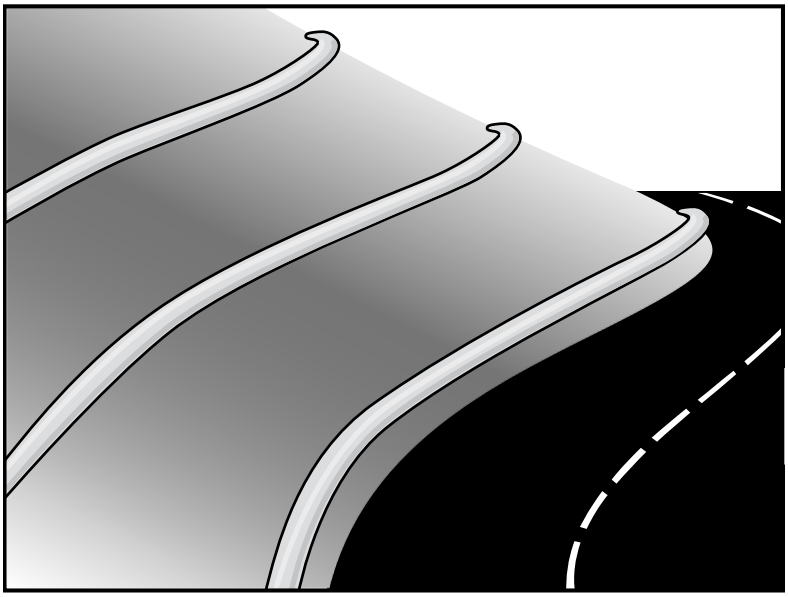
(SEE NOTE 11)


SWPPP preparer to specify length of J–hook based on anticipated sediment load
Sheet Flow
Sheet Flow
Continuous Fence Fabric
200' Max.
Place post adjacent and bind at top with wire

Plan

J–HOOK

Fiber Rolls SE-5



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-12 Manufactured Linear Sediment Controls

SE-14 Biofilter Bags

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- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

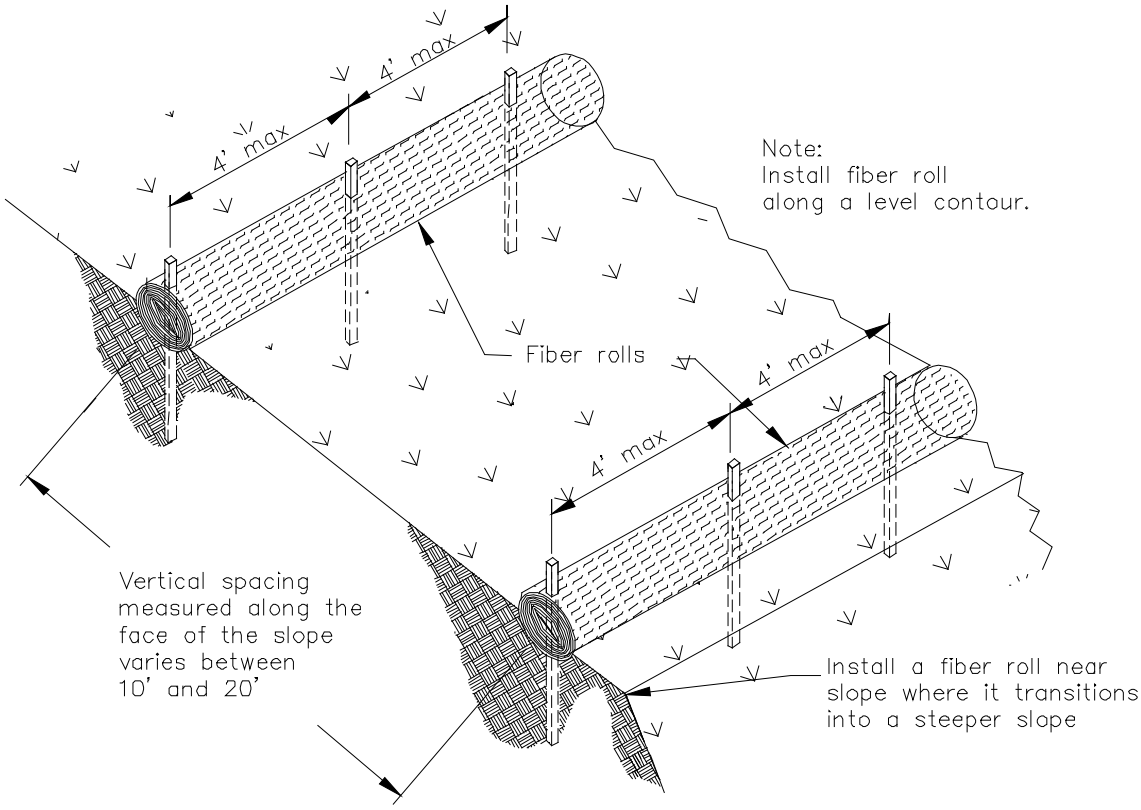
in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

References

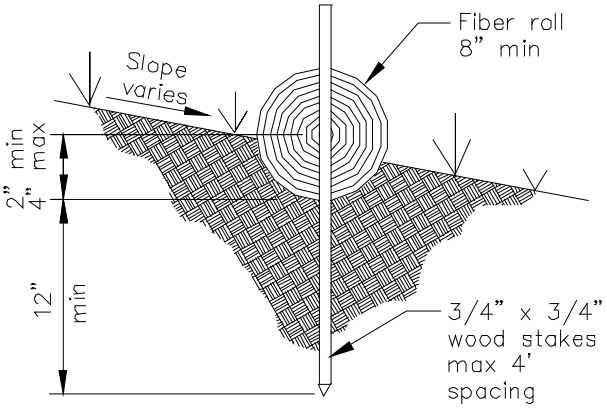
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



TYPICAL FIBER ROLL INSTALLATION

N.T.S.



ENTRENCHMENT DETAIL

N.T.S.

APPENDIX C

Habitat and Jurisdictional Assessment – Vulcan Area Q
(ELMT Consulting, Inc. – May 2020)

VULCAN AREA Q

SAN BERNARDINO COUNTY, CALIFORNIA

Habitat and Jurisdictional Assessment

Prepared For:

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951.285.6014

June 2019
Updated May 2020

VULCAN AREA Q

SAN BERNARDINO COUNTY, CALIFORNIA

Habitat and Jurisdictional Assessment

The undersigned certify that the statements furnished in this report and exhibits present data and information required for this biological evaluation, and the facts, statements, and information presented is a complete and accurate account of the findings and conclusions to the best of our knowledge and beliefs.

Travis J. McGill
Director

Thomas J. McGill, Ph.D.
Managing Director

June 2019
Updated May 2020

Executive Summary

This report contains the findings of ELMT Consulting's (ELMT) Habitat and Jurisdictional Assessment for Vulcan Materials Company's Area Q Project (project) located in an unincorporated area of San Bernardino County, California. ELMT biologists Thomas J. McGill, Ph.D. and Travis J. McGill inventoried and evaluated the condition of the habitat within the project site on May 11 and June 1, 2017. A final site was conducted on February 26, 2018.

The project site consists of both developed and undeveloped land that has been subject to a variety of human-related disturbances from existing rural residential developments, weed abatement activities, and illegal trash dumping. These land uses have resulted in most of the project site being converted to a mosaic of non-native grasses and highly disturbed natural plant communities that have been cut off from the influences of the Cajon Wash by the railroad tracks that border the western boundary of the site. Several residential developments are primarily found on the western half of the project site. These developments consist of homes and storage yards.

Four (4) plant communities were observed within the boundaries of the project site during the habitat assessment: highly disturbed Riversidean alluvial fan sage scrub (RAFSS), buckwheat scrub, non-native grassland, and ornamental. In addition, the project site contains land cover types that would be classified as disturbed and developed. The isolated and senescing RAFSS habitats identified on the project site has either succeeded to upland chaparral habitat or are no longer functioning as viable RAFSS habitats with long-term conservation value. More specifically, the RAFSS plant community on-site been extensively disturbed by human activity for decades, and is fragmented by roads, trails, and development. The project site is bordered to the north by existing sand and gravel operations, to the south by residential developments and to the east by industrial developments. The project site is bordered by the raised Union Pacific Railroad tracks and man-made berm on its western boundary, which separates the project site's RAFSS habitats from less disturbed vegetation associated with the Cajon Wash. The RAFSS habitat within the proposed project footprint is not occupied by any listed or otherwise special-status plant or wildlife species, indicating minimal or no value as biological habitat. Therefore, the loss of the disturbed, fragmented, low-quality RAFSS on the project site is not considered a significant impact and would not require specific mitigation.

Twenty-one (21) special-status plant species have been recorded in the CNDDB and CNPS in the San Bernardino North and Devore USGS 7.5-minute quadrangle. Based on habitat requirements, availability and quality of habitats needed by each special-status plant species,

and habitat assessment results, it was determined that the project site has a moderate to high potential to provide suitable habitat for six (6) special-status plant species. Singlewhorl burrobrush (*Ambrosia monogyra*), Parry's spineflower (*Chorizanthe parryi var. parryi*), White-bracted spineflower (*Chorizanthe xanti var. leucotheca*), slender-horned spineflower (*Dodecahema leptoceras*), Santa Ana River woollystar (*Eriastrum densifolium ssp. sanctorum*), and Mesa horkelia (*Horkelia cuneata var. puberula*).

Thirty-one (31) special-status wildlife species have been recorded in the San Bernardino North and Devore USGS 7.5-minute quadrangle. San Diego black-tailed jackrabbit (*Lepus californicus bennettii*), a California "Species of Special Concern," was the only special-status species observed on the project site.

Based on habitat requirements for specific special-status wildlife species and the availability and quality of habitats needed by each species, it was determined that the project site has a moderate potential to support burrowing owl (*Athene cunicularia*), San Bernardino kangaroo rat (*Dipodomys merriami parvus*; SBKR), California horned lark (*Eremophila alpestris actia*), southern California rufous-crowned sparrow (*Aimophila ruficeps canescens*), Bell's sage sparrow (*Artemisiospiza belli belli*), coastal whiptail (*Aspidoscelis tigris stejnegeri*), northwestern San Diego pocket mouse (*Chaetodipus fallax fallax*), pallid San Diego pocket mouse (*Chaetodipus fallax pallidus*), coast horned lizard (*Phrynosoma blainvillii*); and a low potential to support orangethroat whiptail (*Aspidoscelis hyperythra*), San Diego desert woodrat (*Neotoma lepida intermedia*), Los Angeles pocket mouse (*Perognathus longimembris brevinasus*), and coastal California gnatcatcher (*Polioptila californica californica*). While suitable habitat may exist, extensive surveys were completed and none of these species were observed on the project site. All remaining special-status wildlife species are absent from the project site based on habitat surveys, habitat requirements, availability and quality of habitat needed by each species, and known distributions.

The project site is located within federally designated Critical Habitat for San Bernardino kangaroo rat (*Dipodomys merriami parvus*; SBKR). Since the project site is located within designated Critical Habitat and is adjacent to occupied habitat (although separated from the adjacent habitat associated with the Cajon Wash by an elevated railroad tracks), a SBKR presence/absence trapping study was conducted within suitable habitat on the project site. No SBKR were captured during the 2017 trapping studies.

No jurisdictional drainage and/or wetland features were observed within the project site during the field survey. It should be noted that a concrete-lined trapezoidal channel (Devils Creek

Diversion Channel) runs northeast to southwest along the southeastern boundary of the project site, outside the limits of disturbance. The concrete-lined channel receives water from Cable Creek and the Sweetwater Percolation Basins and is tributary to Cajon Wash. In addition, the Cajon Wash runs north to south west of the project site, west of the Union Pacific railroad, outside of the project footprint. Devils Creek Diversion Channel and Cajon Wash are located outside of the project footprint and no impacts will occur to these features from implementation of the proposed project.

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APPENDIX

Appendix A Site Photographs
Appendix B Potentially Occurring Special-Status Biological Resources
Appendix C 2017 SBKR Trapping Study

LIST OF ACRONYMS

CDFW	California Department of Fish and Wildlife
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
Corps	United States Army Corps of Engineers
CWA	Clean Water Act
GIS	Geographic Information System
MBTA	Migratory Bird Treaty Act
NRCS	Natural Resources Conservation Service
RAFSS	Riversidean Alluvial Fan Sage Scrub
Regional Board	Regional Water Quality Control Board
SBKR	San Bernardino Kangaroo Rat
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

Section 1 Introduction

This report contains the findings of ELMT Consulting's (ELMT) Habitat and Jurisdictional Assessment for Vulcan Materials Company's Area Q Project (project) located in an unincorporated area of San Bernardino County, California. ELMT biologists Thomas J. McGill, Ph.D. and Travis J. McGill inventoried and evaluated the condition of the habitat within the project site on May 11 and June 1, 2017. A third field investigation was conducted on February 26, 2018.

The habitat assessment was conducted to characterize current site conditions and to assess the probability of occurrence of special-status[1] plant and wildlife species that could pose a constraint to project implementation. This report provides an in-depth assessment of the habitats, Riversidean Alluvial Fan Sage Scrub (RAFSS), found on the project site and their potential to support burrowing owl (*Athene cunicularia*), San Bernardino kangaroo rat (*Dipodomys merriami parvus*; SBKR), coastal California gnatcatcher (*Polioptila californica californica*), slender-horned spineflower (*Dodecahema leptoceras*), and Santa Ana River woolly star (*Eriastrum densifolium* ssp. *sanctorum*).

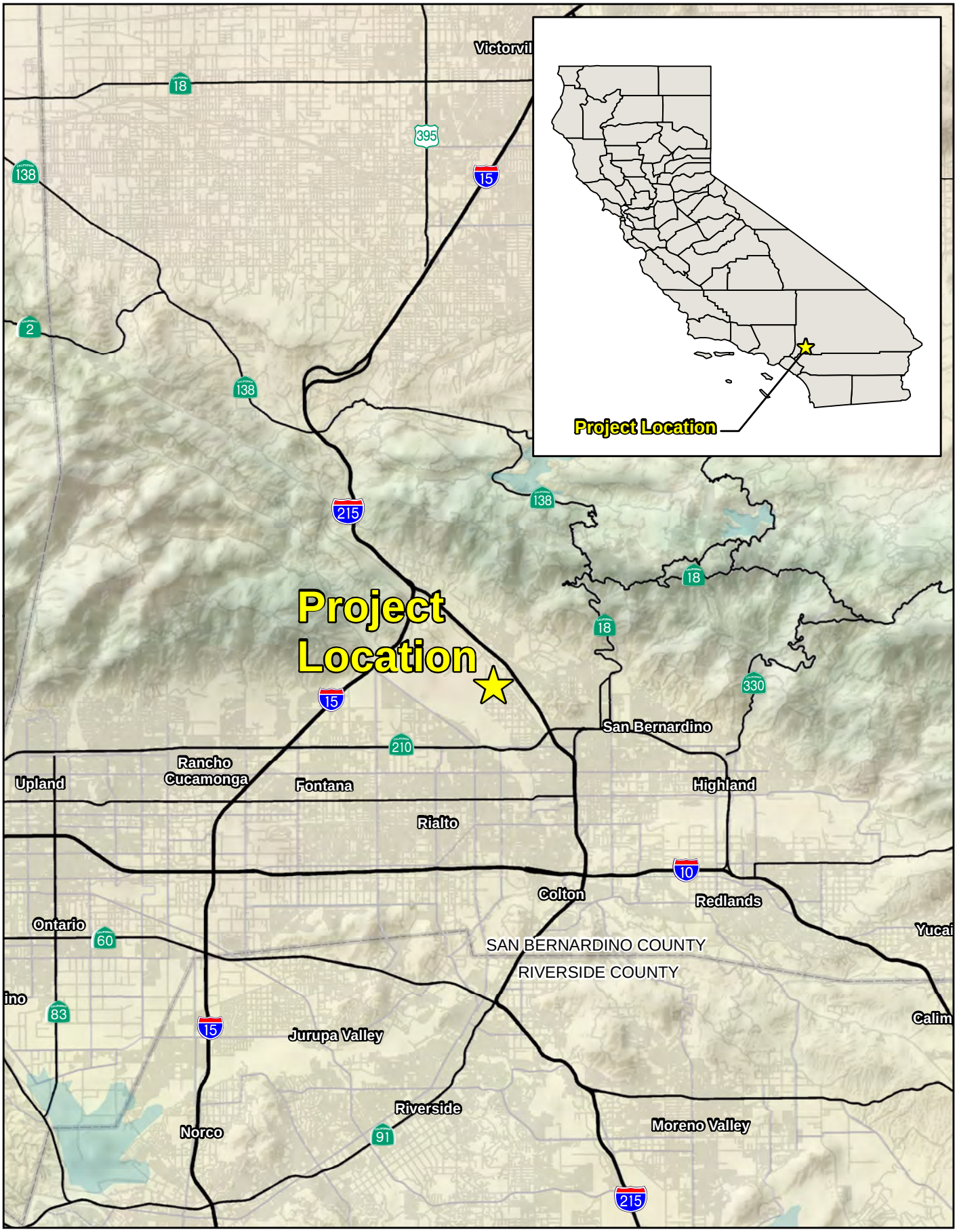
In addition to the habitat assessment, ELMT conducted a jurisdictional assessment in order to preliminarily identify jurisdictional features that have the potential to fall under the regulatory authority of the U.S. Army Corps of Engineers (Corps), the Regional Water Quality Control Board (Regional Board), and the California Department of Fish and Wildlife (CDFW) pursuant to Sections 401 and 404 of the Federal Clean Water Act (CWA), the California Porter-Cologne Water Quality Control Act, and Section 1600 *et seq.* of the California Fish and Game Code.

1.1 PROJECT LOCATION

The project site is generally north of State Route 210, east of Interstate 15, and west of Interstate 215 in an unincorporated area of San Bernardino County, California (refer to Exhibit 1, *Regional Vicinity*). The project site is depicted on the San Bernardino North quadrangle of the United States Geological Survey's (USGS) 7.5-minute topographic map series in an un-sectioned area of Township 1 north, Range 5 west (refer to Exhibit 2, *Site Vicinity*). Specifically, the project site is bordered by a concrete-lined trapezoidal flood control channel

[1] As used in this report, "special-status" refers to plant and wildlife species that are federally or State listed, proposed, or candidates; plant species that have been designated a California Native Plant Society (CNPS) Rare Plant Rank 1.B or 2; and wildlife species that are designated by the California Department of Fish and Wildlife (CDFW) as fully protected, species of special concern, or watch list species. Note that not all "special-status" species require protection or mitigation under the law.

on is southeastern boundary, the Union Pacific railroad tracks and berm on its western boundary, Area L, an active surface mining operation on its northern boundary, and Cajon Boulevard on its eastern boundary. The project site is separated from Cajon Wash and Lytle Creek by the Union Pacific railroad track and man-made berm and is located outside of the 100-year flood plain.



VULCAN AREA Q
HABITAT AND JURISDICTIONAL ASSESSMENT

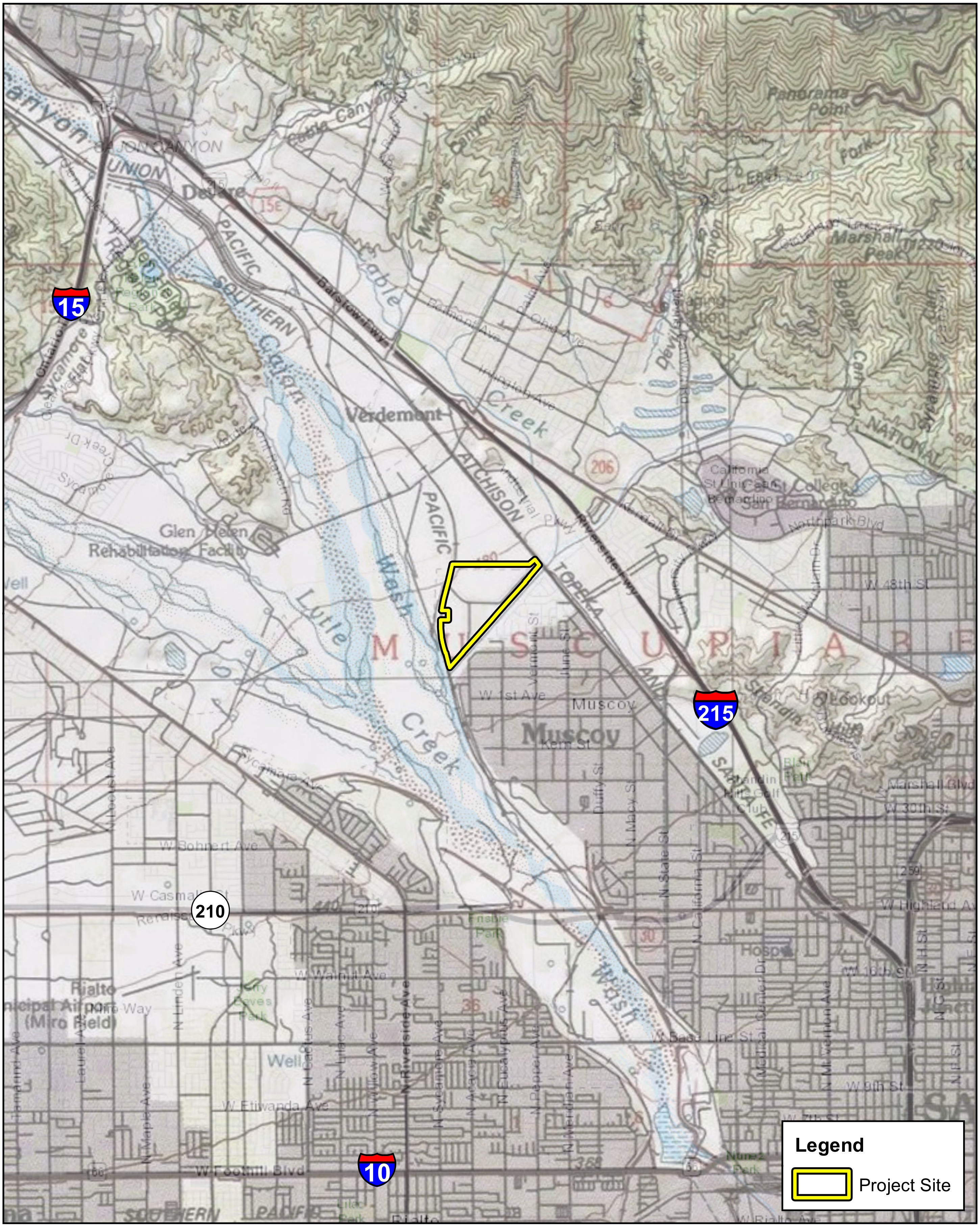
ELMT CONSULTING

0 2.5 5 Miles

Source: ESRI Relief Map, National Highway Planning Network

Regional Vicinity

Exhibit 1



VULCAN AREA Q
HABITAT AND JURISDICTIONAL ASSESSMENT

Site Vicinity

Exhibit 2

ELMT CONSULTING

0 0.5 1 2 Miles

Source: USA Topographic Map, San Bernardino County

VULCAN AREA Q
HABITAT AND JURISDICTIONAL ASSESSMENT

ELMT CONSULTING

0 250 500 1,000 Feet

Source: ESRI Aerial Imagery, San Bernardino County

Project Site

Exhibit 3

Section 2 Methodology

ELMT conducted a thorough literature review and records search to determine which special-status plant and wildlife species have the potential to occur on or within the general vicinity of the project site. In addition, a general habitat assessment and field investigation was conducted in order to document existing conditions onsite to help determine the potential for special-status plant and wildlife species to occur and to document potential jurisdictional features that occur on and adjacent to the project site.

2.1 LITERATURE REVIEW

Prior to conducting the field survey, a literature review and records search was conducted for special-status biological resources potentially occurring on or within the vicinity of the project site. Previously recorded occurrences of special-status plant and wildlife species and their proximity to the project site were determined through a query of the California Department of Fish and Wildlife (CDFW) CNDDB Rarefind 5, the California Native Plant Society (CNPS) Electronic Inventory of Rare and Endangered Vascular Plants of California, Calflora Database, compendia of special-status species published by CDFW, and the United States Fish and Wildlife Service (USFWS) species listings.

All available reports, survey results, and literature detailing the biological resources previously observed on or within the vicinity of the project site were reviewed to understand existing site conditions and note the extent of any disturbances that have occurred on the project site that would otherwise limit the distribution of special-status biological resources. Standard field guides and texts were reviewed for specific habitat requirements of special-status and non-special-status biological resources, as well as the following resources:

- Google Earth Pro historic aerial imagery (1995 – 2018);
- San Bernardino County General Plan (URS 2007);
- United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Web Soil Survey;
- USFWS Critical Habitat designations for Threatened and Endangered Species;
- USFWS Endangered Species Profile and/or Primary Constituent Elements for SBKR, coastal California gnatcatcher, slender-horned spineflower, and Santa Ana River woolly star; and
- *Claremonters v. City of Claremont*, 2005 Cal. App. Unpub. LEXIS 9074

The literature review provided a baseline from which to inventory the biological resources potentially occurring within the project site. Additional recorded occurrences of those species found on or near the project site were derived from database queries. The CNDDB database was used, in conjunction with ArcGIS software, to locate the occurrence records and determine the distance from the project site.

2.2 HABITAT ASSESSMENT AND FIELD INVESTIGATION

ELMT biologists Thomas J. McGill, Ph.D. and Travis J. McGill inventoried and evaluated the condition of the habitat within the project site on May 11 and June 1, 2017. A third site visit was conducted on February 26, 2018. Plant communities identified on aerial photographs during the literature review were verified by walking meandering transects through the plant communities and along boundaries between plant communities. Aerial photography was reviewed prior to the site investigation to locate potential natural wildlife corridors and linkages that may support the movement of wildlife through the area. These areas identified on aerial photography were then walked during the field investigation.

Special attention was paid to any special-status habitats and/or undeveloped, natural areas, which have a higher potential to support special-status plant and wildlife species. Areas providing suitable habitat for burrowing owl were closely surveyed for signs of presence during the habitat assessment. Methods to detect the presence of burrowing owl included direct observation, aural detection, and signs of presence including pellets, white wash, feathers, or prey remains.

All plant and wildlife species observed, as well as dominant plant species within each plant community, were recorded. Plant species observed during the field survey were identified by visual characteristics and morphology in the field. Unusual and less familiar plant species were photographed during the survey and identified in the laboratory using taxonomical guides. Wildlife detections were made through observation of scat, trails, tracks, burrows, nests, and/or visual and aural observation. In addition, site characteristics such as soil condition, topography, hydrology, anthropogenic disturbances, indicator species, condition of on-site plant communities, and presence of potential jurisdictional drainage and/or wetland features were noted.

2.3 SOIL SERIES ASSESSMENT

On-site and adjoining soils were researched prior to the field visit using the USDA NRCS Soil Survey for San Bernardino County, California. In addition, a review of the local geological

conditions and historical aerial photographs was conducted to assess the ecological changes the project site has undergone.

2.4 PLANT COMMUNITIES

Plant communities were mapped using 7.5-minute USGS topographic base maps and aerial photography. The plant communities were classified in accordance with Sawyer, Keeler-Wolf and Evens (2009), CDFW (2010), and Holland (1986), delineated on an aerial photograph, and then digitized into GIS Arcview. The Arcview application was used to compute the area of each plant community in acres.

2.5 PLANTS

Common plant species observed during the field survey were identified by visual characteristics and morphology in the field, and recorded in a field notebook. Unusual and less familiar plants were photographed in the field and identified in the laboratory using taxonomic guides. Taxonomic nomenclature used in this study follows the 2012 Jepson Manual (Baldwin et al. 2012). In this report, scientific names are provided immediately following common names of plant species (first reference only).

2.6 WILDLIFE

Wildlife species detected during field surveys by sight, calls, tracks, scat, or other sign were recorded during surveys in a field notebook. Field guides were used to assist with identification of species during surveys included The Sibley Field Guide to the Birds of Western North America (Sibley 2003) for birds, A Field Guide to Western Reptiles and Amphibians (Stebbins 2003) for herpetofauna, and A Field Guide to Mammals of North America (Reid 2006) for mammals. Although common names of wildlife species are fairly well standardized, scientific names are provided immediately following common names in this report (first reference only).

2.7 JURISDICTIONAL AREAS

Aerial photography was reviewed prior to conducting the habitat assessment. The aerials were used to locate potential natural drainage features, ponded areas, or water bodies that may fall under the jurisdiction of the Corps, Regional Board, or CDFW for inspection during the field investigation. In general, surface drainage features indicated as blue-line streams on USGS maps that are observed or expected to exhibit evidence of flow are subject to state and federal regulatory authorities.

Section 3 Existing Conditions

3.1 LOCAL CLIMATE

San Bernardino County is characterized by cool winter temperatures and warm summer temperatures, with its rainfall occurring almost entirely in the winter. Relative to other areas in Southern California, winters are colder with chilly to cold morning temperatures common. Climatological data obtained for the nearby City of San Bernardino indicates the annual precipitation averages 16.43 inches per year (Intellicast 2016). Almost all of the precipitation occurs in the months between November and March, with hardly any occurring between the months of April and October. The wettest month is February, with a monthly average total precipitation of 3.70 inches. The record maximum and minimum temperatures for the City of San Bernardino are 117 and 17 degrees Fahrenheit respectively with July and August being on average the hottest months and December being on average the coldest. Temperatures during the Site visit were in the mid-80s (degrees Fahrenheit).

3.2 TOPOGRAPHY AND SOILS

On-site surface elevation ranges from approximately 1,495 to 1,580 feet above mean sea level and generally slopes from north to south. The project site is relatively flat with no areas of significant topographic relief. Based on the USDA NRCS Web Soil Survey, the project site is underlain by the following soil units (refer to Exhibit 4, *Soils*).

- **Soboba gravelly loamy sand, 0 to 9 percent slopes (SoC):** The Soboba gravelly loamy sand (0 to 9 percent slopes) consists of excessively drained soils formed from alluvium derived from granite sources. It is found on alluvial fans. Elevations are recorded at 25 to 3,700 feet above mean sea level (msl).

- **Tujunga gravelly loamy sand, 0 to 9 percent slopes (TvC):** The Tujunga gravelly loamy sand (0 to 9 percent slopes) consists of somewhat excessively drained soils formed from alluvium derived from granite sources. It is found on alluvial fans. Elevations are recorded at 10 to 1,500 feet above msl.

- **Psamments, Fluvents and Frequently flooded soils (Ps):** Psamments form on terraces or outwash plans and contain well sorted, freely draining soils that contain sand, fine sand, loamy sand or coarse sand in subsoils between 10 and 40 inches in depth. Fluvents are formed by recent water-deposited sediments in floodplains, fans and stream or river deltas and consist of layers of various soil textures. These soils consist of somewhat excessively drained soils formed in sandy alluvium.

VULCAN AREA Q
HABITAT AND JURISDICTIONAL ASSESSMENT

ELMT CONSULTING

0 250 500 1,000 Feet

Source: ESRI Aerial Imagery, Soil Survey Geographic Database, San Bernardino County

Soils

Exhibit 4

3.3 SURROUNDING LAND USES

The project site is located in an area that surrounded by rural development characterized as scattered homes throughout undeveloped areas (refer to Exhibit 3). The area southeast of the project site supports residential developments, while the area east of the project site consists of industrial buildings, and the area north of the project site supports active sand and gravel mining operations. However, the western boundary of the project site abuts the Union Pacific railroad tracks which is located east of the confluence of Lytle Creek and Cajon Wash. The project site has been completely cut off from the fluvial flow patterns and scouring regimes of Cajon Wash and Lytle Creek since the installation of the railroad track and man-made berm in 1966.

Section 4 Discussion

4.1 SITE CONDITIONS

The project site consists of both developed and undeveloped land that has been subject to a variety of direct and indirect human-related disturbances from existing rural residential developments, weed abatement activities, and illegal trash dumping. These land uses have resulted in the majority of the project site being converted to a mosaic of non-native grasses and highly disturbed natural plant communities that have been cut off from the influences of the Cajon Wash by the railroad tracks that border the western boundary of the site. Several residential developments are primarily found on the western half of the project site. These developments consist of homes and storage yards.

4.2 VEGETATION

Four (4) plant communities were observed within the boundaries of the project site during the habitat assessment: highly disturbed Riversidean alluvial fan sage scrub (RAFSS), buckwheat scrub, non-native grassland, and ornamental (Exhibit 5, *Vegetation*). In addition, the project site contains a land cover type that would be classified as disturbed and developed. These plant communities and land cover type are described in further detail below.

4.2.1 RIVERSIDEAN ALLUVIAL FAN SAGE SCRUB

Riversidean alluvial fan sage scrub (RAFSS) is considered a sensitive plant community, and is listed by CDFW as rare. RAFSS is a vegetation type in which scale broom (*Lepidospartum squamatum*) is dominant, co-dominant, or conspicuous in the shrub canopy. Scale broom, a member of the aster family, is a long-lived, deep-rooted shrub found in riverine or alluvial soils, often in dry washes.

RAFSS is a community restricted to intermittently or rarely-flooded, low-gradient alluvial deposits along streams, washes, and fans within large canyons on the coastal slopes of the San Gabriel Mountains and San Bernardino Mountains in San Bernardino County. This community is composed of a variety of drought-deciduous subshrubs and large evergreen woody shrubs. In addition to scale broom, woody shrubs such as chamise (*Adenostoma fasciculatum*), California buckwheat (*Eriogonum fasciculatum*), white sage (*Salvia apiana*), and yerba santa (*Eriodictyon trichocalyx*) are present in RAFSS. Common subshrubs include deerweed (*Acmispon glaber*), matchweed (*Gutierrezia californica*), and Douglas' nightshade (*Solanum douglasii*). Native species found within the herbaceous understory include fiddleneck

ELMT CONSULTING

0 250 500 1,000 Feet

Source: ESRI Aerial Imagery, San Bernardino County

VULCAN AREA Q
HABITAT AND JURISDICTIONAL ASSESSMENT

Vegetation

Exhibit 5

(*Amsinckia menziesii*), croton (*Croton californicus*), and cryptantha (*Cryptantha* spp.). Due to intense, periodic flooding and erosion within the alluvial plain, a series of step-like terraces are created above wash channels, each exhibiting a different successional phase. These phases are related to the amount of time elapsed since the most recent flood and occur as a sequential gradation of terrace types with increasing distance from the active channel.

These three phases, as well as two associated terrace levels of RAFSS plant communities have been described by Sharon Lockhart for the areas within and adjacent to what is now known as the Cajon Creek Conservation Bank and for additional properties owned by Vulcan in the vicinity of the Conservation Bank (Lockhart and Chambers 1995). The descriptions and the locations of the phases and terrace levels found within the project area and surrounding vicinity are provided below:

Terrace 1 Young or Pioneer Phase:

Sparsely vegetated with low species diversity and it is typically located within active stream channels or recently scoured streambeds. This terrace requires approximately 3 to 6 years to become established after a flood disturbance. Vegetation that fits this phase or terrace designation is present at the southwestern end of the project area along the active stream channel of Cajon Creek. The storm drain will discharge into Terrace 1 vegetation in Cajon Creek.

Terrace 2 Intermediate Phase:

Consists of relatively dense vegetation dominated by scale broom and California buckwheat, as well as grasses and other herbaceous species. This terrace requires approximately 5 to 14 years to become established after a flood disturbance.

Terrace 3 Old or Mature Phase:

Denser that Terrace 2, but includes yerba santa, cacti (*Opuntia* spp.), and chaparral yucca (*Hesperoyucca whipplei*). Very few annual species are present. This terrace requires approximately 6 to 18 years to become established after a flood disturbance.

Terrace 4 Isolated Phase:

Consists of other fully developed shrubs such as chamise, yerba santa, white sage, black sage (*Salvia mellifera*), and chaparral yucca. Emergent trees

including mountain mahogany (*Cercocarpus betuloides*) and blue elderberry (*Sambucus nigra ssp. caerulea*) are also present at low cover. This terrace requires up to 15 years to become established after a flood disturbance.

Terrace 5 Isolated Phase:

Terrace 5 is another designation that was given to terraces located outside of the floodplain that are cut off from the active stream channel. Terrace type 5 vegetation occurs outside the floodplain in the portion of the project area located east of the Union Pacific railroad track embankment. This terrace has been cut off from the active stream channel by the Southern Pacific railroad embankment. Terrace 5 vegetation is succeeding to upland chaparral. Additional species present in this terrace include bigpod ceanothus (*Ceanothus megacarpus*), laurel sumac (*Malosma laurina*), holly-leaved cherry (*Prunus ilicifolia*), and California sycamore (*Platanus racemosa*).

The isolated and senescing RAFSS habitat that occurs on the project site is classified as Terrace 5. The habitats have either succeeded to upland chaparral habitat or are no longer functioning as viable RAFSS habitat with long-term conservation value for the following reasons.

First, the project site's RAFSS habitat has been extensively disturbed by human activity for decades, and is heavily fragmented by roads, trails, and other human development. A dirt road runs through the center of the property from Historic Route 66/Cajon Boulevard, connecting scattered single-family residences. These residences include large outdoor storage yards, which are both fenced and unfenced. Due to many years of illegal trespass and dumping numerous trash and debris piles of varying size were observed. For example, boats, appliances, mattresses, electronics, tires, furniture, and clothing were observed during site visits.

Second, the RAFSS habitat is isolated from the historic fluvial flow patterns and scouring regimes due to residential and industrial development. The project site is bordered on the north by Area L, Vulcan's existing surface mining operation. The project site is bordered on the east by Cajon Boulevard and industrial development. The project site is bordered on the south by the Devil Creek Diversion Channel and the residential community of Muscoy. Union Pacific Railroad's tracks and man-made berm border the west side of the project site. This development has isolated and separated the project site's RAFSS habitat from less disturbed RAFSS vegetation off-site, especially in Cajon Wash.

Third, the elimination of fluvial processes from the project area has removed the physical and biotic attributes needed to support viable RAFSS habitat and special-status plant and wildlife species. Flooding events vital to maintaining this plant community have not occurred in the general vicinity for over 50 years.

Fourth, the RAFSS habitat is not occupied by any listed or otherwise special-status plant or wildlife species, indicating minimal or no value as biological habitat.

Accordingly, the loss of the disturbed, fragmented, low-quality RAFSS on the project site is not considered a significant impact and requires no mitigation.

4.2.2 BUCKWHEAT SCRUB

The buckwheat scrub plant community is located on the northeast corner of the project site. This portion of the project site historically supported a RAFSS plant community, however, construction of the Union Pacific railroad track and berm that prevent flooding events, weed abatement, and disking activities have thinned this plant community resulting in an open monoculture of California buckwheat, with non-native grasses intermixed.

4.2.3 NON-NATIVE GRASSLAND

Non-native grassland is located throughout the project site, generally filling in otherwise-open spaces between RAFSS vegetation. In some areas, particularly in the northeastern and in the middle of the southern half of the project site, the non-native grassland is the only plant community present and contains very few shrubs. This plant community has been subject to routine weed abatement and disking activities which has removed the native plant communities that once occurred on these portions of the site. This community is dominated primarily by red brome, Mediterranean grass, ripgut brome, cheat grass, and shortpodded mustard.

4.2.4 ORNAMENTAL

Ornamental vegetation is found in the middle of the southern half of the project site in association with residential developments. These ornamental vegetation stands consist of various pine trees (*Pinus* sp.), china berry (*Melia azedarach*), Peruvian pepper (*Schinus molle*), Brazilian pepper (*Schinus terebinthifolius*), and jacaranda (*Jacaranda mimosifolia*).

4.2.5 DISTURBED

Disturbed areas refer to unpaved or dirt areas that are routinely exposed to anthropogenic disturbances and typically do not support native vegetation or comprise a plant community.

Surface soils within these areas are generally devoid of vegetation and have been heavily disturbed/compacted from residential land uses. Within the project site, disturbed areas generally encompass the main dirt roads that traverse the project site and areas that have been subject to illegal dumping.

4.2.6 DEVELOPED

The developed areas within the project site are areas that support rural residential developments and the immediately surrounding areas that are subject to daily residential land uses.

4.3 WILDLIFE

Plant communities provide foraging habitat, nesting/denning sites, and shelter from adverse weather or predation. This section provides a discussion of those wildlife species that were observed or are expected to occur within the project site. The discussion is to be used a general reference and is limited by the season, time of day, and weather conditions in which the field survey was conducted. Wildlife detections were based on calls, songs, scat, tracks, burrows, and direct observation.

4.3.1 FISH

No fish or hydrogeomorphic features (e.g., creeks, ponds, lakes, reservoirs) with frequent sources of water that would support populations of fish were observed on the project site. Therefore, no fish are expected to occur and are presumed absent from the project site.

4.3.2 AMPHIBIANS

No amphibians or hydrogeomorphic features (e.g., creeks, ponds, lakes, reservoirs) with frequent sources of water that would support populations of amphibians were observed on the project. Therefore, no amphibians are expected to occur and are presumed absent from the project site.

4.3.3 REPTILES

The project site and surrounding habitat has the potential to support a variety of reptilian species adapted to a high level of human disturbances. Western side-blotched lizard (*Uta stansburiana elegans*) and coastal whiptail (*Aspidoscelis tigris stejnegeri*) were the only reptilian species observed during the field survey. Other reptilian species that are expected to occur on-site include western fence lizard (*Sceloporus occidentalis*), San Diego alligator lizard (*Elgaria multicarinata webbii*), red racer (*Coluber flagellum piceus*), Great Basin gopher snake

(*Pituophis catenifer deserticola*), and southern Pacific rattlesnake (*Crotalus oreganus helleri*). These reptilian species are not special-status species and no mitigation is required.

4.3.4 BIRDS

The project site provides suitable foraging, nesting, and cover habitat for a variety of resident and migrant bird species. A total of fifteen (15) bird species were observed on the project site during the field survey. Bird species seen during the field survey included cactus wren, Anna's hummingbird (*Calypte anna*), rock pigeon (*Columba livia*), American crow (*Corvus brachyrhynchos*), house finch (*Haemorhous mexicanus*), barn swallow (*Hirundo rustica*), California towhee (*Melozone crissalis*), northern mockingbird (*Mimus polyglottos*), house sparrow (*Passer domesticus*), Say's phoebe (*Sayornis saya*), lesser goldfinch (*Spinus psaltria*), Eurasian collared-dove (*Streptopelia decaocto*), western meadowlark (*Sturnella neglecta*), Cassin's kingbird (*Tyrannus vociferans*), and mourning dove (*Zenaida macroura*). These resident and migrant bird species are not special-status species and no mitigation is required.

4.3.5 MAMMALS

The project site and surrounding habitat has the potential to support a variety of mammalian species adapted to a high level of human disturbances. California ground squirrel (*Otospermophilus beecheyi*), San Diego black-tailed jackrabbit (*Lepus californicus bennettii*), and Audubon's cottontail (*Sylvilagus audubonii*) were the only mammalian species observed/detected during the field survey. Other common mammalian species that are expected to occur on-site include coyote (*Canis latrans*), raccoon (*Procyon lotor*), Botta's pocket gopher (*Thomomys bottae*), opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), and small mammal species such as deer mouse (*Peromyscus* sp.). These mammalian species are not special-status species and no mitigation is required.

4.4 NESTING BIRDS

No active nests or birds displaying nesting behavior were observed on-site during the field survey. The non-native grassland and highly disturbed RAFSS plant communities within the project site provide suitable foraging and nesting habitat for a variety of year-round and seasonal avian residents, as well as migrating songbirds that could occur in the area. The project site also has the potential to support birds that nest on the open ground and in the non-native grasslands, such as killdeer (*Charadrius vociferus*) and western meadowlarks (*Sturnella neglecta*). Additional nesting habitat is present within the ornamental vegetation located throughout the project site, as well as in trees surrounding the site to the north. It should be noted that several occupied cactus wren (*Campylorhynchus brunneicapillus*) nests were

observed in the mature RAFSS plant community on the northwestern corner of the project site. These nests were not active at the time of the site visit. These nesting bird species are not special-status species and no mitigation is required.

4.5 MIGRATORY CORRIDORS AND LINKAGES

Habitat linkages provide links between larger habitat areas that are separated by development. Wildlife corridors are similar to linkages, but provide specific opportunities for animals to disperse or migrate between areas. A corridor can be defined as a linear landscape feature of sufficient width to allow animal movement between two comparatively undisturbed habitat fragments. Adequate cover is essential for a corridor to function as a wildlife movement area. It is possible for a habitat corridor to be adequate for one species yet, inadequate for others. Wildlife corridors are significant features for dispersal, seasonal migration, breeding, and foraging. Additionally, open space can provide a buffer against both human disturbance and natural fluctuations in resources.

The San Bernardino County Land Use Plan Open Space Element depicts wildlife corridors within the Valley and Mountain Areas, one of which, the Cajon Wash Corridor, is located immediately adjacent to the project site and is separated from the project site by the edge of the 100-year floodplain and the Union Pacific railroad, and a bluff area with an elevation of as much as 20 feet. The project site has the potential to provide limited upland movement opportunities from the Cajon Wash/Lytle Creek across the project site. However, the residential development to the south, the active mining operations to the north, and high levels of human disturbances on the project site restrict wildlife movement opportunities. Project implementation is not expected to have a significant impact to wildlife movement.

4.6 JURISDICTIONAL AREAS

There are three key agencies that regulate activities within inland streams, wetlands, and riparian areas in California. The Corps Regulatory Branch regulates discharge of dredge or fill materials into “waters of the United States” pursuant to Section 404 of the Federal Clean Water Act (CWA) and Section 10 of the Rivers and Harbors Act. Of the State agencies, the Regional Board regulates discharges to surface waters pursuant to Section 401 of the CWA and the California Porter-Cologne Water Quality Control Act and the CDFW regulates alterations to streambed and associated plant communities under Fish and Wildlife Code Sections 1600 *et seq*.

No jurisdictional drainage and/or wetland features were observed within the project site during the field survey. It should be noted that a concrete-lined trapezoidal channel (Devils Creek

Diversion Channel) runs northeast to southwest along the southeastern boundary of the project site, outside the limits of disturbance (Exhibit 6, *Jurisdictional Areas*). The concrete-lined channel receives water from Cable Creek and the Sweetwater Percolation Basins and is tributary to Cajon Wash. In addition, the Cajon Wash runs north to south west of the project site, west of the Union Pacific railroad, outside of the project footprint. Cajon Wash is tributary to the Santa Ana River (Relatively Permanent Water) and is ultimately tributary to the Pacific Ocean (Traditional Navigable Water). Therefore, Devils Creek Diversion Channel and Cajon Wash qualify as waters of the United States and fall under the regulatory authority of the Corps, Regional Board, and CDFW. Any impacts to Devils Creek Diversion Channel or Cajon Wash (e.g., storm drain tie-in, etc.) that may occur as a result of the proposed project will require the following regulatory approvals: Corps CWA Section 404 Permit, Regional Board CWA Section 401 Water Quality Certification, and CDFW Section 1602 Streambed Alteration Agreement.

Devils Creek Diversion Channel and Cajon Wash are located outside of the project footprint and not impacts will occur to these features from implementation of the proposed project.

4.7 SPECIAL-STATUS BIOLOGICAL RESOURCES

The CNDDB Rarefind 5 and the CNPS Electronic Inventory of Rare and Endangered Vascular Plants of California were queried for reported locations of special-status plant and wildlife species as well as special-status natural plant communities in the San Bernardino North and Devore USGS 7.5-minute quadrangles. The habitat assessment evaluated the conditions of the habitat(s) within the boundaries of the project site to determine if the existing plant communities, at the time of the survey, have the potential to provide suitable habitat(s) for special-status plant and wildlife species.

The literature search identified twenty-one (21) special-status plant species, thirty-one (31) special-status wildlife species, and three (3) special-status plant communities as having the potential to occur within the San Bernardino North and Devore quadrangles. Special-status plant and wildlife species were evaluated for their potential to occur within the project site based on habitat requirements, availability and quality of suitable habitat, and known distributions. Species determined to have the potential to occur within the general vicinity of the project site are presented in Appendix B, *Potentially Occurring Special-Status Biological Resources*. Refer to Appendix B for a detailed analysis regarding the potential occurrence of special-status plant and wildlife species within the project site.

ELMT CONSULTING

0 250 500 1,000 Feet

Source: ESRI Aerial Imagery, San Bernardino County

VULCAN AREA Q
HABITAT AND JURISDICTIONAL ASSESSMENT

Jurisdictional Areas

Exhibit 6

4.7.1 SPECIAL-STATUS PLANTS

Twenty-one (21) special-status plant species have been recorded in the CNDDB and CNPS in the San Bernardino North and Devore USGS 7.5-minute quadrangles (refer to Appendix B). Based on habitat requirements, availability and quality of habitats needed by each special-status plant species, and habitat assessment results, it was determined that the project site has a moderate to high potential to provide suitable habitat for six (6) special-status plant species. Singlewhorl burrobrush (*Ambrosia monogyra*), Parry's spineflower (*Chorizanthe parryi var. parryi*), White-bracted spineflower (*Chorizanthe xanti var. leucotheca*), slender-horned spineflower (*Dodecahema leptoceras*), Santa Ana River woollystar (*Eriastrum densifolium ssp. sanctorum*), and Mesa horkelia (*Horkelia cuneata var. puberula*). The results of the special-status focused plant survey are provided in Section 4.9.1 of this report.

4.7.2 SPECIAL-STATUS WILDLIFE

Thirty-one (31) special-status wildlife species have been reported in the San Bernardino North and Devore USGS 7.5-minute quadrangles (refer to Appendix B). San Diego black-tailed jackrabbit (*Lepus californicus bennettii*), a California "Species of Special Concern," was the only special-status species observed on the project site. A "Species of Special Concern" is an administrative designation and carries no formal legal status.

Due to existing anthropogenic disturbances on-site, the observation of the San Diego black-tailed jackrabbit is assumed to be a fleeting occurrence and no mitigation is proposed. Additionally, the area west of the project site, associated with the Cajon Wash, provides high quality habitat for San Diego black-tailed jackrabbit where the animal is expected to occur, and has ample area to disperse into the Cajon Wash from the project site.

4.7.3 SPECIAL-STATUS PLANT COMMUNITIES

According to the CNDDB, three (3) special-status plant communities have been reported in the San Bernardino North and Devore USGS 7.5-minute quadrangles: highly degraded and disturbed RAFSS, southern riparian forest, and southern sycamore alder riparian woodland (refer to Appendix B). RAFSS habitat was the only sensitive habitat observed on the project site during the habitat assessment. However, as noted above in Section 4.2.1, the isolated and senescing RAFSS habitats identified on the project site has either succeeded to upland chaparral habitat or is no longer functioning as viable RAFSS habitat with long-term conservation value. More specifically, the RAFSS has been extensively disturbed by human activity for decades, and is fragmented by roads, trails, and development. The project site is surrounded to the north, south, and east sides by residential and industrial development. Union

Pacific Railroad tracks and a man-made berm to the west of the project site separate the project site's RAFSS habitats from less disturbed vegetation in the Cajon Wash. The RAFSS habitat within the proposed project footprint is not occupied by any listed or otherwise special-status plant or wildlife species, indicating minimal or no value as biological habitat. Therefore, the loss of the disturbed, fragmented, low-quality RAFSS on the project site is not considered a significant impact and would not require specific mitigation.

4.8 CRITICAL HABITAT

Under the federal Endangered Species Act, "Critical Habitat" is designated at the time of listing of a species or within one year of listing. Critical Habitat refers to specific areas within the geographical range of a species at the time it is listed that include the physical or biological features that are essential to the survival and eventual recovery of that species. Maintenance of these physical and biological features requires special management considerations or protection, regardless of whether individuals or the species are present or not. All federal agencies are required to consult with the USFWS regarding activities they authorize, fund, or permit which may affect a federally listed species or its designated Critical Habitat. The purpose of the consultation is to ensure that projects will not jeopardize the continued existence of the listed species or adversely modify or destroy its designated Critical Habitat. The designation of Critical Habitat does not affect private landowners, unless a project they are proposing is on federal lands, uses federal funds, or requires federal authorization or permits (e.g., funding from the Federal Highways Administration or a CWA Permit from the Corps). If a there is a federal nexus, then the federal agency that is responsible for providing the funding or permit would consult with the USFWS.

In 2002 the USFWS designated Critical Habitat for SBKR, and the project site was included within the designated area (67 Federal Register [FR] 19812-19845). Subsequently, in 2008 the USFWS reduced the boundaries of their previously designated Critical Habitat and the project site was removed from the designated area (73 FR 61936-62002). Given the site's isolation and the permanent removal of the fluvial scouring needed to maintain viable RAFSS habitat, as well as the advanced state of senescence of the existing plant community, the removal of the site from Critical Habitat designation was warranted. However, in 2011 a federal district court, in response to a legal challenge to the 2008 Critical Habitat re-designation, vacated the 2008 designation and reinstated the original (2002) Critical Habitat designation. Currently the entire project site is located within designated Critical Habitat Unit 2, Lytle Creek/Cajon Wash (Exhibit 7, *Critical Habitat*) for SBKR. It is important to note, however, that no SBKR were observed or trapped during extensive trapping surveys, discussed in detail in Appendix C.

VULCAN AREA Q
HABITAT AND JURISDICTIONAL ASSESSMENT

Critical Habitat

ELMT CONSULTING

0 0.5 1 2 Miles

Source: ESRI Aerial Imagery, USFWS Critical Habitat, San Bernardino County

Exhibit 7

Since there is no federal nexus, and no SBKR were captured on the project site, the applicant will not be required to initiate a Section 7 Consultation for the loss of Critical Habitat.

4.9 FOCUSED SURVEY RESULTS

4.9.1 SPECIAL-STATUS PLANT SURVEY

Surveys were conducted at the time of year when species are both evident and identifiable. Site visits were spaced throughout the growing season to accurately determine what plant species exist on-site. Multiple surveys were conducted to capture the floristic diversity at a level necessary to determine if special status plants are present. The timing and number of surveys was determined based on geographic location, the natural communities present, and the weather patterns of the region.

Suitable habitat occurring on the project site was surveyed by foot. Linear transects were walked throughout the suitable habitat and spaced to ensure maximum visual coverage. A handheld geographic positioning systems (GPS) device and field data sheets were used to record all populations of special-status plants and their characteristics, if found during the surveys.

Target Plant Species

Based on the plant species known to occur within the general vicinity and the suitability of the on-site plant communities to support those plant species, two site visits were conducted, on May 11 and June 1, 2017. A final site visit was conducted on February 26, 2018. These visits were spaced throughout the growing season to capture the appropriate phenotypic stage for proper identification of all special-status plant species determined to have a moderate to high potential to occur on the project site. Based on habitat requirements, availability and quality of habitats needed by each special-status plant species, and habitat assessment results, it was determined that the project site has a moderate to high potential to provide suitable habitat for six (6) special-status plant species. Please refer to Table 1 and the following subsections for additional information on the special-status plant species identified as having a moderate to high potential to occur on the project site.

Singlewhorl Burrobrush

Singlewhorl burrobrush is a species of flowering plant in the sunflower family (Asteraceae). The species is native to the southwestern United States where it grows in deserts and adjacent to mountains and dry valleys. Singlewhorl burrobrush is a thickly branching shrub and can reach heights up to four meters. Stems are thing and covered in narrow, hairy leaves and flower

in large inflorescences. The staminate flowers have translucent white corollas and the fruit is dry with a single whorl of several papery wings. Singlewhorl burrobrush was not observed on-site.

Table 1: Special-Status Plant Species

Scientific Name Common Name	**Status**	**Blooming Period**	**Preferred Habitat**
Ambrosia monogyra Singlewhorl burrobrush	Fed: None CA: None CNPS: 2B.2	Aug – Nov	Found in sandy soils within chaparral and Sonoran Desert scrub habitat. Found at elevations ranging from 33 to 1,640 feet.
Chorizanthe parryi var. parryi Parry's spineflower	Fed: None CA: None CNPS: 1B.1	Apr – Jun	Found in sandy or gravelly soils within coastal scrub (alluvial fans), Mojavean desert scrub, pinyon and juniper woodland habitats. Found at elevations ranging from 984 to 3,937 feet.
Chorizanthe xanti var. leucotheca White-bracted spineflower	Fed: None CA: None CNPS: 1B.2	Apr – Jun	Chaparral, coastal scrub (alluvial fan sage scrub). Flood deposited terraces and washes. Found at elevations ranging from 1,181 to 2,690 feet.
Dodecahema leptoceras Slender-horned spineflower	Fed: END CA: END CNPS: 1B.1	Apr – Jun	Found in sandy soil in association with mature alluvial scrub. Ideal habitat appears to be a terrace or bench that receives overbank deposits every 50 to 100 years. Cryptogamic crusts are frequently present in occupied areas.
Eriastrum densifolium ssp. sanctorum Santa Ana River woollystar	Fed: END CA: END CNPS: 1B.1	May – Sep	Found only within open washes and early successional alluvial fan scrub on open slopes above main watercourses on fluvial deposits where flooding and scouring occur at a frequency that allows the persistence of open shrublands.
Horkelia cuneata var. puberula Mesa horkelia	Fed: None CA: None CNPS: 1B.1	Sept - May	Occurs on sandy or gravelly soils in chaparral, woodlands, and coastal scrub plant communities. Found at elevations ranging from 230 to 2,657 feet.

U.S. Fish and Wildlife Service – Federal (Fed)
FE- Endangered
FT- Threatened

California Department of Fish and Game – State (CA)
SE- Endangered
ST- Threatened

California Native Plant Society – (CNPS) *California Rare Plant Rank*
1B Plants Rare, Threatened, or Endangered in California and Elsewhere
2B Plants Rare, Threatened, or Endangered in California, but More Common Elsewhere

Threat Ranks
0.1- Seriously threatened in California
0.2- Moderately threatened in California

Parry's Spineflower

Parry's spineflower is a species of flowering plant in the buckwheat family (Polygonaceae) found in sandy soil on flats and foothills in mixed grassland and chaparral plant communities. Parry's spineflower is known today only from scattered populations in the foothills of the San Gabriel, San Bernardino, and San Jacinto mountains of Los Angeles, San Bernardino, and Riverside counties, California. Much of the native habitat of Parry's spineflower was

destroyed by development in the twentieth century. No Parry's spineflower was observed on-site.

White-bracted Spineflower

White-bracted spineflower is a species of flowering plant in the buckwheat family (Polygonaceae). It is endemic to southern California, where it is only known to occur on the eastern slopes of the San Jacinto Mountains in Riverside County and in the eastern San Bernardino Mountains in sandy to gravelly places in saltbush, pinyon-juniper, and pine-oak woodland plant communities. White-bracted spineflower is generally erect in form, reaching up to 30 centimeters in height, and reddish in color and coated in thin to dense hairs. The inflorescence is thick and woolly, with each flower surrounded by six reddish, curly-haired bracts tipped with hooked awns. The flower is up to 6 millimeters wide and pink to red in color. No white-bracted spineflower was observed on-site.

Slender-horned Spineflower

Slender-horned spineflower is a small annual plant in the buckwheat family (Polygonaceae) and has been federally and State listed as endangered since the 1980s. The species is usually found in drought prone alluvial benches subject to only rare flood events. Slender-horned spineflower is typically associated with cryptogamic crust or microhabitats that contain soil, bacteria, algae, lichens, and mosses. These crusts act as a living mulch in that they retain soil moisture and discourage the growth of annuals and weeds, as well as resist disturbances of wind and water erosion. No slender-horned spineflower were observed on-site.

Santa Ana River Woollystar

The Santa Ana River woollystar is a short-lived, perennial subshrub of the phlox family (Polemoniaceae). The entire plant is covered with woolly pubescence, giving it a silvery-white appearance. The flower is a blue to violet-blue inflorescence. Santa Ana River woollystar is a pioneer species that colonizes washed sand deposits created by sporadic stream flow action. Between major flood events, these deposits typically exist as terraces above the high-water mark of the river and associated braided streams. Santa Ana River woollystar grows primarily in Riversidean alluvial fan sage scrub habitat in sandy soils from 1,240 to 1,900 feet above mean sea level. The Santa Ana River woollystar is both a federally and State listed endangered plant species. No Santa Ana River woollystar were observed on-site.

Mesa Horkelia

Mesa horkelia is a perennial herb in the rose family (Rosaceae). At its most distinctive, mesa horkelia is represented by historic collections from the hills and plains of Los Angeles, western

Riverside, extreme southwestern San Bernardino, and northwestern San Diego counties; these populations have now largely been destroyed by urbanization. Scattered populations still exist within this core area. Occurs on sandy or gravelly soils in chaparral, woodlands, and coastal scrub plant communities at elevations ranging from 230 to 2,657 feet. No mesa horkelia was observed on-site.

Results

Despite extensive systematic surveys of suitable habitat within the project site, none of the other target special-status plant species were observed within the proposed project footprint.

4.9.2 SBKR PRESENCE/ABSENCE TRAPPING STUDY

SJM Biological Consultants conducted both a SBKR suitability assessment as well as a SBKR presence/absence trapping study. The suitability assessment was conducted to determine which portions of the project site provide suitable habitat for SBKR based on the presence of suitable habitat conditions (sandy soils, open RAFSS habitat, exposure or proximity to a hydrologic source). Habitat conditions were verified by walking transects throughout the habitats within the project site as well as documenting the presence of kangaroo rat sign (i.e., burrows, scat, tail drags, dusting baths) and site characteristics such as (a) the depth, distribution, and composition of soils, (b) topography, (c) hydrologic patterns, and (d) evidence of anthropogenic disturbances in order to identify locations where presence/absence trapping should occur.

Based on the amount of suitable habitat identified during the habitat suitability assessment, three SBKR trapping studies were needed to adequately cover areas of suitable habitat and determine the presence/absence of SBKR. In accordance with USFWS survey protocol, each trapping survey was conducted by a permitted SBKR biologist for five consecutive evenings. Traps were checked twice per night, once at 12:00 midnight and again at dawn, to reduce impacts to any species captured. No SBKR were captured during these 2017 trapping studies.

Section 5 Conclusion and Recommendations

The project site consists of both developed (rural residential housing) and undeveloped land that has been subject to a variety of human-related disturbances from existing rural residential developments, weed abatement activities, and illegal trash dumping. These land uses have resulted in the habitats within the project site being converted to RAFSS habitats to a mosaic of non-native grasses, buckwheat scrub, upland chaparral and highly disturbed intermediate RAFSS that, due to the isolation of the site and the removal of all hydrologic influences of the Cajon Wash, no longer is viable RAFSS habitat with long-term conservation value. Several residential developments are primarily found on the western half of the project site. These developments consist of homes and storage yards.

Four (4) plant communities were observed within the boundaries of the project site during the habitat assessment: highly disturbed Riversidean alluvial fan sage scrub (RAFSS), buckwheat scrub, non-native grassland, and ornamental. However, as noted above in Section 4, the isolated and senescing RAFSS habitats identified on the project site has either succeeded to upland chaparral habitat or is no longer functioning as viable RAFSS habitat with long-term conservation value. More specifically, the RAFFS has been extensively disturbed by human activity for decades, and is fragmented by roads, trails, and development. The project site is surrounded to the north, south, and east sides by residential and industrial development. Union Pacific Railroad tracks and a man-made berm to the west of the project site separate the project site's RAFSS habitats from less disturbed vegetation in the Cajon Wash. The RAFSS habitat within the proposed project footprint is not occupied by any listed or otherwise special-status plant or wildlife species, indicating minimal or no value as biological habitat. Therefore, the loss of the disturbed, fragmented, low-quality RAFSS on the project site is not considered a significant impact and would not require specific mitigation.

Based on the results of the habitat assessment, the following issues need to be considered prior to ground disturbing activities:

Migratory Bird Treaty Act

Pursuant to the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code, removal of any trees, shrubs, or any other potential nesting habitat should be conducted outside the avian nesting season. The nesting season generally extends from early February through August, but can vary slightly from year to year based upon seasonal weather conditions. If ground disturbance and vegetation removal cannot occur outside of the nesting season, a pre-construction clearance survey for nesting birds should be conducted within thirty (30) days of

the start of any vegetation removal or ground disturbing activities to ensure that no nesting birds will be disturbed during construction. The biologist conducting the clearance survey should document a negative survey with a brief letter report indicating that no impacts to active avian nests will occur. If an active avian nest is discovered during the pre-construction clearance survey, construction activities should stay outside of a 300-foot buffer around the active nest. For raptor species, this buffer is expanded to 500 feet. It is recommended that a biological monitor be present to delineate the boundaries of the buffer area and to monitor the active nest to ensure that nesting behavior is not adversely affected by the construction activity. Once the young have fledged and left the nest, or the nest otherwise becomes inactive under natural conditions, normal construction activities can occur.

Pursuant to California Fish and Game Code Section 3503, it is unlawful to destroy any bird's nest or any bird's eggs that are protected under the MBTA. Further, any birds in the orders Falconiformes or Strigiformes (Birds of Prey, such as hawks and owls) are protected under California Fish and Game Code Section 3503.5 which makes it unlawful to take, possess, or destroy their nest or eggs. Consultation with CDFW might be required prior to the removal of any raptor nest on the project site, if found.

Section 6 References

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Appendix A Site Photographs

Photograph 1: From the eastern half of the project site looking north at the non-native grassland. A row of trees that borders the northern boundary can be observed in the background.

Photograph 2: Looking southwest from the middle of the southern portion of the project site at the non-native grassland.

Photograph 3: Looking north at the intergrade between the non-native grassland and the intermediate RAFSS plant community in the middle of the northern portion of the project site.

Photograph 4: Looking south at the intermediate RAFSS plant community in the middle of the western boundary of the project site.

Photograph 5: Looking at the intermediate RAFSS plant community in the middle of the northern portion of the project site.

Photograph 6: Looking at the buckwheat scrub plant community on the southeastern portion of the project site.

Photograph 7: View of the disturbed dirt access road and weed abatement activities on the eastern portion of the project site.

Photograph 8: Rural residential development on the project site.

Photograph 9: Looking northeast at the mature RAFSS plant community on the northwestern portion of the project site.

Photograph 10: Looking southeast at the mature RAFSS plant community on the northwestern portion of the project site.

Photograph 11: Looking northeast (upstream) at the concrete lined v-ditch that borders the southern boundary of the project site.

Appendix B Potentially Occurring Special-Status Biological Resources

Table B-1: Potentially Occurring Special-Status Biological Resources

Scientific Name Common Name	**Status**	**Habitat**	**Observed On-site**
Special-Status Wildlife Species			
Aimophila ruficeps canescens southern California rufous-crowned sparrow	Fed: None CA: WL	Typically found between 3,000 and 6,000 feet in elevation. Breed in sparsely vegetated shrublands on hillsides and canyons. Prefers coastal sage scrub dominated by California sagebrush (*Artemisia californica*), but can also be found breeding in coastal bluff scrub, low-growing serpentine chaparral, and along the edges of tall chaparral habitats.	No
Anniella stebbinsi southern California legless lizard	Fed: None CA: SSC	Occurs primarily in areas with sandy or loose loamy soils under sparse vegetation of beaches, chaparral, or pine-oak woodland; or near sycamores, oaks, or cottonwoods that grow on stream terraces. Often found under or in the close vicinity of logs, rocks, old boards, and the compacted debris of woodrat nests.	No
Arizona elegans occidentalis California glossy snake	Fed: None CA: SSC	Occurs in a wide variety of habitat types including open desert, grasslands, shrublands, chaparral, and woodlands. Prefers areas where the soil is loose and sandy which allows for burrowing.	No
Artemisiospiza belli belli Bell's sage sparrow	Fed: None CA: WL	Occurs in chaparral dominated by fairly dense stands of chamise. Also found in coastal sage scrub in south of range.	No
Aspidoscelis hyperythra orangethroat whiptail	Fed: None CA: SSC	Inhabits low-elevations coastal scrub, chamise-redshank chaparral, mixed chaparral, and valley-foothill hardwood habitats. Semi-arid brushy areas typically with loose soil and rocks, including washes, streamsides, rocky hillsides, and coastal chaparral.	No
Aspidoscelis tigris stejnegeri coastal whiptail	Fed: None CA: SSC	Found in a variety of ecosystems, primarily hot and dry open areas with sparse foliage such as chaparral, woodland, and riparian areas.	No
Athene cunicularia burrowing owl	Fed: None CA: SSC	Primarily a grassland species, but it persists and even thrives in some landscapes highly altered by human activity. Occurs in open, annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. The overriding characteristics of suitable habitat appear to be burrows for roosting and nesting and relatively short vegetation with only sparse shrubs and taller vegetation.	No
Baeolophus inornatus oak titmouse	Fed: None CA: None	Lives mostly in warm, open, dry oak or oak-pine woodlands. Restricted to southwest Oregon to northwest Baja California with another population in the Cape District of south Baja California.	No
Batrachoseps gabrieli San Gabriel slender salamander	Fed: None CA: None	Known from select localities in the San Gabriel Mountains and the Mt. Baldy area of Los Angeles County and the western end of the San Bernardino Mountains in San Bernardino Co., with an elevation range of 1,200- 5,085 feet. Occurs on talus slopes surrounded by a variety of conifer and montane hardwood species, including bigcone spruce, pine, white fir, incense cedar, canyon live oak, black oak, and California laurel.	No
Bombus crotchii Crotch bumble bee	Fed: None CA: None	Exclusive to coastal California east towards the Sierra-Cascade Crest; less common in western Nevada.	No

Scientific Name Common Name	**Status**	**Habitat**	**Observed On-site**
Chaetodipus fallax fallax northwestern San Diego pocket mouse	Fed: None CA: SSC	Occurs in desert and coastal habitats in southern California, Mexico, and northern Baja California, from sea level to at least 1,400 meters above msl. Found in a variety of temperate habitats ranging from chaparral and grasslands to scrub forests and deserts. Requires low growing vegetation or rocky outcroppings, as well as sandy soils for burrowing.	No
Chaetodipus fallax pallidus pallid San Diego pocket mouse	Fed: None CA: SSC	Occurs in sandy herbaceous areas, usually in association with rocks or coarse gravel in desert wash, desert scrub, desert succulent scrub, and pinyon-juniper communities.	No
Charina umbratica southern rubber boa	Fed: None CA: **THR**	Found in a variety of montane forest habitats, particularly in the vicinity of streams or wet meadows. Requires loose, moist soil for burrowing and seeks cover in rotting logs. Restricted to the San Bernardino and San Jacinto Mountains.	No
Diadophis punctatus modestus San Bernardino ringneck snake	Fed: None CA: None	Common in open, relatively rocky areas within valley-foothill, mixed chaparral, and annual grass habitats.	No
Dipodomys merriami parvus San Bernardino kangaroo rat	Fed: **END** CA: SSC	Primarily found in Riversidian alluvial fan sage scrub and sandy loam soils, alluvial fans and flood plains, and along washes with nearby sage scrub. May occur at lower densities in Riversidian upland sage scrub, chaparral and grassland in uplands and tributaries in proximity to Riversidian alluvial fan sage scrub habitats. Tend to avoid rocky substrates and prefer sandy loam substrates for digging of shallow burrows.	No
Eremophila alpestris actia California horned lark	Fed: None CA: WL	Generally found in shortgrass prairies, grasslands, disturbed fields, or similar habitat types. Flocks in groups.	No
Euchloe hyantis andrewsi Andrew's marble butterfly	Fed: None CA: None	Inhabits yellow pine forests near Lake Arrowhead and Big Bear Lake at elevations between 5,000 and 6,000 feet. Uses Laguna Mountains jewelflower (*Streptanthus bernardinus*) and pine rockcress (*Arabis holboelli var. pinetorum*) as host plants; larvae feed on mountain tansy mustard (*Descurainia incana*).	No
Glaucomys sabrinus californicus San Bernardino flying squirrel	Fed: None CA: SSC	Occurs in white fir (*Abies concolor*) and Jeffrey pine (*Pinus jeffreyi*) mixed conifer forests with black oak (*Quercus kelloggii*) components at higher elevations. Use cavities in large trees, snags, and logs for cover. Habitats are typically mature, dense conifer forest in close proximity to riparian areas.	No
Lasiurus xanthinus western yellow bat	Fed: None CA: SSC	Roosts in palm trees in foothill riparian, desert wash, and palm oasis habitats with access to water for foraging.	No
Lepus californicus bennettii San Diego black-tailed jackrabbit	Fed: None CA: SSC	Occurs in diverse habitats, but primarily is found in arid regions supporting shortgrass habitats. Openness of open scrub habitat is preferred over dense chaparral.	Yes
Neotoma lepida intermedia San Diego desert woodrat	Fed: None CA: SSC	Occurs in coastal scrub communities between San Luis Obispo and San Diego Counties. Prefers moderate to dense canopies, and especially rocky outcrops.	No
Nyctinomops femorosaccus pocketed free-tailed bat	Fed: None CA: SSC	Often found in pinyon-juniper woodlands, desert scrub, desert succulent shrub, desert riparian, desert wash, alkali desert scrub, Joshua tree, and palm oasis.	No

Scientific Name Common Name	**Status**	**Habitat**	**Observed On-site**
Perognathus longimembris brevinasus Los Angeles pocket mouse	Fed: None CA: SSC	Occurs in lower elevation grasslands and coastal sage scrub communities in and around the Los Angeles Basin. Prefers open ground with fine sandy soils. May not dig extensive burrows, but instead will seek refuge under weeds and dead leaves instead.	No
Phrynosoma blainvillii coast horned lizard	Fed: None CA: SSC	Occurs in a wide variety of vegetation types including coastal sage scrub, annual grassland, chaparral, oak woodland, riparian woodland and coniferous forest. In inland areas, this species is restricted to areas with pockets of open microhabitat, created by disturbance (i.e. fire, floods, roads, grazing, fire breaks). The key elements of such habitats are loose, fine soils with a high sand fraction; an abundance of native ants or other insects; and open areas with limited overstory for basking and low, but relatively dense shrubs for refuge.	No
Polioptila californica californica coastal California gnatcatcher	Fed: **THR** CA: SSC	Obligate resident of sage scrub habitats that are dominated by California sagebrush (*Artemisia californica*). This species generally occurs below 750 feet elevation in coastal regions and below 1,500 feet inland. Ranges from the Ventura County, south to San Diego County and northern Baja California and it is less common in sage scrub with a high percentage of tall shrubs. Prefers habitat with more low-growing vegetation.	No
Rana muscosa southern mountain yellow-legged frog	Fed: **END** CA: **END**; SSC	Occurs in lower elevation habitats characterized by rocky streambeds and wet meadows, while higher elevation habitats include lakes, ponds, and streams. Occupy streams in narrow, rock-walled canyons. Often found along rock walls or vegetated banks and always within a few feet of the water.	No
Rhinichthys osculus* ssp. *3 Santa Ana speckled dace	Fed: None CA: SSC	Requires permanent flowing streams within summer water temperatures of 17 – 20 degrees Celsius. Inhabits shallow cobble and gravel riffles and small streams that flow through steep, rocky canyons with chaparral covered walls.	No
Setophaga petechial yellow warbler	Fed: None CA: SSC	Nests over all of California except the Central Valley, the Mojave Desert region, and high altitudes and the eastern side of the Sierra Nevada. Winters along the Colorado River and in parts of Imperial and Riverside Counties. Nests in riparian areas dominated by willows, cottonwoods, sycamores, or alders or in mature chaparral. May also use oaks, conifers, and urban areas near stream courses.	No
Spea hammondii western spadefoot	Fed: None CA: SSC	Prefers open areas with sandy or gravelly soils, in a variety of habitats including mixed woodlands, grasslands, coastal sage scrub, chaparral, sandy washed, lowlands, river floodplains, alluvial fans, playas, alkali flats, foothills, and mountains. Rainpools which do not contain bullfrogs, fish, or crayfish are necessary for breeding.	No
Thamnophis hammondii two-striped garter snake	Fed: None CA: CSC	Occurs in or near permanent fresh water, often along streams with rocky beds and riparian growth up to 7,000 feet in elevation.	No

Scientific Name Common Name	**Status**	**Habitat**	**Observed On-site**
Vireo bellii pusillus least Bell's vireo	Fed: **END** CA: **END**	Primarily occupy Riverine riparian habitat that typically feature dense cover within 1-2 meters of the ground and a dense, stratified canopy. Typically it is associated with southern willow scrub, cottonwood-willow forest, mule fat scrub, sycamore alluvial woodlands, coast live oak riparian forest, arroyo willow riparian forest, or mesquite in desert localities. It uses habitat which is limited to the immediate vicinity of water courses, 2,000 feet elevation in the interior.	No
Special-Status Plant Species			
Ambrosia monogyra singlewhorl burrobush	Fed: None CA: None CNPS: 2B.2	Found in sandy soils within chaparral and Sonoran desert scrub habitat. Found at elevations ranging from 33 to 1,640 feet. Blooming period is from August to November.	No
Arenaria paludicola marsh sandwort	Fed: **END** CA: **END** CNPS: 1B.1	Grows mainly in wetlands and freshwater marshes in arid climates. The plant can grow in saturated acidic bog soils and soils that are sandy with a high organic content. Found at elevations ranging from 33 to 558 feet. Blooming period is from May to August.	No
Berberis nevinii Nevin's barberry	Fed: **END** CA: **END** CNPS: 1B.1	Grows in chaparral, cismontane woodland, coastal scrub, and riparian scrub. Usually found on steep, north facing slopes or in low grade sandy washes. Found at elevations ranging from 197 to 3,904 feet. Blooming period ranges from March to June.	No
Brodiaea filifolia thread-leaved brodiaea	Fed: **THR** CA: **END** CNPS: 1B.1	Often found in clay soils within openings of chaparral, cismontane woodland, coastal scrub, playas, vernal pools, valley and foothill grassland habitats. Found at elevations ranging from 82 to 3,675 feet. Blooming period ranges from March to June.	No
Calochortus catalinae Catalina mariposa-lily	Fed: None CA: None CNPS: 4.2	Grows in chaparral, cismontane woodland, coastal scrub, valley and foothill grassland. Found at elevations ranging from 49 to 2,297 feet. Blooming period is from February to June.	No
Calochortus plummerae Plummer's mariposa-lily	Fed: None CA: None CNPS: 4.2	Prefers openings in chaparral, foothill woodland, coastal sage scrub, valley foothill grasslands, cismontane woodland, lower montane coniferous forest and yellow pine forest. Often found on dry, rocky slopes and soils and brushy areas. Can be very common after a fire. Found at elevations ranging from 459 to 6,299 feet. Blooming period is from May to July.	No
Castilleja lasiorhyncha San Bernardino Mountains owl's-clover	Fed: None CA: None CNPS: 1B.2	Found in chaparral, riparian woodland, pebble (pavement) plain, upper montane coniferous forest, meadows and seeps habitats. Found at elevations ranging from 4,265 to 7,841 feet. Blooming period is from May to August.	No
Centromadia pungens* ssp. *laevis smooth tarplant	Fed: None CA: None CNPS: 1B.1	Occurs in alkaline soils within chenopod scrub, meadows and seeps, playas, riparian woodland, and valley and foothill grassland habitats. Grows in elevation from 0 to 2,100 feet. Blooming period ranges from April to September.	No
Chloropyron maritimum* ssp. *maritimum salt marsh bird's-beak	Fed: **END** CA: **END** CNPS: 1B.2	Upper terraces and higher edges of coastal salt marshes where tidal inundation is periodic. Found at elevations ranging from 0 to 98 feet. Blooming period is from May to October.	No

Scientific Name Common Name	**Status**	**Habitat**	**Observed On-site**
Chorizanthe parryi* var. *parryi Parry's spineflower	Fed: None CA: None CNPS: 1B.1	Occurs on sandy and/or rocky soils in chaparral, coastal sage scrub, and sandy openings within alluvial washes and margins. Found at elevations ranging from 951 to 3,773 feet. Blooming period is from April to June.	No
Chorizanthe xanti var. leucotheca white-bracted spineflower	Fed: None CA: None CNPS: 1B.2	Found in sandy or gravelly soils within coastal scrub (alluvial fans), Mojavean desert scrub, pinyon and juniper woodland habitats. Found at elevations ranging from 984 to 3,937 feet. Blooming period is from April to June.	No
Dodecahema leptoceras slender-horned spineflower	Fed: **END** CA: **END** CNPS: 1B.1	Chaparral, coastal scrub (alluvial fan sage scrub). Flood deposited terraces and washes. Found at elevations ranging from 1,181 to 2,690 feet. Blooming period is from April to June.	No
Eriastrum densifolium* ssp. *sanctorum Santa Ana River woollystar	Fed: **END** CA: **END** CNPS: 1B.1	Found in sandy soil in association with mature alluvial scrub. Ideal habitat appears to be a terrace or bench that receives overbank deposits every 50 to 100 years. Cryptogamic crusts are frequently present in occupied areas. Found at elevations ranging from 299 to 2,001 feet. Blooming period is from April to September.	No
Fimbristylis thermalis hot springs fimbristylis	Fed: None CA: None CNPS: 2B.2	Habitat includes meadows and seeps (alkaline, near hot springs). Found at elevations ranging from 361 to 4,396 feet. Blooming period is from July to September.	No
Frasera neglecta pine green-gentian	Fed: None CA: None CNPS: 4.3	Found in lower montane coniferous forest, upper montane coniferous forest, pinyon and juniper woodland habitats. Found at elevations ranging from 4,593 to 8,202 feet. Blooming period is from May to July.	No
Galium johnstonii Johnston's bedstraw	Fed: None CA: None CNPS: 4.3	Found in granitic, rocky or gravelly soils within lower montane coniferous forest and upper montane coniferous forest habitats. Found at elevations ranging from 5,052 to 8,202 feet. Blooming period is from July to August.	No
Horkelia cuneata var. puberula Mesa horkelia	Fed: None CA: None CNPS: 1B.1	Occurs on sandy or gravelly soils in chaparral, woodlands, and coastal scrub plant communities. Found at elevations ranging from 230 to 2,657 feet. Blooming period is from February to September.	No
Imperata brevifolia California satintail	Fed: None CA: None CNPS: 2B.1	Grows in chaparral, coastal scrub, mojavean desert scrub, riparian scrub, and meadows and seeps. Found at elevations ranging from 0 to 3,986 feet. Blooming period is from September to May.	No
Juglans californica southern California black walnut	Fed: None CA: None CNPS: 4.2	Found in chaparral, cismontane woodland, coastal scrub, and riparian woodland habitats. Found at elevations ranging from 164 to 2,953 feet. Blooming period is from March to August.	Yes
Juncus duranii Duran's rush	Fed: None CA: None CNPS: 4.3	Habitats include lower and upper montane coniferous forests, meadows and seeps. Found at elevations ranging from 5,801 to 9,199 feet. Blooming period is from July to August.	No
Lilium humboldtii* ssp. *ocellatum ocellated humboldt lily	Fed: None CA: None CNPS: 4.2	Found in openings within chaparral, cismontane woodland, coastal scrub, lower montane coniferous forest, and riparian woodland habitats. Found at elevations ranging from 98 to 5,906 feet in elevation. Blooming period is from March to August.	No

Scientific Name Common Name	**Status**	**Habitat**	**Observed On-site**
Lilium parryi lemon lily	Fed: None CA: None CNPS: 1B.2	Prefers lower montane coniferous forest, riparian forests, upper montane coniferous forests, meadows and seeps. Found at elevations ranging from 4,003 to 9,006 feet. Blooming period is from July to August.	No
Lycium parishii Parish's desert-thorn	Fed: None CA: None CNPS: 2B.3	Habitats include coastal scrub and Sonoran desert scrub. Found at elevations ranging from 443 to 3,281 feet. Blooming period is from March to April.	No
Malacothamnus parishii Parish's bush-mallow	Fed: None CA: None CNPS: 1A	Species is presumed extinct. Habitats include coastal scrub and chaparral. Found at elevations ranging from 1,000 to 1,495 feet. Blooming period is from June to July.	No
Monardella saxicola rock monardella	Fed: None CA: None CNPS: 4.2	Found in rocky, usually serpentinite, soils within closed-cone coniferous forest, chaparral, and lower montane coniferous forest habitats. Found at elevations ranging from 1,640 to 5,906 feet. Blooming period is from June to September.	No
Muhlenbergia californica California muhly	Fed: None CA: None CNPS: 4.3	Found in chaparral, coastal scrub, lower montane coniferous forest, meadows and seeps. Only known to occur in the San Bernardino Mountains. Found at elevations ranging from 328 to 6,562 feet. Blooming period is from June to September.	No
Opuntia basilaris var. brachyclada short-joint beavertial	Fed: None CA: None CNPS: 1B.1	Habitats include chaparral, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodlands. Found at elevations ranging from 1,394 to 5,906 feet. Blooming period is from April to August.	No
Pickeringia montana var. tomentosa woolly chaparral pea	Fed: None CA: None CNPS: 4.3	Found in gabbroic, granitic, clay soils in chaparral habitats. Found at elevations ranging from 0 to 5,557 feet. Blooming period is from May to August.	No
Schoenus nigricans black bog-rush	Fed: None CA: None CNPS: 2B.2	Grows within marches and swamps (often alkaline). Found at elevations ranging from 492 to 6,562 feet. Blooming period is from August to September.	No
Senecio astephanus San Gabriel ragwort	Fed: None CA: None CNPS: 4.3	Grows in chaparral, cismontane woodland, and coastal scrub habitat. Found at elevations ranging from 49 to 2,625 feet. Blooming period is from January to April.	No
Streptanthus bernardinus Laguna Mountains jewelflower	Fed: None CA: None CNPS: 4.3	Grows in chaparral and lower montane coniferous forest on clay or decomposed granite soils. It is sometimes found in disturbed areas such as streamsides or roadcuts. From 4,724 to 8,202 feet in elevation. Blooming period is from May to August.	No
Streptanthus campestris southern jewelflower	Fed: None CA: None CNPS: 1B.3	Found in rocky habitats within chaparral, lower montane coniferous forest, pinyon and juniper woodland. Found at elevations ranging from 2,953 to 7,546 feet. Blooming period is from April to July.	No
Symphyotrichum defoliatum San Bernardino aster	Fed: None CA: None CNPS: 1B.2	Grows in cismontane woodland, coastal scrub, lower montane coniferous forest, meadows and seeps, marshes and swamps, valley and foothill grassland (vernally mesic). Can be found growing near ditches, streams, and springs within these habitats. Found at elevations ranging from 7 to 6,693 feet. Blooming period is from July to November.	No

Scientific Name Common Name	**Status**	**Habitat**	**Observed On-site**
Special-Status Plant Communities			
Riversidean Alluvial Fan Sage Scrub	CDFW Sensitive Habitat	Occur within broad washes of sandy alluvial drainages that carry rainfall runoff sporadically in winter and spring, but remain relatively dry through the remainder of the year. Is restricted to drainages and floodplains with very sandy substrates that have a dearth of decomposed plant material. These areas do not develop into riparian woodland or scrub due to the limited water resources and scouring by occasional floods.	Yes
Southern Riparian Forest	CDFW Sensitive Habitat	Dense riparian forests found along streams and rivers. Characteristic plant species include western sycamore, cottonwood, and many other wetland plants.	No
Southern Sycamore Alder Riparian Woodland	CDFW Sensitive Habitat	Occurs below 2,000 meters in elevation, sycamore and alder often occur along seasonally-flooded banks; cottonwoods and willows are also often present. Poison oak, mugwort, elderberry and wild raspberry may be present in understory.	No

U.S. Fish and Wildlife Service (USFWS) - Federal
END- Federal Endangered
THR- Federal Threatened

California Department of Fish and Wildlife (CDFW) - California
END- California Endangered
THR- California Threatened
FP- California Fully Protected
SSC- California Species of Concern
WL- Watch List

California Native Plant Society (CNPS)
California Rare Plant Rank
1A Plants Presumed Extirpated in California and Either Rare or Extinct Elsewhere
1B Plants Rare, Threatened, or Endangered in California and Elsewhere
2B Plants Rare, Threatened, or Endangered in California, but More Common Elsewhere
4 Plants of Limited Distribution – A Watch List

Threat Ranks
0.1- Seriously threatened in California
0.2- Moderately threatened in California
0.3- Not very threatened in California

Appendix C 2017 SBKR Trapping Study

SJM BIOLOGICAL CONSULTANTS

23 February 2018 SJMBC.980

Ms. Stacey Love
Recovery Permit Coordinator
Carlsbad Fish and Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, California 92008

Subject: Results of trapping surveys for the federally endangered San Bernardino kangaroo rat (*Dipodomys merriami parvus* [SBKR]) at the Vulcan Area Q Property in unincorporated lands in San Bernardino County, California (Exhibits 1 and 2).

Dear Ms. Love:

This report presents the results of a habitat assessment and follow-up trapping survey for the federally endangered San Bernardino kangaroo rat (*Dipodomys merriami parvus* [SBKR]) at the Vulcan Area Q Property, located in unincorporated San Bernardino County. The purpose of the habitat assessment and trapping surveys was to determine the presence/absence of SBKR within the Vulcan Property. Exhibit 1 shows the Vulcan Property on the San Bernardino North 7.5" quadrangle USGS Quadrangle Map (Township 1N, Range 5W, Unsectioned lands) (Exhibit 1). The coordinates of the approximate center of the survey area are 11S 466692 E/3781088 N (UTM, NAD 83). On-site surface elevation ranges from approximately 1,495 to 1,580 feet above mean sea level and generally slopes from north to south.

INTRODUCTION

Project Description

Vulcan Materials Company currently owns the property and is conducting due diligence biological studies in anticipation of expanding surface mining operations within the vicinity of Cajon Creek Wash.

SBKR Background

SBKR was emergency listed (USFWS 1998a) and then confirmed as "endangered" in 1998 by the U.S. Fish and Wildlife Service (USFWS 1998b). The Final Critical Habitat designation for this species (USFWS 2008) includes portions of Cajon Wash and Lytle Creek alluvial systems, a major part of the eastern portion of Santa Ana River, and eastern sections of the San Jacinto River up to the area around Hemet.

SBKR occur mainly in Riversidean alluvial fan sage scrub habitat (RAFSS), which is a plant community with coastal sage scrub and chaparral elements on alluvial terraces and braided river channels in southern California (McKernan 1997). SBKR can also occur in abandoned agricultural fields and orchards, but usually only when such habitats are in proximity to suitable natural habitats. SBKR abundance is greatest where there is sandy substrate with low-to- moderate perennial vegetative cover (less than 30 to 50 percent), and without a dense cover of non-native annual plants (McKernan 1997, MEC 2000). Root's (2008a,b) analysis of SBKR occurrence in the Wooly Star Preserve Area found that SBKR occupancy is negatively

correlated with a dense cover of non-native grasses and areas where boulders and rocks dominate the surface. SBKR occurrence was positively correlated with sandy sparse ground cover and the perennial bush scalebroom (*Lepidospartum squamatum*). SBKR generally occur in habitats associated with active stream channels.

Property in Relation to SBKR Historical Range and Critical Habitat

The Vulcan Property is within designated critical habitat for SBKR based on information provided in the FWS online critical habitat mapper (http://criticalhabitat.fws.gov/crithab/) (Refer to Exhibit 3). The Vulcan Property occurs immediately east of the open alluvial habitat of Lytle/Cajon Creek, where SBKR are known to be common. The recent trapping surveys conducted for the Cajon Creek Conservation Area found SBKR in 26 of 28 locations trapped, one of which was approximately 150 meters directly west of the Vulcan Property. It is also presumed that other habitat sites in closer proximity to the Vulcan Property are currently occupied by SBKR, particularly near the confluence of the adjacent concrete flood control channel and the Cajon Creek Wash at the extreme southern corner of the Vulcan Property (S. Montgomery, 2017 pers. observ.). It is a possibility that this location would be a "connecting" point for SBKR between the Vulcan Property and the main wash system. However, the flood control channel along the southern boundary of the Vulcan Property is lined with concrete and heavily disturbed immediately west of the confluence thus decreasing it suitability and limiting its ability to provide a movement corridor for SBKR to colonize the Vulcan Property.

SBKR are known to occur widely in the Cajon Creek alluvial system located in the area west of the property beyond the railroad tracks. A recent trapping survey at numerous locations in the Cajon Creek wash confirmed SBKR presence at 93% of the trapped locations (Montgomery 2018).

METHODS

Prior to conducting trapping surveys, a preliminary field habitat assessment was conducted on 7 July 2017 by Stephen J. Montgomery (USFWS Permit TE745541-11, CDFW Memorandum of Understanding). During the site visit, all accessible portions of the Vulcan Property were checked by vehicle and on foot to assess habitat quality and potential for SBKR to occur, as well as search for kangaroo rat sign. The Vulcan Property was divided into eight (8) habitat areas during the preliminary habitat assessment, exclusive of the various developed and heavily disturbed properties within the overall Vulcan Property. Habitat conditions in these eight areas were then described separately (Table 1). Due to the presence of numerous private properties in the overall project area, several smaller parcels were not accessible and therefore were not covered by the field surveys. Following the preliminary field habitat assessment, a live-trapping program was carried out by Stephen J Montgomery during three 5-night sessions between 25 July and 20 September 2017.

Areas trapped during the live-trapping program exhibited habitat conditions most closely resembling those preferred by SBKR, which included the following: areas with sandy soils, stands of alluvial fan sage scrub (scalebroom scrub vegetation), open areas in the chamise chaparral in the northwest corner of the site, and disturbed sparse stands of annual grassland typically integrated with stands of scrub/chaparral. Heavily disked fields and locations immediately adjacent to residential homes/developed sites were not trapped during the live-trapping program.

Three trapping sessions were conducted to adequately cover all areas of the Vulcan Property with the highest quality suitable habitat and/or kangaroo rat sign. Although certain stands of generally suitable habitat were not included in the trapping survey, those that were trapped exhibited the highest potential for harboring SBKR. Some un-trapped habitat areas invariably occurred adjacent to trapped habitat areas; thus, any SBKR that were present in these un-trapped areas would also would have been present in the adjacent

trapped areas. The live-trapping effort used large (3 x 3.75 x 12") Sherman live-traps with doors shortened to avoid tail damage. A total of 330 large Sherman live traps were used nightly between 25 and 29 July 2017 and 183 traps were used between 16 and 20 September 2017. Trap spacing was generally 10 meters, but closer spacing occurred on numerous occasions in locations where clear sign of kangaroo rats was observed, and where it was considered important to set multiple traps in closer proximity to maximize the likelihood of capturing the resident kangaroo rat, since captures of non-kangaroo rat species can prevent kangaroo rats from entering such occupied traps. Traps were opened and baited with bird seed within one hour of sunset and checked twice each day near midnight and in the morning. In accordance with USFWS protocol, trapping occurred on consecutive nights except when low air temperatures (<50°F) prevented trap setting. Captured animals were identified and then released immediately at the point of capture. A total of 2,565 trap-nights was accrued during the entire live-trapping program. Exhibit 5 shows the Vulcan Property and locations of the Trap Areas A thru E.

RESULTS

Site Description

The overall Vulcan Property has long been heavily disturbed by human activities, including: disking in some areas, numerous dirt roads, fire (assumed to be human generated), residential lot and home development, extensive trash dumping, off-road vehicle activity, wandering domestic pets (primarily dogs), regular passage of freight trains, and occasional horse traffic. According to the U.S. Department of Agriculture's Natural Resources Conservation Services Web Soil Survey, soils within the Vulcan Property consist of Psamments, Fluvents and Frequently flooded soils (Ps), Soboba gravelly loamy sand (0 to 9% slopes [SoC]), and Tujunga gravelly loamy sand (0 to 9% slopes [TvC]). Soils within the Vulcan Property are generally sandy in all areas, which is the primary substrate preferred by SBKR.

A variety of habitat conditions were confirmed across the property during the habitat assessment. Several of the eight habitat areas exhibited conditions generally suitable for SBKR, with the most suitable habitat occurring just east of the railroad tracks, and along and near the northern boundary in the north-central portion of the Vulcan Property (Exhibit 4, Table 1, Site Photographs). Scattered small locations along the southerly concrete flood control channel also exhibited generally suitable habitat conditions for SBKR. Kangaroo rat sign was common in most areas of the Vulcan Property that were not too heavily disturbed, including many areas amidst dumped trash. Refer to Table 1 below and Exhibit 4 for a description of habitat areas within the Vulcan Property. The Site Photographs at the end of this document illustrate the types of habitat that exist on the property.

Table 1 – General Habitat Area Descriptions (See Exhibit 5)

Habitat Area	Description
1	Dense chamise chaparral (*Adenostoma fasciculatum*) and alluvial fan sage scrub dominated by California buckwheat (*Eriogonum fasciculatum*), yerba santa (*Eriodictyon trichocalyx*), holly leaf cherry (*Prunus ilicifolia*), redberry buckthorn (*Rhamnus crocea*), skunkbush (*Rhus aromatica*), stillingia (Stillingia sp.), and California cholla (*Cylindropuntia californica*).* Disturbances include illegal trash dumping, dirt roads, off-road vehicle use, and encroachment from adjacent rural residential property. Kangaroo rat sign was consistent throughout in scrub habitats but mostly along dirt roads in chamise.
2	Open weedy, non-native grassland with few to no shrubs. Disturbances include disking, roadway, and recent fire. *Some evidence of kangaroo rat activity was detected.
3	Open alluvial fan sage scrub dominated by yerba santa and scalebroom (*Lepidospartum squamatum*), with scattered mountain mahogany (*Cercocarpus betuloides*), holly leaf cherry, and redberry buckthorn. * Disturbances include illegal trash dumping, dirt roads, off-road vehicle use,

	and encroachment from adjacent rural residential property. Kangaroo rat sign was consistent throughout.
4	Open alluvial fan sage scrub dominated by yerba santa. * Disturbances include illegal trash dumping, dirt roads, off-road vehicle use, and encroachment from rural residential property. Kangaroo rat sign was consistent throughout.
5	Open weedy, non-native grassland with little to no shrub cover. * Disturbances include illegal trash dumping, routine disking, dirt roads, and off-road vehicle use. No kangaroo rat sign was detected.
6	Open alluvial fan sage scrub dominated by California buckwheat. * Disturbances include encroachment from adjacent rural residential property. Kangaroo rat sign was detected.
7	Open weedy, non-native grassland with patches of scrub including skunkbush and California buckwheat. * Disturbances include routine disking, dirt roads, off-road vehicle use, and encroachment from adjacent rural residential property. Some evidence of kangaroo rat activity was detected in association with patches of scrub vegetation.
8	Open alluvial fan sage scrub dominated by yerba santa. * Disturbances include dirt roads and encroachment from adjacent rural residential property. Kangaroo rat sign was consistent throughout.

* All areas exhibited a variety of herbaceous species, including (and depending on the specific location) such common plants as: *Acmispon glaber, Eremocarpus (Croton) setigerus, Amsinckia sp., Lessingia glandulifera, L. filaginifolia, Croton californica, Bromus madritensis rubens, B. diandrus, Vulpia myuros, Schismus barbatus, Eriogonum gracile, Eriastrum sapphirinum, Centaurea melitensis, Heterotheca sessiliflora, and H. grandiflorum. Other shrub species found at scattered locations included: Salvia apiana, Salvia mellifera, Artemisia californica, Senecio flaccidus, Gutierrezia sp., Yucca sp., and Opuntia parryi.*

Small Mammal Survey Results

Weather conditions during the trapping effort included clear to overcast skies, moderate air temperatures and low winds. Air temperatures ranged from 60 to 85 °F with low winds. Cloud cover ranged from 0 to 100%, without precipitation. Table 2 summarizes representative weather conditions during the surveys.

Table 2 – Representative Weather Conditions

Date	Temperature (°F)	Cloud Cover (%)	Wind (mph)
7/24/2017	85	90	2 to 5
7/25/2017	72	90	0 to 2
7/26/2017	68	0	0 to 1
7/27/2017	70	5	1 to 2
7/28/2017	69	0	0 to 1
7/29/2017	66	0	0 to 1
9/16/2017	63	100	2 to 3
9/17/2017	63	100	1 to 2
9/18/2017	63	100	0 to 1
9/19/2017	60	100	0 to 1
9/20/2017	61	100	2 to 3

The trapping surveys included a total of 2,565 trap-nights distributed across 10 nights, yielding 904 captures belonging to six species, the most common being the Dulzura kangaroo rat (*Dipodomys simulans* [DKR]) (87%). Captured individuals were not individually marked; therefore, the number of captures do not necessarily represent the number of individuals of any trapped species. No SBKR were captured during the

live-trapping program. Table 3 summarizes the captures for all species. Exhibit 5 shows the Vulcan Property and locations of Trap Areas A thru E. Figure 6 shows the locations of DKR captures at all trapped areas.

Table 3 – Summary of Small Mammal Captures

Capture Location (Trap Line)	Number of Traps Set	Date Traps Checked	Species*	Number of captures
B + D	170	7/25/2017	DISI	30
B + D			PEMA	7
A	160		DISI	42
A			PEMA	2
A			NEBR	1
A			CHFA	1
C			DISI	5
C			PEMA	3
B + D	170	7/26/2017	DISI	34
B + D			PEMA	9
B + D			NEBR	2
A	160		DISI	44
A			PEMA	2
A			CHFA	1
A			OTBE	2
A			PEFR	1
C			DISI	4
C			PEMA	1
B + D	170	7/27/2017	DISI	47
B + D			PEMA	15
B + D			CHFA	2
A	160		DISI	33
A			PEMA	2
A			NEBR	1
A			CHFA	3
A			OTBE	3
C			DISI	4
C			PEMA	2
B + D	170	7/28/2017	DISI	44
B + D			PEMA	14

Capture Location (Trap Line)	Number of Traps Set	Date Traps Checked	Species*	Number of captures
B + D			NEBR	2
A	160		DISI	43
A			PEMA	2
A			CHFA	2
C			DISI	4
C			PEMA	1
B + D	170	7/29/2017	DISI	55
B + D			PEMA	13
B + D			CHFA	1
B + D			NEBR	2
A	160		DISI	38
A			PEMA	4
A			CHFA	1
A			PEFR	1
C			DISI	5
E - 6 Lines	183	9/16/2017	DISI	54
E - 6 Lines	183	9/17/2017	DISI	59
			PEMA	1
E - 6 Lines	183	9/18/2017	DISI	79
			PEMA	2
			NEBR	1
E - 6 Lines	183	9/19/2017	DISI	86
			NEBR	1
			PEMA	2
E - 6 Lines	183	9/20/2017	DISI	79
			NEBR	2
			PEMA	3
TOTAL TRAP-NIGHTS, ALL AREAS	**2,565**			

*Species
DISI = *Dipodomys simulans* (Dulzura kangaroo rat)
CHFA = *Chaetodipus fallax fallax* (Northwestern San Diego pocket mouse)
PEMA = *Peromyscus maniculatus* (deer mouse)
PEFR = *Peromyscus fraterculus* (Baja mouse)
NEBR = *Neotoma bryanti* (Bryant's desert woodrat)

Capture Location (Trap Line)	Number of Traps Set	Date Traps Checked	Species*	Number of captures
OTBE = *Otospermophilus beecheyi* (California ground squirrel)				

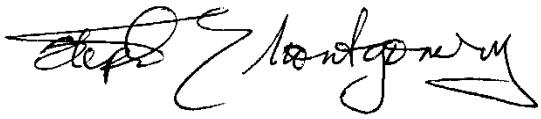
Discussion and Conclusions

The habitat assessment identified all parts of the property with habitat conditions potentially suitable for SBKR. Several areas exhibited what appeared to be high-quality habitat for the species, with soft sandy soils, and open scrub habitats with many of the plant species typically associated with occupied SBKR habitats. The follow-up trapping survey then sampled all habitats exhibiting the highest potential for SBKR presence. The absence of SBKR in all trapped habitat areas confirms that this species is absent on this site. Although the property occurs within SBKR Critical Habitat, it appears as though the species has been extirpated from the site over time or never occurred there. The long-term presence of the railroad track and associated berm may be responsible for the absence of SBKR on the property, with the property presently being essentially isolated (i.e. cut off) from the occupied habitats of the Cajon Wash alluvial system. The only point on the property that is not blocked from Cajon Wash by the railroad berm/tracks occurs at a narrow bridge overcrossing (over the exit point for the large southerly steep-sloping cement drainage structure), at its extreme southwestern corner. This overcrossing is subjected to extensive and constant disturbance from off-road vehicle (quad, motorcycle) and horse traffic, as well as frequent daily human traffic, which have eliminated all vegetation cover. These conditions are highly unsuitable for use by SBKR, and would likely prevent or nearly prevent all access to the property by any SBKR happening to occur near this overcrossing.

In summary, although several areas of the property exhibited habitat conditions that appeared suitable for SBKR, this species was not captured during the live-trapping program. The absence of SBKR in this protocol survey indicates that this species does not currently occur on the Vulcan Property; thus, no impacts to SBKR would occur during development/disturbance to this site under current conditions. Although there is some very low potential for the species to access the property at its southwestern corner overcrossing, the constant extreme disturbance that occurs at and adjacent to this location in the Cajon Wash, as well as the steep cement wall of the drainage structure, would essentially prevent any occurrence of SBKR on the property in the future.

Please contact me if you have any questions regarding this report or the associated field effort.

Sincerely,



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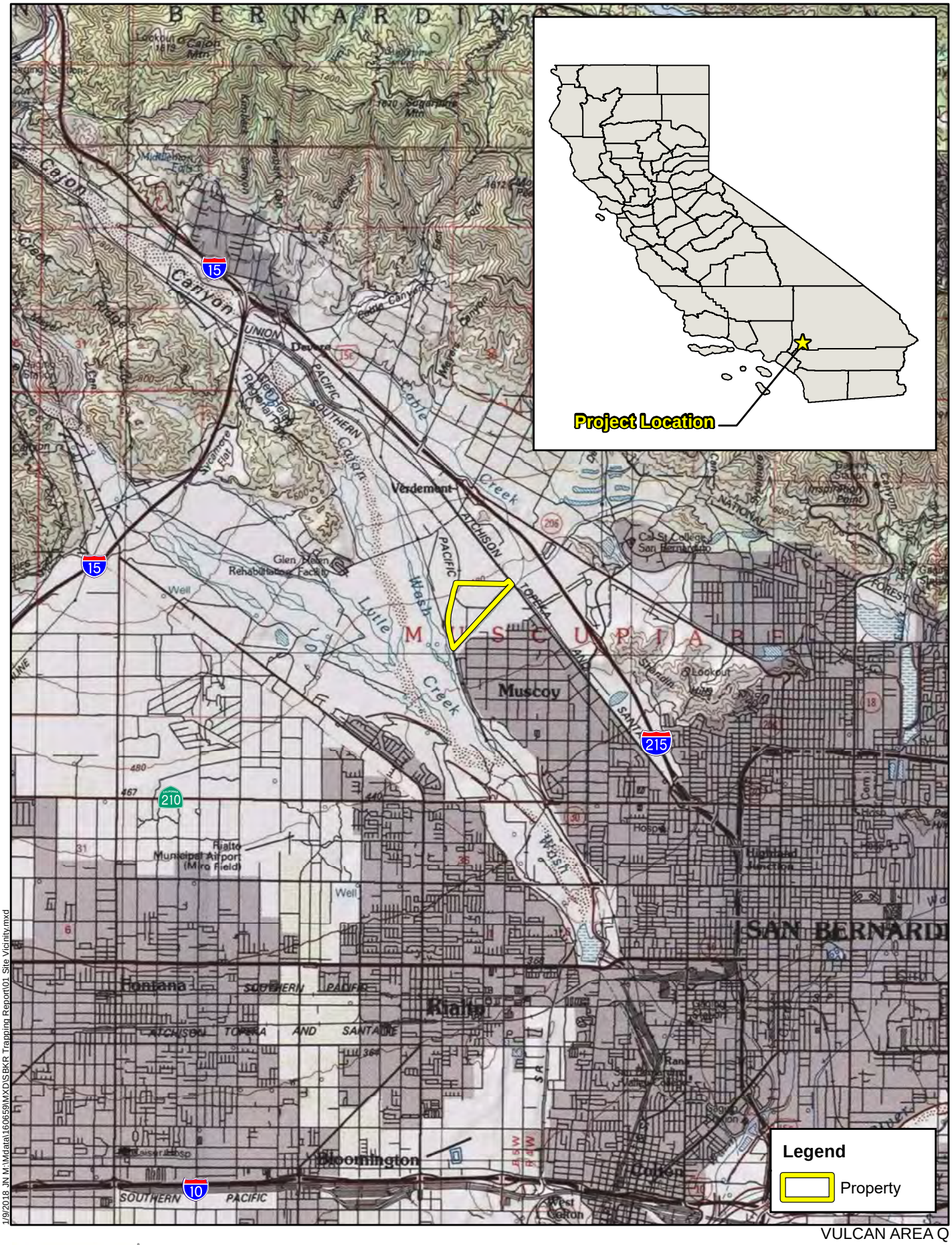
Attachment A

Project Exhibits



1/9/2018 JN M:\Mdata\160659\MXD\SBKR Trapping Report\01 Site Vicinity.mxd

Michael Baker INTERNATIONAL

0 1 2 Miles

Source: San Bernardino County, ESRI USA Topographic Basemap, USGS

VULCAN AREA Q
SBKR TRAPPING SURVEY REPORT

Site Vicinity

Exhibit 1

1/9/2018 JN M:\Mdata\160659\MXD\SBKR Trapping Report\02 Project Site.mxd

Michael Baker INTERNATIONAL

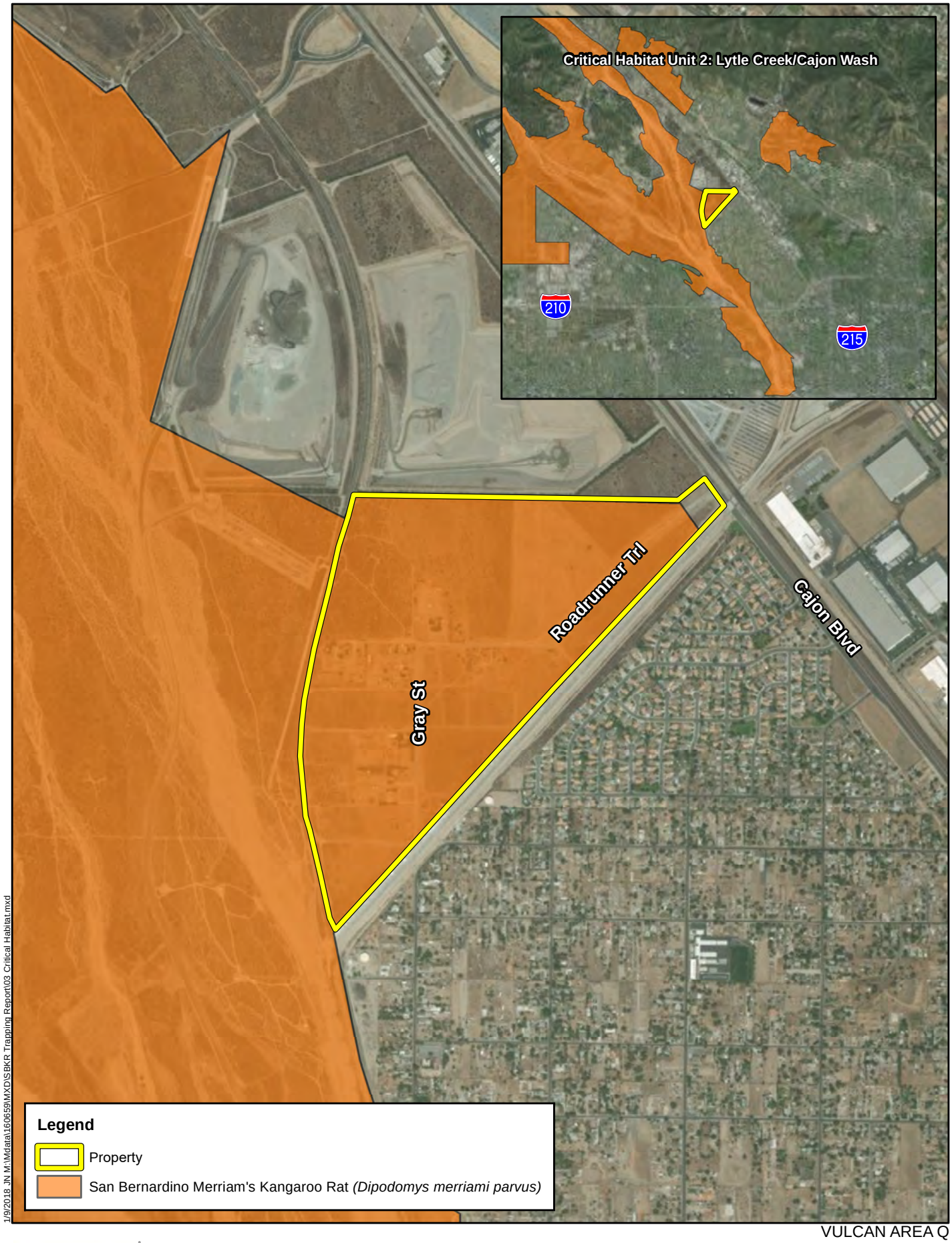
0 500 1,000 Feet

Source: San Bernardino County, Google Imagery 2016

VULCAN AREA Q
SBKR TRAPPING SURVEY REPORT

Project Site

Exhibit 2



1/9/2018 JN M:\Mdata\160659\MXD\SBKR Trapping Report\03 Critical Habitat.mxd

Michael Baker INTERNATIONAL

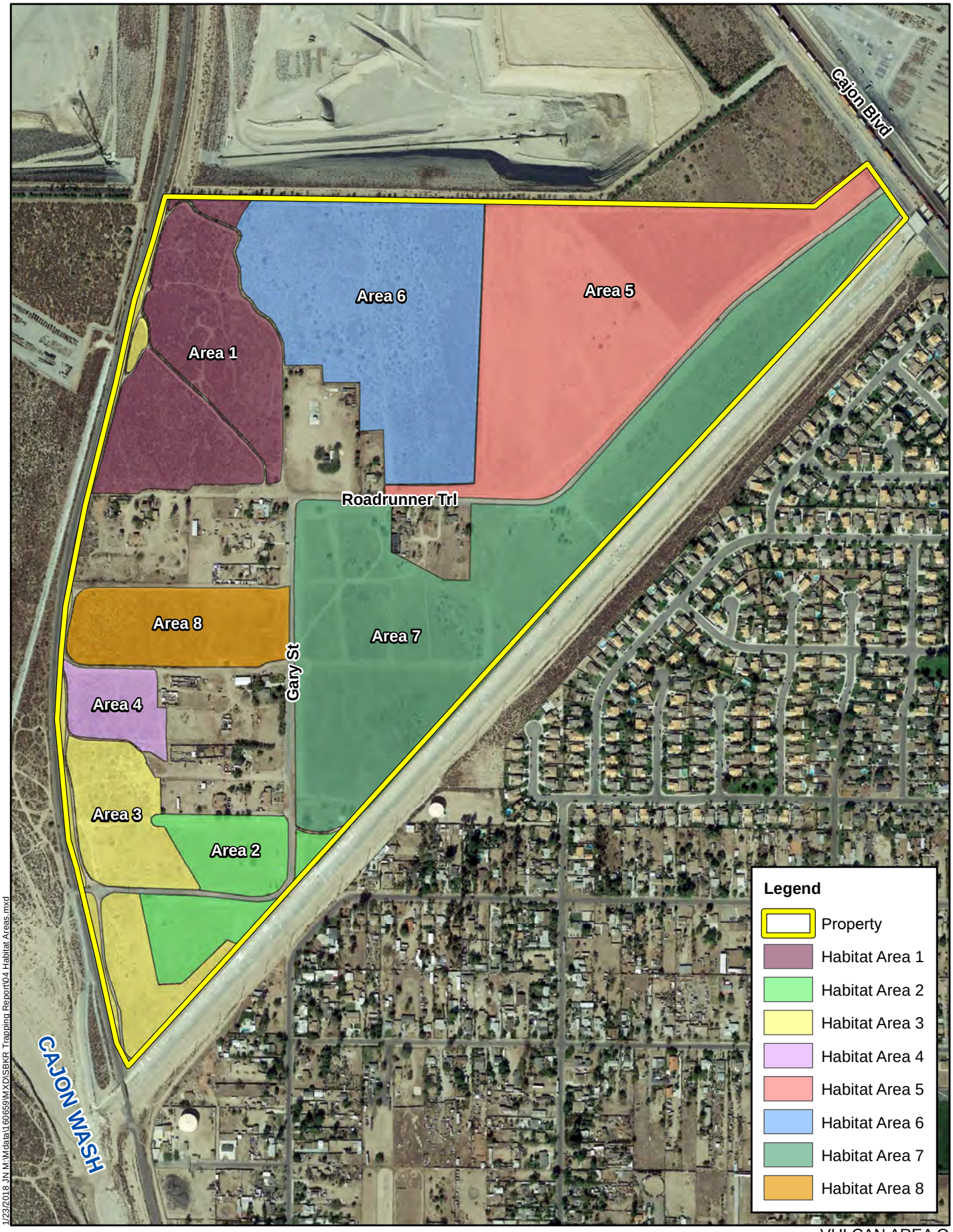
0 1,000 2,000 Feet

Source: San Bernardino County, ESRI Imagery, US Fish and Wildlife

VULCAN AREA Q
SBKR TRAPPING SURVEY REPORT

Critical Habitat

Exhibit 3



1/23/2018 JN M:\Mdata\160659\MXD\SBKR Trapping Report\04 Habitat Areas.mxd

Michael Baker INTERNATIONAL

0 500 1,000 Feet

Source: San Bernardino County, Google Imagery 2016

VULCAN AREA Q
SBKR TRAPPING SURVEY REPORT

Habitat Areas

Exhibit 4

2/8/2018 JN M:\Mdata\160659\MXD\SBKR Trapping Report\05 Trap Areas.mxd

Michael Baker INTERNATIONAL

0 500 1,000 Feet

Source: San Bernardino County, Google Imagery 2016

VULCAN AREA Q
SBKR TRAPPING SURVEY REPORT

Trap Areas

Exhibit 5

2/8/2018 JN M:\Mdata\160659\MXD\SBKR Trapping Report\06 DKR Captures.mxd

Michael Baker INTERNATIONAL

0 500 1,000 Feet

Source: San Bernardino County, Google Imagery 2016

VULCAN AREA Q
SBKR TRAPPING SURVEY REPORT

DKR Captures

Exhibit 6

Attachment B

Site Photographs

Photograph 1: Habitat Area 2 burned area looking northeast.

Photograph 2: Habitat Area 3 looking northeast.

Photograph 3: Habitat Area 3 looking southeast.

Photograph 4: Habitat Area 3 looking southwest.

Photograph 5: Habitat Area 3 south burned end looking southwest.

Photograph 6: Habitat Area 5 looking southeast from east edge of Area 6.

Photograph 7: Habitat Area 7 looking east along the main access road.

Photograph 8: Habitat Area 7 looking northeast along main access road.

Photograph 9: Trap Area B looking eastward from railroad tracks.

Photograph 10: Trap Area B looking north along railroad tracks.

Photograph 11: Trap Area B looking north.

Photograph 12: Trap Area B looking south along railroad tracks.

Photograph 13: Trap Area E looking northwest.

Photograph 14: Trap Area E looking southward.

Photograph 15: Trap Area E looking westward.

Photograph 16: Eastern portion of Trap Area B looking southeast.

Photograph 17: Looking west from far east end of Habitat Area 5.

Photograph 18: Western portion of Habitat Area 5 looking northwest from main access road.

Photograph 19: Western portion of Habitat Area 5.

APPENDIX D

Legal Descriptions – Area Q Property
(Chicago Title Company, Thienes Engineering, Inc., Johnson-Frank & Associates, Inc. – 2004-2016)

APPENDIX D – LEGAL DESCRIPTION

Assessor's Parcel Numbers (APN) – Area Q Property

ID #	Parcel Numbers	Size (Acres)	County Zoning Designation
1	262-201-11	12.4	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
2	262-201-12	20.1	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
3	262-201-13	8.2	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
4	262-201-14	4.2	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
5	262-211-02	32.6	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
6	262-211-03	4.6	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
7	262-211-04	0.7	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
8	262-211-05	9.3	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
9	262-211-06	10.0	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
10	262-221-03	1.0	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
11	262-221-04	3.3	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
12	262-221-05	0.8	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
13	262-221-09	12.5	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
14	262-221-10	9.0	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
15	262-221-11	8.4	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
16	262-221-12	1.1	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
17	262-221-13	3.1	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
18	262-221-17	9.9	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
19	262-221-21	5.3	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
20	262-221-23	10.0	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
21	262-221-29	6.0	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
22	262-221-30	2.4	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
23	262-231-01	2.9	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
24	262-241-13	3.6	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
25	262-241-14	0.6	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
26	262-241-16	8.7	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)
27	262-241-26	4.9	Muscoy/Single Residential – 1 Acre Minimum (Single Residential)

Parcel #1
APN's: 262-201-11

LEGAL DESCRIPTION
THAT PORTION OF LAND WITHIN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA DESCRIBED AS FOLLOWS:
PARCEL 2 OF PARCEL MAP NO. 3834, AS PER PLAT RECORDED IN BOOK 38 OF PARCEL MAPS, PAGE 26, RECORDS OF SAID COUNTY.

LEGAL DESCRIPTION
PARCEL 2:

AN EASEMENT FOR ROAD PURPOSES UPON THE FOLLOWING DESCRIBED LAND:

COMMENCING AT THE TRUE POINT OF BEGINNING OF THE ABOVE DESCRIBED LAND;
THENCE NORTH 0 DEGREES 00' 15" EAST 558 FEET;
THENCE SOUTH 89 DEGREES 45' EAST 60 FEET;
THENCE SOUTH 0 DEGREES 00' 15" WEST 558 FEET;
THENCE NORTH 89 DEGREES 45' WEST 60 FEET TO THE POINT OF BEGINNING.

Source: A.L.T.A./A.C.S.M. Land Title Survey (Johnson-Frank & Associates, Inc. – August 27, 2004)

4. **The land referred to in this policy is situated in the State of California, County of SAN BERNARDINO and is described as follows:**

PARCEL 2 OF PARCEL MAP NO. 3834, AS PER PLAT RECORDED IN BOOK 38 OF PARCEL MAPS, PAGE 26, RECORDS OF SAID COUNTY.

Source: Chicago Title Company – December 14, 2004

Parcel #2
APN's: 262-201-12

LEGAL DESCRIPTION TR1:

THE LAND REFERRED TO HEREON BELOW IS SITUATED IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

PARCEL 1 OF PARCEL MAP NO. 3834, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 38 OF PARCEL MAPS, PAGE 26, RECORDS OF SAID COUNTY.

APN: 0262-201-12-0-000

Source: ALTA/NSPS Land Title Survey (Thienes Engineering, Inc. – October 2016)

Parcels: #3, #4

APN's: 262-201-13, 262-201-14

LEGAL DESCRIPTION
THOSE PORTIONS OF LAND WITHIN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA PARCELS 3 AND 4 OF PARCEL MAP NO. 3834, AS PER PLAT RECORDED IN BOOK 38 OF PARCEL MAPS, PAGE 26, RECORDS OF SAID COUNTY.

Source: A.L.T.A./A.C.S.M. Land Title Survey (Johnson-Frank & Associates, Inc. – August 27, 2004)

4. The land referred to in this policy is situated in the State of California, County of SAN BERNARDINO and is described as follows:

PARCELS 3 AND 4 OF PARCEL MAP NO. 3834, AS PER PLAT RECORDED IN BOOK 38 OF PARCEL MAPS, PAGE 26, RECORDS OF SAID COUNTY.

Source: Chicago Title Company – December 14, 2004

Parcel #5

APN's: 262-211-02

LEGAL DESCRIPTION

PARCEL 1:

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAID COUNTY, BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE INTERSECTION OF THE NORTHWESTERLY LINE OF THE DEVIL CANYON DIVERSION CHANNEL, AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS, AND THE WESTERLY EXTENSION OF THE CENTER LINE OF THIRD AVENUE, AS SHOWN ON THE MAP OF TRACT NO. 2824, AS PER PLAT RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY, SAID INTERSECTION BEING NORTH 89 DEGREES 45' WEST, 286.59 FEET, MEASURED ALONG SAID WESTERLY EXTENSION OF THE CENTER LINE OF THIRD AVENUE FROM THE CENTER LINE INTERSECTION OF THIRD AVENUE AND GRAY STREET, AS SHOWN ON SAID MAP OF TRACT NO. 2824;
THENCE NORTH 41 DEGREES 40' 45" EAST, 12.11 FEET;
THENCE NORTH 0 DEGREES 00' 15" EAST, 1927.05 FEET TO NORTHEAST CORNER OF THE LAND CONVEYED TO LAWRENCE E. POLK, ET UX., BY DEED RECORDED DECEMBER 11, 1956, IN BOOK 4106, PAGE 366, OFFICIAL RECORDS;
THENCE ALONG THE NORTHERLY LINE OF SAID LAND SO CONVEYED TO POLK, NORTH 89 DEGREES 45' WEST, 30 FEET TO THE TRUE POINT OF BEGINNING;
THENCE FROM THE TRUE POINT OF BEGINNING, NORTH 0 DEGREES 00' 15" EAST, 558 FEET;

THENCE SOUTH 89 DEGREES 45' EAST, 180 FEET;
THENCE SOUTH 0 DEGREES 00' 15" WEST, 60 FEET;
THENCE SOUTH 89 DEGREES 45' EAST, 180 FEET TO THE WESTERLY LINE OF THE LAND CONVEYED TO ELSA OLDER, A MARRIED WOMAN, AS HER SEPARATE PROPERTY, BY DEED RECORDED AUGUST 10, 1951, IN BOOK 2807, PAGE 595, OFFICIAL RECORDS;
THENCE ALONG THE LAST MENTIONED WESTERLY LINE, NORTH 0 DEGREES 00' 15" EAST, 921.89 FEET TO A POINT IN THE NORTHERLY LINE OF THE LAND DESCRIBED AS PARCEL NO. 10 IN THE DEED TO FARM HOMES CORPORATION, A CORPORATION, RECORDED OCTOBER 13, 1934, IN BOOK 1011, PAGE 14, OFFICIAL RECORDS;
THENCE ALONG SAID LAST MENTIONED NORTHERLY LINE, NORTH 89 DEGREES 45' WEST, 934.23 FEET TO A POINT IN THE NORTHERLY EXTENSION OF THE EASTERLY LINE OF THE LAND DESCRIBED AS PARCEL P-6 IN THE LIS PENDENS RECORDED SEPTEMBER 13, 1945, IN BOOK 1809, PAGE 43, OFFICIAL RECORDS;
THENCE ALONG SAID LAST MENTIONED EASTERLY LINE AND THE NORTHERLY EXTENSION THEREOF, SOUTH 14 DEGREES 22' 30" WEST, 1464.15 FEET TO THE NORTHWESTERLY CORNER OF SAID LAND SO CONVEYED TO POLK;
THENCE SOUTH 89 DEGREES 45' EAST ALONG THE NORTHERLY LINE OF SAID POLK LAND, 937.64 FEET TO THE TRUE POINT OF BEGINNING.

Source: A.L.T.A./A.C.S.M. Land Title Survey (Johnson-Frank & Associates, Inc. – August 27, 2004)

PARCEL 1:

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAID COUNTY, BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE INTERSECTION OF THE NORTHWESTERLY LINE OF THE DEVIL CANYON DIVERSION CHANNEL, AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS, AND THE WESTERLY EXTENSION OF THE CENTER LINE OF THIRD AVENUE, AS SHOWN ON THE MAP OF TRACT NO. 2824, AS PER PLAT RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY, SAID INTERSECTION BEING NORTH 89 DEGREES 45' WEST, 286.59 FEET, MEASURED ALONG SAID WESTERLY EXTENSION OF THE CENTER LINE OF THIRD AVENUE FROM THE CENTER LINE INTERSECTION OF THIRD AVENUE AND GRAY STREET, AS SHOWN ON SAID MAP OF TRACT NO. 2824;
THENCE NORTH 41 DEGREES 40' 45" EAST, 12.11 FEET;
THENCE NORTH 0 DEGREES 00' 15" EAST, 1927.05 FEET TO NORTHEAST CORNER OF THE LAND CONVEYED TO LAWRENCE E. POLK, ET UX., BY DEED RECORDED DECEMBER 11, 1956, IN BOOK 4106, PAGE 366, OFFICIAL RECORDS;
THENCE ALONG THE NORTHERLY LINE OF SAID LAND SO CONVEYED TO POLK, NORTH 89 DEGREES 45' WEST, 30 FEET TO THE TRUE POINT OF BEGINNING;
THENCE FROM THE TRUE POINT OF BEGINNING, NORTH 0 DEGREES 00' 15" EAST, 558 FEET;

THENCE SOUTH 89 DEGREES 45' EAST, 180 FEET;
THENCE SOUTH 0 DEGREES 00' 15" WEST, 60 FEET;
THENCE SOUTH 89 DEGREES 45' EAST, 180 FEET TO THE WESTERLY LINE OF THE LAND CONVEYED TO ELSA OLDER, A MARRIED WOMAN, AS HER SEPARATE PROPERTY, BY DEED RECORDED AUGUST 10, 1951, IN BOOK 2807, PAGE 595, OFFICIAL RECORDS;
THENCE ALONG THE LAST MENTIONED WESTERLY LINE, NORTH 0 DEGREES 00' 15" EAST, 921.89 FEET TO A POINT IN THE NORTHERLY LINE OF THE LAND DESCRIBED AS PARCEL NO. 10 IN THE DEED TO FARM HOMES CORPORATION, A CORPORATION, RECORDED OCTOBER 13, 1934, IN BOOK 1011, PAGE 14, OFFICIAL RECORDS;
THENCE ALONG SAID LAST MENTIONED NORTHERLY LINE, NORTH 89 DEGREES 45' WEST, 934.23 FEET TO A POINT IN THE NORTHERLY EXTENSION OF THE EASTERLY LINE OF THE LAND DESCRIBED AS PARCEL P-6 IN THE LIS PENDENS RECORDED SEPTEMBER 13, 1945, IN BOOK 1809, PAGE 43, OFFICIAL RECORDS;
THENCE ALONG SAID LAST MENTIONED EASTERLY LINE AND THE NORTHERLY EXTENSION THEREOF, SOUTH 14 DEGREES 22' 30" WEST, 1464.15 FEET TO THE NORTHWESTERLY CORNER OF SAID LAND SO CONVEYED TO POLK;
THENCE SOUTH 89 DEGREES 45' EAST ALONG THE NORTHERLY LINE OF SAID POLK LAND, 937.64 FEET TO THE TRUE POINT OF BEGINNING.

PARCEL 2:

AN EASEMENT FOR ROAD PURPOSES UPON THE FOLLOWING DESCRIBED LAND:

COMMENCING AT THE TRUE POINT OF BEGINNING OF THE ABOVE DESCRIBED LAND;

THENCE NORTH 0° 00' 15" EAST 558 FEET;

THENCE SOUTH 89° 45' EAST 60 FEET;

THENCE SOUTH 0° 00' 15" WEST 558 FEET;

THENCE NORTH 89° 454' WEST 60 FEET TO THE POINT OF BEGINNING.

Source: Chicago Title Company – December 14, 2004

Parcel #6

APN's: 262-221-03

REPORT NO. 00062710-994-LT2-KD
LEGAL DESCRIPTION TR2:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED SAN BERNARDINO, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, AS SHOWN BY MAP ON FILE IN BOOK 7 PAGE(S) 23, OF MAPS, RECORDS OF SAID COUNTY, BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE INTERSECTION OF THE NORTHWESTERLY LINE OF THE DEVIL CANYON DIVERSION CHANNEL, AS PER DEED RECORDED AUGUST 30, 1945, IN BOOK 1799, PAGE 366, OFFICIAL RECORDS, AND THE WESTERLY EXTENSION OF THE CENTERLINE OF THIRD AVENUE, AS SHOWN BY MAP OF TRACT NO. 2824, ON FILE IN BOOK 39 PAGE(S) 7-8, OF MAPS, RECORDS OF SAID COUNTY, SAID INTERSECTION BEING NORTH 89° 45' WEST, 286.59 FEET, MEASURED ALONG SAID WESTERLY EXTENSION OF THE CENTERLINE OF THIRD AVENUE FROM THE CENTERLINE INTERSECTION OF THIRD AVENUE AND GRAY STREET, AS SHOWN ON SAID MAP OF TRACT NO. 2824;
THENCE NORTH 41° 40' 45" EAST, 12.11 FEET;
THENCE NORTH 0° 00' 15" EAST, 1927.05 FEET TO THE TRUE POINT OF BEGINNING;
THENCE FROM THE TRUE POINT OF BEGINNING, NORTH 0° 00' 15" EAST, 30 FEET TO THE NORTHEAST CORNER OF THE LAND CONVEYED TO LAWRENCE R. POLK, ET UX, BY DEED RECORDED DECEMBER 11, 1956, IN BOOK 4106, PAGE 366, OFFICIAL RECORDS;
THENCE ALONG THE NORTHERLY LINE OF SAID LAND SO CONVEYED TO POLK, NORTH 89° 45' WEST, 30 FEET;
THENCE NORTH 0° 00' 15" EAST, 558 FEET;
THENCE SOUTH 89° 45' EAST, 180 FEET;
THENCE SOUTH 0° 00' 15" WEST, 60 FEET;
THENCE SOUTH 89° 45' EAST 180 FEET TO THE WESTERLY LINE OF THE LAND CONVEYED TO ELSA OLDER, A MARRIED WOMAN AS HER SOLE AND SEPARATE PROPERTY, BY DEED RECORDED AUGUST 10, 1951, IN BOOK 2807, PAGE 595, OFFICIAL RECORDS;
THENCE ALONG THE LAST MENTIONED WESTERLY LINE, SOUTH 0° 00' 15" WEST, 528 FEET;
THENCE NORTH 89° 45' WEST, 330 FEET TO THE TRUE POINT OF BEGINNING.

APN: 0262-211-03-0-000

Source: ALTA/NSPS Land Title Survey (Thienes Engineering, Inc. – December 2016)

Parcel #7

APN's: 262-211-04

REPORT NO. 00062705–994–LT2–KD

LEGAL DESCRIPTION TR3:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED SAN BERNARDINO, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAID COUNTY, BEING PORTIONS OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, ACCORDING TO GOVERNMENT SURVEY, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS :

COMMENCING AT THE CENTER LINE INTERSECTION OF THIRD AVENUE AND GRAY STREET AS SHOWN ON TRACT NO. 2824, AS PER PLAT RECORDED IN BOOK 39, OF MAPS, PAGES 7 AND 8 RECORDS OF SAN BERNARDINO COUNTY; THENCE NORTH 89° 45' WEST 286.59 FEET ALONG THE CENTER LINE OF SAID THIRD AVENUE EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON FLOOD CONTROL LAND, AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366 OFFICIAL RECORDS; THENCE ALONG THE NORTHWESTERLY LINE OF SAID FLOOD CONTROL LAND NORTH 41° 40 ' 45" EAST (RECORD NORTH 41° 39' 31" EAST) 12.11 FEET; THENCE NORTH 0° 00' 15" EAST 1927.05 FEET; THENCE SOUTH 89° 45' EAST 330.00 FEET TO THE TRUE POINT OF BEGINNING ;
THENCE NORTH 0° 00' 15" EAST 290.40 FEET; THENCE SOUTH 89° 45' EAST 112.00 FEET; THENCE SOUTH 0° 00' 15" WEST 290.40 FEET; THENCE NORTH 89° 45' WEST 112.00 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPTING THEREFROM A 1/2 INTEREST IN ALL OIL, OIL, GAS AND OTHER HYDROCARBONS AND MINERALS, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO EXTRACT SAME AS RESERVED IN THE DEED FROM STANDARD PROPERTIES, INC., TO J. THOMAS SCHANTZ, ET UX, RECORDED JUNE 18, 1956, IN BOOK 3964, PAGE 599, OFFICIAL RECORDS.

APN: 0262–211–04–0–000

Source: ALTA/NSPS Land Title Survey (Thienes Engineering, Inc. – December 2016)

Parcel #8

APN's: 262-211-05

LEGAL DESCRIPTION TR2:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED ~~IN THE CITY OF SAN BERNARDINO~~, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, AS PER PLAT RECORDED IN BOOK 7, PAGE 23 OF MAPS, RECORDS OF SAN BERNARDINO COUNTY, BEING PORTIONS OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:
COMMENCING AT THE CENTERLINE INTERSECTION OF THIRD AVENUE AND GRAY STREET, AS SHOWN ON TRACT NO. 2824, RECORDED IN BOOK 39, PAGES 7 AND 8 OF MAPS, RECORDS OF SAN BERNARDINO COUNTY, STATE OF CALIFORNIA;
THENCE NORTH 89° 45' WEST, 286.59 FEET ALONG THE CENTERLINE OF SAID THIRD AVENUE, EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF CABLE CANYON COUNTRY FLOOD CONTROL LAND, AS PER DEED RECORDED AUGUST 30, 1945 AS INSTRUMENT NO. 170, IN BOOK 1799, PAGE 366 OF OFFICIAL RECORDS;
THENCE ALONG THE NORTHWESTERLY LINE OF SAID FLOOD CONTROL LAND, NORTH 41° 40' 45" EAST (RECORD NORTH 41° 39' 31" EAST), 12.11 FEET;
THENCE NORTH 00° 00' 15" EAST, 1927.05 FEET;
THENCE SOUTH 89° 45' EAST442.00 FEET TO THE TRUE POINT OF BEGINNING;
THENCE NORTH 00° 00' 15" EAST 290.40 FEET;
THENCE NORTH 89° 45' WEST, 112.00 FEET;
THENCE NORTH 00° 00' 15" EAST, 1159.49 FEET TO A POINT IN THE NORTHERLY LINE OF THE LAND DESCRIBED AS PARCEL 10 IN THE TRUSTEE'S DEED TO FARM HOMES CORPORATION, A CORPORATION, RECORDED OCTOBER 13, 1934 AS INSTRUMENT NO. 1, IN BOOK 1011, PAGE 14 OF OFFICIAL RECORDS;
THENCE ALONG THE NORTHERLY LINE OF THE LAND SO CONVEYED TO FARM HOMES CORPORATION, SOUTH 89° 45' EAST, 300.00 FEET;
THENCE SOUTH 00° 00' 15" WEST, 1449.89 FEET;
THENCE NORTH 89° 45' WEST, 188.00 FEET TO THE POINT OF BEGINNING.
EXCEPT THEREFROM AN UNDIVIDED ½ INTEREST IN ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO EXTRACT SAME, AS RESERVED IN THE DEED FROM STANDARD PROPERTIES, INC., TO J. THOMAS SCHANTZ, ET UX., RECORDED JUNE 18, 1956 AS INSTRUMENT NO. 100, IN BOOK 3964, PAGE 599 OF OFFICIAL RECORDS.

APN(s): 0262–211–05–0–000

Source: ALTA/NSPS Land Title Survey (Thienes Engineering, Inc. – October 2016)

Parcel #9

APN's: 262-211-06

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAID COUNTY, BEING PORTIONS OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO MERIDIAN, ACCORDING TO GOVERNMENT SURVEY. IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER LINE INTERSECTION OF THIRD AVENUE AND GRAY STREET AS SHOWN ON MAP OF TRACT NO. 2824, AS PER PLAT RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAN BERNARDINO COUNTY;

THENCE NORTH 89° 45' WEST, 286.59 FEET ALONG THE CENTER LINE OF SAID THIRD AVENUE EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON FLOOD CONTROL LAND, AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS;

THENCE NORTH 41° 40' 45" EAST, 12.11 FEET;

THENCE NORTH 0° 00' 15" EAST, 1,927.05 FEET;

THENCE SOUTH 89° 45' EAST, 630 FEET TO THE TO THE TRUE POINT OF BEGINNING;

THENCE FROM THE TRUE POINT OF BEGINNING NORTH 0° 00' 15" EAST, 1,449.89 FEET TO A POINT IN THE NORTHERLY LINE OF THE LAND DESCRIBED AS PARCEL 10 IN THE TRUSTEE'S DEED TO FARM HOMES CORPORATION, A CORPORATION, RECORDED OCTOBER 13, 1934 IN BOOK 1011, PAGE 14, OFFICIAL RECORDS;

THENCE ALONG SAID NORTHERLY LINE SOUTH 89° 45' EAST, 300.00 FEET;

THENCE SOUTH 0° 00' 15" WEST, 1,449.89 FEET;

THENCE NORTH 89° 45' WEST, 300.00 FEET TO THE TO THE TRUE POINT OF BEGINNING.

EXCEPTING THEREFROM ALL OIL, GAS AND OTHER HYDROCARBONS AS CONTAINED IN THE DEED FROM STANDARD PROPERTIES, INC., RECORDED MAY 5, 1958 IN BOOK 4499, PAGE 287, OFFICIAL RECORDS.

Assessor's Parcel Number: 262-211-06

Source: Chicago Title Company – August 20, 2008

Parcel #10

APN's: 262-221-03

LEGAL DESCRIPTION TR4:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED SAN BERNARDINO, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAID COUNTY, BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCH, DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER LINE OF THE INTERSECTION OF THIRD ADDITION AND GRAY STREET, AS SHOWN ON TRACT NO. 2824, RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY;
THENCE NORTH 89 DEGREES 45' WEST, 286.59 FEET ALONG THE CENTER LINE OF THIRD AVENUE EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF CABLE COUNTY FLOOD CONTROL, AS PER DEED RECORDED AUGUST 30, 1945, IN BOOK 1799, PAGE 366, OFFICIAL RECORDS OF SAID COUNTY;
THENCE NORTH 41 DEGREES 40' 45" EAST, 12.11 FEET;
THENCE NORTH 0 DEGREES 00' 15" EAST, 1837.05 FEET TO THE TRUE POINT OF BEGINNING;
THENCE FROM THE TRUE POINT OF BEGINNING, NORTH 89 DEGREES 45' WEST, 380.00 FEET;
THENCE NORTH 0 DEGREES 00' 15" EAST, 120.00 FEET;
THENCE SOUTH 89 DEGREES 45' EAST, 380.00 FEET;
THENCE SOUTH 0 DEGREES 00' 15" WEST, 120.00 FEET TO THE TRUE POINT OF BEGINNING.

APN: 0262-221-03-0-000

Source: ALTA/NSPS Land Title Survey (Thienes Engineering, Inc. – December 2016)

Parcel #11

APN's: 262-221-04

REPORT NO. 00060236-994-LT2-KD

LEGAL DESCRIPTION TR2:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED SAN BERNARDINO, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAID COUNTY, BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:
COMMENCING AT THE CENTER LINE INTERSECTION OF 3RD AVENUE AND GRAY STREET, AS SHOWN ON TRACT NO. 2824, RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY; THENCE NORTH 89 DEG. 45' WEST, 286.59 FEET ALONG THE CENTER LINE OF SAID 3RD AVENUE EXTENDED WEST TO THE INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND, AS PER DEED RECORDED JANUARY 12, 1965, IN BOOK 6300, PAGE 867, OFFICIAL RECORDS OF SAID COUNTY; THENCE NORTH 41 DEG. 40' 45" EAST, 12.11 FEET; THENCE NORTH 0 DEG. 00' 15" EAST, 1507.05 FEET TO THE TRUE POINT OF BEGINNING;
THENCE FROM THE TRUE POINT OF BEGINNING, NORTH 89 DEG. 45' WEST, 500.00 FEET; THENCE NORTH 0 DEG. 00' 15" EAST, 450.00 FEET; THENCE SOUTH 89 DEG. 45' EAST, 500.00 FEET; THENCE SOUTH 0 DEG. 00' 15" WEST, 450.00 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPTING THEREFROM 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OR LEVELS, 100 FEET OR MORE BELOW THE SURFACE OF SAID LAND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, AS RESERVED BY DEED RECORDED DECEMBER 11, 1956, IN BOOK 4106, PAGE 366, OFFICIAL RECORDS.

ALSO EXCEPTING THEREFROM THAT PORTION CONVEYED TO CECIL O. BOONE AND ANGELIA M. BOONE, HUSBAND AND WIFE AS JOINT TENANTS, BY DEED RECORDED MARCH 11, 1957, IN BOOK 4176, PAGE 406, OFFICIAL RECORDS.

ALSO EXCEPTING THEREFROM THAT PORTION CONVEYED TO LAWRENCE E. POLK, JR., A MARRIED MAN, AS HIS SOLE AND SEPARATE PROPERTY, BY DEED RECORDED SEPTEMBER 7, 1962, IN BOOK 5764, PAGE 280, OFFICIAL RECORDS.

APN: 0262-221-04-0-000

Source: ALTA/NSPS Land Title Survey (Thienes Engineering, Inc. – October 2016)

Parcel #12

APN's: 262-221-05

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAN BERNARDINO COUNTY, BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, ACCORDING TO THE OFFICIAL PLAT THEREOF, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER LINE INTERSECTION OF 3RD AVENUE AND GRAY STREET, AS SHOWN ON TRACT NO. 2824, RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY;
THENCE NORTH 89° 45' WEST, 286.59 FEET ALONG THE CENTER LINE OF SAID 3RD AVENUE EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND, AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS OF SAID COUNTY;
THENCE NORTH 41° 40' 45" EAST 12.11 FEET;
THENCE NORTH 0° 00' 15" EAST 1507.05 FEET TO THE TRUE POINT OF BEGINNING;
THENCE FROM THE TRUE POINT OF BEGINNING NORTH 89° 45' WEST 380.00 FEET;
THENCE NORTH 0° 00' 15" EAST 90.00 FEET;
THENCE SOUTH 89° 45' EAST 380.00 FEET;
THENCE SOUTH 0° 00' 15" WEST 90.00 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPTING THEREFROM 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OR LEVELS 100 FEET, OR MORE BELOW THE SURFACE OF SAID LAND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES; AS RESERVED BY BARBARA T. OLDER, IN THE DEED TO LAWRENCE E. POLK AND CECILLE L. POLK, HUSBAND AND WIFE, AS JOINT TENANTS, FILED FOR RECORD DECEMBER 11, 1956, IN BOOK 4106, PAGE 366, OFFICIAL RECORDS.

Assessor's Parcel Number: 0262-221-05-0-000

Source: Chicago Title Company – August 13, 2010

Parcel #13

APN's: 262-221-09

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAID COUNTY, BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER LINE INTERSECTION OF THIRD AVENUE AND GRAY STREET, AS SHOWN ON TRACT NO. 2824, AS PER PLAT RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY; THENCE NORTH 89° 45' WEST, 286.59 FEET ALONG SAID CENTER LINE OF THIRD AVENUE, EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND, AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS; THENCE NORTH 41° 40' 45" EAST, 12.11 FEET TO THE TRUE POINT OF BEGINNING; THENCE FROM THE TRUE POINT OF BEGINNING NORTH 0° 00' 15" EAST, 1107.05 FEET; THENCE SOUTH 89° 45' EAST, 981.88 FEET TO A POINT IN THE NORTHWESTERLY LINE OF SAID CABLE CANYON COUNTY FLOOD CONTROL LAND; THENCE SOUTH 41° 40' 45" WEST, 1476.76 FEET ALONG SAID NORTHWESTERLY LINE OF SAID CABLE CANYON COUNTY FLOOD CONTROL LAND TO THE TRUE POINT OF BEGINNING.

EXCEPTING THEREFROM 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME THEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE ON AND BENEATH THE SURFACE OF SAID LAND AT ANY LEVEL OR LEVELS FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, TOGETHER WITH THE RIGHT OF INGRESS AND EGRESS UPON, OVER AND ACROSS SAID LAND, AS RESERVED IN THE DEED FROM CHARLES S. OLDER, ETAL, RECORDED FEBRUARY 20, 1962 IN BOOK 5649, PAGE 562, OFFICIAL RECORDS.

END OF LEGAL DESCRIPTION

Source: Chicago Title Company – December 28, 2006

Parcel #14

APN's: 262-221-10

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAID COUNTY, BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTERLINE INTERSECTION OF THIRD AVENUE AND GRAY STREET, AS SHOWN ON TRACT NO. 2824, RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY; THENCE 89° 45' WEST 286.29 FEET ALONG THE CENTERLINE OF THIRD AVENUE EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND AS PER DEED RECORDED AUGUST 30, 1945, IN BOOK 1799, PAGE 366, OFFICIAL RECORDS; THENCE NORTH 41° 40' 45" EAST 12.11 FEET; THENCE NORTH 0° 00' 15" EAST 1107.05 FEET TO THE TRUE POINT OF BEGINNING; THENCE FROM THE TRUE POINT NORTH 0° 00' 15" EAST 820.00 FEET; THENCE SOUTH 89° 45' EAST 480.00 FEET; THENCE SOUTH 0° 00' 15" WEST 820.00 FEET; THENCE NORTH 89° 45' WEST 480.00 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPTING THEREFROM 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM TOGETHER WITH ANY FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OR LEVELS 100 FEET OR MORE BELOW THE SURFACE OF SAID LAND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES AS RESERVED IN THE DEED RECORDED MARCH 7, 1960 IN BOOK 5074, PAGE 59, OFFICIAL RECORDS.

END OF LEGAL DESCRIPTION

Source: Chicago Title Company – December 28, 2006

Parcel #15

APN's: 262-221-11

ALL OF THAT PORTION OF THE RANCHO MUSCUPIABE, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAN 'BERNARDINO COUNTY, STATE OF CALIFORNIA, BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTERLINE INTERSECTION OF THIRD AVENUE AND GRAY STREET, AS SHOWN ON PLAT OF TRACT NO. 2824, RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY; THENCE NORTH 89° 45' WEST 286.59 FEET ALONG THE CENTERLINE OF SAID THIRD AVENUE EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND, AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS OF SAID COUNTY; THENCE NORTH 41° 40' 45" EAST 12.11 FEET; THENCE NORTH 0° 00' 15" EAST 1927.05 FEET; THENCE SOUTH 89° 45' EAST 480.00 FEET TO THE TRUE POINT OF BEGINNING; THENCE FROM THE TRUE POINT OF BEGINNING SOUTH 89° 45' EAST 450.00 FEET TO THE NORTHWEST CORNER OF THE LAND CONVEYED TO ELSA OLDER, A MARRIED WOMAN, BY DEED RECORDED DECEMBER 30, 1953 IN BOOK 3302, PAGE 203, OFFICIAL RECORDS OF SAID COUNTY; THENCE SOUTH 0° 00' 15" WEST 30.00 FEET; THENCE SOUTH 89° 45' EAST 51.88 FEET; THENCE SOUTH 00° 00' 15" WEST 790.00 FEET TO A POINT IN THE AFORESAID NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND; THENCE NORTH 89° 45' WEST 501.88 FEET; THENCE NORTH 0° 00' 15" EAST 820.00 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPT THAT PORTION OF SAID LAND DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER LINE INTERSECTION OF THIRD AVENUE AND GRAY STREET, AS SHOWN ON PLAT OF TRACT NO. 2824, RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY; THENCE NORTH 89° 45' WEST 286.59 FEET ALONG THE CENTERLINE OF SAID THIRD AVENUE EXTENDED WEST TO US INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND, AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS OF SAID COUNTY; THENCE NORTH 41° 40' 45" EAST 12.11 FEET; THENCE NORTH 0° 00' 15" EAST 1927.05 FEET; THENCE SOUTH 89° 45' EAST 739.88 FEET TO THE TRUE POINT OF BEGINNING; THENCE FROM THE TRUE POINT OF BEGINNING SOUTH 89° 45' EAST 120.00 FEET TO A POINT; THENCE SOUTH 0° 00' 15" WEST 393.00 FEET TO A POINT; THENCE NORTH 89° 45' WEST 120.00 FEET TO A POINT; THENCE NORTH 0° 00' 15" EAST 393.00 FEET TO THE TRUE POINT OF BEGINNING.

ALSO EXCEPTING THEREFROM 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OR LEVELS 100 FEET OR MORE BELOW THE SURFACE OF SAID LAND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, AS RESERVED IN THE DEED FROM CHARLES S. OLDER, ET AL., RECORDED JUNE 19, 1956, IN BOOK 3966, PAGE 377, OFFICIAL RECORDS.

ALSO EXCEPTING FROM ALL OF THE ABOVE DESCRIBED LAND, 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATE THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OR LEVELS 100 FEET OR MORE BELOW THE SURFACE OF SAID LAND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, AS SAVED, EXCEPTED AND RESERVED IN DEED RECORDED OCTOBER 29, 2004 AS INSTRUMENT NO. 2004-0792457, OFFICIAL RECORDS.

Assessor's Parcel Number: 0262-221-11-0-000

Source: Chicago Title Company – September 4, 2009

Parcel #16

APN's: 262-221-12

REPORT NO. 00060237–994–LT2–KD
LEGAL DESCRIPTION TR3:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED SAN BERNARDINO, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 7 OF MAPS, PAGE(S) 23, IN THE OFFICE OF THE COUNTY RECORDER OF SAID SAN BERNARDINO COUNTY; BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER LINE INTERSECTION OF THIRD AVENUE AND GRAY STREET, AS SHOWN ON PLAT OF TRACT NO. 2824, RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY; THENCE NORTH 89° 45' WEST, 286.59 FEET ALONG THE CENTER LINE OF SAID THIRD AVENUE, EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND, AS PER DEED RECORDED AUGUST 30, 1945, IN BOOK 1799 OF OFFICIAL RECORDS, PAGE 366; THENCE NORTH 41° 40' 45" EAST, 12.11 FEET; THENCE NORTH 0° 00' 15" EAST, 1927.05 FEET; THENCE SOUTH 89° 45' EAST, 739.88 FEET TO THE TRUE POINT OF BEGINNING;
THENCE FROM THE TRUE POINT OF BEGINNING SOUTH 89° 45' EAST, 120.00 FEET TO A POINT; THENCE SOUTH 0° 00' 15" WEST, 393.00 FEET TO A POINT; THENCE NORTH 89° 45' WEST, 120 FEET TO A POINT; THENCE NORTH 0° 00' 15" EAST, 393.00 FEET TO THE TRUE POINT OF BEGINNING.

ALSO EXCEPTING THEREFROM ONE–HALF OF ALL OIL, GAS, AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OR LEVELS 100 FEET OR MORE BELOW THE SURFACE OF SAID U\ND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, AS RESERVED IN THE DEED FROM CHARLES S. OLDER, ET AL., TO STELLA E. MAXWELL, A WIDOW, AN UNDIVIDED ONE–THIRD INTEREST, HARRY J. MAXWELL AND CAROL E. MAXWELL, HUSBAND AND WIFE AS JOINT TENANTS, AN UNDIVIDED ONE–THIRD INTEREST, AND RAYMOND W. MAXWELL AND THELMA MAXWELL, HUSBAND AND WIFE AS JOINT TENANTS, AN UNDIVIDED ONE–THIRD INTEREST, FILED FOR RECORD JUNE 19, 1956.

ALSO EXCEPTING THEREFROM ONE–HALF OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OR LEVELS 100 FEET OR MORE BELOW THE SURFACE OF SAID LAND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, AS RESERVED IN THE DEED FROM STELLA E, MAXWELL, A WIDOW, HARRY J. MAXWELL AND CAROL E. MAXWELL, HUSBAND AND WIFE, AND RAYMOND W. MAXWELL AND THELMA MAXWELL, HUSBAND AND WIFE, RECORDED AUGUST 19, 1957, IN BOOK 4306, OF OFFICIAL RECORDS, PAGE 18.

APN: 0262–221–12–0–000

Source: ALTA/NSPS Land Title Survey (Thienes Engineering, Inc. – October 2016)

Parcel #17

APN's: 262-221-13

LEGAL DESCRIPTION

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, AS PER PLAT THEREOF RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAID COUNTY, WHICH WOULD LIE IN SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, WERE GOVERNMENT SURVEY LINES EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE INTERSECTION OF THE SOUTHWESTERLY RIGHT OF WAY LINE OF CAJON HIGHWAY, KNOWN AS UNITED STATES HIGHWAY NO. 66, 90 FEET WIDE, WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND, AS DESCRIBED IN THE DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS OF SAID COUNTY;

THENCE ALONG SAID NORTHWESTERLY LINE OF SAID FLOOD CONTROL LAND SOUTH 41° 40' 45" WEST 2971.03 FEET TO THE TRUE POINT OF BEGINNING;

THENCE FROM THE TRUE POINT OF BEGINNING NORTH 0° 00' 15" EAST 790 FEET;

THENCE SOUTH 89° 45' EAST 200 FEET;

THENCE SOUTH 0° 00' 15" WEST TO A POINT IN SAID NORTHWESTERLY LINE OF SAID FLOOD CONTROL LAND;

THENCE ALONG SAID NORTHWESTERLY LINE OF SAID FLOOD CONTROL LAND SOUTH 41° 40' 45" WEST TO THE TRUE POINT OF BEGINNING.

EXCEPTING THEREFROM ANY PORTION WHICH MAY LIE WITHIN THE LAND CONVEYED TO STELLA E. MAXWELL, ETAL., RECORDED JUNE 19, 1956 IN BOOK 3966, PAGE 377, OFFICIAL RECORDS.

ALSO EXCEPTING FROM ALL OF THE ABOVE DESCRIBED LAND, ONE-HALF OF ALL WATER, OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE ON AND BENEATH THE SURFACE OF SAID LAND AT ANY LEVEL OR LEVELS FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES INCLUDING THE RIGHT TO LAY PIPE LINES AND TO PERFORM SUCH OTHER CONSTRUCTION AS MAY BE NECESSARY FOR THE DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES; AS RESERVED IN THE DEED RECORDED JANUARY 22, 1964, IN BOOK 6071, PAGE 498, OFFICIAL RECORDS.

Source: A.L.T.A./A.C.S.M. Land Title Survey (Johnson-Frank & Associates, Inc. – August 27, 2004)

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, AS PER PLAT THEREOF RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAN BERNARDINO COUNTY, WHICH WOULD LIE IN SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, WERE GOVERNMENT SURVEY LINES EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE INTERSECTION OF THE SOUTHWESTERLY RIGHT OF WAY LINE OF CAJON HIGHWAY, KNOWN AS UNITED STATES HIGHWAY NO. 66, 90 FEET WIDE, WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND, AS DESCRIBED IN THE DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS OF SAID COUNTY;
THENCE ALONG SAID NORTHWESTERLY LINE OF SAID FLOOD CONTROL LAND SOUTH 41° 40′ 45" WEST 2971.03 FEET TO THE TRUE POINT OF BEGINNING;
THENCE FROM THE TRUE POINT OF BEGINNING NORTH 0° 00′ 15" EAST 790 FEET;
THENCE SOUTH 89° 45′ EAST 200 FEET;
THENCE SOUTH 0° 00′ 15" WEST TO A POINT IN SAID NORTHWESTERLY LINE OF SAID FLOOD CONTROL LAND;
THENCE ALONG SAID NORTHWESTERLY LINE OF SAID FLOOD CONTROL LAND SOUTH 41° 40′ 45" WEST TO THE TRUE POINT OF BEGINNING.

ALSO EXCEPTING FROM ALL OF THE ABOVE DESCRIBED LAND, ONE-HALF OF ALL WATER, OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE ON AND BENEATH THE SURFACE OF SAID LAND AT ANY LEVEL OR LEVELS FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES INCLUDING THE RIGHT TO LAY PIPE LINES AND TO PERFORM SUCH OTHER CONSTRUCTION AS MAY BE NECESSARY FOR THE DEVELOPMENT OR REMOVAL OF SUCH - SUBSTANCES; AS RESERVED IN THE DEED RECORDED JANUARY 22, 1964, IN BOOK 6071, PAGE 498, OFFICIAL RECORDS.

Source: Chicago Title Company – January 14, 2005

Parcel #18

APN's: 262-221-17

REPORT NO. 00060235-994-LT2-KD

LEGAL DESCRIPTION TR1:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED SAN BERNARDINO, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

ALL THAT PORTION OF THE RANCHO MUSCUPIABE, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAN BERNARDINO COUNTY, STATE OF CALIFORNIA, BEING A PORTION OF SECTION 13, OF TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER LINE INTERSECTION OF 3RD AVENUE AND GRAY STREET AS SHOWN ON TRACT NO. 2824, RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAN BERNARDINO COUNTY, STATE OF CALIFORNIA; THENCE NORTH 89° 45' WEST 286.59 FEET ALONG THE CENTER LINE OF SAID 3RD AVENUE EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND AS PER DEED RECORDED AUGUST 30, 1945, IN BOOK 1799, PAGE 366, OFFICIAL RECORDS OF SAID COUNTY; THENCE NORTH 41° 40' 45" EAST 12.11 FEET; THENCE NORTH 0° 00' 15" EAST 720.92 FEET TO THE TRUE POINT OF BEGINNING;
THENCE FROM THE TRUE POINT OF BEGINNING NORTH 89° 45' WEST 1284.00 FEET TO A POINT TO THE SOUTHEASTERLY LINE OF A CERTAIN PARCEL OF LAND DESCRIBED AS PARCEL P-6 IN THE LIS PENDES RECORDED SEPTEMBER 13, 1945, IN BOOK 1809, PAGE 43, OFFICIAL RECORDS OF SAID COUNTY; THENCE NORTH 14° 22* 30" EAST 398.17 FEET ALONG THE SOUTHEASTERLY LINE OF SAID PARCEL P-6; THENCE SOUTH 89° 45' EAST 1185.19 FEET; THENCE SOUTH 0° 00' 15" WEST 386.13 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPTING THEREFROM THAT PORTION OF SAID PROPERTY CONVEYED TO SOUTHERN PACIFIC COMPANY, A DELAWARE CORPORATION, BY DEED RECORDED SEPTEMBER 8, 1965, IN BOOK 6468, PAGE 666, OFFICIAL RECORDS.

ALSO EXCEPTING THEREFROM 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OR LEVELS FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES AS RESERVED IN THE DEED RECORDED IN BOOK 3151 OF OFFICIAL RECORDS, PAGE 173.

APN: 0262-221-17-0-000

Source: ALTA/NSPS Land Title Survey (Thienes Engineering, Inc. – October 2016)

Parcel #19

APN's: 262-221-21

REPORT NO. 00062709-994-LT2-KD

LEGAL DESCRIPTION TR1:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED SAN BERNARDINO, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

THAT PORTION OF THE RANCHO MUSCUPIABE, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 7, PAGE 23 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER LINE INTERSECTION OF THIRD AVENUE AND GRAY STREET AS SHOWN ON TRACT NO. 2824, RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY; THENCE NORTH 89° 45' WEST 286.59 FEET ALONG THE CENTER LINE OF SAID THIRD AVENUE EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS OF SAID COUNTY; THENCE NORTH 41° 40' 45" EAST 12.11 FEET; THENCE NORTH 0° 00' 15" EAST 1507.05 FEET; THENCE NORTH 89° 45' WEST 500.00 FEET TO THE TRUE POINT OF BEGINNING; THENCE CONTINUING NORTH 89° 45' WEST 582.81 FEET TO A POINT IN THE SOUTHEASTERLY LINE OF THE LAND DESCRIBED AS PARCEL P-6 IN THE LIS PENDENS RECORDED SEPTEMBER 13, 1945 IN BOOK 1809, PAGE 43, OFFICIAL RECORDS OF SAID COUNTY; THENCE NORTH 14° 22' 30" EAST 464.03 FEET ALONG THE SOUTHEASTERLY LINE OF SAID PARCEL P-6;
THENCE SOUTH 89° 45' EAST 467.64 FEET TO A LINE WHICH BEARS NORTH 0° 00' 15" EAST FROM THE TRUE POINT OF BEGINNING; THENCE SOUTH 0° 00' 15" WEST 450.00 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPT THEREFROM THAT PORTION CONVEYED TO SOUTHERN PACIFIC COMPANY BY DEED RECORDED NOVEMBER 9, 1965 IN BOOK 6509 PAGE 188 OF OFFICIAL RECORDS.

ALSO EXCEPT THEREFROM 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OF LEVELS 100 FEET OR MORE BELOW THE SURFACE OF SAID LAND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, AS RESERVED IN THE DEED FROM BARBARA T. OLDER RECORDED DECEMBER 11, 1956 IN BOOK 4106 PAGE 366 OF OFFICIAL RECORDS.

APN: 0262-221-21-0-000

Source: ALTA/NSPS Land Title Survey (Thienes Engineering, Inc. – December 2016)

Parcel #20

APN's: 262-221-23

LEGAL DESCRIPTION TR3:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

ALL OF THAT PORTION OF THE RANCHO MUSCUPIABE, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 7, PAGE 23, OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, BEING A PORTION OF SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:
COMMENCING AT THE CENTERLINE INTERSECTION OF THIRD AVENUE AND GRAY STREET AS SHOWN ON TRACT NO. 2824, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 39, PAGE(S) 7 AND 8 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, THENCE NORTH 89° 45' WEST 286.59 FEET ALONG THE CENTERLINE OF SAID THIRD AVENUE EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND, AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366 OF OFFICIAL RECORDS; THENCE NORTH 41° 40' 45" EAST 12.11 FEET; THENCE NORTH 0° 00' 15" EAST 1107.05 FEET TO THE TRUE POINT OF BEGINNING; THENCE NORTH 89° 45' WEST 1185.19 FEET TO A POINT IN THE SOUTHEASTERLY LINE OF THE LAND DESCRIBED AS PARCEL P-6, IN THE LIS PENDENS RECORDED SEPTEMBER 13, 1945 IN BOOK 1809, PAGE 43 OF OFFICIAL RECORDS; THENCE NORTH 14° 22' 30" EAST 412.47 FEET ALONG THE SOUTHEASTERLY LINE OF SAID PARCEL P-6, THENCE SOUTH 89° 45' EAST 1082.81 FEET; THENCE SOUTH 0° 00' 15" WEST 400.00 FEET TO THE TRUE POINT OF BEGINNING.
EXCEPTING THEREFROM ONE HALF OF ALL OIL GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE ON AND BENEATH THE SURFACE OF SAID LAND AT ANY LEVEL OR LEVELS FOR THE PURPOSES OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, TOGETHER PURPOSES AS RESERVED TO BARBARA T. OLDER BY DEED RECORDED FEBRUARY 14, 1962 IN BOOK 5646, PAGE 563 OF OFFICIAL RECORDS.
ALSO EXCEPTING THEREFROM THAT PORTION DESCRIBED AS FOLLOWS:
BEGINNING AT THE SOUTHWEST CORNER OF THAT CERTAIN PARCEL DESCRIBED IN DEED RECORDED FEBRUARY 14, 1962 IN BOOK 5646, PAGE 563 OF OFFICIAL RECORDS, SAID POINT BEING ALSO IN THE SOUTHEASTERLY LINE OF THE LAND DESCRIBED AS PARCEL P-6, IN THE LIS PENDENS, RECORDED SEPTEMBER 13, 1945 IN BOOK 1809, PAGE 43 OF OFFICIAL RECORDS; THENCE ALONG SAID SOUTHEASTERLY LINE NORTH 14° 01' 03" EAST (RECORDED NORTH 15° 00' EAST IN SAID PARCEL P-6) 412.47 FEET TO THE POINT OF INTERSECTION WITH THE NORTH LINE OF AFOREMENTIONED PARCEL DESCRIBED IN DEED RECORDED IN BOOK 5646, PAGE 563 OF OFFICIAL RECORDS; THENCE ALONG SAID NORTH LINE NORTH 89° 53' 33" EAST, (RECORDED SOUTH 89° 45' EAST) 25.36 FEET; THENCE ALONG THE ARC OF A NON-TANGENTIAL CURVE CONCAVE SOUTHEASTERLY HAVING A RADIUS OF 3769.75 FEET AND A CENTRAL ANGLE OF 6° 06' 34" AN ARC DISTANCE OF 401.97 FEET, (CHORD BEARS SOUTH 5° 08' 17" WEST 401.78 FEET) TO A POINT IN THE SOUTH LINE OF SAID PARCEL DESCRIBED IN DEED RECORDED IN BOOK 5646, PAGE 563 OF OFFICIAL RECORDS; THENCE ALONG SAID SOUTH LINE SOUTH 89° 53' 33" WEST, (RECORDED NORTH 89° 45' WEST) 89.29 FEET TO THE POINT OF BEGINNING.

APN: 0262-221-23-0-000

Source: ALTA/NSPS Land Title Survey (Thienes Engineering, Inc. – October 2016)

Parcel #21
APN's: 262-221-29

PARCEL 1 OF PARCEL MAP NO. 16641, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 213, PAGE(S) 44 AND 45 OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

EXCEPT THEREFROM 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE ON AND BENEATH THE SURFACE OF SAID LAND AT ANY LEVEL OR LEVELS FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES AS RESERVED IN THE DEED RECORDED JUNE, 10, 1957 IN BOOK 4251 PAGE 432, OFFICIAL RECORDS.

Assessor's Parcel Number: 0262-221-29-0-000

Source: Chicago Title Company – January 4, 2013

Parcel #22
APN's: 262-221-30

PARCEL 2 OF PARCEL MAP NO. 16641, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER MAP FILED IN BOOK 213 PAGES 44 AND 45 OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

EXCEPT THEREFROM 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE OR BORE ON AND BENEATH THE SURFACE OF SAID LAND AT ANY LEVEL OR LEVELS FOR THE PURPOSE OR DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES AS RESERVED IN THE DEED RECORDED JUNE 10, 1957 IN BOOK 4251 PAGE 432, OFFICIAL RECORDS.

Assessor's Parcel Number: 0262-221-30-0-000

Source: Chicago Title Company – September 21, 2010

Parcel #23

APN's: 262-231-01

ALL THAT PORTION OF RANCHO MUSCUPIABE, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAID COUNTY, WHICH WOULD LIE IN SECTION 13, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, WERE GOVERNMENT SURVEY LINES EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE INTERSECTION OF THE SOUTHWESTERLY RIGHT OF WAY LINE OF CAJON HIGHWAY, KNOWN AS UNITED STATES HIGHWAY NO. 66, 90 FEET WIDE, WITH THE NORTHWESTERLY LINE OF CABLE CANYON COUNTY FLOOD CONTROL LAND, AS DESCRIBED IN THE DEED RECORDED AUGUST 30, 1945, IN BOOK 1799 PAGE 366, OFFICIAL RECORDS OF SAID COUNTY; THENCE ALONG SAID NORTHWESTERLY LINE OF SAID FLOOD CONTROL LAND SOUTH 41 DEGREES 40' 45" WEST 2082.72 FEET TO THE TRUE POINT OF BEGINNING; THENCE FROM THE TRUE POINT OF BEGINNING NORTH 48 DEGREES 19' 15" WEST 187.35 FEET; THENCE NORTH 89 DEGREES 45' WEST 250.41 FEET; THENCE SOUTH 0 DEGREES 00' 15" WEST 563.38 FEET, MORE OR LESS, TO A POINT IN SAID NORTHWESTERLY LINE OF SAID FLOOD CONTROL LAND; THENCE ALONG SAID NORTHWESTERLY LINE OF SAID FLOOD CONTROL LAND, NORTH 41 DEGREES 40' 45" EAST 585.77 FEET, MORE OR LESS TO THE TRUE POINT OF BEGINNING.

EXCEPTING THEREFROM 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS, AND 1/2 OF ALL WATER AND WATER RIGHTS OF EVERY KIND, CHARACTER AND DESCRIPTION, NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OR LEVELS ON AND BENEATH THE SURFACE OF SAID LAND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES AS RESERVED IN THE DEED FROM ELSA OLDER, A MARRIED WOMAN, RECORDED MAY 20, 1963 IN BOOK 5912, PAGE 366, OFFICIAL RECORDS OF SAID COUNTY.

END OF LEGAL DESCRIPTION

Source: Chicago Title Company – December 28, 2006

Parcels: #24, #25

APN's: 262-241-13, 262-241-14

LEGAL DESCRIPTION

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

THAT PORTION OF THE RANCHO MUSCUPIABE, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAID COUNTY, BEING A PORTION OF SECTION 24, TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINE WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT WHICH BEARS NORTH 89° 45' WEST 286.59 FEET FROM THE CENTER LINE INTERSECTION OF THIRD AVENUE AND GRAY STREET; THENCE ALONG THE WESTERLY EXTENSION OF THE CENTERLINE OF THIRD AVENUE NORTH 89° 45' WEST, 961.47 FEET; THENCE SOUTH 13° 49' 15" EAST, 220 FEET; THENCE SOUTH 89° 45' EAST 719.59 FEET TO A POINT ON THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND; THENCE ALONG SAID NORTHWESTERLY LINE NORTH 41° 41' 30" EAST (RECORDED NORTH 41° 40' 45" EAST) 284.67 FEET TO THE POINT OF BEGINNING.

EXCEPTING THEREFROM, AN UNDIVIDED 1/2 INTEREST OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS, NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN OR THEREUNDER OR PRODUCABLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE BENEATH THE SURFACE OF SAID LAND AT ANY LEVEL OR LEVELS, 100 FEET OR MORE BELOW THE SURFACE OF SAID LAND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, AS RESERVED IN THE DEED FROM CHARLES S. OLDER, ET AL., RECORDED MAY 18, 1954 IN BOOK 3384, PAGE 513, OFFICIAL RECORDS.

AFFECTS: A PORTION OF THE PROPERTY HEREIN DESCRIBED.

ALSO EXCEPTING THEREFROM, AN UNDIVIDED 1/2 INTEREST OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCABLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE ON AND BENEATH THE SURFACE OF SAID LAND AT ANY LEVEL OR LEVELS FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SAID SUBSTANCES, TOGETHER WITH THE RIGHT OF INGRESS AND EGRESS UPON SAID LAND, AS RESERVED IN THE DEED FROM STANDARD PROPERTIES INC., A CALIFORNIA CORPORATION RECORDED MARCH 22, 1962 IN BOOK 5666, PAGE 745, OFFICIAL RECORDS.

AFFECTS: A PORTION OF THE PROPERTY HEREIN DESCRIBED.

APN: 262-241-13 & 14

Source: Chicago Title Company – December 17, 2013

Parcel #26

APN's: 262-241-16

LEGAL DESCRIPTION:

ALL OF THAT PORTION OF THE RANCHO MUSCUPIABE, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAN BERNARDINO COUNTY, STATE OF CALIFORNIA, BEING A PORTION OF SECTIONS 13, 14, 23 AND 24 OF TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTERLINE INTERSECTION OF THIRD AVENUE AND GRAY STREET AS SHOWN ON TRACT 2824, RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY; THENCE NORTH 89 DEGREES 45' WEST, 286.59 FEET ALONG THE CENTERLINE OF SAID THIRD AVENUE EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS OF SAID COUNTY, SAID INTERSECTION BEING THE **TRUE POINT OF BEGINNING**; THENCE FROM THE TRUE POINT OF BEGINNING 89 DEGREES 45' WEST 1213.75 FEET ALONG THE SAID WESTERLY EXTENSION OF THE CENTERLINE OF THIRD AVENUE TO ITS INTERSECTION WITH A LINE RUNNING SOUTH 18 DEGREES 45 EAST (SOUTH 18 DEGREES 44' 19" EAST, DEED) FROM THE SOUTHEASTERLY CORNER OF THE LAND DESCRIBED AS PARCEL P-6 IN THE LIS PENDENS RECORDED SEPTEMBER 13, 1945, IN BOOK 1809, PAGE 43, OFFICIAL RECORDS OF SAID COUNTY; THENCE NORTH 18 DEGREES 45' WEST, 401.90 FEET; THENCE SOUTH 89 DEGREES 45' EAST, 1351.03 FEET; THENCE SOUTH 0 DEGREES 00' 15" WEST, 370.92 FEET; THENCE SOUTH 41 DEGREES 40' 45" WEST, 12.11 FEET TO THE **TRUE POINT OF BEGINNING**.

EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE SOUTHERN PACIFIC COMPANY BY DEED RECORDED AUGUST 26, 1965 IN BOOK 6460, PAGE 935.

ALSO EXCEPTING THEREFROM ALL OF THE ABOVE DESCRIBED LAND, 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN OR THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OR LEVELS 100 FEET OR MORE BENEATH THE SURFACE OF SAID LAND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, AS EXCEPTED IN THE DEED RECORDED DECEMBER 5, 1954 IN BOOK 3524, PAGE 324.

Source: A.L.T.A./A.C.S.M. Land Title Survey (Johnson-Frank & Associates, Inc. – September 11, 2007)

ALL OF THAT PORTION OF THE RANCHO MUSCUPIABE, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAN BERNARDINO COUNTY, STATE OF CALIFORNIA, BEING A PORTION OF SECTIONS 13, 14, 23 AND 24 OF TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IF SAID SECTION LINES WERE EXTENDED ACROSS SAID RANCHO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTERLINE INTERSECTION OF THIRD AVENUE AND GRAY STREET AS SHOWN ON TRACT 2824, RECORDED IN BOOK 39 OF MAPS, PAGES 7 AND 8, RECORDS OF SAID COUNTY; THENCE NORTH 89 DEGREES 45' WEST, 286.59 FEET ALONG THE CENTERLINE OF SAID THIRD AVENUE EXTENDED WEST TO ITS INTERSECTION WITH THE NORTHWESTERLY LINE OF THE CABLE CANYON COUNTY FLOOD CONTROL LAND AS PER DEED RECORDED AUGUST 30, 1945 IN BOOK 1799, PAGE 366, OFFICIAL RECORDS OF SAID COUNTY, SAID INTERSECTION BEING THE TRUE POINT OF BEGINNING; THENCE FROM THE TRUE POINT OF BEGINNING 89 DEGREES 45' WEST 1213.75 FEET ALONG THE SAID WESTERLY EXTENSION OF THE CENTERLINE OF THIRD AVENUE TO ITS INTERSECTION WITH A LINE RUNNING SOUTH 18 DEGREES 45' EAST (SOUTH 18 DEGREES 44' 19" EAST, DEED) FROM THE SOUTHEASTERLY CORNER OF THE LAND DESCRIBED AS PARCEL P-6 IN THE LIS PENDENS RECORDED SEPTEMBER 13, 1945, IN BOOK 1809, PAGE 43, OFFICIAL RECORDS OF SAID COUNTY; THENCE NORTH 18 DEGREES 45' WEST, 401.90 FEET; THENCE SOUTH 89 DEGREES 45' EAST, 1351.03 FEET; THENCE SOUTH 0 DEGREES 00' 15" WEST, 370.92 FEET; THENCE SOUTH 41 DEGREES 40' 45" WEST, 12.11 FEET TO THE TRUE POINT OF BEGINNING.

EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE SOUTHERN PACIFIC COMPANY BY DEED RECORDED AUGUST 26, 1965 IN BOOK 6460, PAGE 935, OFFICIAL RECORDS.

ALSO EXCEPTING THEREFROM ALL OF THE ABOVE DESCRIBED LAND, 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN OR THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE AT ANY LEVEL OR LEVELS 100 FEET OR MORE BENEATH THE SURFACE OF SAID LAND FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, AS EXCEPTED IN THE DEED RECORDED DECEMBER 5, 1954 IN BOOK 3524, PAGE 324, OFFICIAL RECORDS.

Source: Chicago Title Company – November 30, 2007

Parcels: #27

APN's: 262-241-26

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

THAT PORTION OF THE RANCHO MUSCUPIABE, AS PER PLAT RECORDED IN BOOK 7 OF MAPS, PAGE 23, RECORDS OF SAN BERNARDINO COUNTY; BEING ALSO A PORTION OF SECTIONS 13, 14, 23, AND 24 OF TOWNSHIP 1 NORTH, RANGE 5 WEST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA AS SAID SECTION LINES MAY BE EXTENDED ACROSS SAID RANCHO, MORE PARTICULARLY DESCRIBED IN THAT CERTAIN **CORRECTION TO CERTIFICATE OF COMPLIANCE NO. EVL026-08, RECORDED OCTOBER 22, 2008 AS INSTRUMENT NO. 2008-0469264, OF OFFICIAL RECORDS.**

EXCEPT THEREFROM THAT PORTION OF SAID LAND LYING WITHIN THE LAND SET OUT IN THE DEED HEREIN BELOW REFERENCED ONE-HALF (1/2) OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE ON AND BENEATH THE SURFACE OF SAID LAND AT ANY LEVEL OR LEVELS 100 FEET OR MORE BELOW THE SURFACE FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, AS RESERVED IN THE DEED FROM STANDARD PROPERTIES, INC., A CALIFORNIA CORPORATION, RECORDED MARCH 22, 1962 IN BOOK 5666, PAGE 745 OF OFFICIAL RECORDS.

ALSO EXCEPT THEREFROM THAT PORTION OF SAID LAND LYING WITHIN THE LAND SET OUT IN THE DEED HEREIN BELOW REFERENCED ONE-HALF 1/2 OF ALL OIL, GAS AND OTHER HYDROCARBONS AND MINERALS NOW OR AT ANY TIME HEREAFTER SITUATED THEREIN AND THEREUNDER OR PRODUCIBLE THEREFROM, TOGETHER WITH THE FREE AND UNLIMITED RIGHT TO MINE, DRILL AND BORE ON AND BENEATH THE SURFACE OF SAID LAND AT ANY LEVEL OR LEVELS 100 FEET OR MORE BELOW THE SURFACE FOR THE PURPOSE OF DEVELOPMENT OR REMOVAL OF SUCH SUBSTANCES, AS RESERVED IN THE DEED FROM CHARLES S. OLDER, ET AL, RECORDED MAY 18, 1954 IN BOOK 3384, PAGE 513 OF OFFICIAL RECORDS.

ALSO EXCEPTING AND RESERVING FOREVER, ALL MINERALS AND ALL MINERAL RIGHTS OF EVERY KIND AND CHARACTER NOW KNOWN TO EXIST OR HEREAFTER DISCOVERED, INCLUDING, WITHOUT LIMITATION, OIL AND GAS AND RIGHTS THERETO, TOGETHER WITH THE SOLE, EXCLUSIVE AND PERPETUAL RIGHT TO EXPLORE FOR, REMOVE AND DISPOSE OF SAID MINERALS BY ANY MEANS OR METHODS SUITABLE TO GRANTOR, ITS SUCCESSORS AND ASSIGNS, BUT WITHOUT ENTERING UPON OR USING THE SURFACE OF THE PROPERTY, AND IN SUCH MANNER AS NOT TO DAMAGE THE SURFACE OF THE PROPERTY OR TO INTERFERE WITH THE USE OF THE PROPERTY BY GRANTEE, ITS SUCCESSORS OR ASSIGNS, AS EXCEPTED AND RESERVED BY UNION PACIFIC RAILROAD COMPANY, A DELAWARE CORPORATION IN DEED RECORDED OCTOBER 27, 2008 AS INSTRUMENT NO. 2008-474671.

END OF LEGAL DESCRIPTION

Source: Chicago Title Company – December 11, 2008