APPENDIX G

GEOTECHNICAL AND GEOLOGIC EVALUATION

June 12, 2017
Project No. 16-1214

Mr. Andrew White
Benchmark Resources
2515 East Bidwell Street
Folsom, California 95630

Subject: Geotechnical and Engineering Geologic Evaluation
Reclamation Plan Amendment
SMP 34 – Niles Canyon Quarry
Sunol, California

Dear Mr. White:

This letter presents the results of our geotechnical and engineering geologic evaluation of the slope stability and landslide hazards at the Niles Canyon Quarry (SMP 34) in Sunol, California. Previously, we performed a geotechnical review of the Reclamation Plan Amendment (RPA) prepared for Niles Canyon Quarry in accordance with our proposal dated October 12, 2016 and presented the results in a draft letter dated November 14, 2016. This geotechnical and engineering geologic evaluation was performed in accordance with our Budget Increase Request No. 1 dated January 12, 2017. Gilpin Geosciences, Inc. (GGI) performed the engineering geologic evaluation for this project as a subconsultant to Rockridge Geotechnical, Inc.

BACKGROUND

The Niles Canyon Quarry is an idle quarry owned by SRDC, Inc. (SRDC). SRDC purchased the property in 1984 and renewed the Reclamation Plan in 1996. Mining and reclamation are allowed by Alameda County surface mining and reclamation plan permit (SMP) 34. The approved reclamation plan's end use is open space and agriculture. Slopes shall be reclaimed at an angle of 1.5:1 (horizontal to vertical) or flatter. Mining activities at the site ceased in the 2010. No further mining operations are proposed. In 2012 and 2013, SRDC removed imported recycled material from the upper pad and the base rock from the lower yard down to native ground and the surface was graded to provide positive drainage and slope stability. Some residual material remains on-site or may have become blended during the course of grading operations to enhance drainage and erosion control.

SRDC submitted a RPA to the County in June 2014. The RPA requested amending the approved reclamation plan to reflect current site conditions that are inconsistent with the approved 1996 Reclamation Plan. Specifically, onsite slopes at some locations are steeper than 1.5:1. The RPA was submitted to the Department of Conservation, Division of Mine Reclamation (DWR) for review and comment. DWR concluded the geotechnical analysis submitted with the June 2014 RPA did not address the slope stability of the Upper North Cut Slopes and Upper South Cut Slopes. A revised RPA was submitted by SRDC in December 2015 to address these and other comments received.

We performed a geotechnical review of the December 2015 RPA prepared for Niles Canyon Quarry in accordance with our proposal dated October 12, 2016. Specifically, we reviewed the following RPA documents:

- Letter for Niles Canyon Quarry SMP-34 Reclamation Plan Amendment, CA Mine ID# 91-0-0003, prepared by Department of Conservation Office of Mine Reclamation and dated July 1, 2015.
- Reclamation Plan Amendment for Niles Canyon Quarry SMP-34, prepared by Spinardi Associates and dated December 2015 (update to RPA June 2014).

The results of our review were presented in a draft letter dated November 14, 2016. Based on the results of our geotechnical review of the RPA documents, we recommended additional geotechnical and engineering geologic evaluation be performed to address the stability of the current slope configuration.

REGULATORY SETTING

This section presents County grading ordinance and surface mining ordinance relevant to slope regulations and guidance.

Alameda County General Ordinances, Section 15.36.470 - Excavation Slope

The slope of cut surfaces of permanent excavations shall not be steeper than two horizontal to one vertical exclusive of terraces and exclusive of roundings described herein. Steeper slopes may be permitted in competent bedrock provided such slope inclinations are in accordance with recommendations contained in the geotechnical or geological report. The bedding planes or principal joint sets in any formation when dipping towards the cut face shall not be daylighted by the cut slope unless the soils and geologic investigations contain recommendations for steeper cut slopes. The director of public works may require the excavation to be made with a cut face flatter in slope than two horizontal to one vertical if necessary for stability and safety. Cut slopes shall be rounded into the existing terrain to produce a contoured transition from cut face to natural ground.

Alameda County Surface Mining and Reclamation Code, Chapter 6.80.240

E. Final Slope Gradient. Final slopes shall be of such gradient as necessary to provide for slope stability, maintenance of required vegetation, public safety, and the control of drainage, as may be determined by engineering analysis of soils and geologic conditions and by taking into account probable future uses of the site. Final slopes shall not be steeper than two feet horizontal to one foot vertical (2:1) unless the applicant can demonstrate to the satisfaction of the planning commission that any such steeper slope will not:

1. Be incompatible with the alternate future uses approved for the site;
2. Be hazardous to persons that may utilize the site under the alternate future uses approved for the site; and
3. Reduce the effectiveness of revegetation and erosion control measures where such are necessary.

In no event shall the steepness of slopes exceed the critical gradient as determined by an engineering analysis of the slope stability.

SMP 34 Conditions of Approval

37. Permittee shall create no final or interim grades of greater slope than 1.5 feet horizontal to 1 foot vertical (1.5: 1), sufficient to avoid adverse bedding or other conditions on site that could result in instability. Monitoring shall consist of inspection and reporting once annually by Public Works staff on the slopes achieved and the condition of those slopes, along with recommendations to the Planning Commission for stabilization of slopes if the slopes indicated on the mining and reclamation plans show significant signs of instability. The Planning Commission shall have authority to impose additional requirements to ensure slope stability if necessary, including but not limited to gentler slopes in unstable areas.

38. Permittee shall use dampened soil for coverage on idle or rough reclamation slopes, lightly compacted, and use a "high-tack" hydroseed mixture to apply on the slopes; revegetation for stabilization or reclamation shall be performed during the late summer and early fall to establish substantial root growth prior to the rainy season. Blankets or netting for soil stabilization may be used sparingly when necessary, but only for temporary coverage and only on recently disturbed areas that are without substantial vegetative growth; when used for areas that will not be disturbed for six months or more, these methods may only be used in conjunction with interim revegetation establishment and until the interim revegetation has become established. Monitoring shall consist of inspection of erosive areas frequently by the Permittee and inspection and reporting

periodically by Public Works staff of the condition of idle or reclaimed slopes and the vegetative cover thereupon, with recommendations to the Planning Director to correct deficiencies. Planning Director shall have authority to impose additional requirements as necessary to preserve vegetation on idle or reclaimed slopes.

SCOPE OF SERVICES

This geotechnical and engineering geologic evaluation addresses the stability of the current slope configuration. We have focused our evaluation on the slope stability of the upper quarried slopes labelled as Upper Upper Cut Slope, Upper North Cut Slope, and Upper South Cut Slope on the Site Plan, Figure 1.

Our scope of services included the following tasks:

- Review available published and unpublished geologic data for the site vicinity, including consultant reports of previous geotechnical investigations that have been provided.
- Review available historical aerial photography of the site to identify features that may be associated with past grading operations and areas of slope instability.
- Perform a site geologic reconnaissance.
- Where the upper north, upper south, and upper-upper cut slopes exceed 2:1 (horizontal: vertical), perform stability analysis to evaluate whether the current slope configuration has a factor of safety that is suitable for the most adverse conditions that could possibly occur at the site, such as a large earthquake on either the Hayward fault or Calaveras fault under saturated conditions.
- Identify areas on the upper north, upper south, and upper upper cut slopes where revegetation will be beneficial for erosion control (recommendations for type of revegetation and seeding ratio are not part of our scope).
- Analyze the compiled geologic data and geotechnical study and prepare a letter presenting our findings, conclusions and recommendations regarding the proposed reclamation.

ENGINEERING GEOLOGIC EVALUATION

GGI performed an engineering geologic evaluation of the slope stability and landslide hazards at the Niles Canyon Quarry. Specifically, GGI performed the following tasks:

- Reviewed available published and unpublished geologic data for the site vicinity, including consultant reports of previous geotechnical investigations that have been provided.
- Reviewed available historical aerial photography of the site dating from 1947 to 2002 to identify features that may be associated with past grading operations and areas of slope instability.
- Performed a site geologic reconnaissance on March 1, 2017.
- Analyzed the compiled geologic data.

GGI prepared a letter presenting their findings and conclusions dated June 7, 2017, which is included as Appendix A of this letter.

OBSERVED SLOPE CONDITIONS

A summary of existing slope conditions at the Upper South Cut Slope, Upper North Cut Slope, and Upper Upper Cut Slope are presented in this section. For detail descriptions of existing slope conditions, as well as areas of slope instability, see the Engineering Geologic Evaluation letter prepared by GGI in Appendix A.

Upper South Cut Slope

The Upper South Cut Slope is formed by narrow benches that expose competent shale. Based on the 2014 Topographic Survey[1], the cut slopes are generally 2:1 (horizontal to vertical) or flatter, except along the eastern limit of the Upper South Cut Slope (see Figure 1) where the slope is as steep as 1.3:1. Bedding orientation of the shale is dipping out of slope (adverse bedding condition). Significant slope failure associated with bedrock failure was <u>not</u> observed by GGI (2017), except at the eastern limit of the Upper South Cut Slope (see Figure 1) where ongoing erosion and slope creep are occurring.

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1 Reclamation Plan Amendment for Niles Canyon Quarry SMP-34, prepared by Spinardi Associates and dated December 2015 (update to RPA June 2014), Sheet 2 – 2014 Topographic Survey – Quarry Area.

Upper North Cut Slope

The Upper North Cut Slope is characterized by cast quarry fill on the slope and slivers of fill underlying the various benches and access roads. Based on the 2014 Topographic Survey, the cut slopes are generally 1.5:1 or flatter, except parts of the cut slope are steeper than 1:1 (with a localized area of the slope inclined at 0.7:1, see Figure 1). Long-term static slope stability is a concern at the Upper North Cut Slope. Recent shallow landslide activity and localized fill erosion and failures along the downslope edges of the benches and roads are examples of the ongoing erosion and slope creep that are occurring.

Upper Upper Cut Slope

Benches of the Upper Upper Cut Slope are cut into competent bedrock. Based on the 2014 Topographic Survey, the cut slopes are generally 1.7:1. At the time of our reconnaissance, the slopes appeared to be performing adequately. No significant evidence of erosion was noted on aerial photographs or during site reconnaissance.

SLOPE STABILITY EVALUATION

We performed static slope stability, pseudostatic and seismic slope deformation analyses for the following slope inclinations:

- Case A: Maximum slope inclination that will have a static factor of safety (FS) of at least 1.5
- Case B: Static FS for slope inclination of 1.5:1
- Case C: Static FS for slope inclination of 1.25:1
- Case D: Maximum slope inclination that will have a static FS of at least 1.0

Static slope stability and pseudostatic analyses were performed using the computer program, Slope/W (Released 2012) and the Morgenstern-Price method. Seismic slope deformation analysis was performed following the methodology developed by Bray and Travasarou[2] (2007); this methodology is one of the accepted simplified Newmark displacement estimation procedures listed in the California Geological Survey (CGS) Special Publication SP 117A (SP 117A), *Guidelines for Evaluating and Mitigating*

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[2] J.D. Bray and T. Travasarou (2007). *Simplified Procedure for Estimating Earthquake Induced Deviatoric Slope Displacements*, Journal of Geotechnical and Geonvironmental Engineering, ASCE, V. 133(4), pp. 381-392, April 2007.

Seismic Hazards in California, for estimating seismic ground displacements. In accordance with the 2016 California Building Code (CBC), we used peak ground accelerations (PGAs) of 0.52 and 0.78 times gravity (g) in our seismic slope deformation analysis; these PGAs are consistent with the Design Earthquake (DE) and the Maximum Considered Earthquake (MCE) events, respectively. We also used a moment magnitude 7.33 earthquake, which is consistent with the mean characteristic moment magnitude for the Hayward Fault.

Our scope of services did not include a site-specific field investigation, such as drilling test borings or performing geotechnical laboratory testing on soil/bedrock samples obtained from the site, to characterize the soil/bedrock and to evaluate the soil/bedrock engineering properties for slope stability analysis. Material properties for shale used for our slope stability analysis are based on shale properties presented in the report prepared by CGS titled *State of California, Seismic Hazard Zone Report for the Niles 7.5-Minute Quadrangle, Alameda County, California*, dated 2004. The assumed shale properties, cohesion of 750 pounds per square foot (psf) and friction angle of 23 degrees, take into account adverse bedding conditions and creep behavior.

The results of our slope stability analysis and seismic slope deformation analysis are presented in Table 1.

TABLE 1
SLOPE STABILITY AND SEISMIC SLOPE DEFORMATOIN RESULTS

Slope Inclination	Static FS	Yield Acceleration (Ky)	DE – Seismic Slope Displacement	MCE – Seismic Slope Displacement
1.85:1 (Case A)	1.5	0.22	12 to 44 cm median = 23 cm	26 to 98 cm median = 51 cm
1.5:1 (Case B)	1.4	0.175	17 to 64 cm median = 33 cm	36 to 134 cm median = 70 cm
1.25:1 (Case C)	1.2	0.115	31 to 114 cm median = 59 cm	59 to 218 cm median = 113 cm
0.9:1 (Case D)	1.0	-	-	-

SP 117A provides the following general guidelines in evaluating potential earthquake-induced landslide hazards.

- Newmark displacements of 0 to 15 cm are unlikely to correspond to serious landslide movement and damage.
- In the 15 to 100 cm range, slope deformation may be sufficient to cause serious ground cracking or enough strength loss to result in continuing (post-seismic) failure. Determining whether displacements in this range can be accommodated safely requires good professional judgement that takes into account issues such as landslide geometry and material properties.
- Calculated displacements greater than 100 cm are very likely to correspond to damaging landslide movement, including possible catastrophic failure, and such slopes should be considered unstable.

Considering the site is underlain by bedrock, we judge Newmark displacements in the 15 to 100 cm range will result in serious ground cracking; however, we judge the potential for strength loss to result in continuing (post-seismic) failure to be low. Newmark displacements greater than 100 cm are likely to result in landslide movements, such as deep-seated slope failures. Based on the results of our slope stability analysis, we anticipate deep-seated slope failures could be on the order of 30 feet deep.

The results of our slope stability analysis indicate the following:

- Case A: Slope inclination 1.85:1 has static of FS of 1.5. The seismic slope displacements are generally between 15 cm and 100 cm for DE or MCE events, indicating there may be serious ground cracking, however these seismic slope displacements are below the SP 117A screening threshold (100 cm) for landslide movement.
- Case B: Slope inclined 1.5:1 has static FS of 1.4. The median seismic slope displacements are 17 to 70 cm during DE and MCE events, respectively, which may be sufficient to cause serious ground cracking; however, these seismic slope displacements are below the SP 117A screening threshold for landslide movement. The upper limit of seismic slope displacement is 134 cm during a MCE event, which is above the SP 117A screening threshold for landslide movement.
- Case C: Slope inclined 1.25:1 has static FS of 1.2, indicating long-term static slope stability is questionable. The median seismic slope displacement is 59 cm during a DE event, which is sufficient to cause serious ground cracking but the potential for landslide movement is low. The median seismic slope displacement

for the MCE event, as well as the upper limits of seismic slope displacements for DE and MCE events, exceed 100 cm, indicating there is a potential for landslide movement during DE and MCE events.

- Case D: Slope inclined 0.9:1 are marginally stable with static FS of about 1.0. Long-term static stability of slopes inclined 0.9:1 or steeper is questionable. Potential for landslide movement, such as deep-seated slope failure during DE and MCE events is likely.

CONCLUSION

Based on the results of our geotechnical and engineering geologic evaluation, we make the following conclusions regarding the stability of the Upper South Cut Slope, Upper North Cut Slope, and Upper Upper Cut Slope:

- Slopes inclined 1.85:1 or flatter have a static FS of at least 1.5 and seismic slope displacements are less than 100 cm during DE and MCE events. There may be serious ground cracking during the DE and MCE events; however, the potential for landslide movement is low. Therefore, we conclude slopes inclined 1.85:1 or flatter are stable under static and seismic conditions.
- Slopes inclined at 1.5:1 have a static FS of about 1.4 and can be considered as stable under static conditions for agricultural use. The median seismic slope displacements are between the range of 15 cm and 100 cm during DE and MCE events which may be sufficient to cause serious ground cracking; however, the potential for landslide movement is low. During the MCE event, however, the upper limit of seismic slope displacement is 134 cm; therefore, there is a potential for landslide movement, such as a deep-seated slope failure.
- Long-term static stability of slopes inclined steeper than 1.5:1 are questionable and potentially susceptible to landslide movement during DE and MCE events.

The approved reclamation plan's end use is open space and agriculture. Per SMP-34 Conditions of Approval #37, slopes shall be reclaimed at an angle of 1.5:1 (horizontal to vertical) or flatter, and be sufficient to avoid slope instabililty. If the potential for landslide movement during an MCE event is acceptable, provided the slope is stable under static and DE conditions, the slopes should be graded to an inclination no steeper than 1.5:1. Slopes steeper than 1.5:1 are susceptible to ongoing erosion and slope creep and landslide movement (i.e. deep-seated slope failure on the order of 30 feet deep) during DE and MCE events.

Based on the results of the geologic site reconnaissance performed by GGI and the 2014 Topographic Survey, we identified the following areas that have existing slopes steeper than 1.5:1 that are susceptible to ongoing erosion and slope creep and landslide movement during DE and MCE events.

- **Upper North Cut Slope**: Based on the 2014 Topographic Survey, the cut slopes at the Upper North Cut Slope are generally 1.5:1 or flatter, except parts of the cut slopes are steeper than 1.5:1 (see Figure 1 of this letter and also Figure 3 of Appendix A for mapped slope inclinations).

- **Upper South Cut Slope**: The slopes along the eastern limit of the Upper South Cut Slope (see Figure 1) are inclined about 1.3:1.

Revegetation

We judge there are areas in the upper quarried slopes where revegetation will be beneficial for erosion control. However, revegetation activities that could adversely impact slope conditions should be avoided, including any grubbing and grading of existing established grasses and installing temporary irrigation. Our conclusions regarding revegetation for erosion control are presented below:

- The Upper North Cut Slope, characterized by cast quarry fill on the slope and slivers of fill underlying the various benches and access roads, will benefit from revegetation for erosion control.
- The Upper South Cut Slope is formed by narrow benches that expose competent shale. We judge vegetation of the south cut slope for erosion control will be beneficial, particularly along the eastern limit of the Upper Pad where the existing slope is as steep as 1.3:1. However, in areas where shale bedrock is exposed on the face of the slope, successful vegetation may not be practically achievable.
- Benches of the Upper Upper Cut Slope are cut into competent bedrock. No significant evidence of erosion noted on aerial photographs or during site reconnaissance. Considering competent bedrock is exposed on the face of the slope and that no significant evidence of erosion was note on aerial photographs, we judge revegetation is not necessary and may not be practically achievable.

ROCKRIDGE GEOTECHNICAL

We appreciate the opportunity to provide our services to you on this project. If you have any questions, please call.

Sincerely yours,
ROCKRIDGE GEOTECHNICAL, INC.

REGISTERED PROFESSIONAL ENGINEER HUI JUN LIANG GE2663 Exp. 6/30/2018 GEOTECHNICAL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER CRAIG S. SHIELDS GE2116 3/31/19 GEOTECHNICAL STATE OF CALIFORNIA

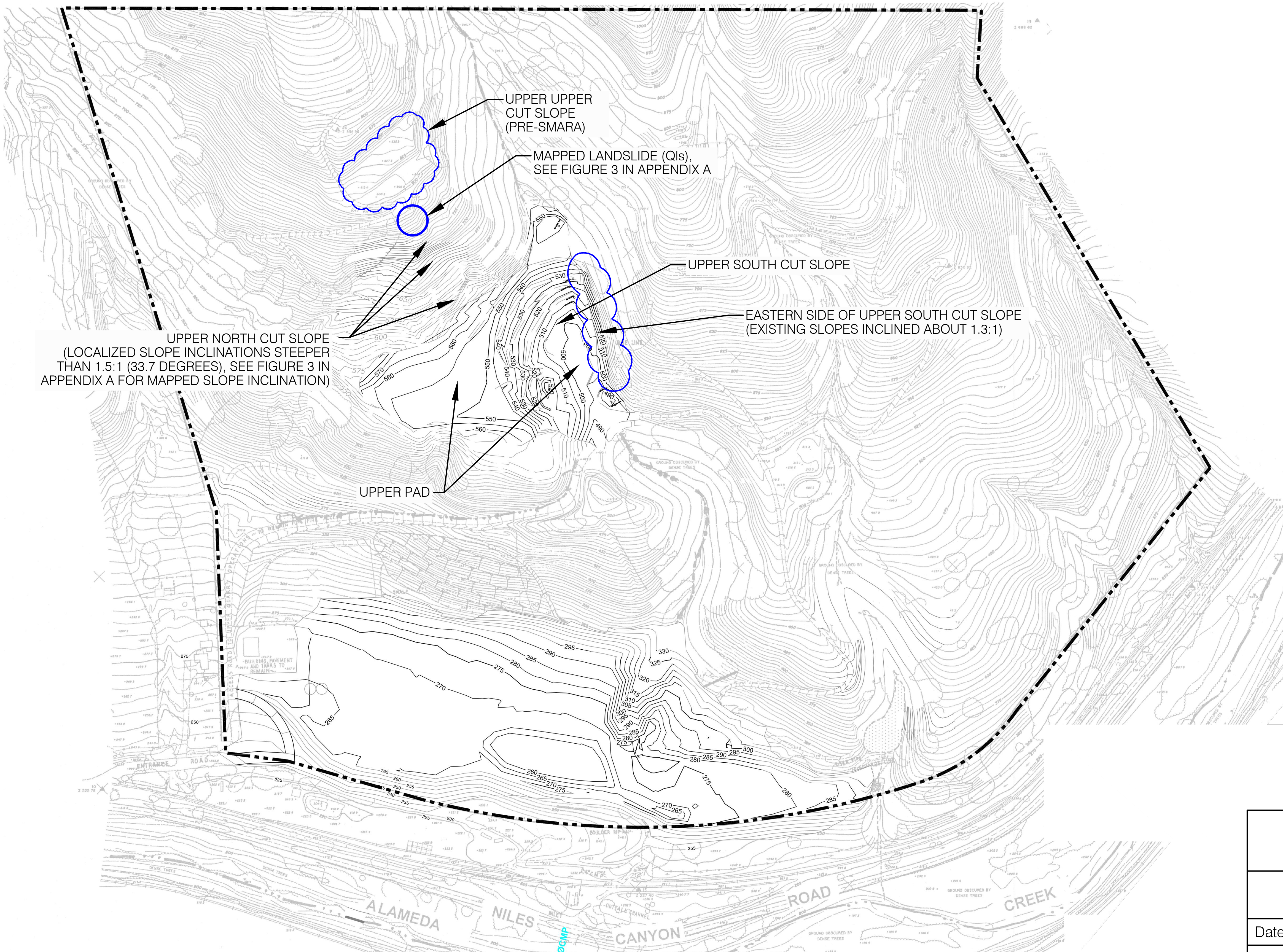
Linda H. J. Liang, P.E., G.E.
Associate Engineer

Craig S. Shields, P.E., G.E.
Principal Geotechnical Engineer

Attachments:

Figure 1 – Site Plan

Appendix A – Engineering Geologic Evaluation



Reference: Base map from a drawing titled "Reclamation Plan Amendment for Niles Canyon Quarry SMP-34", prepared by Spinardi Associates and dated December 2015 (updated to RPA June 2014), Sheet 1 - 2014 Topographic Survey - Overall.

NILES CANYON QUARRY (SMP-34)
Sunol, California

SITE PLAN

Date 06/12/17 | Project No. 16-1214 | Figure 1

ROCKRIDGE GEOTECHNICAL

ROCKRIDGE GEOTECHNICAL

APPENDIX A

ENGINEERING GEOLOGIC EVALUATION

Gilpin Geosciences, Inc
Earthquake & Engineering Geology

June 7, 2017

Linda Liang
Rockridge Geotechnical
270 Grand Avenue
Oakland, California 94610

**RE: Engineering Geologic Evaluation
Reclamation Plan Amendment
Niles Canyon Quarry - SMP 34
Sunol, California**

Dear Ms. Liang,

Gilpin Geosciences, Inc. is pleased to present this evaluation of the slope stability and landslide hazards at the Niles Canyon Quarry near Sunol, California, as shown on the attached Location Map (Figure 1). We understand you have previously performed a Geotechnical Review of the quarry Reclamation Plan Amendment (RPA), and have made several recommendations that you wish us to address.

The quarry is currently owned and operated by SRDC, Inc. (SRDC). SRDC purchased the property in 1984 and renewed the Reclamation Plan in 1996. The permit, SMP-34, extended 25 years and expired on 25 December 2010. SRDC purchased the property with the intention of operating a side hill quarry to harvest clay, shale and natural rock for individual sales and/or use in mixing with crushed concrete to make Class II or Class III base rock. Over the years, large quantities of recycled material were brought to the site for crushing and blending with native materials. It was found that the blended material did not meet specifications for Class II and Class III base rock; therefore, the blending operation was discontinued. The excess quantities of imported recycled materials were stockpiled at the upper pad and graded level to create a flat working area.

We understand, active mining ceased in 2010 and most of the imported material has been removed. Most recently the SRDC submitted a RPA dated June 2014 and an updated RPA dated December 2015.

Our scope of services is based on our discussions with you and review of the following documents:

- Rockridge Geotechnical, 2016 Geotechnical Review Reclamation Plan Amendment SMP 34 – Niles Canyon Quarry Sunol, California: dated 14 November 2016
- Office of Mine Reclamation, 2015, Niles Canyon Quarry SMP-34 Reclamation Plan Amendment CA Mine ID#91-01-0003: dated 1 July 2015
- Spinardi and Associates, 2015, Reclamation Plan Amendment for Niles Canyon Quarry SMP-34: dated December 2015
- Berloger Stevens and Associates, 2014, Limited Assessment of Slopes, Grading, and Erosion Niles Canyhon Quarry, SMP 34 5550 Niles Canyon Road Sunol, California: dated 17 June 2014
- Berloger Geotechnical Consultants, 1995, Geotechnical Review Niles Canyon Quarry Alameda County, California: dated 20 July 1995
- Terrasearch, Inc. 1979, Quarry Slope Stability Evaluation Light Weight Aggregate Mine, Niles Canyon Road, Alameda County, California: dated 30 march 1979
- Grant Line Land Surveying, 2014, Topographic Survey, Niles Canyon Quarry, Sheet 1 of 3, scale 1”=150’: dated 6 June 2014.

SCOPE OF SERVICES

The purpose of our services is to perform a geologic reconnaissance of the site and review aerial photography of the site to identify areas of slope instability. Specifically, we will address two recommendations made in the 2016 Rockridge Geotechnical letter:

- *Perform a geologic site reconnaissance and aerial photograph review to determine areas of landslides or slope stability concerns from 1996 (prior to SMP-34 mining operations) to the present and locate areas of adverse bedrock bedding on cut slopes.*

- *Evaluate if mining operations and grading activities between 1996 and 2014, including construction of access road and cut slopes and benches, destabilized any pre-existing landslides or slopes.*

In order to evaluate the site conditions we performed the following:

1. Reviewed available published and unpublished geologic data for the site vicinity, including consultant reports of previous geotechnical investigations that have been provided;
2. Reviewed available historical aerial photography of the site dating from 1947 to 2002 to identify features that may be associated with past grading operations and areas of slope instability;
3. Performed a site geologic reconnaissance on 1 March 2017; and,

4. Analyze the compiled geologic data and prepared this letter presenting our findings, conclusions and recommendations regarding the proposed quarry reclamation

REGIONAL GEOLOGY AND SEISMICITY

The site is in the Coast Ranges geomorphic province that is characterized by northwest-southeast trending valleys and ridges. These are controlled by folds and faults that resulted from the collision of the Farallon and North American plates and subsequent shearing along the San Andreas Fault. Bedrock in the region is primarily comprised of Lower Cretaceous (about 160 to 100 million years ago) that Hall (1958) attributed to the Niles Canyon or Chico Formation rocks consisting of interbedded sandstone and shale. Subsequent mapping by Dibblee (1980) mapped the same units as Pacheco Formation miceaceous shale and minor sandstone bedrock. More recent mapping by Graymer and others (1996) leave the sedimentary units at the site unnamed (Figure 2a). The bedrock in the site vicinity is overlain by Late Tertiary to Quaternary (3 to million years ago to recent) Livermore Gravels, landslide deposits and various ages of alluvium deposited along the through flowing creeks.

Although a dormant landslide is mapped at the northeastern corner of the site on the Landslide Inventory Map, Figure 2b (California Geologic Survey, 2011), there are no landslides mapped in the quarried areas of the site. A large dormant landslide complex is mapped to the west of the site as part of the landslide inventory. Nilsen (1975) maps a queried landslide and artificial fill on the southwest-facing slopes of the quarry site. The queried landslide roughly corresponds to the old inactive landslide we discuss later in this report.

The site does not lie within a known Earthquake Fault Zone as shown on the Alquist Priolo Special Studies Zone Map (Figure 2c). No active faults were identified on the site during our investigation.

The site lies in the seismically active San Francisco Bay region and is subject to frequent earthshaking. The active faults nearest to the site are the Hayward (6 km southwest), Calaveras (3 km east), Concord (34 km north), and San Andreas (37 km southwest) as listed in Table 1 below. The site can be expected to experience strong ground motion from an earthquake on the nearby faults.

TABLE 1
Regional Faults and Seismicity

Fault Segment	Distance (km)	Direction From Site	Maximum Moment Magnitude
Total Calaveras	3	East	6.9
South Hayward	6	Southwest	6.7

Total Hayward	6	Southwest	6.9
Total Hayward-Rodgers Creek	6	Southwest	7.3
Hayward - South East Extension	15	South	6.4
Mt Diablo - MTD	17	Northeast	6.7
Greenville	23	Northeast	6.9
Monte Vista-Shannon	33	Southwest	6.8
Concord/Green Valley	34	North	6.7
Great Valley 6	36	East	6.7
North Hayward	37	Northwest	6.5
San Andreas - 1906 Rupture	37	Southwest	7.9
San Andreas - Peninsula	37	Southwest	7.2
Great Valley 7	38	East	6.7
San Andreas - Santa Cruz Mnts.	48	South	7.0
Sargent	51	South	6.8
Northern San Gregorio	52	West	7.2
Total San Gregorio	52	West	7.4
Great Valley 5	55	Northeast	6.5
Zayante-Vergeles	57	South	6.8
San Andreas- North Coast South	62	West	7.5
Ortigalita	67	East	6.9
West Napa	69	Northwest	6.5
Great Valley 8	69	East	6.6
Rodgers Creek	71	Northwest	7.0

Since 1800, four major earthquakes have been recorded on the San Andreas Fault. In 1836, an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale occurred east of Monterey Bay on the San Andreas Fault (Toppozada and Borchardt 1998). The estimated Moment magnitude, M_w, for this earthquake is about 6.25. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to an M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas Fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum intensity of XI (MM), an M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The most recent earthquake to affect the Bay Area was the Loma Prieta Earthquake of 17 October 1989 with an M_w of 6.9. This earthquake occurred in the Santa Cruz Mountains about 96 kilometers south of the site.

The site is mapped within an earthquake-induced landslide hazard zone as shown on the Seismic Hazard Zone Map, Figure 2d, (California Geological Survey, 2004) which is characterized by local steep slopes and weak bedrock (California Geological

Survey, 2004). The mapping is based on topography, surface and subsurface geology, borehole data, historical ground-water levels, existing landslide features, slope gradient, rock-strength measurements, geologic structure, and probabilistic earthquake shaking estimates.

The U.S. Geological Survey's 2014 Working Group on California Earthquake Probabilities has compiled the earthquake fault research for the San Francisco Bay area in order to estimate the probability of fault segment rupture. They have determined that the overall probability of moment magnitude 6.7 or greater earthquake occurring in the San Francisco Region during the next 30 years (starting from 2014) is 72 percent. The highest probabilities are assigned to the Hayward Fault, Calaveras Fault, and the northern segment of the San Andreas Fault. These probabilities are 14.3, 7.4, and 6.4 percent, respectively.

SITE CONDITIONS AND GEOLOGY

The site is an existing quarry from which earth materials have been extracted from the hillside for construction purposes for the last 40 to 50 years. We have focussed our evaluation on the slope stability of the upper quarried slopes labelled as Upper Upper Cut Slope, Upper North Cut Slope, and Upper South Cut Slope on the Site Geology Oblique, Figure 3. The Upper Upper Cut Slope was graded prior to SMARA was enacted.

The site extends across the nose of a prominent topographic ridgeline that is bound by two drainages. The site extends from the more level areas adjacent to Alameda Creek to the steep slopes that climb to the crest of the adjacent ridgelines of the Sunol Ridge crest (Figure 1). At the site, the northwest-southeast trending upland ridgecrest lies at an elevation of 1,200 feet[1] (Upper Upper Cut Slope), whereas the Lower Bench area (Figure 3) lies at approximate elevation 200-260 feet.

The quarried areas encompass most of the nose of the ridgeline exposed across the site. The site has been quarried by excavating into the steep slopes, creating benches that serve as areas used for stockpiling and material processing while excavation continues on the upslope resource areas.

Aerial Photographic Review

We based our mapping on aerial photography and a site reconnaissance. We used the historic aerial photographs to identify both slope stability issues as well as changes in site conditions. Site conditions prior to quarry activities are captured on photographs prior to 1971. We do not have any photographs from the 1960's. Site conditions observed on pre-quarry photographs are characterized by the prominent

[1] Elevations based topographic survey information prepared by Spinardi Associates (2015), Reclamation Plan Amendment, Reclamation Drawings, Sheet 1; reference datum not specified.

old landslide deposits (Qols) as mapped west of subsequent quarry activities on Figure 3.

We have focused our evaluation on the site conditions that presently exist with an attention to the detailed changes since 1996. Figure 4 presents an aerial photograph of the site on 16 October 1996. The site conditions exhibited on this aerial can be compared to the Google image dated 2016 shown on Figure 3. Grading operations that cut benches and cast fill on the Upper North Cut Slope took place in the 70's and 80's. The Upper Upper Cut Slope exposes prominent benches graded between 1973 and 1981. Removal and regrading of soil stockpiles apparent on the 1996 image (Figure 4) contribute to the present configuration of the Upper South Cut Slope.

Site Geologic Reconnaissance

We performed a site geologic reconnaisance of the site on 1 March 2017. We present our observations on Figure 3. The site is characterized by bedrock outcrops of Cretaceous age (approximately 100 million year old) sandstone and shale units. A thrust fault mapped trending east north east across the mid-elevations of the site does not show evidence of Late Quaternary surface offset. Bedding, trending roughly parallel to the faulting, has been mapped on the site, dipping adversely out of the slope, at an inclination of 48 to 65 degrees (Figures 2a, 3). Interbeds of conglomerate have been mapped at higher elevations in the formation north of the site. The bedrock ranges from moderately weathered, weak, and intensely fractured shale units to little weathered, moderately strong, and closely fractured sandstone units.

No published mapping of the site includes details of the surficial deposits present on the site, although numerous landslides have been mentioned in the various consultants reports on the quarry (Terrasearch, 1979; Berloger, 1994). We show our mapping of surficial deposits on Figure 3.

Although bedrock units are exposed in the quarried area, we focus our mapping on the less stable surfical deposits. Our mapping indicates there is a very old landslide deposit (Qols) that underlies the western third of the quarry area. Despite underlying a significant part of the Upper Bench, the slide deposit and overlying quarry fill appear to be stable and performing adequately.

The benches on the Upper Upper Cut are cut into bedrock with slopes separating the benches inclined at approximately 1.5:1 (horizontal to vertical). We noted no significant evidence of erosion of the Upper Upper Cut area on aerial photographs or during our site reconnaissance.

The Upper North Cut slope is characterized by cast quarry fill on the slope and slivers of fill underlying the various benches and access roads. We have mapped the fill, shown as patterned areas on Figure 3. The side-hill fill deposits on the Upper North Cut Slope were placed during quarry operations to create access roadways to higher elevations on the slope. These fill slopes appear to have a mixed performance history. The slope inclinations range from 26 to greater than 45 degrees . Although they have provided adequate access for quarry operations, their long-term stability is questionable. We map some areas where landsliding has impacted the fill and undermined the existing benched roadway. Slopes inclinations ranging from 33 to 45 degrees are not stable on a long-term basis, as evidenced by the mapped young landslide (Qls) shown on Figure 3 on the Upper North Cut Slope.

Grading of the Upper Bench of the main quarry operations area, between the Upper North Cut Slope and the Upper South Cut Slope, included placement of significant fill to create the existing broad level bench. Below this bench, the Upper South Cut Slope is formed by several narrow benches that expose competent shale on the lower elevations with fill exposed on the upper benches (Figure 3). Here the slope appears to be performing well with inter-bench slope (risers) inclinations ranging from 20 to 33 degrees inclination.

CONCLUSIONS AND RECOMMENDATIONS

Based on our review of aerial photographs and site geologic reconnaissance, we have identified fill placement and grading of the Upper South Cut Slope after 1996. Although the bedding orientation is dipping out of the slope, contributing to adverse slope stability at the site, we did not observe significant slope failures associated with bedrock failure. Where the quarry activity has benched into bedrock, such as the Upper Upper Cut and at the low to mid- elevations of the Upper North Cut, the slopes appear to be performing adequately.

The quarry activity over the years has left significant fills perched on the steep Upper North Cut Slope of the quarry that pose a slope stability concern. Recent shallow landslide activity and localized fill erosion and failures along the downslope edges of the benches and roads are examples of the ongoing erosion and slope creep that is occurring. Future shallow slope failures will occur that are similar to those we observed. We did not see any evidence of deep-seated failures, nor the potential for global hillside instability.

We have provided our observations and limited geologic mapping of the surficial deposits that may pose a threat to the future slope stability at the quarry site. We understand a geotechnical stability analysis will be performed using the existing topographic data in combination with our recent mapping.

We trust this provides you with the information you require at this time. If you have questions, or require additional information, please call or email.

Sincerely,
GILPIN GEOSCIENCES, INC.

REGISTERED GEOLOGIST
L. M. GILPIN
No. 1518
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Lou M. Gilpin, Ph.D., C.E.G.
Principal Geologist

Attachments: REFERENCES

FIGURES

Figure 1	Location Map
Figure 2a	Regional Geologic Map
Figure 2b	Landslide Inventory Map
Figure 2c	Alquist Priolo Special Studies Zone Map
Figure 2d	Seismic Hazard Zones Map
Figure 3	Site Geologic Oblique
Figure 4	1996 Aerial Photograph

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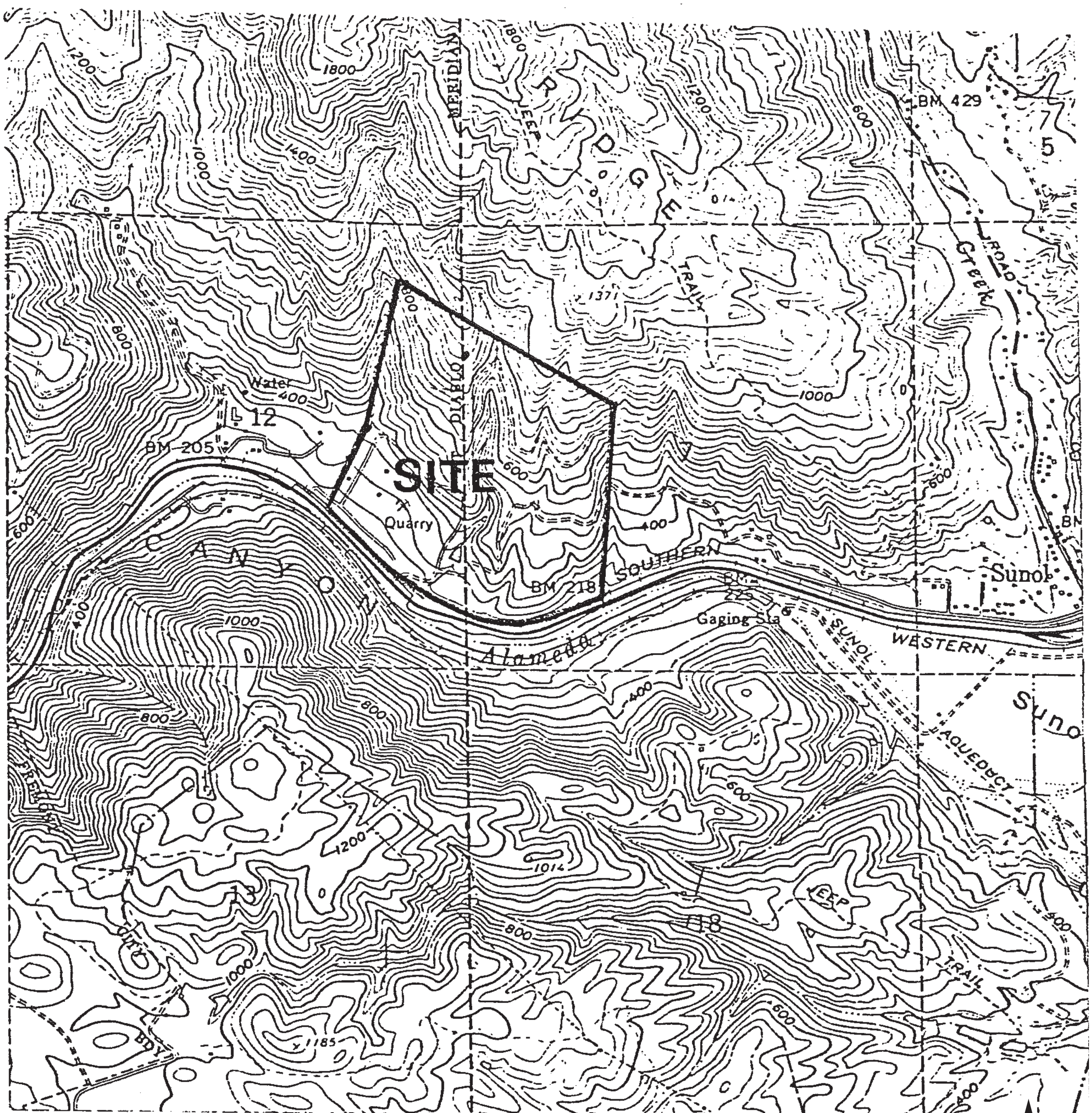
Aerial Photographs

Date	Photo Number	Scale	Source
7/10/02	AV 8202-25- 47, 48	1:12,000	Pacific Aerial Survey
5/17/99	AV 6100 -26, 47, 48, 49	1:12,000	Pacific Aerial Survey
10/16/96	AV 5200-26- 40, 41,42,	1:12,000	Pacific Aerial Survey
9/30/95	KAV 4936-13- 21, 22	1:24,000	Pacific Aerial Survey
7/11/94	AV 4625-126- 44, 45 46,	1:12,000	Pacific Aerial Survey
7/31/92	AV 4230-126- 47, 49	1:12,000	Pacific Aerial Survey
8/30/90	AV 3845-24- 45, 46	1:12,000	Pacific Aerial Survey
5/30/85	AV 2640-11- 58, 59, 60	1:12,000	Pacific Aerial Survey
5/16/918	AV 2040-11- 57, 58, 59	1:12,000	Pacific Aerial Survey
4/30/73	AV 1100-11- 57, 58	1:12,000	Pacific Aerial Survey
5/18/71	AV 995-09- 50, 51	1:12,000	Pacific Aerial Survey
5/16/57	AV 253-24- 45, 46	1:12,000	Pacific Aerial Survey
8/21/54	AV 119-30- 18, 19, 20	1:10,000	Pacific Aerial Survey
3/24/47	AV 11-03- 34, 35	1:20,000	Pacific Aerial Survey

FIGURES



SCALE: 1"=2000'

From: U.S.G.S. Niles Quadrangle 7.5 Minute Series
Topographic Survey

SITE LOCATION MAP

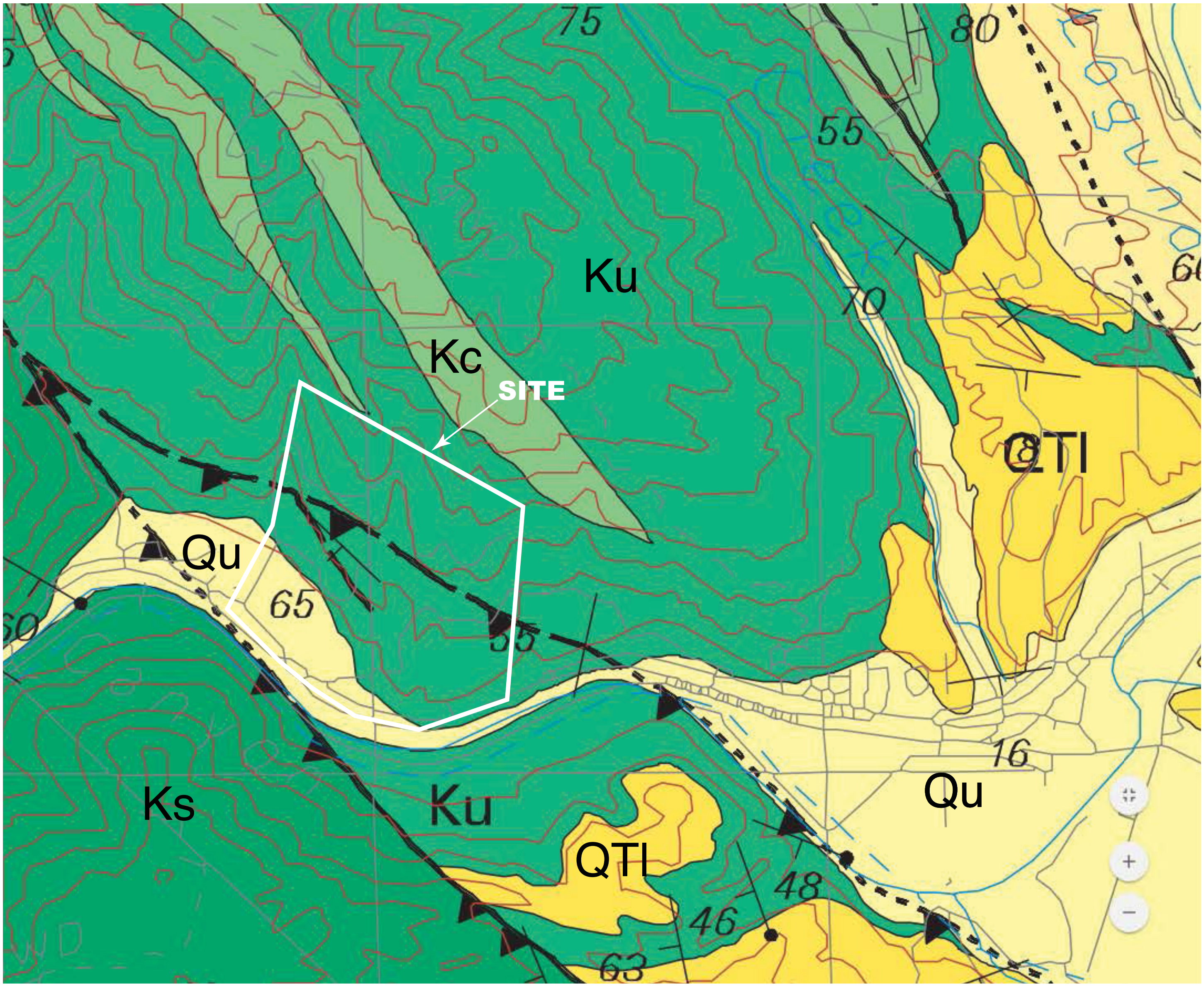
Gilpin Geosciences, Inc.
Earthquake & Engineering Geology Consultants

Niles Canyon Quarry
Sunol, California

JOB NUMBER 91617.01

DATE 6/7/17

FIGURE 1



Geologic Units

Qu Surficial Deposits, undivided

QTl Livermore Gravels

Ku sandstone & shale (unamed)

Kc conglomerate (unamed)

Ks sandstone & shale (unamed)

Key

65 — Strike of bedding with direction & magnitude of dip shown

Fault, barb indicates a thrust, dash is approximate location

1,000 ft

Approximate Scale

N

From: U.S.G.S. Open File Report OFR 96-25

REGIONAL GEOLOGY MAP

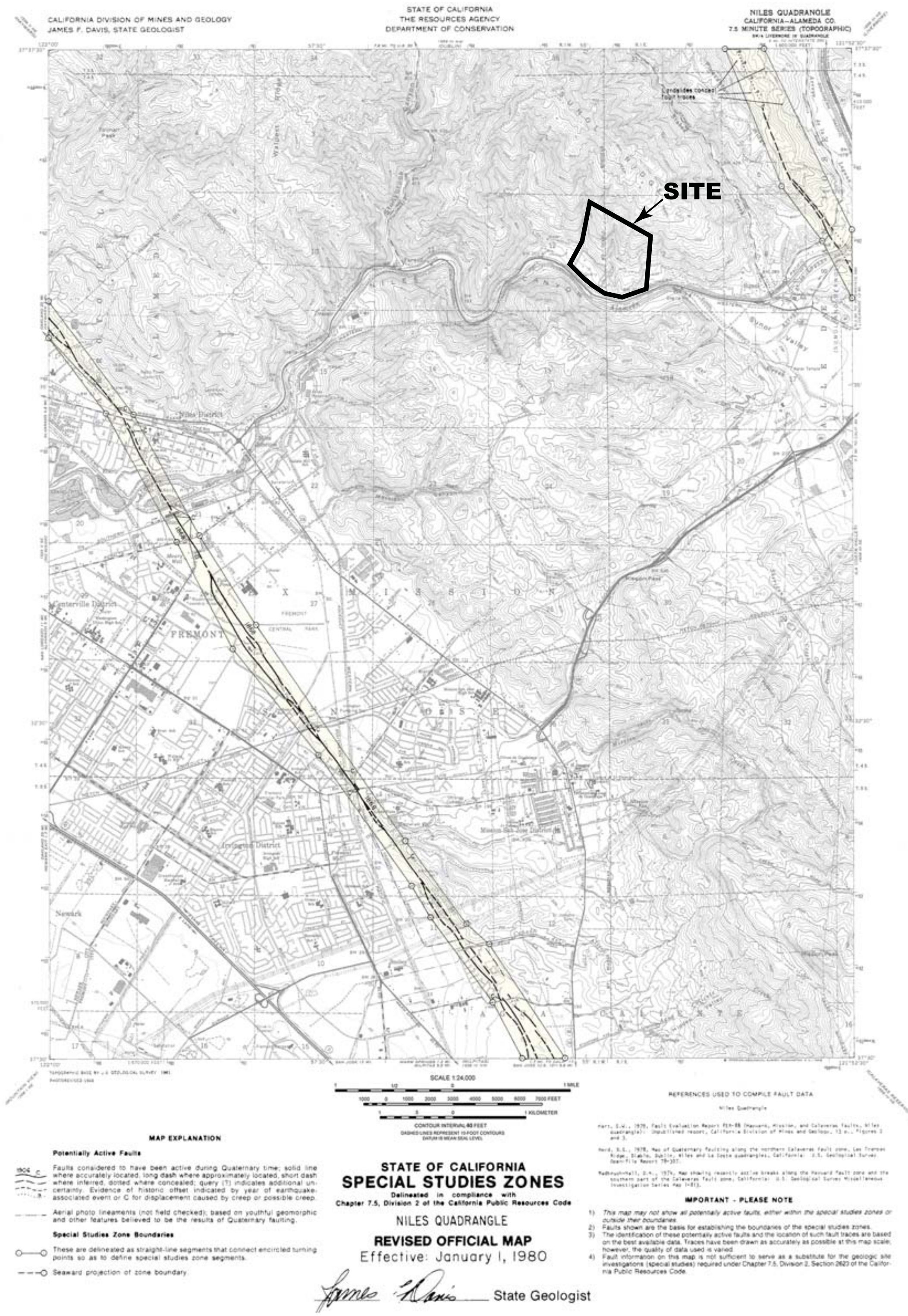
Gilpin Geosciences, Inc.
Earthquake & Engineering Geology Consultants

Niles Canyon Quarry
Sunol, California

JOB NUMBER 91617.01

DATE 6/7/17

FIGURE 2a



From: Callifornia Division of Mines and Geology, 1980

ALQUIST PRIOLO
SPECIAL STUDIES ZONE MAP

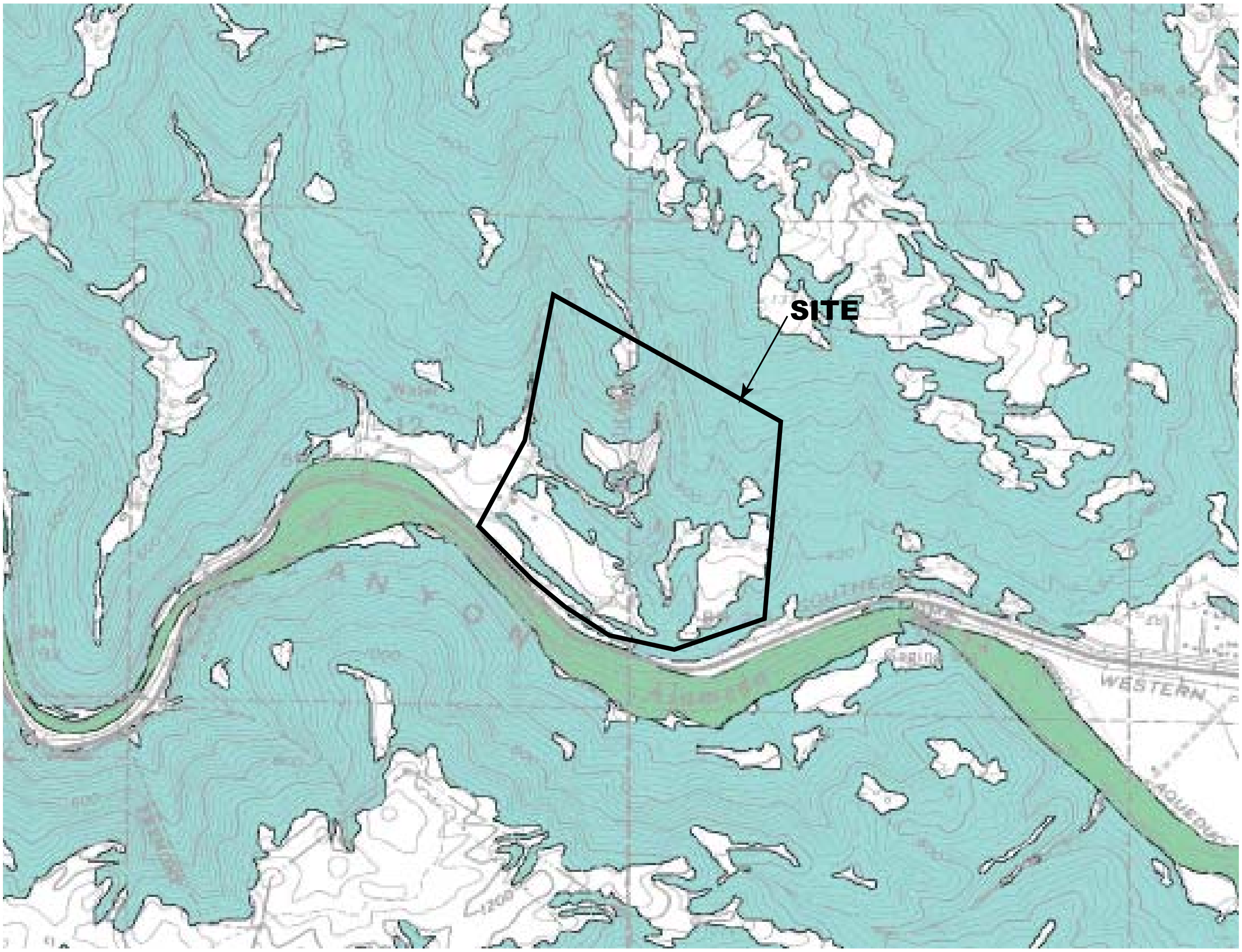
Niles Canyon Quarry
Sunol, California

Gilpin Geosciences, Inc.
Earthquake & Engineering Geology Consultants

JOB NUMBER 91617.01

DATE 6/7/17

FIGURE 2b



MAP EXPLANATION

Zones of Required Investigation:

Liquefaction

Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground-water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

NOTE: Seismic Hazard Zones identified on this map may include developed land where delineated hazards have already been mitigated to city or county standards. Check with your local building/planning department for information regarding the location of such mitigated areas.

N

2,000 ft

Scale

From: California Geological Survey, 2004

SEISMIC HAZARD ZONES MAP

Gilpin Geosciences, Inc.
Earthquake & Engineering Geology Consultants

Niles Canyon Quarry
Sunol, California

JOB NUMBER 91617.01

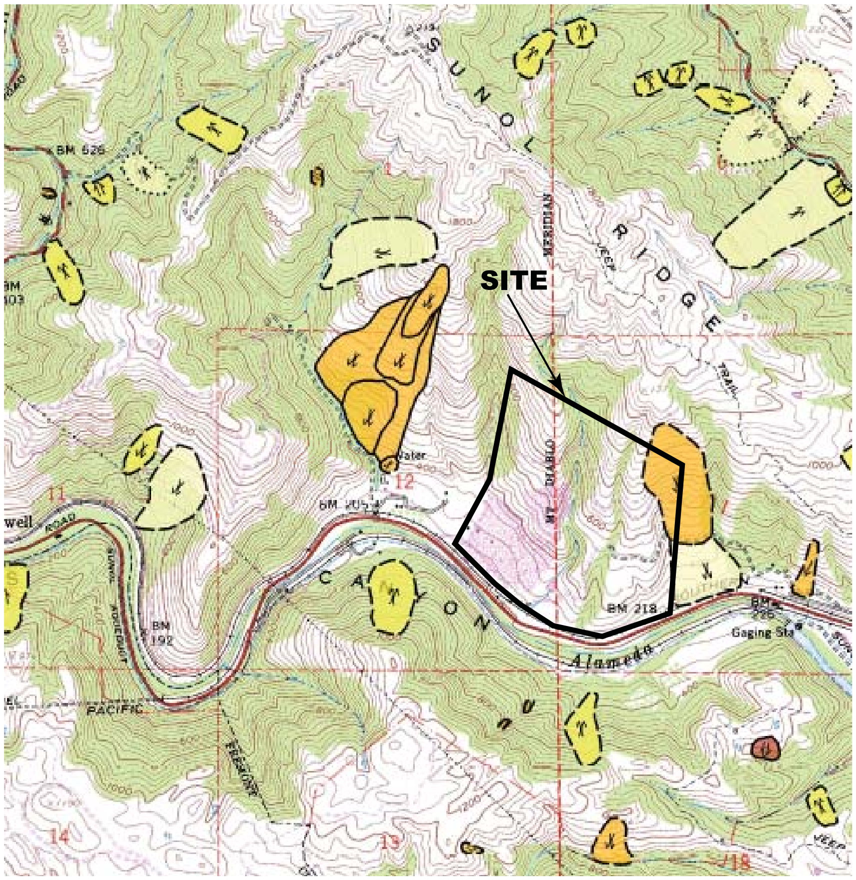
DATE 6/7/17

FIGURE 2c

N

2,000 ft

Scale



LANDSLIDE ACTIVITY: Each landslide has been classified according to how recently the landslide last moved. Because evidence of active or historic landslide movement is difficult to obtain from air photo interpretation, the primary tool employed in making this map, classification typically is inferred from the youthfulness of observed landslide geomorphic characteristics (see "Limitations" below). The classification of landslide activity is based on the system described by Keaton and DeGraff (1996; Table 9-1). This map display uses color to show the activity.

ACTIVE or HISTORIC:
The landslide appears to be currently moving (at the time the aerial photograph was taken or field observation occurred) or to have moved within historic time.

DORMANT - YOUNG:
The observed landforms related to the landslide are fresh or un-eroded, but there is no evidence of historic movement.

DORMANT- MATURE:
The observed landforms related to the landslide have been smoothed and subdued by erosion and vegetation.

DORMANT - OLD:
The observed landforms related to the landslide have been greatly eroded, including significant gullies or canyons cut into the landslide mass and/or main scarp by small streams.

From: California Geological Survey, 2011

LANDSLIDE INVENTORY MAP

Gilpin Geosciences, Inc.
Earthquake & Engineering Geology Consultants

Niles Canyon Quarry
Sunol, California

JOB NUMBER 91617.01

DATE 6/7/17

FIGURE 2d

KEY

Landslide - Qls=active
Qols= old inactive

Quarry fill

Bedrock outcrop, sh=shale

Slope direction with inclination in degrees

Bedding strike with dip direction shown in degrees

N

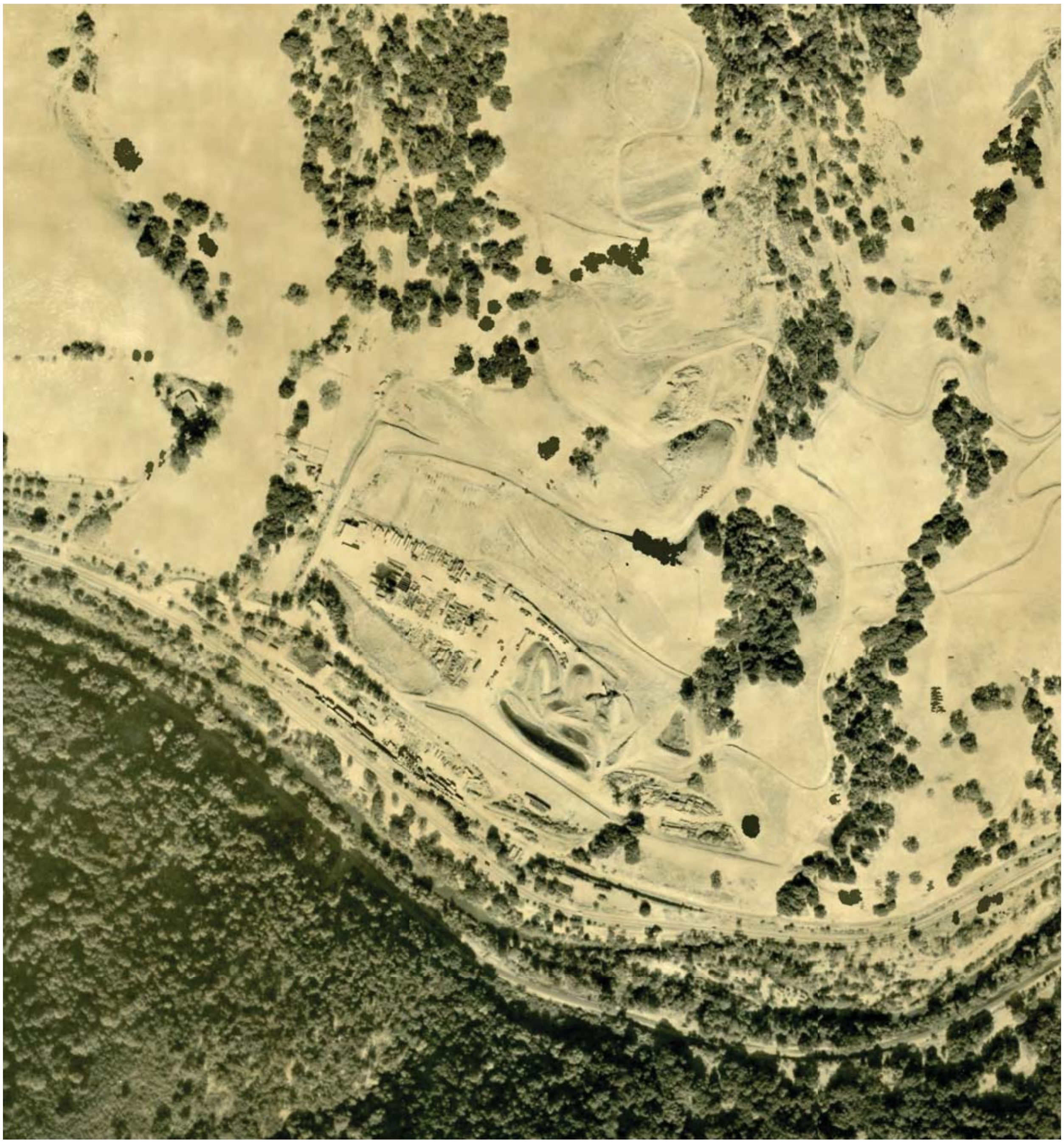
feet 800
Scale

SITE GEOLOGY OBLIQUE

NILES CANYON QUARRY
Sunol, California

Date 6/7/17	Project No. 91617.01	Figure 3

Gilpin Geosciences, Inc.
Earthquake & Engineering Geology Consultants



N

From: Pacific Aerial Contact Print AV-5200-26-41,
dated 10/16/96

1996 AERIAL PHOTOGRAPH

Gilpin Geosciences, Inc.
Earthquake & Engineering Geology Consultants

Niles Canyon Quarry
Sunol, California

JOB NUMBER 91617.01

DATE 6/7/17

FIGURE 4

APPENDIX H
DTSC IMPORTED FILL GUIDELINES

Information Advisory
Clean Imported Fill Material

October 2001

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Executive Summary

This fact sheet has been prepared to ensure that inappropriate fill material is not introduced onto sensitive land use properties under the oversight of the DTSC or applicable regulatory authorities. Sensitive land use properties include those that contain facilities such as hospitals, homes, day care centers, and schools. This document only focuses on human health concerns and ecological issues are not addressed. It identifies those types of land use activities that may be appropriate when determining whether a site may be used as a fill material source area. It also provides guidelines for the appropriate types of analyses that should be performed relative to the former land use, and for the number of samples that should be collected and analyzed based on the estimated volume of fill material that will need to be used. The information provided in this fact sheet is not regulatory in nature, rather is to be used as a guide, and in most situations the final decision as to the acceptability of fill material for a sensitive land use property is made on a case-by-case basis by the appropriate regulatory agency.

Introduction

The use of imported fill material has recently come under scrutiny because of the instances where contaminated soil has been brought onto an otherwise clean site. However, there are currently no established standards in the statutes or regulations that address environmental requirements for imported fill material. Therefore, the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) has prepared this fact sheet to identify procedures that can be used to minimize the possibility of introducing contaminated soil onto a site that requires imported fill material. Such sites include those that are undergoing site remediation, corrective action, and closure activities overseen by DTSC or the appropriate regulatory agency. These procedures may also apply to construction projects that will result in sensitive land uses. The intent of this fact sheet is to protect people who live on or otherwise use a sensitive land use property. By using this fact sheet as a guide, the reader will minimize the chance of introducing fill material that may result in potential risk to human health or the environment at some future time.

It is DTSC's mission to restore, protect and enhance the environment, to ensure public health, environmental quality and economic vitality, by regulating hazardous waste, conducting and overseeing cleanups, and developing and promoting pollution prevention.

State of California

California Environmental Protection Agency

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.dtsc.ca.gov.

Overview

Both natural and manmade fill materials are used for a variety of purposes. Fill material properties are commonly controlled to meet the necessary site specific engineering specifications. Because most sites requiring fill material are located in or near urban areas, the fill materials are often obtained from construction projects that generate an excess of soil, and from demolition debris (asphalt, broken concrete, etc.). However, materials from those types of sites may or may not be appropriate, depending on the proposed use of the fill, and the quality of the assessment and/or mitigation measures, if necessary. Therefore, unless material from construction projects can be demonstrated to be free of contamination and/or appropriate for the proposed use, the use of that material as fill should be avoided.

Selecting Fill Material

In general, the fill source area should be located in nonindustrial areas, and not from sites undergoing an environmental cleanup. Nonindustrial sites include those that were previously undeveloped, or used solely for residential or agricultural purposes. If the source is from an agricultural area, care should be taken to insure that the fill does not include former agricultural waste process byproducts such as manure or other decomposed organic material. Undesirable sources of fill material include industrial and/or commercial sites where hazardous ma-

Potential Contaminants Based on the Fill Source Area

Fill Source:	Target Compounds
Land near to an existing freeway	Lead (EPA methods 6010B or 7471A), PAHs (EPA method 8310)
Land near a mining area or rock quarry	Heavy Metals (EPA methods 6010B and 7471A), asbestos (polarized light microscopy), pH
Agricultural land	Pesticides (Organochlorine Pesticides: EPA method 8081A or 8080A; Organophosphorus Pesticides: EPA method 8141A; Chlorinated Herbicides: EPA method 8151A), heavy metals (EPA methods 6010B and 7471A)
Residential/acceptable commercial land	VOCs (EPA method 8021 or 8260B, as appropriate and combined with collection by EPA Method 5035), semi-VOCs (EPA method 8270C), TPH (modified EPA method 8015), PCBs (EPA method 8082 or 8080A), heavy metals including lead (EPA methods 6010B and 7471A), asbestos (OSHA Method ID-191)

**The recommended analyses should be performed in accordance with USEPA SW-846 methods (1996). Other possible analyses include Hexavalent Chromium: EPA method 7199*

Recommended Fill Material Sampling Schedule

Area of Individual Borrow Area	Sampling Requirements
2 acres or less	Minimum of 4 samples
2 to 4 acres	Minimum of 1 sample every 1/2 acre
4 to 10 acres	Minimum of 8 samples
Greater than 10 acres	Minimum of 8 locations with 4 subsamples per location

Volume of Borrow Area Stockpile	Samples per Volume
Up to 1,000 cubic yards	1 sample per 250 cubic yards
1,000 to 5,000 cubic yards	4 samples for first 1000 cubic yards +1 sample per each additional 500 cubic yards
Greater than 5,000 cubic yards	12 samples for first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards

terials were used, handled or stored as part of the business operations, or unpaved parking areas where petroleum hydrocarbons could have been spilled or leaked into the soil. Undesirable commercial sites include former gasoline service stations, retail strip malls that contained dry cleaners or photographic processing facilities, paint stores, auto repair and/or painting facilities. Undesirable industrial facilities include metal processing shops, manufacturing facilities, aerospace facilities, oil refineries, waste treatment plants, etc. Alternatives to using fill from construction sites include the use of fill material obtained from a commercial supplier of fill material or from soil pits in rural or suburban areas. However, care should be taken to ensure that those materials are also uncontaminated.

Documentation and Analysis

In order to minimize the potential of introducing contaminated fill material onto a site, it is necessary to verify through documentation that the fill source is appropriate and/or to have the fill material analyzed for potential contaminants based on the location and history of the source area. Fill documentation should include detailed information on the previous use of the land from where the fill is taken, whether an environmental site assessment was performed and its findings, and the results of any testing performed. It is recommended that any such documentation should be signed by an appropriately licensed (CA-registered) individual. If such documentation is not available or is inadequate, samples of the fill material should be chemically analyzed. Analysis of the fill material should be based on the source of the fill and knowledge of the prior land use.

Detectable amounts of compounds of concern within the fill material should be evaluated for risk in accordance with the DTSC Preliminary Endangerment Assessment (PEA) Guidance Manual. If metal analyses are performed, only those metals (CAM 17 / Title 22) to which risk levels have been assigned need to be evaluated. At present, the DTSC is working to establish California Screening Levels (CSL) to determine whether some compounds of concern pose a risk. Until such time as these CSL values are established, DTSC recommends that the DTSC PEA Guidance Manual or an equivalent process be referenced. This guidance may include the Regional Water Quality Control Board's (RWQCB) guidelines for reuse of non-hazardous petroleum hydrocarbon contaminated soil as applied to Total Petroleum Hydrocarbons (TPH) only. The RWQCB guidelines should not be used for volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCS). In addition, a standard laboratory data package, including a summary of the QA/QC (Quality Assurance/Quality Control) sample results should also accompany all analytical reports.

When possible, representative samples should be collected at the borrow area while the potential fill material is still in place, and analyzed prior to removal from the borrow area. In addition to performing the appropriate analyses of the fill material, an appropriate number of samples should also be determined based on the approximate volume or area of soil to be used as fill material. The table above can be used as a guide to determine the number of samples needed to adequately characterize the fill material when sampled at the borrow site.

Alternative Sampling

A Phase I or PEA may be conducted prior to sampling to determine whether the borrow area may have been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be determined during a meeting with DTSC or appropriate regulatory agency. However, if it is not possible to analyze the fill material at the borrow area or determine that it is appropriate for use via a Phase I or PEA, it is recommended that one (1) sample per truckload be collected and analyzed for all compounds of concern to ensure that the imported soil is uncontaminated and acceptable. (See chart on Potential Contaminants Based on the Fill Source Area for appropriate analyses). This sampling frequency may be modified upon consultation with the DTSC or appropriate regulatory agency if all of the fill material is derived from a common borrow area. However, fill material that is not characterized at the borrow area will need to be stockpiled either on or off-site until the analyses have been completed. In addition, should contaminants exceeding acceptance criteria be identified in the stockpiled fill material, that material will be deemed unacceptable and new fill material will need to be obtained, sampled and analyzed. Therefore, the DTSC recommends that all sampling and analyses should be completed prior to delivery to the site to ensure the soil is free of contamination, and to eliminate unnecessary transportation charges for unacceptable fill material.

Composite sampling for fill material characterization may or may not be appropriate, depending on quality and homogeneity of source/borrow area, and compounds of concern. Compositing samples for volatile and semivolatile constituents is not acceptable. Composite sampling for heavy metals, pesticides, herbicides or PAH's from unanalyzed stockpiled soil is also unacceptable, unless it is stockpiled at the borrow area and originates from the same source area. In addition, if samples are composited, they should be from the same soil layer, and not from different soil layers.

When very large volumes of fill material are anticipated, or when larger areas are being considered as borrow areas, the DTSC recommends that a Phase I or PEA be conducted on the area to ensure that the borrow area has not been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be determined during a meeting with the DTSC.

For further information, call Shahir Haddad, P.E. at (714) 484-5368.

APPENDIX I

RECLAMATION-RELATED CONDITIONS OF APPROVAL AND MITIGATION MEASURES

Reclamation Related Conditions of Approval and Mitigation Measures to be inserted pending approval.

APPENDIX J
HABITAT ASSESSMENT

FDATE: December 3, 2018

TO: Benchmark Resources

FROM: Holly Burger and Megan Keever, Stillwater Sciences

SUBJECT: Habitat Assessment for Niles Canyon Quarry Reclamation Project

1 INTRODUCTION

Benchmark Resources contracted Stillwater Sciences to conduct a habitat assessment for the Niles Canyon Quarry Reclamation Project (Project). Reclamation activities—including stream restoration, clean up, soil preparation, seeding, and tree planting—have the potential to affect local biological resources including special-status wildlife species. The purpose of this report is to report the results of a desktop review and field evaluation to assess the potential for special-status wildlife species to be present at the site based on habitat types, quality, and extent, including aquatic hydroperiods. This report also outlines the preliminary potential Project-related effects on wildlife and discusses possible mitigation to anticipate for listed species. This report does not address special-status plant species, sensitive natural communities, or jurisdictional wetlands.

1.1 Project Location and Assessment Area

Niles Canyon Quarry is located approximately 1.5 miles (mi) west of Sunol, on the north side of State Highway 84 (Niles Canyon Road) at 5550 Niles Canyon Road in Alameda County, California. Access to the site is from Niles Canyon Road, up a gated paved road to the Project site. The property consists of four parcels owned by SRDC, Inc. (APN 96-115-2-4; APN 96-125-6-1, 6-2, and 6-3) totaling approximately 181 acres; of this area, approximately 28 acres or 16% of the site has been disturbed by mining operations (Spinardi Associates 2015).

The assessment area is defined by the entire extent of the four parcels owned by SRDC, Inc. (Figure 1). The analysis in this report focuses on the areas planned for stream and upland reclamation/restoration, as well as areas affected most by previous mining operations.

1.2 Project Purpose

Niles Quarry Creek, approximately 1,500 feet (ft) of channel on the Niles Canyon Quarry property, is impaired due to significant disturbance of the seasonal creek channel both in terms of the physical landscape and hydrologic function. There are numerous basins, ditches, and culverts along the channel that were constructed in association with quarry operations. The purpose of the proposed Project is to restore the site by removing anthropogenic changes and reconstructing the stream channel to provide habitat connectivity from the lower quarry pad upstream through the native channel reach to upper pad area.

Figure 1. Assessment area and Project vicinity.

2 METHODS

2.1 Definitions

For the purposes of this report, "special-status" wildlife species are defined as those that are:

- listed as endangered or threatened, or are proposed/candidates for listing, under the federal Environmental Species Act (ESA) and/or California ESA (CESA);
- designated by California Department of Fish and Wildlife (CDFW) as a species of special concern; and/or
- designated by CDFW as fully protected under the California Fish and Game Code (Sections 3511, 4700, 5050, and 5515).

2.2 Desktop Review

2.2.1 Hydroperiod analysis

There are eight man-made basins of various sizes throughout the site (Figure 2), seven of which hold water at least seasonally. Hydroperiods (i.e., seasonal water level patterns) for these basins were calculated using basin geometries (e.g., top and bottom elevations, surface area, volume, outlet elevation, drainage area, and seepage), evapotranspiration loss by month (using data from reference evapotranspiration zones in California [DWR 2012]), seepage rates (USDA NRCS 2018), and average precipitation over a 20 year period of record (NOAA 2018). Water year types were classified as wet (i.e., with precipitation values greater than or equal to the upper 10% of recorded values), normal (i.e., median [50^{th} percentile] precipitation values), or dry (i.e., with precipitation values less than or equal to the lower 10% of recorded values). The typical hydroperiod for each basin was considered for a wet water year (using 2017 as the representative year), a dry water year (using 2013 as the representative year), and a median (50^{th} percentile) water year (using 2003 as the representative year). Basin 8 was not assessed for hydroperiod modeling due to the invert elevation of the outlet culvert coinciding with the bottom elevation of the basin, which prohibits any significant water accumulation that could be utilized by wildlife species during all water year types.

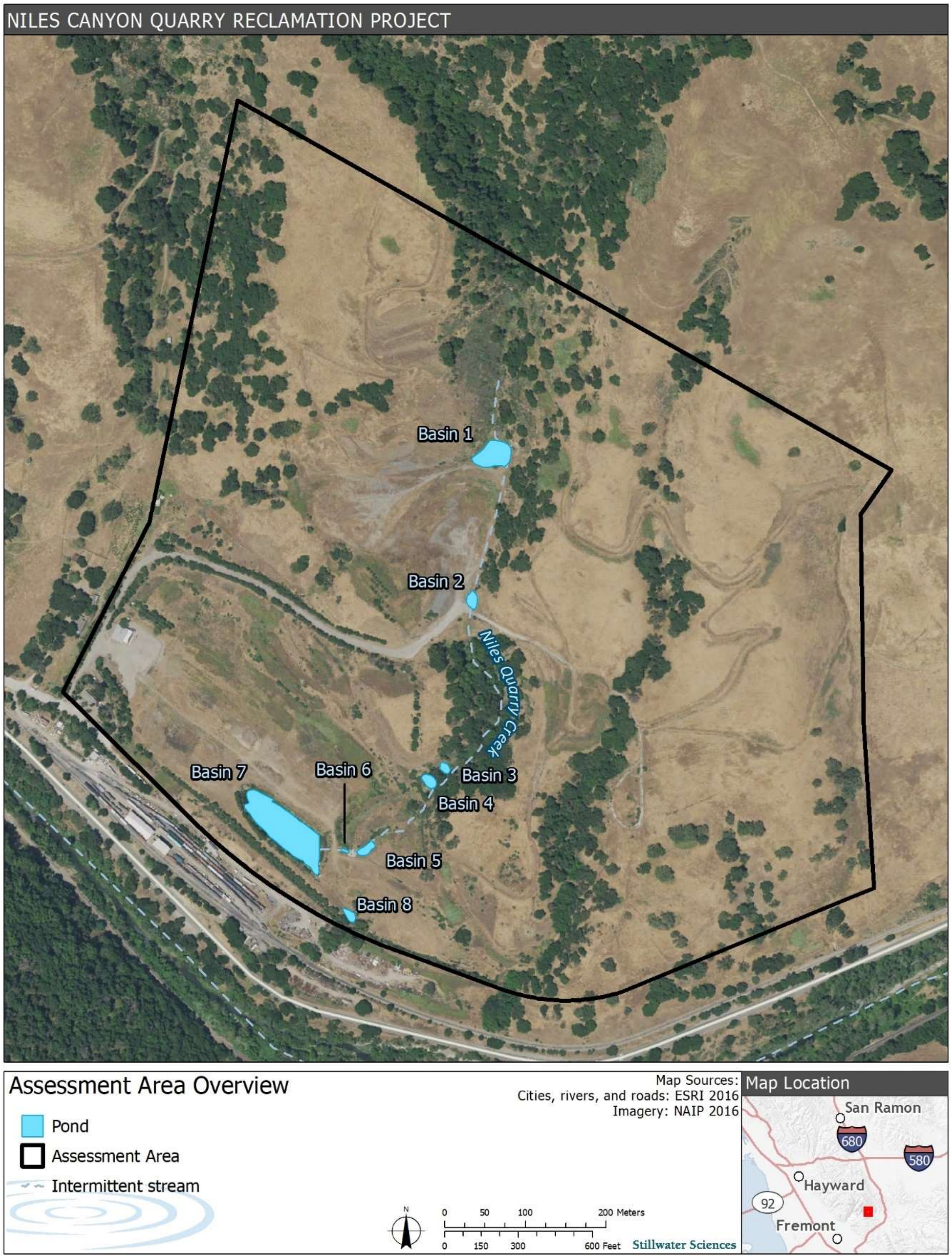


Figure 2. Overview of the ponds/basins within the assessment area.

2.2.2 Database queries

Lists of special-status wildlife species that may occur in the Project region were developed by querying the following databases:

- CDFW's California Natural Diversity Database (CNDDB; CDFW 2018), and
- U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Conservation (IPaC) portal (USFWS 2018).

These database queries were based on a search of the U.S. Geological Survey (USGS) 7.5-minute quadrangle in which the Project is located (Niles), and the surrounding eight quadrangles (Calaveras Reservoir, Dublin, Hayward, La Costa Valley, Livermore, Milpitas, Mountain View, and Newark). The database query results are presented in Appendix A.

The USFWS online database of USFWS and National Marine Fisheries Service (NMFS) critical habitat designations (USFWS 2018) was used to determine if critical habitat for any federally listed species occurs in the Project area.

In addition, relevant local reference material was reviewed, including:

- A 1995 Biological Assessment for Niles Canyon Quarry (LSA 1995),
- the biological resources section of a 1996 Initial Study prepared for the renewal of the Niles Canyon Quarry Surface Mining Permit SMP-34 (Alameda County Planning Department 1996), and
- eBird (2017).

2.3 Field Assessment

A field assessment was conducted by a Stillwater Sciences' senior wildlife biologist (H. Burger), senior botanist (M. Keever), botanist (R. Thoms), and junior ecologist (S. Gabrielson) on April 17, 2018. This site reconnaissance included vegetation and habitat mapping, an evaluation of the habitat suitability for special-status wildlife species, and a nighttime California red-legged frog (*Rana draytonii*) survey, described below.

2.3.1 Vegetation and habitat mapping

The assessment area was mapped to delineate the existing vegetation communities that may provide habitat for wildlife species. Vegetation communities present at the site were characterized and mapped as broad habitat types based on species composition and structure; vegetation communities were not mapped to the alliance level required to determine if sensitive natural communities were present. Preliminary boundaries of each vegetation community were delineated on field maps; post-field, the vegetation types were incorporated into GIS to produce a vegetation map of the assessment area.

2.3.2 Wildlife assessment

2.3.2.1 Daytime surveys

During the field visit, aquatic and terrestrial habitats were qualitatively evaluated for potential for special-status wildlife species based on habitat types, habitat elements (e.g., burrows, large trees, nesting sites, rocky outcrops), and evidence of wildlife activity. General habitats and other notable features in the assessment area were photographed.

To determine the likelihood of each special-status species from the database queries to occur in the assessment area, the habitat preferences and distributional range of each species were compared with the location of the site and current habitat conditions. This analysis resulted in the following categories of the likelihood for a special-status species to occur in or near the assessment area:

- None (no potential to occur): the assessment area is outside of the species' known distribution or elevation range and/or the species' required habitat is lacking from the assessment area.
- Low (not expected to occur): the species' known distribution or elevation range overlaps with the assessment area and the species' required habitat is of very low quality or quantity in the assessment area; suitable key habitat or habitat elements may be present but may be of poor quality or isolated from the nearest extant occurrences.
- Moderate (may possibly occur): the species' known distribution or elevation range overlaps with the assessment area and the species' required habitat occurs in the assessment area.
- High (present): the species has been documented in the assessment area and/or its required habitat occurs in the assessment area and is of high quality.

2.3.2.2 Nighttime California red-legged frog surveys

In addition to looking incidentally for amphibian adults, juveniles, and egg masses during the daytime field visit, the habitat assessment included one nighttime visual encounter survey for California red-legged frogs at the following ponds that were inundated at the time of the visit: Basins 1, 4, 5, 6, and 7. The focus of night surveys was to locate adults and sub-adults. Starting after sunset, surveyors first visually scanned the perimeter of each site from a distance. The entire shoreline of each site was then inspected more closely while walking slowly around the perimeter, where accessible. Surveyors paid special attention to areas with emergent or overhanging vegetation. Surveyors used a flashlight (Streamlight Stinger C4 LED Rechargeable Flashlight, 350 lumens) held at eye level to first look for frog eye shine. Binoculars (Eagle Optics Ranger 8x42) were then used in combination with the flashlight to identify each detected frog to species, when possible.

3 RESULTS

3.1 Hydroperiod Analysis

The seasonal hydroperiods for basins 1 through 7 are presented for representative dry, median, and wet year in figures 3, 4, and 5, respectively. By definition (Section 2.2.1.), a wet water year occurs 10% of the time. Table 1 summarizes typical months in which each basin is estimated to dry (i.e., no remaining standing water) based on water year type. Basin 7 remains inundated year-round, even in the driest years. Basins 4 and 6 follow a similar pattern to each other, estimated to remain inundated through fall during wet years, and until May-June during dry years. Basin 1 is estimated to remain inundated until June during dry years, and, in wet years, remain inundated year-round. Basin 2 is a deep catchment that receivies water from Basin 1 during overflow; Basin 2 drains relatively quickly in most years because of highly permeable soils. Basin 5 is relatively ephemeral and may dry as early as February in dry years, and as late as June in wet years. Basin 3 is a relatively shallow pass-through for water; this is the fastest of the basins to dry, scarcely remaining inundated until February in dry years and until May in wet years. Representative photos of each basin are provided in Figures 6 and 7.

Table 1. Estimated months in which each basin is predicted to dry based on water year type.

	Estimated Month Basin Dries		
Basin Number	**Dry Year**	**Median Year**	**Wet Year**
1	June	August	–
2	April	June	August
3	February	February	May
4	June	–	–
5	February	April	June
6	May	October	–
7	–	–	–

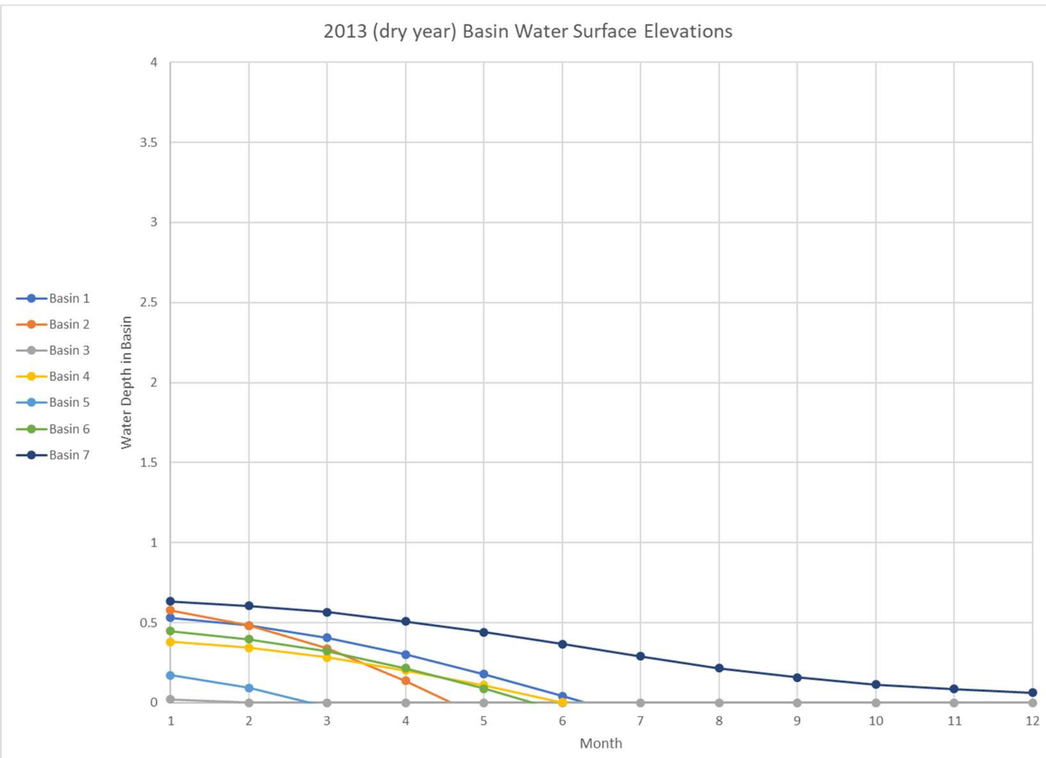


Figure 3. Hydroperiod for basins 1 through 7 in 2013, a representative dry year (Month 1 = January).

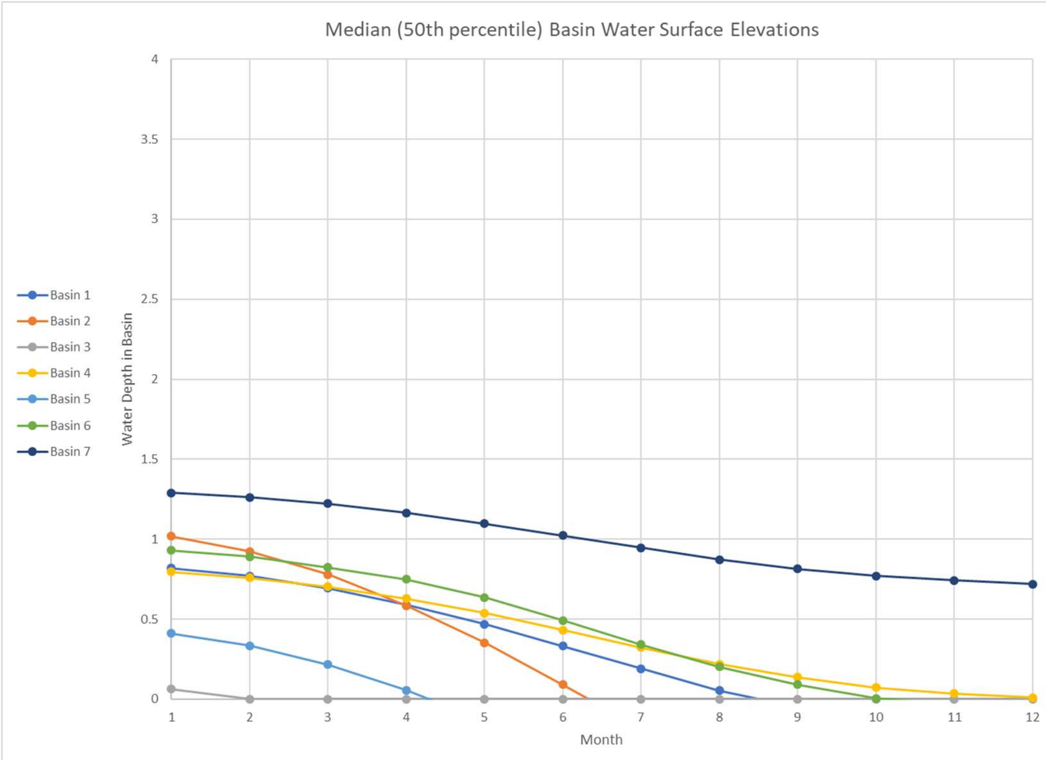


Figure 4. Hydroperiod for basins 1 through 7 in 2003, a representative a median year (Month 1 = January).

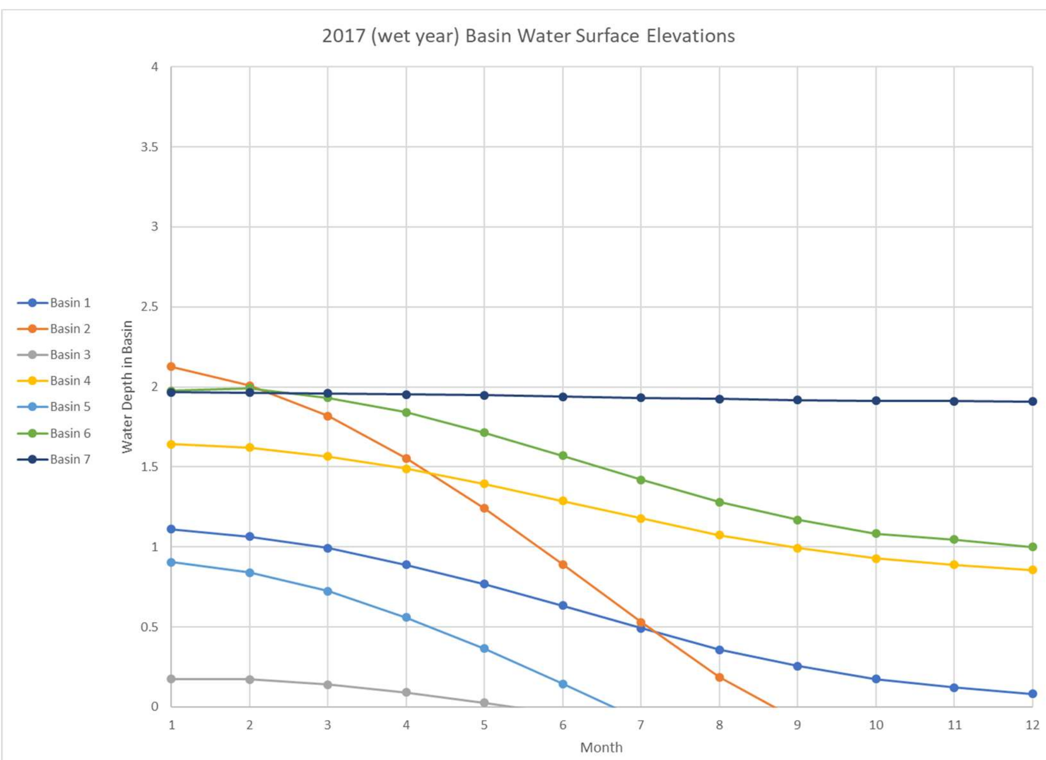


Figure 5. Hydroperiod for basins 1 through 7 in 2017 in a representative wet year (Month 1 = January).

a. Representative photo of Basin 1, taken on June 21, 2017.

b. Representative photo of Basin 1, taken on August 29, 2016.

c. Representative photo of Basin 2, taken on June 21, 2017.

d. Representative photo of Basin 2, taken on April 17, 2018.

e. Representative photo of Basin 3, taken on October 18, 2016.

f. Representative photo of Basin 4, taken on June 21, 2017.

Figure 6. Representative photographs of basins 1 through 4 in the assessment area.

a. Representative photo of Basin 4, taken on October 18, 2017.

b. Representative photo of Basin 5, taken on April 17, 2018.

c. Representative photo of Basin 5, taken on June 21, 2017.

d. Representative photo of Basin 6, taken on April 17, 2018.

e. Representative photo of Basin 7, taken on June 21, 2017.

f. Representative photo of Basin 7, taken on October 18, 2017.

Figure 7. Representative photographs of basins 4 through 7 in the assessment area.

3.2 Vegetation and Habitat Mapping

The 181-acre assessment area is dominated by ruderal herbaceous vegetation, with areas of ornamental plantings, oak woodland, oak riparian forest, chaparral, and coyote brush. Niles Quarry Creek, which flows north-northeast to south-southwest across the site, connects several small ponds and man-made basins and their associated freshwater emergent wetland and riparian scrub vegetation before entering Alameda Creek south of the assessment area. Vegetation/habitat types are listed in Table 1 and presented in Figure 8. Descriptions of the vegetation types are provided below, along with photographs of representative areas.

Table 2. Summary of vegetation and habitat types in the assessment area.

Vegetation/Habitat Type	Acres
Chaparral	4.5
Coyote Brush	3.9
Developed	2.2
Emergent Wetland	0.4
Oak Woodland	26.9
Oak/Riparian Forest	23.6
Open water	1.0
Ornamental plantings	7.0
Riparian Scrub	0.5
Ruderal Herbaceous	111.0
Total	**181.0**

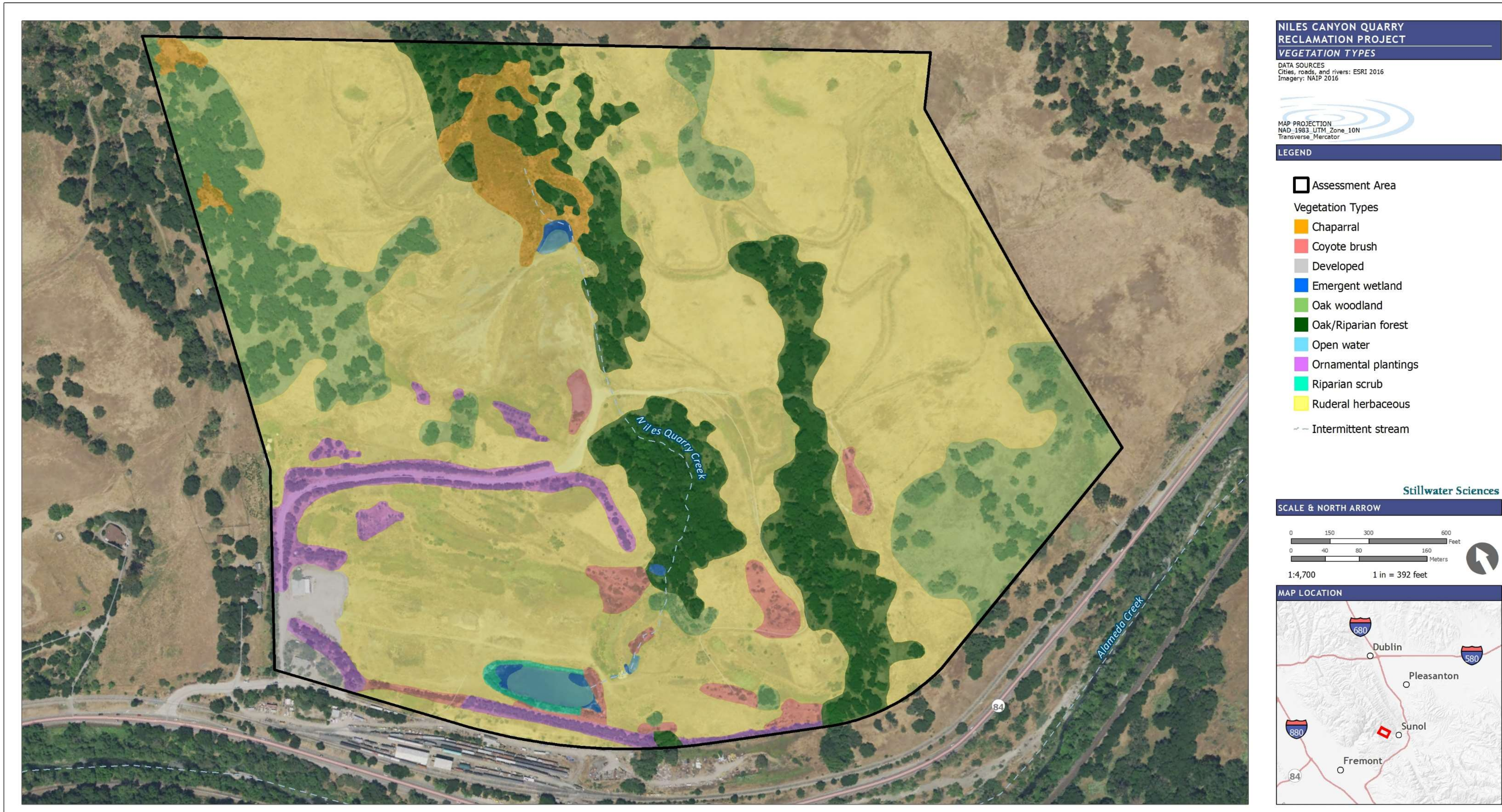


Figure 8. Vegetation and habitat types in the assessment area.

3.2.1 Chaparral

Chaparral occurs on steep slopes above Niles Quarry Creek in the upper portion of the assessment area. This vegetation type is dominated by the native California sagebrush (*Artemisia californica*), with other native shrubs – orange bush monkeyflower (*Diplacus auranticus*) and western poison oak (*Toxicodendron diversilobum*) – as plant associates. Total shrub cover is approximately 75%, with less than 30% cover of herbaceous vegetation. Chaparral is an early successional vegetation type that generally has high diversity. Chaparral covers approximately 2.5% of the assessment area.

3.2.2 Coyote brush

Within the matrix of ruderal herbaceous vegetation in the assessment area, there are areas with sufficient cover of the native coyote brush (*Baccharis pilularis*) to qualify as a shrub community (10%), and occasionally stands have greater than 50% cover of coyote brush. Coyote brush adds vertical structure to the ruderal herbaceous vegetation, is a common pioneer plant species in grasslands that lack regular fire, and can be indicative of a potential transition to woodland. Plant associates include those described in the ruderal herbaceous community, particularly nonnative annual grasses such as ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceous*), and wall barley (*Hordeum murinum*). The coyote brush community covers approximately 2% of the assessment area.

3.2.3 Emergent wetland

Emergent wetlands in the assessment area are small and located in and around the perimeters of water features with perennial or seasonal inundation, generally where basins were created along Niles Quarry Creek. Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes that are present for most of the growing season in most years. Dominant species include broad-leaved cattail (*Typha latifolia*), common tule (*Schoenoplectus acutus* var. *occidentalis*), and southern bulrush (*Schoenoplectus californicus*). Emergent wetlands cover less than 1% of the assessment area.

3.2.4 Oak woodland

Oak woodlands are scattered across 26.9 acres of the assessment area, particularly on slopes above valleys and drainages. The habitat is characterized nearly exclusively by valley oak (*Quercus lobata*) and coast live oak (*Quercus agrifolia*) and has low to moderate canopy cover (10–70%). The understory is predominantly annual grasses and ruderal herbaceous species, with occassional poison oak and coyote brush present. Oak woodland covers approximately 15% of the assessment area.

3.2.5 Oak riparian forest

Within the assessment area, oak riparian forests are found along Niles Quarry Creek and the unnamed drainage to the east, and are characterized by dense tree cover ranging from 60–95%. The overstory is dominated by valley oak and coast live oak, associated tree species include California buckeye (*Aesculus californica*) and California bay (*Umbellularia californica*). Associated shrub species include poison oak, coyote brush, and snowberry (*Symphoricarpos albus* var. *laevigatus*). Herbaceous species are predominantly nonnative annual grasses and other nonnative forbs including spring vetch (*Vicia sativa* subsp. *sativa*), Italian thistle (*Carduus pycnocephalus*), poison hemlock (*Conium maculatum*), bristly ox-tongue (*Helminthotheca echioides*), and black mustard (*Brassica nigra*). Oak riparian forest covers 15% of the assessment area.

3.2.6 Open Water

Open water occurs seasonally at along several basins in the assessment area, depending on month and water year type. For example, Basin 7 is relatively large and is inundated with water year-round. At the time of the field assessment, five of the eight basins contained standing water. Section 3.1 describes the estimated hydroperiod for basins 1 through 7, including representative photos of each. Depending on the amount of surrounding vegetation, some sections of these waterways are mapped in Figure 8 as open water. Open water covers approximately 0.5% of the assessment area.

3.2.7 Ornamental plantings

Within the assessment area, ornamental plantings occur along the paved haul road that leads to the quarry upper pad and on the southwestern border of the property. Common species include Monterey pine (*Pinus radiata*), Mexican fan palm (*Washingtonia robusta*), Italian cypress (*Cupressus sempervirens*), and common pear (*Pyrus communis*). Native plant species are sporadically present, including coast live oak, northern California black walnut (*Juglans hindsii*), and coyote brush. Ornamental plantings cover 4% of the assessment area.

3.2.8 Riparian Scrub

Riparian scrub is found in the assessment area surrounding the perimeter of the lower pond (Basin 7). This community is dominated by mule fat (*Baccharis salicifolia* subsp. *salicifolia*). Associated native species include narrow-leaved willow (*Salix exigua*), arroyo willow (*Salix lasiolepis*), and Fremont cottonwood (*Populus fremontii* subsp. *fremontii*). The nonnative and highly invasive giant reed (*Arundo donax*) was also documented around the perimeter of Basin 7. Canopy cover varies from open (10%) to nearly closed (90%). Riparian scrub covers less than 1% of the assessment area.

3.2.9 Ruderal Herbaceous

The assessment area is dominated by ruderal herbaceous vegetation. Prevalent species include nonnative, annual grasses such as ripgut grass, soft chess, wall barley, and rye grass (*Festuca perennis*). Common forbs include spring vetch, Italian thistle, poison hemlock, bristly ox-tongue, black mustard, yellow star-thistle (*Centaurea solstitialis*), and California burclover (*Medicago polymorpha*). While a few patches of native grasses exist (e.g., purple needle grass [*Stipa pulchra*]), the area is primarily nonnative grass and forbs. Ruderal herbaceous vegetation covers around 60% of the assessment area.

3.3 Wildlife Resources

The wildlife species observed in or near the assessment area during the field evaluation (including sign such as tracks or burrows) are listed in Table 2. One special-status wildlife species, California red-legged frog, was detected; adults and subadults were observed in Basins 4 and 5. Non-native American bullfrogs (*Lithobates catesbeianus*) were found in Basin 5 and Basin 7. In addition to these species, other common and special-status amphibians, reptiles, birds, and mammals may use the assessment area for foraging, resting, cover, dispersal, and breeding.

Table 3. Wildlife species observed in the assessment area on April 17, 2018.

Common name	Scientific name
Amphibians	
California newt	*Taricha torosa*
Pacific chorus frog	*Pseudacris regilla*
American bullfrog	*Lithobates catesbeianus*
California red-legged frog[1]	*Rana draytonii*
Reptiles	
Diablo range garter snake	*Thamnophis atratus zaxanthus*
western fence lizard	*Sceloperus occidentalis*
Birds	
ring-necked duck	*Aythya collaris*
bufflehead	*Bucephala albeola*
California quail	*Callipepla californica*
wild turkey	*Meleagris gallopavo*
American white pelican[2]	*Pelecanus erythrorhynchos*
turkey vulture	*Cathartes aura*
red-tailed hawk	*Buteo jamaicensis*
American coot	*Fulica americana*
killdeer	*Charadrius vociferus*
rock pigeon	*Columba livia*
mourning dove	*Zenaida macroura*
white-throated swift	*Aeronautes saxatalis*
Lewis's woodpecker	*Melanerpes lewis*
acorn woodpecker	*Melanerpes formicivorus*
northern flicker	*Colaptes auratus*
black phoebe	*Sayornis nigricans*
California scrub-jay	*Aphelocoma californica*
violet-green swallow	*Tachycineta thalassina*
cliff swallow	*Petrochelidon pyrrhonota*
barn swallow	*Hirundo rustica*
European starling	*Sturnus vulgaris*
house finch[3]	*Haemorhous mexicanus*
song sparrow	*Melospiza melodia*
white-crowned sparrow	*Zonotrichia leucophrys*
golden-crowned sparrow	*Zonotrichia atricapilla*
red-winged blackbird	*Agelaius phoeniceus*

Common name	Scientific name
Mammals	
California ground squirrel	*Otospermophilus beecheyi*
Botta's pocket gopher[4]	*Thomomys bottae*
Mule deer[5]	*Odocoileus hemionus*

[1] Special-status species
[2] Flyover only
[3] Includes a yellow variant
[4] Sign (burrows)
[5] Sign (antler, tracks)

Forty-two special-status wildlife species (fish, terrestrial invertebrates, amphibians, reptiles, birds, and mammals) had been identified from database queries as potentially occurring in the Project region (Appendix A). Twenty-seven species have no potential to occur in or near the assessment area because no suitable habitat is present or the assessment area is outside of the species' known range (Appendix A). Five species have low potential to occur and are not discussed further (Appendix A). The following nine species were evaluated as having moderate or high likelihood to occur in the assessment area; details of these species include listing status, habitat associations, and notable life history requirements are provided in subsections below:

- valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)
- California red-legged frog (*Rana draytonii*)
- western pond turtle (*Actinemys marmorata*)
- Alameda whipsnake (*Coluber lateralis euryxanthus*)
- white-tailed kite (*Elanus leucurus*)
- San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*)
- Townsend's western big-eared bat (*Corynorhinus townsendii*)
- pallid bat (*Antrozous pallidus*)
- American badger (*Taxidea taxus*)

One species has low potential to occur but is also included in the discussion below because of its federal and state listing status as threatened and interest for involved agencies:

- California tiger salamander (*Ambystoma californiense*)

There is Critical Habitat overlapping the assessment area for one species, Alameda whipsnake.

Figure 9 shows an approximation of suitable core habitat areas for the federally or state-listed wildlife species with moderate or high potential to occur in the assessment area (i.e., California red-legged frog and Alameda whipsnake). For the purposes of this report, "core habitat" is a term used to describe areas in which individuals will likely spend most of their time finding shelter, breeding, hibernating, and foraging. The full assessment area may be used for California red-legged frog and Alameda whipsnake movement and dispersal.

Figure 9. Potential core habitat areas for listed wildlife species in the assessment area.

3.3.1 Valley elderberry longhorn beetle

Valley elderberry longhorn beetle is federally listed as threatened. A California endemic species, the valley elderberry longhorn beetle is found in scattered populations throughout its range, which includes most of the Central Valley (Barr 1991).

Blue elderberry (*Sambucus nigra* subsp. *caerulea*) is the primary host plant for valley elderberry longhorn beetle. It is common along streambanks and in open places in forest throughout the California floristic province below 9,840 ft, and blooms from March to September (Baldwin et al. 2012). Larvae feed on tree pith, while adults eat the foliage and possibly the flowers of the plants. The adult stage of the valley elderberry longhorn beetle is short-lived, and most of the life cycle is spent in the larval stage (USFWS 1999). The adults are active from early March through early June with mating occurring in May (Barr 1991). Eggs are laid singly, or in small groups, in crevices in elderberry bark and hatch in about 10 days (Barr 1991). Larvae bore into the pith of elderberry roots, branches, and trunks to create an opening in the stem within which they pupate, remaining in this stage for one to two years before emerging as adults (Barr 1991, USFWS 1999). After metamorphosing into an adult, the beetle chews a circular exit hole through which it emerges, sometime during the period of late March to June (Barr 1991, USFWS 1999).

Blue elderberry was observed in the oak/riparian forest along Niles Quarry Creek during the field reconnaissance. A focused survey for blue elderberry was not conducted, so more shrubs may be present, though likely limited to riparian habitats in the assessment area.

3.3.2 California tiger salamander

A California endemic species, California tiger salamander is federally and state-listed as threatened. The Sonoma County and Santa Barbara County populations are federally listed as endangered. California tiger salamanders occur in low foothill regions with available aquatic habitat for breeding. Terrestrial habitat is typically annual grassland. During the dry months, California tiger salamanders retreat in refugia provided by ground squirrels and other small burrowing mammals to avoid heat, desiccation, and predation. This species has been found in higher abundances where there is a higher density of refugia (Pittman 2005). For breeding, they prefer natural ephemeral pools or ponds that mimic them (e.g., vernal pools or stock ponds that are allowed to go dry). Adult California tiger salamanders migrate from upland summer refuge sites to aquatic breeding ponds and vernal pools during the rainy season, generally November to May. California tiger salamanders can make typical local migrations of up to 3,300 ft from subterranean summer refuge habitat to breeding ponds, though movements may be potentially as far as 1.3 mi (Orloff 2011). Eggs are laid in clusters of two to four eggs and are attached to live vegetation or detritus. Larvae metamorphose after 4 to 5 months. Peak periods for metamorphs to leave their natal ponds have been reported from May to July. Breeding is very uncommon in ponds and pools where fish or bullfrogs are present.

In the assessment area, habitat suitability for California tiger salamander is marginal due to very limited suitable terrestrial habitat. Aquatic habitat associated with Basins 1, 2, 4, and 6 provides aquatic breeding habitat in wet and median years as these ponds are ephemeral yet inundated long enough to support metamorphosis (i.e., at least May) (Section 3.1). In wet years, water in Basin 3 may also be present long enough through spring to support breeding (Section 3.1). According to the hydroperiod analysis, Basin 5 may not remain inundated long enough in most years to support breeding (Section 3.1). There is only marginally suitable upland/terrestrial habitat associated with all ponds in the assessment area; during the field visit, there were very few visible small mammal burrows, which are necessary for providing refuge during most of the year. Only one California ground squirrel burrow was documented during the field visit was at the lower yard east of the maintenance building, and few small rodent burrows were seen along the access road to the upper pad. While a comprehensive survey for small mammal burrows was not conducted, hard and compacted substrates in terrestrial uplands of the upper pad, potentially a result of previous mining activities, likely prevent the establishment of burrows by ground squirrels and other small mammals. Both suitable terrestrial and aquatic habitats must coexist to support this species, and salamanders are often absent from areas that appear suitable other than their lack of burrows. The other ponds in the assessment area do not provide the appropriate hydroperiod in most years for successful California tiger salamander metamorphosis (e.g., dried too early for larvae to metamorphose into adults), or in the case of Basin 7, is permanent and supports invasive bullfrogs. Breeding is very uncommon in ponds and pools where these non-native predators are present.

The nearest documented California tiger salamander record is approximately one mile to the southeast of the assessment area; larvae were observed in 1994 in a seasonal pond managed by the San Francisco Water Department (CDFW 2018). The next closest sighting is approximately 1.25 mi to the south from 2001 (CDFW 2018).

3.3.3 California red-legged frog

California red-legged frog is federally listed as threatened and a CDFW species of special Concern. California red-legged frogs are currently largely restricted to coastal drainages on the central coast of California. California red-legged frog breeding habitat includes wetlands, wet meadows, ponds, lakes, and low-gradient, slow-moving stream reaches. Breeding habitats are generally characterized by still or slow-moving water with deep pools (usually at least 2.3 ft, though frogs have occasionally been known to breed in pools less than this depth) and emergent and overhanging vegetation (Jennings and Hayes 1994). Breeding sites can be ephemeral or permanent; if ephemeral, inundation is usually necessary into the summer months (through July–August) for successful metamorphosis. Although some adults may remain resident year-round at favorable breeding sites, others may disperse overland up to a mile or more (Fellers and Kleeman 2007). Movements may be along riparian corridors, but many individuals move directly from one site to another without apparent regard for topography or watershed corridors (Bulger et al. 2003).

California red-legged frogs occur in the assessment area; adults and subadults were found during the nighttime surveys at Basins 4 and 5 (Figures 9 and 10). In addition to California red-legged frogs, bullfrogs were observed co-occurring with the California red-legged frogs in Basin 5 (Figure 10). Sierra treefrog tadpoles were observed during daytime surveys at Basin 1. Dozens of bullfrog tadpoles were observed in Basin 7 during nighttime surveys.

Suitable California red-legged frog breeding habitat occurs in basins 1, 4, and 6, as they remain inundated until at least August in wet and median years. Basin 5 has highly suitable habitat, particularly emergent vegetation for egg attachment and cover from predators. In addition, Basin 5 dries each year, which prevents successful bullfrog breeding. However, according to the hydroperiod analysis, Basin 5 may not remain inundated long enough in most years to support breeding (Section 3.1). Basins 2 and 3 do not provide the appropriate hydroperiod in most years for breeding, and cover is limited in Basin 2. Although physical aquatic habitat is present in Basin 7, the presence of breeding bullfrogs creates an inhospitable environment for California red-legged frogs to survive and reproduce. Bullfrogs and California red-legged frogs are not often found occupying the same site, though have been documented to coexist in some environments, typically within large marshes and ponds with high habitat complexity and natural hydrology regimes (Doubledee et al. 2003). Basin 7 does not exhibit the complex habitat or hydrology that would lead to such conditions.

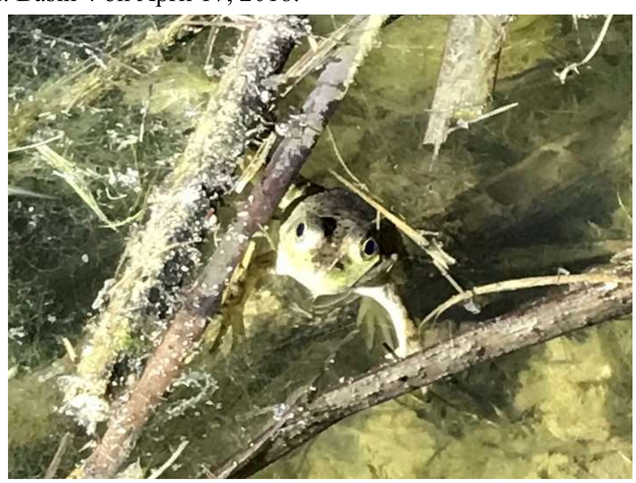
a. California red-legged frog in Basin 4 on April 17, 2018.

b. Basin 4 on April 17, 2018.

c. California red-legged frog in Basin 4 on April 17, 2018.

d. Basin 4 on April 17, 2018.

e. California red-legged frog in Basin 5 on April 17, 2018.



f. American bullfrog in Basin 5 on April 17, 2018.

Figure 10. Representative photographs of California red-legged frog sightings and associated habitat.

3.3.4 Western pond turtle

Western pond turtle is a CDFW species of special concern. Western pond turtles inhabit fresh or brackish water characterized by areas of deep water, low flow velocities, moderate amounts of riparian vegetation, warm water and/or ample basking sites, and underwater cover elements, such as large woody debris and rocks (Jennings and Hayes 1994). Along major rivers, western pond turtles are often concentrated in side channel and backwater areas. Turtles may move to off-channel habitats, such as oxbows, during periods of high flows (Holland 1994). Although adults are habitat generalists, hatchlings and juveniles require specialized habitat for survival through their first few years. Hatchlings spend much of their time feeding in shallow water with dense submerged or short emergent vegetation (Jennings and Hayes 1994). Although an aquatic reptile, western pond turtles require upland habitats for basking, overwintering, and nesting, typically within 0.6 mi from aquatic habitats (Holland 1994).

Western pond turtles have been documented in Alameda Creek approximately 1 mi east of the assessment area. Each basin that provides a permanent source of water and opportunities for basking (i.e., exposure to sunlight) are suitable aquatic habitat for western pond turtle. Basin 7 is the most suitable for this species, and Basin 4 provides relatively suitable aquatic habitat though may dry in some years. There is suitable upland nesting habitat near these basins.

3.3.5 Alameda whipsnake

USFWS designated 154,834 ac of critical habitat for Alameda whipsnake in Alameda, Contra Costa, Santa Clara, and San Joaquin counties on 2 October 2006 (Federal Register 71:58176). The entire assessment area is located within the Hayward-Pleasanton Ridge critical habitat unit (Unit 3).

Alameda whipsnake, one of two subspecies of California whipsnake (*Masticophis lateralis*), is distributed along the inner coast range, primarily in Alameda and Contra Costa counties, with additional occurrence records in northern Santa Clara and western San Joaquin counties (USWFS 2002). There are five identified Alameda whipsnake populations: the Tilden-Briones, Oakland-Las Trampas, and Mount Diablo-Black Hills populations in Contra Costa County; the Hayward-Pleasanton Ridge population in Alameda County; and the Sunol-Cedar Mountain population mostly in Alameda County but extending into San Joaquin and Santa Clara counties (USFWS 2005a). There is believed to be little or no genetic interchange between these populations, as few potential corridors exist between these areas due to habitat loss, degradation, and fragmentation (USFWS 2002).

Adult Alameda whipsnakes have a bimodal seasonal activity pattern, with a considerable peak in activity occurring during the spring mating season, and a smaller peak during late summer and early fall. Courtship and breeding begins soon after spring emergence, which generally occurs around March (Swaim 1994, as cited in USFWS 2002). Eggs are laid in late spring or early summer, and young hatch after approximately 3 months during late summer and early fall (August–November) (Swaim 1994, as cited in USFWS 2002). Around November, Alameda whipsnakes retreat into hibernacula for a winter dormancy period, though some above-ground activity may occur during winter. Whipsnakes exhibit site fidelity to overwintering sites. It may take 2 to 3 years to reach maturity, with adults growing up to 3 to 5 ft in length (USFWS 2002).

Alameda whipsnake habitat is characterized by chaparral or scrub-shrub communities with a mosaic of open and closed canopy that provides shelter from predators as well as opportunities for temperature regulation, prey-viewing, and nesting. Typical scrub communities within the range of the Alameda whipsnake include mixed chaparral, chamise chaparral, and coastal scrub (Mayer and Laudenslayer 1988). Whipsnakes have the ability to easily climb up into brush. Rock outcrops are an important component of whipsnake habitat, providing habitat for their primary prey species, western fence lizard (*Sceloperus occidentalis*) as well as additional opportunities for basking, shelter, and dispersal. Small burrows are often used for hibernacula and shelter; talus, brush piles, and deep soil crevices may also occasionally be used. Whipsnakes are known to venture into adjacent woodlands or annual grasslands, areas that offer additional habitats for foraging, breeding, reproduction, dispersal, and support of the species' prey base (primarily western fence lizards but also includes skinks, frogs, snakes, and birds). Alameda whipsnakes are most commonly documented on east, south, southeast, and southwest facing slopes, though whipsnakes do utilize north-facing slopes in more open stands of scrub-shrub habitat.

The entire Project Area is within critical habitat for Alameda whipsnake. The highest quality whipsnake habitat is the approximately 4.5 acres of chaparral located in the steep canyons north of Basin 1 in addition to an approximately 500-ft radius of this habitat, as depicted in Figure 9. This area is where individuals may most likely spend time finding shelter, breeding, hibernating, and foraging. In addition, Alameda whipsnakes could theoretically use the annual grasslands and other habitats throughout the assessment area for dispersal and movement for shorter periods of time.

3.3.6 White-tailed kite

White-tailed kite is a CDFW fully protected species. White-tailed kite is a resident (breeding and wintering) species throughout central and coastal California, up to the western edge of the foothills of the Sierra Nevada; California constitutes the stronghold of its North American breeding range (Zeiner et al. 1990a, Dunk 1995). They are not migratory but may make slight seasonal range shifts in coastal areas during winter (Zeiner et al. 1990a). White-tailed kites breed in lowland grasslands, oak woodlands or savannah, and wetlands with open areas. Riparian corridors represent a preferred landscape characteristic for kites in both the breeding and non-breeding seasons (Erichsen 1995). Groves of trees are required for perching and nesting, though kites do not seem to associate with particular tree species (Dunk 1995). Preferred foraging sites include open and ungrazed grasslands, agricultural fields, wetlands, and meadows that support large populations of small mammals. The white-tailed kite's year-round diet consists almost entirely of small mammals (Dunk 1995, Erichsen 1995), but can also include birds, insects, and reptiles. White-tailed kites breed between February and October, although peak breeding occurs from May through August (Zeiner et al. 1990a).

White-tailed kites may nest in the oak woodland or oak riparian forest in the assessment area during the nesting season. There have been numerous documented sightings of this species in the Project region during the nesting season, particularly in the area of Vargas Plateau Regional Park located less than 2 mi to the southwest of the assessment area (eBird 2018).

3.3.7 San Francisco dusky-footed woodrat

San Francisco dusky-footed woodrat is a California species of special concern. This subspecies prefers a variety of forest habitats with a moderate canopy, a brushy understory, and available nest-building materials. Dusky-footed woodrats have a complex social structure, which can make them particularly vulnerable to disturbance. They build large dens up to 8 ft high and 8 ft in diameter, often on the ground against a tree or shrub but sometimes in a tree up to 50 ft (Whitaker 1996). Houses are made of sticks, leaves, bark, and other debris and have multiple chambers for nesting, latrine, food storage, and other activities. Dusky-footed woodrats may breed anytime throughout the year, though are typically not sexually active in late fall and early winter (Jameson and Peeters 2004). One or two adult females and their young usually occupy dens for several months until the young disperse to nearby dens. Dens may also allow for other animals to live commensally, including reptiles, amphibians, small mammals, and invertebrates (Ingles 1965). Disturbance to woodrat dens may include direct destruction or removal of dens, vibration, noise, or creation of a canopy opening above dens.

San Francisco dusky-footed woodrats likely occurs in the oak woodland, oak riparian forest, or riparian scrub habitats in the assessment area.

3.3.8 Townsend's western big-eared bat

Townsend's big-eared bat is a California species of special concern. This species occurs throughout California and is associated with caves and structures in a variety of habitats from deserts to coastal scrub to montane forests. This cavity-dwelling species roosts and hibernates in caves (commonly limestone or basaltic lava), mines, buildings, bridges (with a cave-like understructure), rock crevices, tunnels, basal hollows in large trees, and cave-like attics (Pierson and Rainey 2007, Pierson and Rainey 1996, Sherwin and Piaggio 2005). Townsend's big-eared bats breed in both transitory migratory sites and hibernacula between September or October and February (CDFW 2013). The maternity season extends from March 1 through October 31, with colonies forming between March and June and breaking up by September or October (CDFW 2013). Maternity colonies and winter hibernacula are particularly sensitive to disturbance.

Townsend's big-eared bat is a moth specialist with over 90% of its diet comprised of lepidopterans. Foraging habitat associations include edge habitats along streams, adjacent to and within a variety of wooded habitats. These bats often travel large distances while foraging, including movements of over 93 mi during a single evening (Sherwin et al. 2000). Evidence of large foraging distances and large home ranges has also been documented in California (Pierson and Rainey 1996).

Townsend's big-eared bats may forage along edge habitats throughout the assessment area. There is potential roosting habitat should adequately large trees in oak woodlands and riparian forest provide basal hollows. Rock crevices may also provide roosting habitat, though may be limited to some rocky outcrops in the chaparral habitat near Basin 1. No tunnels, caves, or mines are known to occur in the assessment area.

3.3.9 Pallid bat

Pallid bat is a California species of special concern that occurs year-round in California. Pallid bats are associated with a variety of habitats from desert to coastal regions. At low- to mid-elevations, pallid bats are particularly associated with oak habitat (oak savannah, black oak, and oak grasslands) (Pierson and Rainey 2002). In natural settings, day and night roosts are found in rock crevices and cliffs but can also be found in caves and trees (underneath exfoliating bark of pine and oak and in hollows) (Sherwin and Rambaldini 2005, Pierson et al. 2001, Pierson and Rainey 1996). In more urban settings (e.g., Central Valley and western Sierran foothills), day and night roosts are frequently associated with human structures such as abandoned buildings, old mine workings, and bridges (Sherwin and Rambaldini 2005, Pierson and Rainey 1996, Pierson et al. 2001). Overwintering roosts require relatively cool and stable temperatures out of direct sun light.

Pallid bats primarily forage in open spaces away from water. Pallid bats can feed on the ground, on vegetation, and in the air by using a 'wing-cupping' method which forces the prey to the ground (Sherwin and Rambaldini 2005). Their generalist diet consists primarily of large ground-dwelling or slow flying insects and arachnids (Zeiner et al. 1990b) but can also include scorpions, small rodents, and lizards.

Pallid bats may forage in all habitat types throughout the assessment area. Suitable roosting habitat is present in the oak woodlands and riparian forest. Rock crevices may also provide roosting habitat, though may be limited to some rocky outcrops in the chaparral habitat near Basin 1. No tunnels, caves, or mines are known to occur in the assessment area.

3.3.10 American badger

Badgers, a CDFW Species of Special Concern, are uncommon, permanent residents throughout California except in the humid coastal forests of Del Norte County and the northwest portion of Humboldt County (Harris and Ogan 1997, Williams 1986, Grinnell et al. 1937).

Badgers mate in summer and early fall; gestation lasts 180–260 days including time of delayed implantation (Long 1999, Sullivan 1996, Harris and Ogan 1997). An average litter of two to three is born in March or April (Harris and Ogan 1997). Young may emerge from the den as early as five to six weeks old, are weaned by June, and disperse in late summer (Long 1999, Harris and Ogan 1997). A female may breed in the first year with males not reaching sexual maturity until their second year (Harris and Ogan 1997). Home ranges of males span 1,300–2,600 ac during spring and summer, and average 163 ac for both males and females during winter (Harris and Ogan 1997). Badgers are carnivores that feed mostly on rodents: rats (*Ratus* sp.), mice (*Peromyscus* sp.), chipmunks (*Tamias* sp.), ground squirrels (*Spermophilus* sp.), and pocket gophers (*Thomys* sp.). Badgers are also somewhat opportunistic sometimes eating reptiles, insects, and carrion (Harris and Ogan 1997).

Suitable habitat for badgers is characterized by shrubland, open grasslands, fields, and alpine meadows with friable soils (Long 1999, Harris and Ogen 1997). Badgers dig burrows in friable soils for cover and frequently use old burrows excavated by other species (Harris and Ogen 1997).

American badgers may occur in ruderal annual grasslands that are dominant throughout the assessment area. No burrows of appropriate size for badgers were noted during the field evaluation, and the grassland areas where future Project activities are most likely to occur consist of hard-packed soils that are not friable enough for burrowing. However, American badgers have moderate potential to occur in the annual grasslands throughout the eastern half of the assessment area where soils have not been previously impacted by mining activities.

3.3.11 Other migratory nesting birds and raptors

Migratory birds, their occupied nests, and their eggs are protected by California Fish and Game Code Sections 3503, 3513, and 3800, and includes listed and non-listed migratory birds. Fish and Game Code Section 3503.5 prohibits the incidental take of unlisted raptors or the destruction of their nests or eggs. The nesting season for migratory birds is generally February 1 through August 15. Migratory birds or raptors could establish nests in the assessment area, primarily large trees or shrubs associated with the oak woodland, riparian forest, and ornamental trees. Birds may also nest in grasslands, coyote brush, or chaparral.

4 PRELIMINARY IMPACT ANALYSIS AND MITIGATION NEEDS

This section provides a preliminary analysis of impacts that future reclamation activities may have on federally and/or state listed wildlife species, and a high-level summary of potential mitigation requirements. A full analysis of impacts on all special-status wildlife species with potential to occur will be conducted as part of environmental permitting once Project designs and a Project description are complete. All federally listed species in this report will need to be analyzed in a Biological Assessment and are expected to require an incidental take permit.

Depending on the Project design and description, the special-status wildlife species that Project activities may most likely affect include California red-legged frog, western pond turtle, Alameda whipsnake, San Francisco dusky-footed woodrat, and nesting migratory birds and raptors. Long-term effects may be beneficial, adverse, or both. While habitat for California tiger salamanders is suboptimal, there is potential for this species to also be affected. Proposed Project activities are less likely to impact Valley elderberry longhorn beetle, special-status bats, or American badger since habitats for these species (elderberry shrubs, mature tree hollows/rocky outcrops, and grassland with friable soils, respectively) are not expected to be directly removed or otherwise directly impacted. However, if the Project requires removal of or impacts on elderberry, a Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle (USFWS 2017) should be consulted to evaluate potential effects on and develop mitigation measures for Valley elderberry longhorn beetle.

There may be Project-related effects on nesting birds and raptors—including migratory birds and white-tailed kite—if disturbance occurs near active nest sites during the breeding season. A pre-construction nest survey is recommended for work conducted between February 1 and August 15 to avoid impacts on nesting birds.

To protect all aquatic species, standard best management practices need to be incorporated into the Project to reduce potential impairment of all on-site waterbodies from sediment or inadvertent release of hazardous materials.

The three federally and/or state listed species with potential to be impacted by the Project (California tiger salamander, California red-legged frog, and Alameda whipsnake) are discussed below.

4.1 California Tiger Salamander

Habitat suitability for California tiger salamander in the assessment area is considered low based on the lack of suitable upland habitat (Section 3.3.2). Despite the low potential for the species to be present, the species is listed as threatened under federal and state endangered species acts, and there must be certainty that Project activities that affect uplands or ponds will cause no impacts to this species, or that impacts are appropriately mitigated. Both temporary and permanent impacts to potential habitat will need to be mitigated. Basins 1, 4, and 5 provide adequate water for successful breeding in most years, and basins 2 and 3 may provide sufficient water in wet years for successful metamorphosis. Dipnetting for larvae in suitable aquatic habitats would provide more information about potential for breeding. Surveying for salamanders, either via dipnetting or drift-fence trapping, would provide useful information used to inform details of future restoration and provide baseline data for any future monitoring. However, negative survey results would not be sufficient to demonstrate with certainty that the Project would not impact these species.

4.2 California Red-legged Frog

California red-legged frogs were found in the assessment area during the field survey, and several basins likely provide breeding habitat (Section 3.3.3). USFWS protocol-level visual encounter surveys (USFWS 2005) should be conducted to provide further information on which basins are being used for reproduction to inform appropriate measures to incorporate into the Project to minimize impacts. These data will also provide a baseline from which to monitor success of habitat improvements after pond restoration activities are complete.

Pond restoration design should incorporate elements to improve California red-legged frog habitat. For example, ponds should be designed to dry in late summer during most years to manage against bullfrogs; bullfrogs need permanent water to breed successfully as tadpoles typically overwinter. In Basin 1, thinning cattails would increase habitat suitability by providing additional open water for frog movement and breeding. If possible, Basin 5 should be designed to extend the hydroperiod in most years to allow time for successful California red-legged frog metamorphosis. Basin 7 is likely providing a source population of bullfrogs; dewatering Basin 7 is recommended in late summer during construction activities to eradicate bullfrog tadpoles to reduce the source population.

Any conversion of ponded habitats to stream or upland habitat will be considered an indirect impact resulting from loss of California red-legged frog habitat and may require mitigation. Direct impacts to frogs could also occur during construction activities via direct mortality (e.g., being crushed by equipment, people, or sediment). Measures to avoid or minimization direct impacts may include, but would not be limited to, appropriate timing for specific Project activities, such as working in ponds only when they are dry to avoid the frogs most sensitive life stages (i.e., breeding). Planning should also be incorporated for scenarios in which temporary relocation of animals may be needed.

4.3 Alameda Whipsnake

Suitable core habitat for Alameda whipsnake occurs in the chaparral habitats upslope from Basin 1 and the upper pad quarry area (Section 3.3.5). Ruderal grassland habitats in this area may be used for Alameda whipsnake movement and dispersal. Terrestrial habitats impacted by the Project should be replaced with equivalent or improved snake habitat. If feasible, fill sites in the upper quarry pad area should be planted with high-quality scrub/chaparral to improve existing habitat conditions for Alameda whipsnake. This would include planting vegetation dominated by low- to medium-stature woody shrubs and creating mosaic of open and closed canopy chamise and chaparral species. A planting/irrigation plan and monitoring plan would need to be developed to ensure success of revegetation.

Project activities have the potential to directly or indirectly affect Alameda whipsnakes. Direct affects include mortality from crushing snakes that may traverse the area during construction, particularly in the upper quarry pad area. Indirect impacts to movement habitat include the flat, ruderal upland areas that may be filled. Impacts to habitat will need to be mitigated; mitigation ratios would be coordinated with USFWS. Based on the East Alameda County Conservation Strategy, mitigation will be required at a ratio of between 1:1 and 3:1.

Surveying for Alameda whipsnakes, either via cover boards or drift-fence trapping, would provide information used to inform details of future restoration and provide baseline data for any future monitoring, particularly the area around Basin 1 near chaparral. However, negative survey results would not be adequate to demonstrate with certainty that the Project would not impact these species.

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Appendix A

Special-status Wildlife Species Documented in the Project Region

Table 4. Niles Canyon special-status fish and wildlife scoping table.

Common name Scientific name	Query Sources	Status[a] Federal/ State	Distribution in California	Habitat Association	Likelihood to Occur in Project area
Invertebrates					
Conservancy fairy shrimp *Branchinecta conservatio*	USFWS	FE/–	Disjunct occurrences in Tehama, Glenn, Butte, Yolo, Solano, Stanislaus, Merced, and Ventura counties	Large, deep vernal pools in annual grasslands	None; no suitable habitat
Vernal pool fairy shrimp *Branchinecta lynchi*	CDFW, USFWS	FT/–	Central Valley, central and south Coast Ranges from Tehama County to Santa Barbara County; isolated populations also in Riverside County	Vernal pools; also found in sandstone rock outcrop pools	None; no suitable habitat
Vernal pool tadpole shrimp *Lepidurus packardi*	CDFW, USFWS	FE/–	Shasta County south to Merced County	Vernal pools and ephemeral stock ponds	None; no suitable habitat
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	USFWS	FT/–	Streamside habitats throughout the Central Valley; below 915 m (3,000 ft)	Riparian and oak savanna habitats with host plant *Sambucus* sp. (blue elderberry)	Moderate; elderberry documented in riparian habitat in assessment area
San Bruno elfin butterfly *Callophrys mossii bayensis*	USFWS	FE/–	Largest population on San Bruno Mountain in San Mateo County; smaller populations may occur in Contra Costa and Marin counties	Coastal scrub; host plant is Pacific stonecrop (*Sedum spathulifolium*)	None; no suitable habitat
Bay checkerspot butterfly *Euphydryas editha bayensis*	USFWS	FT/–	Populations only known in San Mateo and Santa Clara counties	Serpentinite soils; host plants are dwarf plantain (*Plantago erecta*) or purple owl's clover (*Castilleja densiflora/C. exserta*)	None; no suitable habitat, and outside of species' range

Common name Scientific name	Query Sources	Status[a] Federal/ State	Distribution in California	Habitat Association	Likelihood to Occur in Project area
Fish					
Delta smelt *Hypomesus transpacificus*	USFWS	FT/SE	Found only in the Sacramento-San Joaquin Estuary, including the lower reaches of Sacramento and Napa rivers; the Delta including Suisun Bay, Goodyear, Suisun, Cutoff, First Mallard, and Montezuma sloughs	Estuarine or brackish waters up to 18 parts per thousand (ppt); spawn in shallow brackish water upstream of the mixing zone (zone of saltwater-freshwater interface) where salinity is around 2 ppt	None; no suitable habitat, and outside of species' range
Longfin smelt *Spirnichus thaleichthys*	CNDDB	FPT/ST	San Francisco estuary from Rio Vista or Medford Island in the Delta as far downstream as South Bay; concentrated in Suisun, San Pablo, and North San Francisco bays; historical populations in Humboldt Bay, Eel River estuary, and Klamath River estuary	Adults in large bays, estuaries, and nearshore coastal areas; migrate into freshwater rivers to spawn; salinities of 15–30 ppt	None; no suitable habitat, and outside of species' range
Steelhead, central California coast DPS *Oncorhynchus mykiss*	CNDDB	FT/–	Coastal California streams from the Russian River, south to Aptos Creek, San Francisco, San Pablo, and Suisun bays; the drainages of San Francisco, San Pablo, and Suisun bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin rivers; excludes the SacramentoSan Joaquin Delta,	Rivers and streams with cold water, clean gravel of appropriate size for spawning, and suitable rearing habitat; typically rear in fresh water for one or more years before migrating to the ocean	None; no suitable habitat
Amphibians					
California tiger salamander *Ambystoma californiense*	CDFW, USFWS	FT/ST	Very fragmented; along the coast from Sonoma County to Santa Barbara County, in the Central Valley and Sierra foothills from Sacramento County to Tulare County	Grassland, oak savannah, or edges of woodland that provide subterranean refuge (typically mammal burrows); breeds in nearby temporary ponds, vernal pools, or slow-moving parts of streams	Low; very few burrows present in assessment area

Common name Scientific name	Query Sources	Status[a] Federal/ State	Distribution in California	Habitat Association	Likelihood to Occur in Project area
California red-legged frog *Rana draytonii*	CDFW, USFWS	FT/SSC	Largely restricted to coastal drainages on the central coast from Mendocino County to Baja California; in the Sierra foothills south to Tulare and possibly Kern counties	Breeds in still or slow-moving water with emergent and overhanging vegetation, including wetlands, wet meadows, ponds, lakes, and low-gradient, slow moving stream reaches with permanent pools; uses adjacent uplands for dispersal and summer retreat	High; confirmed present during surveys
Foothill yellow-legged frog *Rana boylii*	CNDDB	–SCE, SSC	From the Oregon border along the coast to the Transverse Ranges, and south along the western side of the Sierra Nevada Mountains to Kern County; a possible isolated population in Baja California	Shallow tributaries and mainstems of perennial streams and rivers, typically associated with cobble or boulder substrate	None; no suitable habitat
Reptiles					
Western pond turtle *Actinemys marmorata*	CNDDB	–/SSC	From the Oregon border along the coast ranges to the Mexican border, and west of the crest of the Cascades and Sierras	Permanent, slow-moving fresh or brackish water with available basking sites and adjacent open habitats or forest for nesting	Moderate; suitable habitat present in Basin 7
Green sea turtle *Chelonia mydas*	USFWS	FT/–	Warm waters of the Pacific coast, primarily from San Diego south; does not nest in California	Uses convergence zones in the open ocean and benthic feeding grounds in coastal areas; nests on sandy ocean beaches	None; no suitable habitat (marine species)
California legless lizard *Anniella pulchra*	CNDDB	–/SSC	Northern Contra Costa County south to northwestern Baja California; scattered occurrences in San Joaquin Valley, along the southern Sierra Nevada mountains, and in the western Mojave Desert	Sparsely vegetated areas of beach dunes, chaparral, pine-oak woodlands, desert scrub, sandy washes, and stream terraces; warm, moist, loose soil for burrowing	None; no suitable habitat
Alameda whipsnake *Masticophis lateralis euryxanthus*	CDFW, USFWS	FT/ST	Inner coast range, mostly Contra Costa and Alameda counties; additional records in San Joaquin and Santa Clara counties	Chaparral (northern coastal sage scrub and coastal sage) and rocky outcrops; may venture into adjacent habitats	Moderate; suitable habitat present and assessment area within critical habitat

Common name Scientific name	Query Sources	Status[a] Federal/ State	Distribution in California	Habitat Association	Likelihood to Occur in Project area
				including grassland, oak savanna, and woodlands	
Giant garter snake *Thamnophis gigas*	USFWS	FT/ST	Central Valley from the vicinity of Burrel in Fresno County north to near Chico in Butte County; has been extirpated from areas south of Fresno	Sloughs, canals, low- gradient streams and freshwater marsh habitats where there is a prey base of small fish and amphibians; also found in irrigation ditches and rice fields; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter	None; no suitable habitat, and outside of species' range
Birds					
White-tailed kite *Elanus leucurus*	CNDDB	–/SFP	Year-round resident; found in nearly all lowlands of California west of the Sierra Nevada mountains and the southeast deserts	Lowland grasslands and wetlands with open areas; nests in trees near open foraging area	Moderate; may nest in trees in assessment area
Northern harrier *Circus cyaneus*	CNDDB	–/SSC	Year-round resident; scattered throughout California; in the northwest, nests largely within coastal lowlands from Del Norte County south to Bodega Head in Sonoma County, inland to Napa County	Nests, forages, and roosts in wetlands or along rivers or lakes, but also in grasslands, meadows, or grain fields	Low; marginally suitable foraging habitat, not suitable for nesting
Golden eagle *Aquila chrysaetos*	CNDDB	BGEPA/SFP	Uncommon permanent resident and migrant throughout California, except center of Central Valley	Open woodlands and oak savannahs, grasslands, chaparral, sagebrush flats; nests on steep cliffs or medium to tall trees	Low; foraging only
American peregrine falcon *Falco peregrinus anatum*	CNDDB	FD/SD, SFP	Most of California during migrations and in winter; nests primarily in the Coast Ranges, northern Sierra Nevada Mountains, and other	Wetlands, woodlands, cities, agricultural lands, and coastal area with cliffs (and rarely broken-top, predominant trees) for nesting; often forages near water	Low; foraging only

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			mountainous areas of northern California		
Yellow rail *Coturnicops noveboracensis*	CNDDB	–/SSC	Extremely rare	Marshes	None; no suitable habitat
California black rail *Laterallus jamaicenis coturniculus*	CNDDB	–/ST, SFP	Northern San Francisco Bay area (primarily San Pablo and Suisun bays) and Sacramento-San Joaquin Delta	Large tidally-influenced marshes with saline to brackish water, typically with a high proportion of pickleweed (*Salicornia virginica*); also can be associated with bulrush (*Schoenoplectus* spp.), cattail (*Typha* spp.), or rushes (*Juncus* spp.); peripheral vegetation at and above mean high higher water necessary to protect nesting birds during extremely high tides	None; no suitable habitat
California Ridgway's rail *Rallus obsoletus obsoletus*	CNDDB	FE/SE, SFP	Predominantly in the marshes of the San Francisco estuary: South San Francisco Bay, North San Francisco Bay, San Pablo Bay, and sporadically throughout the Suisun Marsh area east to Browns Island	Salt and brackish water marshes, typically dominated by pickleweed (*Salicornia virginica*) and Pacific cordgrass (*Spartina foliosa*)	None; no suitable habitat
Western snowy plover *Charadrius alexandrinus nivosus*	CNDDB, USFWS	FT (Pacific coastal population)/SSC (interior population)	Nests in locations along the California coast, including the Eel River in Humboldt County; nests in the interior of the state in the Central Valley, Klamath Basin, Modoc Plateau, and Great Basin, Mojave, and Colorado deserts; winters primarily along coast	Barren to sparsely vegetated beaches, barrier beaches, salt-evaporation pond levees, and shores of alkali lakes; also nests on gravel bars in rivers with wide flood plains; needs sandy, gravelly, or friable soils for nesting	None; no suitable habitat

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California least tern *Sternula antillarum browni*		FE/SE, SFP	Pacific coast from San Francisco to Baja California	Sparsely vegetated coastal beaches and estuaries near shallow waters, above high tide line	None; no suitable habitat
Black skimmer *Rynchops niger*		–/SSC	Breeds on the coast from San Francisco Bay south to south San Diego Bay and in the interior at the Salton Sea	Large areas of bare ground adequately isolated from terrestrial predators and disturbances	None; no suitable habitat
Western yellow-billed cuckoo *Coccyzus americanus*		FT/SE	Breeds in limited portions of the Sacramento River and the South Fork Kern River; small populations may nest in Butte, Yuba, Sutter, San Bernardino, Riverside, Inyo, Los Angeles, and Imperial counties	Summer resident of valley foothill and desert riparian habitats; nests in open woodland with clearings and low, dense, scrubby vegetation	None; no suitable habitat
Western burrowing owl *Athene cunicularia hypugaea*		–/SSC	Year-round resident throughout much of the state; Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast	Level, open, dry, heavily grazed or low-stature grassland or desert vegetation with available burrows	None; no suitable habitat due to steep terrain and lack of available burrows
Bank swallow *Riparia riparia*		–/ST	Summer resident; occurs along the Sacramento River from Tehama County to Sacramento County, along the Feather and lower American rivers; and in the plains east of the Cascade Range in Modoc, Lassen, and northern Siskiyou counties; small populations near the coast from San Francisco County to Monterey County	Nests in vertical bluffs or banks, usually adjacent to water, where the soil consists of sand or sandy loam	None; no suitable habitat
Yellow warbler *Dendroica petechia*		–/SSC	Summer resident; nests in most of California, except most of the Central Valley, high Sierras, and Mojave and Colorado deserts	Open-canopy, deciduous riparian woodland close to water, along streams or wet meadows	None; no suitable habitat

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Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*		–/SSC	San Francisco Bay region	Brackish marsh, riparian woodland/swamp, freshwater marsh, and salt marsh often near upland habitats	None; no suitable habitat
Alameda song sparrow *Melospiza melodia pusillula*		–/SSC	Restricted to the periphery of southern San Francisco Bay	Tidal salt marsh	None; no suitable habitat
Tricolored blackbird *Agelaius tricolor*		–/SCE, SSC	Permanent resident, but makes extensive migrations both in breeding season and winter; common locally throughout Central Valley and in coastal areas from Sonoma County south	Feeds in grasslands and agriculture fields; nesting habitat components include open accessible water, a protected nesting substrate (including flooded or thorny vegetation), and a suitable nearby foraging space with adequate insect prey	Low; marginal nesting habitat along Basin 7
Mammals					
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*		–/SSC	San Francisco Bay area	A variety of forest habitats with a moderate canopy, a brushy understory, and available nest-building materials	Moderate; suitable habitat present especially in riparian and brushy areas
Salt marsh harvest mouse *Reithrodontomys raviventris*		FE/SE, SFP	San Pablo, Suisun, and San Francisco bays in Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, and San Mateo counties	Tidal salt marshes; depend on dense cover, preferring pickleweed (*Salicornia pacifica*) and saltgrass	None; no suitable habitat
Salt marsh wandering shrew *Sorex vagrans halicoetes*		–/SSC	San Francisco Bay in San Mateo, Santa Clara, Alameda and Contra Costa counties	Saline emergent wetlands, preferably with pickleweed (*Salicornia virginica*)	None; no suitable habitat
Western mastiff bat *Eumops perotis californicus*		–/SSC	Found mostly in southern half of California	Primarily a cliff-dwelling species though may be found in crevices in large boulders and buildings	Low; foraging only

Common name Scientific name	Query Sources	Status[a] Federal/ State	Distribution in California	Habitat Association	Likelihood to Occur in Project area
Townsend's western big-eared bat *Corynorhinus townsendii*		–/SSC	Throughout California, found in all but subalpine and alpine habitats, details of distribution not well known	Most abundant in mesic habitats, also found in oak woodlands, desert, vegetated drainages, caves or cave-like structures (including basal hollows in large trees, mines, tunnels, and buildings)	Moderate; may be found in tree hollows
Pallid bat *Antrozous pallidus*		–/SSC	Throughout California except for elevations greater than 3,000 m in the Sierra Nevada	Roosts in rock crevices, tree hollows, mines, caves, and a variety of vacant and occupied buildings; feeds in a variety of open woodland habitats	Moderate; may be found in tree hollows
San Joaquin kit fox *Vulpes macrotis mutica*		FE/ST	San Joaquin Valley floor and surrounding foothills of the coastal ranges, Sierra Nevada, and Tehachapi mountains	Annual grasslands or open areas dominated by scattered brush, shrubs, and scrub	None; outside of species' range
American badger *Taxidea taxus*		–/SSC	Throughout the state except in the humid coastal forests of Del Norte County and the northwest portion of Humboldt County	Shrubland, open grasslands, fields, and alpine meadows with friable soils	Moderate potential in open grasslands in assessment area

[a] Status codes:

Federal
FE = Listed as endangered under the federal Endangered Species Act
FT = Listed as threatened under the federal Endangered Species Act
FD = Federally delisted
BGEPA = Federally protected under the Bald and Golden Eagle Protection Act

State
SE = Listed as Endangered under the California Endangered Species Act
ST = Listed as Threatened under the California Endangered Species Act
SCE = State Candidate Endangered
SD = State Delisted
SSC = CDFW species of special concern
SFP = CDFW fully protected species