California Environmental Protection Agency
San Francisco Bay Regional Water Quality Control Board

MITIGATED NEGATIVE DECLARATION

Project Title
Environmental Cleanup of IR-6 and IR-8 Drainages

Project Location
SLAC National Accelerator Laboratory (SLAC)
2575 Sand Hill Road, San Mateo County, California

The project is located within unincorporated San Mateo County on Stanford University property, south of Sand Hill Road and East of Interstate 280 (see Figure 1 of the Initial Study). A portion of the Project is within the SLAC facility limits, and a portion is outside SLAC facility limits (see Figure 2 of the Initial Study).

Project Description
The Project is intended to be a final action to remove soil containing polychlorinated biphenyls (PCBs) from portions of three earthen drainage channels at SLAC to address cleanup requirements of Water Board Cleanup and Abatement Order R2-2009-0072. Approximately 1,550 bank cubic yards of soil will be removed and disposed off-site at a permitted landfill. Riparian and wetland vegetation currently growing in the drainage channels will be removed in the course of excavation. Following soil removal, the drainages will be backfilled and restored.

The Project will have a net environmental benefit by removing soil containing PCBs from the drainages and restoring the Project area to continue to function as stormwater drainages with wetland, riparian, and upland vegetation.

An Initial Study that identifies and evaluates environmental effects of the Project and describes mitigation measures to reduce potentially significant effects to less than significant is attached.

Findings
It is hereby determined that, although the proposed Project could have a significant effect on the environment, there will not be a significant effect in this case because the Project has been revised to mitigate any potential significant effects. The following mitigation measures are necessary to avoid the potentially significant effects on the environment:

- Avoidance and minimization measures to limit impacts and to protect wildlife;
- Regrading the channel to restore drainage channels and installing erosion control blankets to limit erosion;
- Removing 75 feet of riprap in IR-8 and restoring this portion of the reach to an earthen channel;
- Replanting disturbed wetland areas with cattails;
- Replanting disturbed riparian areas with willows;
- Replanting disturbed soil in upland areas with native grasses; and,
- Implementing a monitoring program to document habitat restoration.

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Additional detail about these mitigation measures is found in the attached Initial Study, which is hereby incorporated and fully made part of this Mitigated Negative Declaration. SLAC has agreed to implement the identified mitigation measures, which are described in the Project documents cited in the Initial Study, including the Restoration and Monitoring Plan.

_____ _____

Bruce H. Wolfe
Executive Officer
San Francisco Bay Regional Water Quality Control Board

Date

Project Title

Environmental Cleanup of IR-6 and IR-8 Drainages

Lead Agency Name and Address

California Regional Water Quality Control Board, San Francisco Bay Region
1515 Clay Street #1400, Oakland, CA 94612

Contact Person:
Nathan King, P.G.
(510) 622-3966
nathan.king@waterboards.ca.gov

Other Permits and Approvals Required

- U.S. Army Corps of Engineers: Clean Water Act, Section 404 Permit
- California Department of Fish and Wildlife: Lake and Streambed Alteration Agreement
- Regional Water Board: Clean Water Act, Section 401 Certification or Waste Discharge Requirements

Project Location

SLAC National Accelerator Laboratory (SLAC)
2575 Sand Hill Road, San Mateo County, California (street address)

The project is located within unincorporated San Mateo County on Stanford University property, south of Sand Hill Road and East of Interstate 280, partially within the SLAC leasehold and partially outside of the SLAC leasehold. Figure 1 shows the project location. Figure 2 shows the location of the IR-6 and IR-8 drainages at the southern area of SLAC.

Project Sponsor

SLAC National Accelerator Laboratory
2575 Sand Hill Road, Menlo Park, California 94025 (mailing address)

SLAC is operated by Stanford University for the Department of Energy (DOE) and is a multi-program laboratory exploring frontier questions in accelerator research, particle physics and astrophysics, and the structure and function of matter. The linear accelerator began operation in the mid-1960's. SLAC is located on land owned by Stanford University, which is leased to the DOE.

Contact Person:
Adam Ng
(650) 926-4673
asng@slac.stanford.edu

General Plan Designation

San Mateo County last updated its General Plan in 1986. The General Plan land use designation is Institutional / General Open Space / Future Study for the Stanford University lands where SLAC is located, including the Project area.

Zoning and Location

SLAC is a federally-funded national research laboratory constructed in 1963 and continuously managed and operated by Stanford University (Stanford) under a contract with the United States Department of Energy (DOE). The SLAC facility is located on land owned by Stanford and leased to DOE, although the drainage channels for which the Project is planned are located partly within the SLAC leasehold and partly outside of the SLAC leasehold on Stanford University property, as shown on Figures 2 and 3. As a federal facility, the SLAC facility is exempt from local zoning laws. In addition, the SLAC land is part of the original land grant that established Stanford; the land cannot be sold and must be held in perpetuity by Stanford's trustees to support its educational mission.

The current zoning for the land at SLAC and adjacent to SLAC where the Project is located allows for farming and single-family Residential Estates with a 1- to 5-acre minimum lot size (R-E/S-11). Schools, libraries, riding academies, and golf courses are allowed subject to securing a Use Permit. All of the Project area falls within the R-E/S-11 zoning.

Land Uses

Land use at the SLAC facility is a combination of industrial, educational, and short-term residential. Adjacent land uses north and east of SLAC near Sand Hill Road are commercial and residential; other adjacent land uses include to the south of SLAC include agricultural and open space. As shown on Figure 2, the adjacent land to the south of the project area is a horse track operated by the Portola Valley Training Center (PVTC), an equine facility located on property owned by Stanford University. The open adjacent land to the west of the Project area (see Figure 2) is also owned by Stanford University, and is grassland used primarily for grazing.

I. Project Summary

The Project will remove soil containing polychlorinated biphenyls (PCBs), lead, zinc, and copper from portions of earthen drainage channels at SLAC to comply with Regional Water Board Cleanup and Abatement Order No. R2-2009-0072. Following soil removal, the drainages will be backfilled and replanted to enable them to continue to function as drainages and habitat. SLAC is in the process of preparing a Removal Action Work Plan for this Project, which will be submitted to the Regional Water Board for approval before the field work is conducted.

The Project will have a net environmental benefit by removing soil containing PCBs and metals from the drainages and by restoring the Project area's function as a stormwater drainage system with wetland, riparian, and upland vegetation. This Initial Study identifies and evaluates the anticipated environmental effects of the Project and describes mitigation measures to reduce any potentially significant effects to less than significant.

A. Supporting Documents

A biological assessment (BA) of the Project area was performed in 2016 and is documented in the report: *Biological Assessment for the California Red-legged Frog* (HTH, 2017a). The BA reviews the proposed Project in sufficient detail to determine the extent to which the proposed

action may affect (a) any threatened, endangered, or candidate animal or plant species and/or its habitat and (b) designated critical habitat of those species.

A delineation of wetland, riparian, and upland areas within the Project area is presented in the report *Preliminary Identification of Waters of the United States* (Wetland Delineation Report; HTH, 2017b).

Plans for vegetation removal, restoration, and monitoring are described in the *Restoration and Monitoring Plan* (HTH, 2017c).

Draft construction plans, attached to this Initial Study, provide details on the scope of the excavations, staging areas, and restoration plans. The construction plans may be modified prior to starting the work, but the draft plans sufficiently illustrate the key elements of the Project.

Related documents, describing prior environmental investigations in the IR-6 and IR-8 drainage channels, the development of risk-based cleanup goals for soil and sediments at SLAC, and the approach to implementing removal actions at SLAC have been prepared in accordance with the Water Board Order and are available on the Water Board's Geotracker website for SLAC [https://geotracker.waterboards.ca.gov/], site SL0608125065. Prior Regional Water Board orders for the SLAC site were: Order No. R2-2005-0022 and Order No. R2-1985-0088.

II. Project Description

Stormwater runoff from the narrow linear accelerator, Research Yard (RY), Stanford Synchrotron Radiation Lightsource (SSRL), Campus Area and other parts of the SLAC facility is collected in three earthen surface water channels, referred to as the IR-6 primary, IR-6 secondary, and IR-8 drainage channels. As shown on Figure 2, stormwater combines at the IR-6/8 confluence area, passes through buried culverts under the horse track at the PVTC, and flows through surface drainages at PVTC before discharge to San Francisquito Creek.

The Project will be performed in portions of these three drainage channels and their confluence area (the IR-6/8 confluence area) on undeveloped land near the southern portion of SLAC. The areas of the planned excavations in the drainage channels are shown on Figure 3.

The watersheds of the IR-6 primary and IR-8 channels are largely paved and urbanized. The IR-6 channel drains approximately 30 paved and/or urbanized acres from a network of 7,500 linear feet of stormwater piping. The IR-8 channel drains approximately 65 acres from a network of approximately 12,000 linear feet of storm drain piping. The IR-6 secondary channel receives runoff from a small and mostly unpaved area at the southern edge of SLAC. The drainage channels, the upstream catchment areas, and nearby features of the area are shown on Figure 2.

Sediments in the drainage channels and confluence area contain PCBs; copper, lead, and zinc have also been detected above cleanup levels in limited sediments within the IR-6/8 confluence area. The sources of these impacts were electrical transformers, flaking paints, and lead used as shields during operation of the accelerator. Spills, releases, and known sources of PCBs and metals in those areas have been remediated, and the oil in remaining PCB-transformers has been

replaced with non-PCB transformer oil or the PCB-transformers removed, so recontamination of sediment is not expected to take place. SLAC previously removed soil from all known upstream sources; from portions of IR-6 primary drainage channel in 1995 and 2006; the IR-6 secondary drainage channel in 2011; and from the upper reach of the IR-8 drainage channel in 2005, as interim actions. Those actions targeted areas with PCBs in soil; and based on periodic soil sampling since those removals, the detected concentrations of PCBs in soil in the drainage channels have significantly decreased with each successive removal activity. Thus source areas in the RY and SSRL have been addressed and residual impacts in the drainages have also been removed to the extent practicable at the time; therefore, this Project will excavate remaining areas with elevated levels of PCBs and metals in sediment and is intended to be a final action to meet cleanup goals.

The Project area includes the earthen portions of the IR-6 drainages, the IR-8 drainage, and the IR-6/8 confluence area, as well as equipment staging and material handling areas and access routes to these areas. Project work areas are shown on the draft construction plans attached to this Initial Study. Temporary access will include the paved road on SLAC leasehold north of the IR-6 drainage and east of the IR-8 drainage, and a grassy path through a gate on the earthen hillside between the channels and the road (see Figure 3). Staging areas will be alongside the paved road and in other asphalt-paved or gravel-covered laydown areas within the SLAC facility. Additional detail about the scope of the project within each of the drainage channels follows:

A. IR-6 Primary Drainage Channel

The IR-6 primary drainage receives stormwater flow from the RY-SSRL area at SLAC through a network of storm drain lines that daylight into a concrete-lined drainage channel and then into the unlined earthen drainage (see Figures 2 and 3). The earthen portion of the IR-6 primary drainage is approximately 330 feet long, and includes rip-rap in first 60 feet (at the eastern end) to dissipate the high energy flow from the outfall of the concrete-lined channel. There is an earthen berm approximately 3 to 4 feet high between the earthen portions of the IR-6 primary channel and the IR-6 secondary channel to the south. The IR-6 primary drainage channel is normally dry during the summer months and is vegetated with grasses, forbs, and some trees (HTH, 2017b). The Project includes soil and rip-rap removal and replacement, removal of part of the berm separating the primary and secondary channels, followed by backfill and revegetation, along the entire length of the earthen channel, as shown on Figures 3 and 4 and described further below. The estimated total excavation volume in the IR-6 primary drainage, including partial berm removal, is approximately 700 bank cubic yards (BCY).

B. IR-6 Secondary Drainage Channel

The IR-6 secondary drainage channel parallels the earthen portion of the IR-6 primary channel south of the earthen berm. It includes a concrete-lined portion approximately 180 feet long followed by an unlined earthen channel approximately 360 feet long. The secondary channel receives a stormwater flow from a small area (approximately 0.3 acres) near the southern edge of SLAC. The IR-6 secondary drainage channel is normally dry during the summer months and the earthen portion is vegetated with grasses, forbs, and some trees (HTH, 2017b). Soil

with PCBs was removed from much of the secondary channel in 2011. The proposed Project includes soil removal and replacement, followed by backfill and revegetation, along portions of the secondary channel where PCBs remain, as shown on Figures 3 and 4 and described further below. The portions of the IR-6 secondary drainage to be excavated have a combined length of approximately 130 linear feet; the estimated excavation volume is approximately 150 BCY.

C. IR-8 Drainage Channel

The IR-8 drainage receives stormwater in the rainy season from the Campus Area at SLAC through a network of storm drain lines that daylight into a concrete-lined drainage channel and then outfalls into the unlined earthen drainage (see Figures 2 and 3). The IR-8 drainage also receives approximately two gallons per minute (on average) of groundwater collected from two subdrain systems for tunnels at SLAC. The earthen portion of the IR-8 drainage is approximately 700 feet long, and includes rip-rap in the first 150 feet (at the northern end) to dissipate the high energy flow from the outfall of the concrete-lined channel.

Due to the pumped groundwater from the tunnel subdrain systems, water flows in the IR-8 drainage year-round. Therefore, the center-line of the IR-8 drainage is perennially wet, creating artificially-induced wetland and riparian conditions. Recent surveys have identified the presence of perennial marsh wetland, riparian, and uplands vegetation in the IR-8 drainage. The vegetation delineations, with proposed excavation areas overlain, are shown on Figure 4 (HTH, 2017b).

For the IR-8 drainage channel, the proposed Project includes soil and rip-rap removal and partial replacement (only half the rip-rap will be replaced), followed by backfill and revegetation, along approximately the upper 360 linear feet of the channel, as shown on Figures 3 and 4 and described further below. The lower half of the IR-8 drainage channel will not be disturbed for the Project. The estimated excavation volume in the IR-8 drainage is approximately 650 BCY.

A concrete oil-water separator (OWS) is located just east of the IR-8 drainage, approximately 120 feet from the start of the unlined earthen channel, as shown on Figure 3. The OWS was installed in approximately 1979 but is currently not in service, and it may never have been used. There is a 6-inch diameter pipe from the end of the concrete-lined channel to the OWS, but the pipe is currently plugged at its inlet in the channel. The OWS is approximately 6.5 feet deep and is installed with roughly half the OWS below ground and half above ground. Based on testing results, the OWS does not include asbestos-containing materials, and water and sediments in the OWS do not contain PCBs. The OWS is within the planned limits of excavation in the IR-8 drainage, and will be demolished and removed as part of this Project; the area where the OWS is located will be restored along with the surrounding drainage.

D. IR-6/8 Confluence Area

The IR-6 and IR-8 earthen drainages come together at the IR-6/8 confluence area, as shown on Figure 3. The IR-6/8 confluence area extends for approximately 50 feet beyond the southern end of the IR-8 drainage channel and receives stormwater from the IR-6 and IR-8 drainage

channels, as well as the groundwater pumped year-round from the tunnel sub-drains into the IR-8 drainage channel. A small swale is present on the west side of the confluence area, which receives some overland stormwater runoff from west of the confluence area, from Stanford University land leased by the Portola Valley Training Center (PVTC), the horse track south of the confluence area. Water drains from the confluence area to the south through two underground culverts that pass beneath the PVTC. Riparian vegetation is present in the IR-6/8 confluence area due to the year-round flow of groundwater pumped from the tunnel sub-drains into the IR-8 drainage channel. For the IR-6/8 confluence area, the proposed Project includes soil removal and replacement, followed by backfill and revegetation, along approximately 33 feet of the drainage, as shown on Figures 3 and 4 and described further below. The estimated excavation volume in the IR-6/8 confluence area is approximately 50 BCY.

E. Equipment Staging and Materials Handling Areas

Construction equipment as needed, such as small backhoes or excavators, off-road haul trucks, loaders, and a small bulldozer, will be temporarily staged in upland areas along the paved access road on the SLAC leasehold, as well as just north of the IR-6 drainage channel, as shown on Figure 3 and on Sheets G-3 and G-4 in the attached Construction Plans. These staging areas are currently either paved or vegetated with a mix of native and invasive grasses. No grading of equipment or material storage or handling areas is planned. The proposed project would involve placing plastic sheeting below stockpiles, loading from stockpiles, and parking of the construction equipment for two months. Soil excavated from the drainage channels will temporarily be placed on plastic sheeting and, when not actively in use, covered with weighed sheeting to limit dust, until removal by truck to the appropriate offsite disposal facility. Staging and materials handling areas will be restored with erosion control matting and native plant seeding at the completion of soil backfill activities.

F. Confirmation Sampling and Analysis

Confirmation soil samples will be collected from the base of the excavations and analyzed as described below, following sampling procedures in the SLAC Standard Operating Procedures (SOPs) Manual (SLAC, 2008) and analyzed for PCBs and/or zinc, copper, and lead. One 9-point composite sample will be collected every approximately 225 square feet or less. This confirmation sampling strategy is expected to result in the collection of approximately 72 samples from the IR-6 drainage channel (approximately 60 samples from the primary drainage channel and 12 samples from the secondary drainage channel), 43 samples from the IR-8 drainage, and two samples from the IR-6/8 confluence area. The samples from the IR-6 primary, IR-6 secondary, and IR-8 channels will be analyzed for PCBs only. The samples from the IR-6/8 confluence area will also be analyzed for copper, lead, and zinc because these metals were detected at concentrations exceeding ecological screening levels in soil co-located with PCBs. If concentrations of PCBs and/or metals do not meet clean-up goals, additional soil will be excavated to the extent feasible and additional confirmation samples will be collected

The chemical analysis methods for IR-6 and IR-8 Drainage Channel IAs are listed below:

a. Confirmation samples from the IR-6 and IR-8 drainage channels

i. PCBs – U.S. EPA Method 8082; and

ii. Moisture content – American Society for Testing and Materials (ASTM) Method D2216.

b. Confirmation samples from IR-6/8 confluence area

i. PCBs – U.S. EPA Method 8082;

ii. Copper, lead, and zinc – U.S. EPA Method 6020A; and

iii. Moisture content – ASTM Method D2216.

III. Overview of Project Impacts and Mitigation Measures

A. Excavation and Soil Removal

The estimated total area of excavation is approximately 18,000 square feet (~0.4 acre), and the depth of excavation is planned to range from 1 to 3 feet below the existing ground surface in most areas, and approximately 5 feet deep near the oil/water separator (see Figure 3). The estimated combined excavation volume is approximately 1,550 BCY, or 2,500 tons. It is estimated that approximately 130 truckloads of excavated material will be transported to a landfill, and a similar number of truckloads of fill material will be brought to the site for restoration. The field work for performing excavation and site restoration is anticipated to take approximately two months. The primary field work is planned for the summer months, within the June through September time frame, to avoid the typical periods of rainfall and stormwater runoff. Water quality is not expected to be impacted during or following the Project, as erosion control measures will be implemented during the Project and while vegetation re-establishes post-excavation.

- Existing PCB concentrations range up to 5.9 milligrams per kilogram (mg/kg) in the drainage channels, and up to 35 mg/kg in fill material near the OWS. The extent and locations of the excavations are designed based on the SLAC site-specific cleanup goal of 0.23 mg/kg for PCBs in soil. This cleanup target reflects human health risk-based goals for potential future unrestricted land use (SLAC, 2007a, 2016) and is also protective based on ecological risk-based goals for soil and sediment (SLAC, 2007b, 2016), as required by the Board Order.

- Existing lead, copper, and zinc concentrations in the IR-6/IR-8 confluence area range up to 235 mg/kg, 130 mg/kg, and 1,600 mg/kg, respectively. The extent and location of the excavation in the confluence area is designed based on locations where these metals exceed both background concentrations (19 mg/kg, 54 mg/kg, and 300 mg/kg, respectively) and screening levels for ecological protection (7.4 mg/kg, 69 mg/kg, and 168 mg/kg, respectively). The cleanup goal for the metals are background levels or the ecological protection screening levels if higher than background.

- An abandoned concrete OWS that is located within the planned excavation area for the IR-8 drainage channel will also be removed. The OWS extends to approximately 4 feet below ground surface.

- Water will temporarily be diverted around the excavation areas in the IR-8 drainage channel during the Project. Existing water flow in the portion of the IR-8 drainage channel that is not subject to excavation will be maintained.

- Excavated soil, concrete debris from the oil/water separator, and removed vegetation will be disposed off-site in a permitted landfill.

B. Vegetation Removal

Vegetation will be removed as needed from the planned excavation areas; the planned excavation areas are shown on Figure 3. Approximately 0.02 acres of wetland vegetation and approximately 0.09 acres (360 linear feet on each bank) of riparian vegetation will be removed, as shown on Figure 4. The extent of vegetation removal is described in more detail in the Wetland Delineation Report (HTH, 2017b) and the Restoration and Monitoring Plan (HTH, 2017c). An arborist (Newcomb Tree Experts, Inc.) surveyed the proposed excavation and access areas for the Project in December 2016 and identified trees to be removed as follows:

- IR-6 drainage channel and IR-6/8 confluence work areas (16 trees)
  - 5 Arroyo Willow[1]
  - 8 Live Oak[2]; and,
  - 3 Valley Oak.
- IR-8 drainage channel work area (58 trees):
  - 53 Arroyo Willow
  - 2 Eucalyptus[3]
  - 1 Live Oak; and,
  - 2 London Plane.[4]

No tree or vegetation removal is proposed for equipment staging and materials handling areas.

[1] Of the 58 willows to be removed in total, 53 are living. For the most part, the willows are small in size: of the living trees, only 19 have a diameter at breast height (dbh) of 6-inches or larger.
[2] The total of 12 Live Oak and Valley Oak trees to be removed range in size from 3 to 20 inches dbh.
[3] The two Eucalyptus trees to be removed are 4 and 7 inches dbh.
[4] The two London Plane trees to be removed are 6 and 10 inches dbh.

C. Mitigation Measures and Site Restoration

Excavation of the drainage channels will temporarily impact the wetland and riparian habitat there and will permanently remove existing vegetation within the excavation footprint. However, these impacts will be mitigated by "minimizing impacts by limiting the degree or magnitude of the action" and "repairing, rehabilitating, or restoring the impacted environment." (Cal. Code Regs., tit. 14, § 15370, subds. (c) and (d). To minimize potential impacts, both excavation and restoration will be conducted during summer months, when the flow in all the channels is at its lowest.

Following completion of the excavation and confirmation sampling, the following restoration actions will be implemented:

- Excavated areas will be backfilled with clean import fill and regraded to restore the drainage patterns.

- Permanent erosion control measures will be constructed in backfilled areas, including replacement of rip-rap in approximately 60 feet of the upper IR-6 drainage channel and the upper 75 feet of the IR-8 drainage channel.

- Temporary erosion control measures will be put in place during and after the project, including placement of biodegradable coconut fiber netting in the channels and straw wattles on slopes to prevent erosion until vegetation is re-established.

The following mitigation measures will be implemented:

- Avoidance and minimization measures will be implemented during Project field activities in accordance with U.S. Fish and Wildlife Service's *Programmatic Biological Opinion for Issuance of Permits for Projects that May Affect the Threatened California Red-Legged Frog in Nine San Francisco Bay Area Counties, California* (USFWS, 2014).

- Rip rap along 75 feet of IR-8 will be removed and restored to an earthen-bottom channel. The restored channel reach will have more gradually sloped banks to facilitate riparian vegetation growth and to reduce stormwater velocities during large storm events, reducing erosion.

- Affected wetland areas in the IR-8 drainage channel will be replanted with cattails.

- Affected riparian areas in the IR-8 drainage channel and IR-6/8 confluence area will be replanted with willows. The 58 willows to be removed willows will be replaced with 86 willow cuttings (HTH, 2017c). Survival will be monitored in accordance with the Restoration and Monitoring Plan (attached).

- Affected upland areas (including the IR-6 drainage channel) will be replanted with grasses.

- A monitoring program will be implemented to document habitat restoration.

These mitigation activities are discussed in more detail in the attached Restoration and Monitoring Plan.

D. Net Environmental Benefit

The positive long-term benefits of the Project are anticipated to outweigh its temporary adverse impacts. The Project's primary benefit will be to remove soil containing PCBs from the drainages. In addition, the Project will restore and improve the channels' dual function as a stormwater drainage and wetland, riparian, and upland habitat because the project will replace some hardscape (an OWS and a portion of existing rip-rap) with vegetated earthen channels. Revegetation will use native cattails, willows, and grasses.

IV. Environmental Factors Potentially Affected

The environmental factors checked below (if any) would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture and Forestry Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology /Soils
☐ Greenhouse Gas Emissions	☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality
☐ Land Use / Planning	☐ Mineral Resources	☐ Noise
☐ Population / Housing	☐ Public Services	☐ Recreation
☐ Transportation/Traffic	☐ Tribal Cultural Resources	☐ Utilities / Service Systems
☐ Mandatory Findings of Significance		

DETERMINATION

On the basis of this initial evaluation:

☐	I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
☒	I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
☐	I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
☐	I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.
☐	I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature Date

Signature Date

EVALUATION OF ENVIRONMENTAL IMPACTS

1. AESTHETICS – Would the Project:

a) Have a substantial adverse effect on a scenic vista?

Evaluation: The project area is not part of a scenic vista.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Evaluation: Interstate 280 west of the project area is a designated scenic highway. However, there will be not be damage to scenic resources. The Project area is approximately 500 to 900 feet west of the highway and approximately 20 to 30 feet lower in elevation, so the Project area is not readily visible from the highway due to distance and topography. Also, the trees nearest the highway (on the west side of the IR-8 drainage channel) will not be removed for the Project, thus preserving any existing visual presence from the highway.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

c) Substantially degrade the existing visual character or quality of the site and its surroundings?

Evaluation: There will be short term impacts that will degrade the existing visual character or quality of the site, primarily due to the removal of vegetation and construction activities. These impacts are not anticipated to be significant because they are temporary and localized in nature. Restoration activities are expected to restore or enhance the visual character of the site.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☒ Less Than Significant Impact
☐ No Impact

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Evaluation: No new source of light is included in the Project.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

2. AGRICULTURE AND FOREST RESOURCES – Would the Project:

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use?

Evaluation: The Project area is within land designated as Grazing Land under the Farmland Mapping and Monitoring Program, and is not within Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (CDC, 2016).

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?

Evaluation: The Project area is not zoned for agricultural use, and is not within a Williamson Act contract area.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

Evaluation: The Project area is not zoned as forest land, timberland, or Timberland Production.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

3. AIR QUALITY - Would the project:

a) Conflict with or obstruct implementation of the applicable air quality plan?

Evaluation: The Project construction activities will not conflict with applicable air quality plans or regulations. The Project does not include excavating contaminated soil with over 50 parts per million (ppm) of organic compounds, and therefore is not subject to Bay Area Air Quality Management District (BAAQMD) Regulation 8 Rule 40 (Aeration of Contaminated Soil and Removal of Underground Storage Tanks) or other BAAQMD regulations.

Construction-related activities generate criteria air pollutants including carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM_{10}, and $PM_{2.5}$), ozone precursor emissions such as reactive organic gases (ROG) and oxides of nitrogen (NO_x); and greenhouse gases (GHGs). Sources of these emissions include on-road haul trucks, delivery trucks, worker motor vehicles, and off-road excavation and loading equipment. Sources of fugitive dust emissions could include construction-related activities such as soil excavation and loading, and soil hauling. The OWS to be demolished and removed has been determined to not contain asbestos, so there are no potential asbestos emissions during the Project.

BAAQMD CEQA Guidelines (BAAQMD, 2012) recommend that all construction projects implement "Basic Construction Mitigation Measures" listed in Table 8-1 of those guidelines to mitigate emissions of criteria pollutants and ozone precursors. The Table 8-1 Basic Construction Mitigation Measures are (BAAQMD, 2012) are copied below:

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
4. All vehicle speeds on unpaved roads shall be limited to 15 mph.
5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator.

8. Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

The applicable elements of the BAAQMD's "Basic Construction Mitigation Measures" will be utilized on the Project. The Project is expected to include approximately two small backhoes or excavators, two to four off-road haul trucks for moving excavated soil and fill, a loader, a small dozer for grading during restoration, on-road trucks for soil transportation (approximately 130 loads each of excavated soil and imported fill spread out over two months), and support equipment. This Project will not lead to any long-term increase in emissions, such as an increase in vehicle trips from a new development. With the limited amount of equipment, a project duration of approximately two months, and no increase in long-term emissions, this Project is smaller than many construction projects in the Bay Area and the "Basic Construction Mitigation Measures" are considered sufficient to assure the construction-related emissions on this Project are less than significant.

☐ Potentially Significant Impact
☒ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☐ No Impact.

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?

Evaluation: See evaluation for Question 3a, above. Based on that evaluation, the Project is not expected to have a significant impact on any air quality standard or contribute substantially to an existing or projected air quality violation.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☒ Less Than Significant Impact
☐ No Impact

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

Evaluation: See evaluation for Question 3a, above. Based on that evaluation, the Project will not have a significant impact on any air quality standard.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☒ Less Than Significant Impact
☐ No Impact

d) Expose sensitive receptors to substantial pollutant concentrations?

Evaluation: We do not expect the Project to generate substantial pollutant concentrations, and there are no sensitive receptors, near the Project area. Adjacent property includes SLAC itself and open areas at the PVTC used for horse riding and grazing. With standard dust controls during soil excavation, fugitive dusts are not expected to reach the adjacent properties.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

e) Create objectionable odors affecting a substantial number of people?

Evaluation: The Project construction activities are not expected to create objectionable odors.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

4. BIOLOGICAL RESOURCES - Would the project:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

Evaluation: A wetland delineation report (HTH, 2017b), biological assessment (HTH, 2017a), and restoration and monitoring plan (HTH, 2017c) have been prepared for the Project. As described in those reports, the proposed project site includes wetland areas (~0.02 acre) along the IR-8 drainage that provide marginally suitable aquatic habitat for the California red-legged frog (*Rana draytonii*), which is listed as a threatened species under the federal Endangered Species Act, and surrounding riparian and annual grassland habitats support upland habitat for this species. The San Francisco Dusky-footed woodrat (*Neotoma fuscipes annectens*) (a state species of special concern) is present within the Project site, and the western pond turtle (*Actinemys marmorata*) (a state species of special concern) has the potential to occur within the project area. The California tiger salamander (*Ambystoma californiense*) (a state endangered species) was determined to be absent.

California red-legged frogs are known to occur in San Francisquito Creek approximately 0.5 mile south of the site; however, the project site is not considered occupied habitat under the Stanford *Habitat Conservation Plan* (Stanford, 2013). No California red-legged frogs were observed in the IR-8 drainage during surveys conducted in 1998 (Stanford, 1998), 2005 (Stanford, 2005), 2006/2007 (SLAC, 2007b), 2009 (Stanford, 2009), and 2016 (HTH, 2017a), and multiple barriers to dispersal (e.g., Interstate 280, the SLAC development and facilities, and a major equestrian training center) are present between the site and areas known to support the

species. Although frogs have not been observed in IR-8 and they are not likely to occur on the project site, the site is within potential dispersal distances from occupied areas, and there is a small chance that a transient red-legged frog could disperse through IR-8 and into the project site. In this unlikely event, an individual red-legged frog could be encountered during project implementation. Therefore, the project will implement measures to avoid or minimize potential effects on California red-legged frogs consistent with the U. S. Fish and Wildlife Service's *Programmatic Biological Opinion for Issuance of Permits for Projects that May Affect the Threatened California Red-Legged Frog in Nine San Francisco Bay Area Counties, California* (USFWS, 2014). Mitigation measures for the red-legged frog include a pre-construction survey by a qualified biologist, 5-foot tall orange plastic fencing to restrict frog access to the project area, protection of any frogs observed during the work, restoration with native plant species collected on-site or from local sources, and other measures described in the Programmatic Biological Opinion (USFWS, 2014). Implementation of these mitigation measures would reduce potential project impacts on California red-legged frog to a *less-than-significant* level, as defined by the CEQA Guidelines.

The same measures for avoidance and minimization implemented for the red-legged frog will also limit impacts for the San Francisco Dusky-footed woodrat and western pond turtle. Implementation of these mitigation measures would reduce potential project impacts on a Francisco Dusky-footed woodrat and western pond turtle to a *less-than-significant* level, as defined by the CEQA Guidelines.

☐ Potentially Significant Impact
☒ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☐ No Impact

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?

Evaluation: The Project will temporarily remove riparian vegetation in the IR-8 drainage channel and IR-6/8 confluence area, which will be replaced in equal or larger amount in the rainy season following the excavation with willow plantings. The willow plantings and full restoration details are described in the Restoration and Monitoring Plan (HTH, 2017c), and include planting approximately 86 new willow cuttings within the Project's riparian area to replace approximately 19 living willows that have a dbh of 6- to 12-inches and will be removed for the Project. The willow planting will provide a continuous riparian corridor in the Project area, within the existing IR-8 drainage channel riparian corridor. Implementation of this mitigation measure is expected to reduce potential project impacts on riparian habitat to a *less-than-significant* level, as defined by the CEQA Guidelines.

☐ Potentially Significant Impact
☒ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☐ No Impact

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Evaluation: The Project will temporarily remove wetland vegetation in the IR-8 drainage channel, which will be replaced in equal or larger amount following the excavation with cattail plantings in the same area as existing wetland vegetation. The cattail plantings and full restoration details are described in the Restoration and Monitoring Plan (HTH, 2017c), and include planting approximately 63 new cattail plugs within the Project's wetland areas to replace cattails removed for the Project. Implementation of this mitigation measures is expected to reduce potential project impacts on wetlands to a *less-than-significant* level, as defined by the CEQA Guidelines.

☐ Potentially Significant Impact
☒ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☐ No Impact

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Evaluation: As described in the Restoration and Monitoring Plan (HTH, 2017c), the IR-8 drainage does not support native resident or migratory fish as culverts act as barriers to fish. In addition, due to the small size and isolation of the Project area, the presence of existing fences, infrastructure and other development in close proximity to the work site, the work conducted within the IR-6 and IR-8 drainages is not expected to interfere with the movement of any wildlife species.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

Evaluation: The proposed project will not conflict with any local policies ordinances; Stanford lands do not fall within the tree ordinances of Menlo Park or the County of San Mateo.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Evaluation: No Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan covers the Project Area. The Stanford *Habitat Conservation Plan* (Stanford, 2013) does not include the Project area.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

5. CULTURAL RESOURCES - Would the project:

a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?

Evaluation: The Project area does not include any known historical resource as defined in §15064.5.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

Evaluation: The Project area does not include any known archaeological resource pursuant to §15064.5. If any historic or prehistoric cultural artifacts are encountered during site disturbance, all ground disturbance within 100 feet of the find shall be halted until the San Francisco Bay Regional Water Quality Control Board (Water Board) is notified, and a qualified archaeologist can identify and evaluate the resource(s) and, if necessary, recommend mitigation measures to document and prevent any significant adverse effects on the resource(s). Indicators of archaeological resources could include items of ceramic, glass, or metal, and could include building foundations. Prehistoric indicators could include chipped chert and obsidian tools and tool manufacture waste flakes; grinding and hammering implements; or locally darkened soil.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Evaluation: No known unique paleontological resource or site or unique geologic feature is identified in the Project area. If any paleontological resources are encountered during site grading or other construction activities, all ground disturbance shall be halted until the services

of a qualified paleontologist can be retained to identify and evaluate the scientific value of the resource(s) and, if necessary, recommend mitigation measures to document and prevent any significant adverse effects on the resource(s). Significant paleontological resources shall be salvaged and deposited in an accredited and permanent scientific institution, such as the University of California Museum of Paleontology (UCMP).

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

d) Disturb any human remains, including those interred outside of formal cemeteries?

Evaluation: No human remains are known to be present in the Project area or have been observed during prior sampling or excavation activities in the Project area. In the event that any human remains are encountered during site disturbance, all ground-disturbing work shall cease immediately and a qualified archaeologist shall notify the Coroner's Division of the San Mateo County Office of the Sheriff and advise that office as to whether the remains are likely to be prehistoric or historic period in date. If determined to be prehistoric, the Coroner's Division will notify the Native American Heritage Commission of the find, which, in turn, will then appoint a "Most Likely Descendant" (MLD). The MLD in consultation with the archaeological consultant and the project sponsor, shall advise and help formulate an appropriate plan for treatment of the remains, which might include recordation, removal, and scientific study of the remains and any associated artifacts. After completion of analysis and preparation of the report of findings, the remains and associated grave goods shall be returned to the MLD for reburial.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

6. GEOLOGY AND SOILS -- Would the project:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) **Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.**
ii) **Strong seismic ground shaking?**
iii) **Seismic-related ground failure, including liquefaction?**
iv) **Landslides?**

Evaluation: No structures are present or planned to be constructed in the Project area, and the Project area is not occupied. For construction workers during the project, due to the limited and

shallow scope of the excavation and the absence of structures, the geologic/seismic hazards, if any, would not present a significant risk.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

b) Result in substantial soil erosion or the loss of topsoil?

Evaluation: Soil that is to be excavated in the Project area will be replaced with imported fill and topsoil. Erosion control measures, such as replacement of rip-rap, and coconut fiber netting and straw wattles in other areas, will prevent soil erosion in excavated areas. In addition, the riparian, upland, and wetland areas will be revegetated, providing further erosion control function. Implementation of this mitigation measure is expected to reduce the potential for erosion to a *less-than-significant* level, as defined by the CEQA Guidelines.

☐ Potentially Significant Impact
☒ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☐ No Impact

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

Evaluation: The Project does not involve constructing any structures on soil or alteration of the geologic unit.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

Evaluation: The Project does not involve constructing any structures on soil.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

Evaluation: Septic tanks or other wastewater disposal is not required for the Project.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

7. GREENHOUSE GAS EMISSIONS - Would the project:

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Evaluation: Limited greenhouse gas (GHG) emissions will occur directly during the Project in the form of carbon dioxide (CO_2) from combustion of diesel fuel in construction equipment and transportation vehicles. This evaluation uses a qualitative approach in accordance with Section 15064.4(a)(2) of the CEQA Guidelines. The GHG emissions during Project excavation and restoration activities would not be a considerable contribution to the cumulative GHG impact, given that the work would be temporary (approximately 2 months) and would be less intensive than traditional land use development that requires a larger fleet of earthmoving equipment and soil off hauling. Therefore, the impact to GHG emissions during the Project would be less than significant. Following excavation and restoration, the Project will not result in a new source of GHG emissions as no new facilities are being constructed, so the Project will not induce population growth in the area, increase vehicle trips, or increase energy or electricity consumption. In addition, enhanced revegetated areas will absorb carbon dioxide from the environment. Therefore, no long-term impact to GHG emissions would occur.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☒ Less Than Significant Impact
☐ No Impact

b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Evaluation: There is currently no applicable federal, State, or local threshold pertaining to construction related greenhouse gas (GHG) emissions, and the BAAQMD CEQA Guidelines (BAAQMD, 2012) do not include screening criteria or significance thresholds for construction. Therefore, this evaluation uses a qualitative approach in accordance with Section 15064.4(a)(2) of the CEQA Guidelines. The Project would result in a temporary increase in GHG emissions during excavation and restoration from the use of construction equipment and haul trucks. However, Project emissions during excavation and restoration would not be a considerable contribution to the cumulative GHG impact, given that the work would be temporary (approximately 2 months) and would be less intensive than traditional land use development that requires a larger fleet of earthmoving equipment and soil off hauling. Therefore, the impact to GHG emissions during the Project would be less than significant. Following excavation and restoration, the Project will not result in a new source of GHG emissions as no new facilities are being constructed, so the Project will not induce population growth in the area, increase vehicle trips, or increase energy or electricity consumption. Therefore, no long-term impact to GHG emissions would occur.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

8. HAZARDS AND HAZARDOUS MATERIALS - Would the project:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

Evaluation: The Project involves the transport of soil that is excavated from the Project area and contains PCBs. The excavated soil is not classified as a hazardous waste. The soil will be transported on public roads to a permitted disposal facility. The transport route near SLAC is a short trip on Alpine Road and/or Sand Hill Road, from which transport will occur along major thoroughfares. The truck beds with the soil will be covered during transportation to prevent soil particle losses to the air during transport. This activity will not cause a significant hazard to the public or the environment during transport, as such transport of impacted soil and disposal in a permitted landfill is standard practice and will not result in exposure of the public to the soil or the PCBs in the soil.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☒ Less Than Significant Impact
☐ No Impact

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

Evaluation: The excavated soils will be solid, non-flammable, non-corrosive and non-explosive. Temporary on-site stockpiles of excavated are not accessible by the public and will be covered if left overnight. A site-specific Stormwater Pollution Prevention Plan (SWPPP) will be prepared for the Project to describe and implement measures to reduce potential for spills, properly contain and address any spills that may occur, and address erosion and runoff control measures to protect the environment in the event of rain during the Project. The transportation of soil and debris will be accomplished using end-dump tractor-trailer trucks or roll-off trucks, and in the unlikely event of an accident during transportation where soil spills to the ground, such an accident would not present a significant health risk or environmental threat because the soil is a solid that would remain where spilled, and the spilled soil would be re-loaded and transported to the landfill. The excavated soil will be transported in accordance with state and federal requirements for the handling and transportation of hazardous materials. Transport will occur along major thoroughfares outside of SLAC. Based on these activities, the Project will not create a significant hazard to the public due to foreseeable upset or accident conditions resulting in a release of hazardous substances.

☐ Potentially Significant Impact
☒ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☐ No Impact

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

Evaluation: There are no existing or proposed schools within one-quarter mile of the Project area. Although the project is located on Stanford University property, the project is approximately two miles from Stanford classroom buildings and is not expected to generate hazardous emissions. As described in section 3(d) above, we do not expect the Project to generate substantial pollutant concentrations. With standard dust controls during soil excavation, fugitive dusts containing PCBs are not expected to reach the adjacent properties. Implementation of these dust control measures is expected to reduce the potential impacts of hazardous emissions to less than significant levels.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

Evaluation: The Project is located within property that is subject to Cleanup and Abatement Order R2-2009-0072 for SLAC. The Project is being performed to comply with the cleanup requirements of that Order and to reduce the hazard to human health and the environment. Since the Project will reduce the potential hazard, rather than create a hazard to the public or the environment, the "No Impact" determination is selected.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

Evaluation: The Project is not located within an airport land use plan or within two miles of a public airport or public use airport.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

Evaluation: The Project is not located in the vicinity of a private airstrip.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

Evaluation: The Project area consists of two drainage channels that do not cross roadways or any other pathway for emergency response or evacuation.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

Evaluation: Limited vegetation will be removed and replaced as part of the Project. This will have no impact on wildland fire conditions.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

9. HYDROLOGY AND WATER QUALITY - Would the project:

a) Violate any water quality standards or waste discharge requirements?

Evaluation: SLAC has demonstrated that PCBs in stormwater from the IR-6 and IR-8 drainages are not impacting water quality in San Francisco Creek, based on a risk assessment performed by SLAC and approved by Water Board (SLAC, 2014). Therefore, the project purpose is focused on removing soil with residual PCBs to improve soil quality.

The Project will not significantly affect groundwater or surface water bodies. The excavations are not to a depth that would encounter groundwater. Stormwater from SLAC flows through the IR-6 and IR-8 drainage channels during storm events in the rainy season, so no stormwater flow is expected during the Project which is planned for summer months. Stormwater diversion around the excavation areas will be provided during construction to prevent soil erosion and

transport downstream in the event of an unseasonable small storm during the Project, and diversion is planned in IR-8 to convey the flow from SLAC tunnel sub-drains that is pumped into the channel year-round. In the unlikely event of a large storm during the Project, excavated areas will be temporarily lined with secured plastic sheeting during the storm to prevent erosion and sediment runoff. Following excavation, the excavated portions of the drainage channels will be restored with imported fill, and erosion controls consisting of rip-rap, secured coconut fiber netting and straw wattles, and revegetation as applicable will prevent long-term erosion.

☐ Potentially Significant Impact
☒ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☐ No Impact

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

Evaluation: The Project involves excavation in shallow soils above the groundwater table, and therefore will not affect groundwater supplies.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

Evaluation: The Project will not affect the drainage pattern of the Project area or the upstream stormwater catchment areas for the IR-6 and IR-8 drainage channels in a manner that will result in erosion or siltation on- or off-site. The Project includes excavating portions of the IR-6 and IR-8 drainage channels and then restoring the drainage patterns to substantially the same grade and course as prior to the excavation. The IR-6 drainages will be restored to the existing shallow V-channel shape with an earthen berm separating the primary and secondary channels. Cross sections for the restoration of the IR-8 channel are shown on Sheet G-6 in the Construction Plans. The excavated portions of the IR-8 drainage channel will be restored in a manner such that the channel slopes on either side of the channel base for the perennial low flow conditions are flatter than some of the existing side slopes. The slope flattening will allow larger stormwater flows to spread, reducing stormwater flow velocities and thus reducing the potential for erosion. The flatter channel slopes near the perennial water flow channel will also facilitate riparian vegetation growth, and thus is expected to be an environmental benefit.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

Evaluation: See Item (c) above. The Project will not affect the drainage pattern of the Project area or the upstream stormwater catchment areas for the IR-6 and IR-8 drainage channels in a manner that will result in flooding on- or off-site. Also, the Project does not include work in areas upstream of the drainage channels, and therefore will not affect the amount of surface runoff.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Evaluation: The Project does not include work in areas upstream of the drainage channels, and therefore will not affect the amount of surface runoff.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

f) Otherwise substantially degrade water quality?

Evaluation: The Project is not expected to significantly affect water quality. See evaluation for Question 9a, above.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☒ Less Than Significant Impact
☐ No Impact

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

Evaluation: The Project does not include housing.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

Evaluation: The Project does not include any structures.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

Evaluation: The Project does not involve placing people or structures in a new area, or modifying any levee or dam.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

j) Inundation by seiche, tsunami, or mudflow?

Evaluation: The Project is not in an area subject to seiche, tsunami, or mudflow.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

10. <u>LAND USE AND PLANNING Would the project:</u>

a) Physically divide an established community?

Evaluation: The Project will not change the land use or construct any barriers between communities.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan,

local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Evaluation: The Project is not changing the land use, and therefore is not in conflict with any land use policies, zoning, or regulations regarding land use.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

Evaluation: The Project area is not within the boundary of the Stanford *Habitat Conservation Plan* (Stanford, 2013) or any other natural community conservation plan.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

11. MINERAL RESOURCES - Would the project:

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

Evaluation: Shallow excavation of approximately 5 feet or less for the Project will have no impact on mineral resources, and there are no known mineral resources identified in the Project area.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

Evaluation: Shallow excavation of approximately 5 feet or less for the Project will have no impact on mineral resources, and there are no known mineral resources identified in the Project area.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

12. NOISE -- Would the project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Evaluation: San Mateo County noise regulations are provided in §4.88 of the San Mateo County Code of Ordinances (Noise Control). Specific outdoor noise limits are provided only for residences, schools, hospitals, churches, and public library properties (§4.88.330), none of which is adjoining the Project area. Section 4.88.350 (General Noise Regulation) makes it unlawful to willfully or negligently create noise "which causes any discomfort or annoyance to any person of normal sensitivity residing in the area." The proposed Project is exempt from the noise ordinance, as §4.88.360(e) provides an exemption for noise sources associated with demolition, construction, repair, remodeling, or grading (e.g., excavation) during the hours of 7 AM to 6 PM weekdays and 9 AM to 5 PM on Saturdays. The Project work is planned to take place during those hours. Noise will be limited to standard construction equipment and trucks during daytime working hours. Similar excavation has been performed in the IR-6 drainage channel, adjacent to the PVTC horse track, without any noise concerns raised by the PVTC.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Evaluation: There are no nearby structures that would be affected by limited groundborne vibration associated with soil excavation and backfill operations, and no excessive groundborne noise with the Project.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

Evaluation: There will be no permanent change in noise levels associated with the Project, as no new structures or facilities are being constructed.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Evaluation: Some noise will be generated temporarily during the Project from construction equipment and trucks. Noise will be limited to normal working hours and will be similar to typical workday noise in commercial areas and is not expected to be a significant impact on surrounding properties. Similar excavation has been performed in the IR-6 drainage channel, adjacent to the PVTC horse track, without any noise concerns raised by the PVTC.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☒ Less Than Significant Impact
☐ No Impact

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

Evaluation: The Project is not located within an airport land use plan or within two miles of a public airport or public use airport.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

Evaluation: The Project is not located within the vicinity of a private airstrip.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

13. POPULATION AND HOUSING – Would the project:

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

Evaluation: The Project includes no new homes or infrastructure, and thus will have no impact on population growth.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

Evaluation: The Project will have no impact on existing housing.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

Evaluation: The Project will not displace any people.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

14. PUBLIC SERVICES

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

Fire protection?
Police protection?
Schools?
Parks?
Other public facilities?

Evaluation: The Project will not require any new governmental facilities or services or impact existing government services or facilities in any way.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

15. RECREATION

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

Evaluation: The Project will have no effect on use of recreational facilities.

- ☐ Potentially Significant Impact
- ☐ Less than Significant with Mitigation Incorporated
- ☐ Less Than Significant Impact
- ☒ No Impact

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

Evaluation: The Project will does not include or require recreational facilities.

- ☐ Potentially Significant Impact
- ☐ Less than Significant with Mitigation Incorporated
- ☐ Less Than Significant Impact
- ☒ No Impact

16. TRANSPORTATION/TRAFFIC – Would the project:

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

Evaluation: The Project includes no changes to infrastructure or facilities and thus will have no impact on transportation or traffic.

- ☐ Potentially Significant Impact
- ☐ Less than Significant with Mitigation Incorporated
- ☐ Less Than Significant Impact
- ☒ No Impact

b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

Evaluation: The Project includes no changes to infrastructure or facilities and thus will have no impact on traffic demand or congestion.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

Evaluation: The Project includes no changes to infrastructure or facilities and thus will have no impact on traffic patterns or traffic levels.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

Evaluation: The Project does not involve any changes to road designs. Existing roads will be used for transportation of excavated soil and fill material, which are routine and compatible uses of existing roadways.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

e) Result in inadequate emergency access?

Evaluation: The Project includes no changes to infrastructure or facilities and thus will have no impact on emergency access.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

Evaluation: The Project includes no changes to infrastructure or facilities and thus will have no impact on public transit, bicycle, or pedestrian facilities.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

17. TRIBAL CULTURAL RESOURCES

Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or

ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

Evaluation: The appropriate California Bay Area Native American Tribes have been notified of the planned scope of project. In response, other than one Tribe requesting to be informed of project progress, no Tribe responded with a request for consultation. In addition, as part of addressing Section 106 of the Historical Preservation Act, a site-specific intensive cultural resources survey was conducted for the proposed project. A surface survey included visual and metal detector transects across slopes focusing on the central area of the main IR-8 channel, the eastern portion of the project area, and both the primary and secondary channels of IR-6. In addition, eight shovel test pits were excavated, and the test pit soils were screened through ¼" hardware cloth. No artifacts of any type were found in the surface surveys or in shovel test pits. Evidence of past soil disturbance was widespread in this area, further reducing the potential for any significant cultural resources. The survey findings concluded that project site has a very low probability of containing cultural deposits associated with Native American activities both within the project area or its immediate vicinity.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

18. UTILITIES AND SERVICE SYSTEMS - Would the project:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

Evaluation: The Project does not include, facilitate, or impact any discharges to wastewater treatment systems.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

Evaluation: The Project does not include any wastewater discharges and thus does not require construction or expansion of any wastewater treatment facilities.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

Evaluation: The Project will be performed within existing stormwater drainages, which will be restored following soil excavation to continue to serve as stormwater drainage pathways in substantially the same configuration and dimensions as pre-excavation. As shown in the channel restoration sections on Sheet G-6 in the Construction Plans, the side slopes of the IR-8 channel will be flattened within the excavated areas to reduce stormwater velocities to reduce erosion potential and to facilitate riparian vegetation growth, and thus is expected to be an environmental benefit. No new stormwater drainage facilities or expansion of existing facilities is required.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

Evaluation: Temporary water supply for dust control during the Project will be provided by existing SLAC water supplies. The Project does not create any new permanent water supply requirement. No new water supplies are necessary to serve the project.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

Evaluation: The Project does not create any demand for wastewater treatment.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

Evaluation: The Project includes disposing of excavated soil at a Class II permitted landfill, such as the Altamont landfill located at 10840 Altamont Pass Road in Livermore (Contra Costa County), California. The Altamont landfill has sufficient permitted capacity to receive the solid waste, and has accepted similar soil with PCBs from SLAC on past projects. An alternative Class II landfill permitted to accept the waste may also be selected during Project implementation.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

g) Comply with federal, state, and local statutes and regulations related to solid waste?

Evaluation: The Project is required to comply with federal, state, and local statutes and regulations related to solid waste. The primary element of compliance is to properly transport and dispose of excavated material at a permitted solid waste disposal landfill.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

19. MANDATORY FINDINGS OF SIGNIFICANCE

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

Evaluation: The purpose of the Project is to improve the quality of the environment by removing soil impacted by PCBs in the IR-6 and IR-8 drainage channels at SLAC and restore the Project area to existing conditions to continue to function as stormwater drainage pathways and wetland, riparian, and upland habitat. The project will have temporary impacts to riparian and wetland

vegetation but all disturbed areas will be restored on-site to their original condition, or better, following excavation as described above and in the Wetland Delineation Report (HTH, 2017b) and the Restoration and Monitoring Plan (HTH, 2017c). There are no fish in the Project area. The project will not substantially reduce wildlife populations below a self-sustaining level, and will not eliminate, reduce the number, or restrict the range of any special-status plant or wildlife population, as described above and in the Restoration and Monitoring Plan (HTH, 2017c).

☐ Potentially Significant Impact
☒ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☐ No Impact

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Evaluation: There will be no cumulative impacts. The Project is intended to provide the final cleanup of these drainage channels so that future excavations will not be required. If future excavations are required in the same area(s) for some reason, there would be no cumulative impacts because restoration would be provided following each event. There are no other currently planned Projects at SLAC that would have cumulative effects.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

Evaluation: The Project does not have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly. Persons outside the Project area will not be exposed to the PCB-containing soil that is being excavated and disposed at a regulated landfill. Project personnel are specifically trained to execute the scope of work and will utilize proper personal protective equipment to minimize any potential exposure to PCBs.

☐ Potentially Significant Impact
☐ Less than Significant with Mitigation Incorporated
☐ Less Than Significant Impact
☒ No Impact

Attachments

Figure 1 Regional Map
Figure 2 Location of IR-6 and IR-8 Drainage Channels
Figure 3 Proposed Excavation Areas at IR-6 and IR-8 Drainage Channels
Figure 4 Existing Vegetation and Proposed Excavation Areas at IR-6 and IR-8 Drainage Channels

Construction Plans: Environmental Cleanup of IR-6 and IR-8 Drainages, SLAC National Accelerator Laboratory, February 2017 (DRAFT)

Biological Assessment for the California Red-legged Frog

Preliminary Identification of Waters of the United States

Restoration and Monitoring Plan

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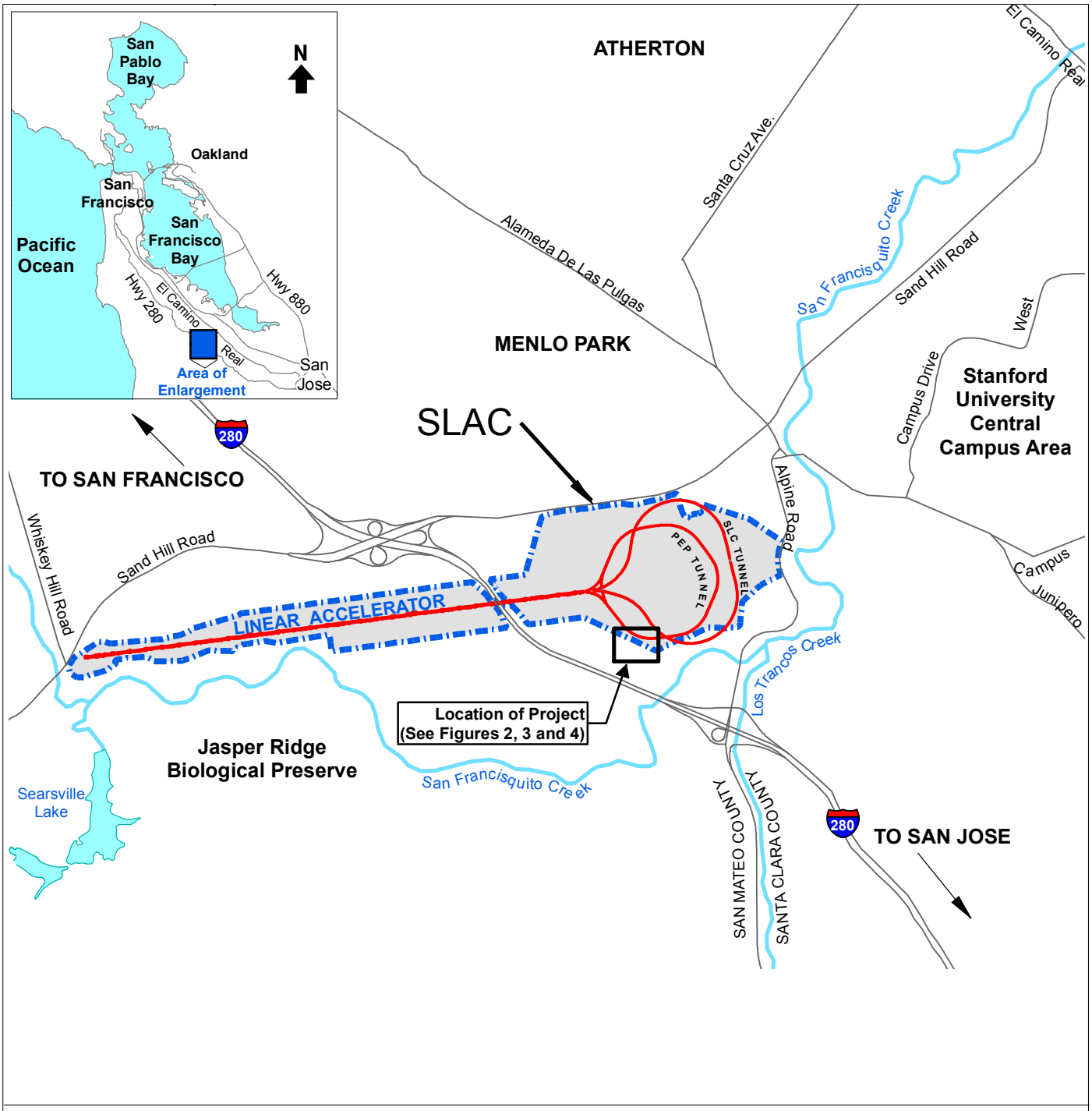
USFWS, 2014. *Programmatic Biological Opinion for Issuance of Permits for Projects under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, including Authorizations Under 22 Nationwide Permits, that May Affect the Threatened California Red-Legged Frog in Nine San Francisco Bay Area Counties, California.* United States Department of the Interior, Fish and Wildlife Service, Sacramento Fish and Wildlife Office, June 18, 2014.



Notes
1. All locations are approximate.

0 0.25 0.5 1
(Approximate Scale in Miles)

0 3000 6000
(Approximate Scale in Feet)

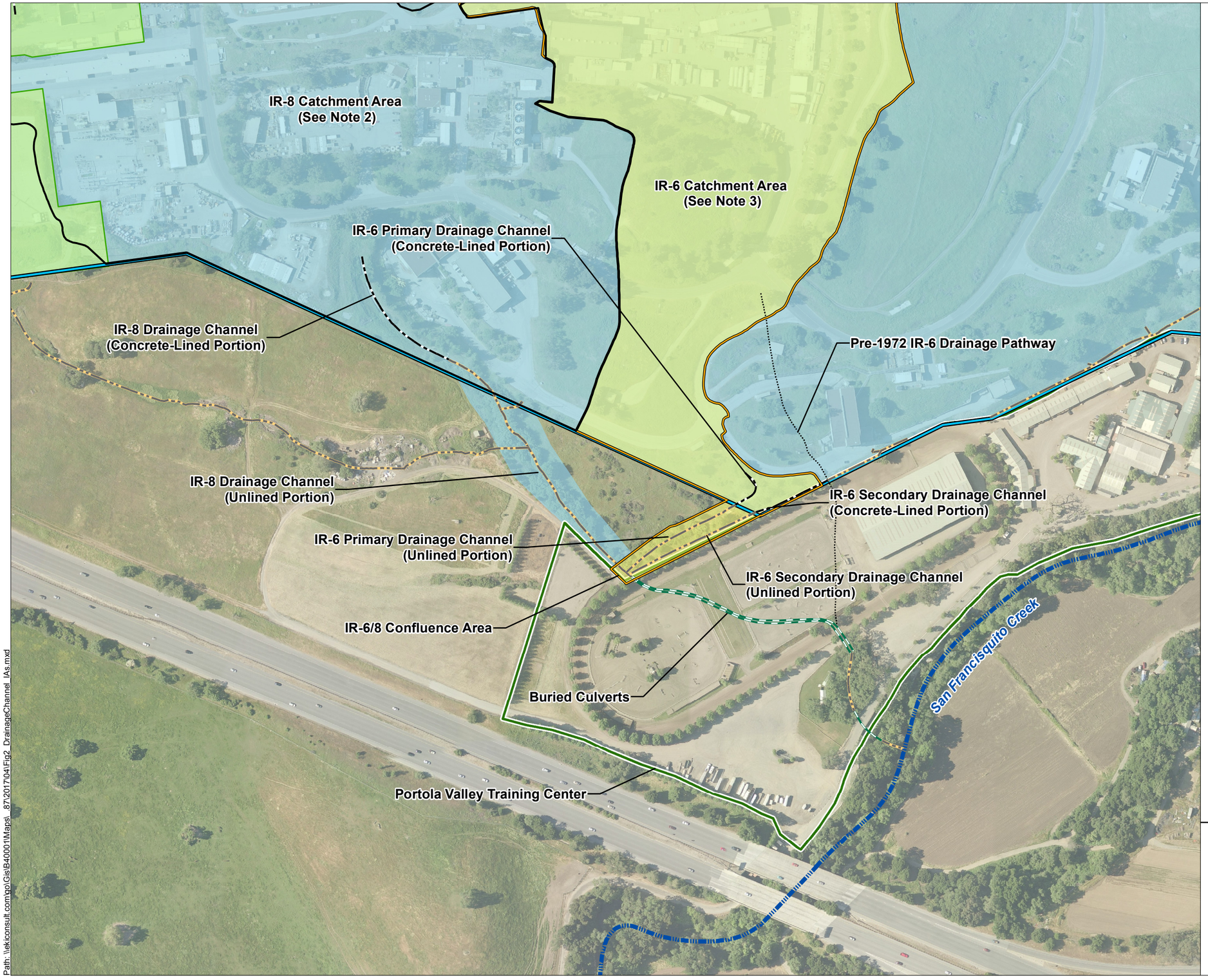
N

Erler & Kalinowski, Inc.

Regional Map

SLAC National Accelerator Laboratory
Menlo Park, CA
April 2017
EKI B40001.87
Figure 1

Path: \\ekiconsult.com\go\Gis\B40001\Maps_87\2017\04\Fig1_RegionalMap.mxd



0 250 500

(Approximate Scale in Feet)

N

Legend

- SLAC National Accelerator Laboratory
- Subunit
- Groundwater VOC OU
- Research Yard-SSRL / IR-6 Drainage Channel OU
- West SLAC / Campus Area / IR-8 Drainage Channel OU
- Channel - Lined
- Channel - Unlined
- Creek
- Culvert

Abbreviations

IR	=	Interaction Region
OU	=	Operable Unit
SLAC	=	SLAC National Accelerator Laboratory
SSRL	=	Stanford Synchrotron Radiation Lightsource
VOC	=	volatile organic compound
West SLAC	=	West SLAC/ Campus Area/ IR-8 Drainage Channel

Notes

1. All locations are approximate.
2. The IR-8 Catchment Area is the area from which surface water runoff drains to the IR-8 drainage channel.
3. The IR-6 Catchment Area is the portion of the Research-Yard-SSRL/IR-6 OU upstream of the IR-6 drainage channel.

Sources

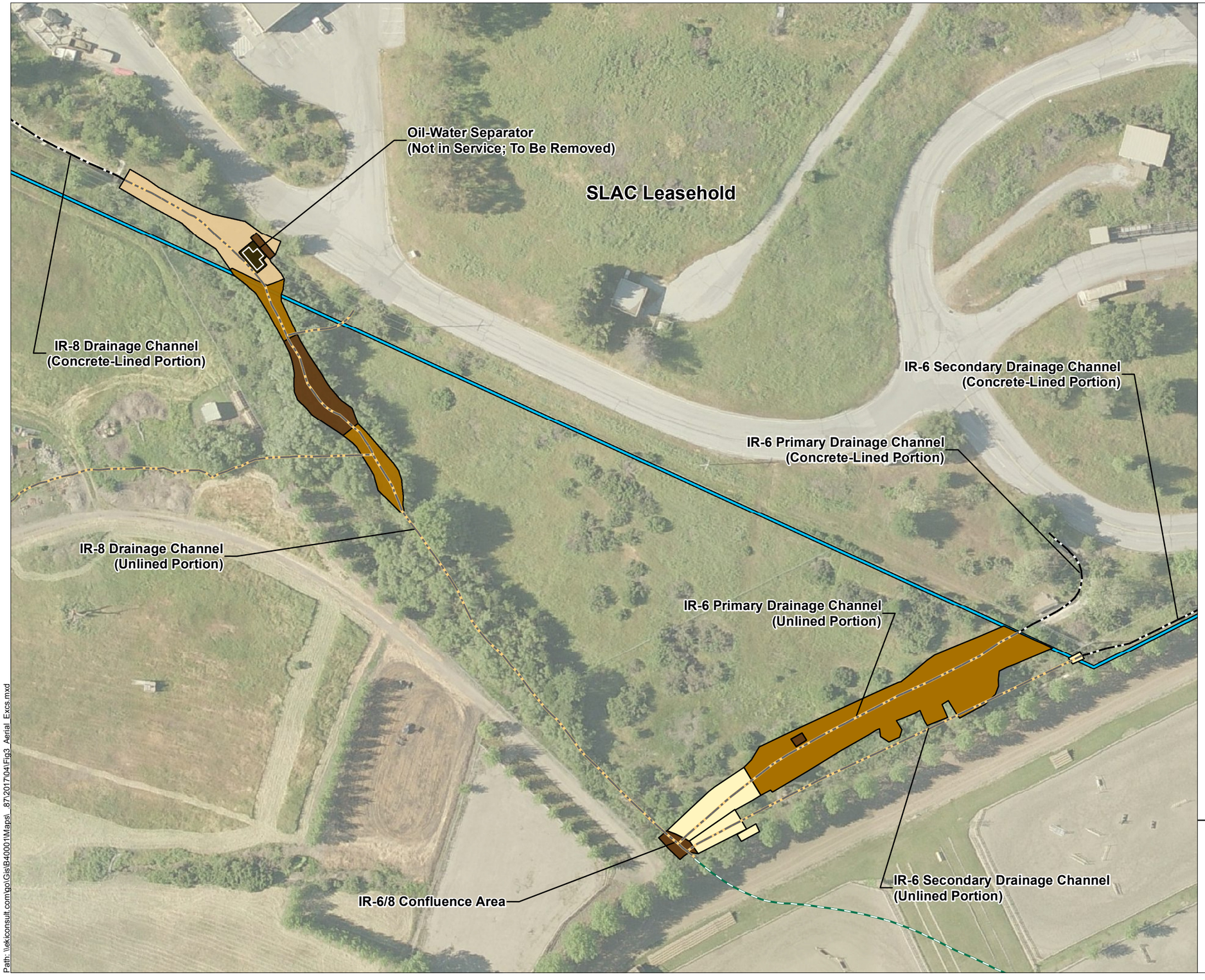
Aerial photograph provided by URS Corporation (March 2011), date unknown.

Erler & Kalinowski, Inc.

Location of IR-6 and IR-8 Drainage Channels

SLAC National Accelerator Laboratory
Menlo Park, CA
April 2017
EKI B40001.87
Figure 2

Path: \\ekiconsult.com\go\Gis\B40001\Maps_87\2017\041\Fig2_DrainageChannel_IAs.mxd



0 80 160

(Approximate Scale in Feet)

N

Legend

- SLAC National Accelerator Laboratory
- Channel - Lined
- Channel - Unlined
- Culvert

Planned Excavation Area

- 1 ft bgs
- 2 feet below rip-rap
- 2 ft bgs
- 3 ft bgs
- 5 ft bgs

Abbreviations

ft bgs = feet below ground surface
IR = Interaction Region
SLAC = SLAC National Accelerator Laboratory

Notes

1. All locations are approximate.

Sources

Aerial photograph provided by URS Corporation (March 2011), date unknown.

Erler & Kalinowski, Inc.

Proposed Excavation Areas at
IR-6 and IR-8 Drainage Channels

SLAC National Accelerator Laboratory
Menlo Park, CA
April 2017
EKI B40001.87
Figure 3

Path: \\ekiconsult.com\go\GIS\B40001\Maps_87\20170404\Fig3_Aerial_Excs.mxd

0 80 160

(Approximate Scale in Feet)

N

Legend

- SLAC National Accelerator Laboratory
- Channel
- Wetland
- Riparian Area

Planned Excavation Area

- 1 ft bgs
- 2 feet below rip-rap
- 2 ft bgs
- 3 ft bgs
- 5 ft bgs

Abbreviations
ft bgs = feet below ground surface
IR = Interaction Region
SLAC = SLAC National Accelerator Laboratory

Notes
1. All locations are approximate.

Sources
Aerial photograph provided by URS Corporation (March 2011), date unknown.

Erler & Kalinowski, Inc.

Existing Vegetation and Proposed Excavation Areas at IR-6 and IR-8 Drainage Channels

SLAC National Accelerator Laboratory
Menlo Park, CA
April 2017
EKI B40001.87
Figure 4

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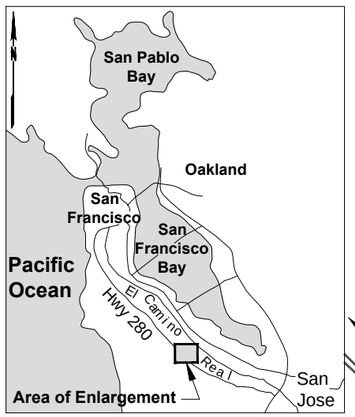
ENVIRONMENTAL CLEANUP OF IR-6 AND IR-8 DRAINAGE CHANNELS

SLAC NATIONAL ACCELERATOR LABORATORY
MENLO PARK, CALIFORNIA

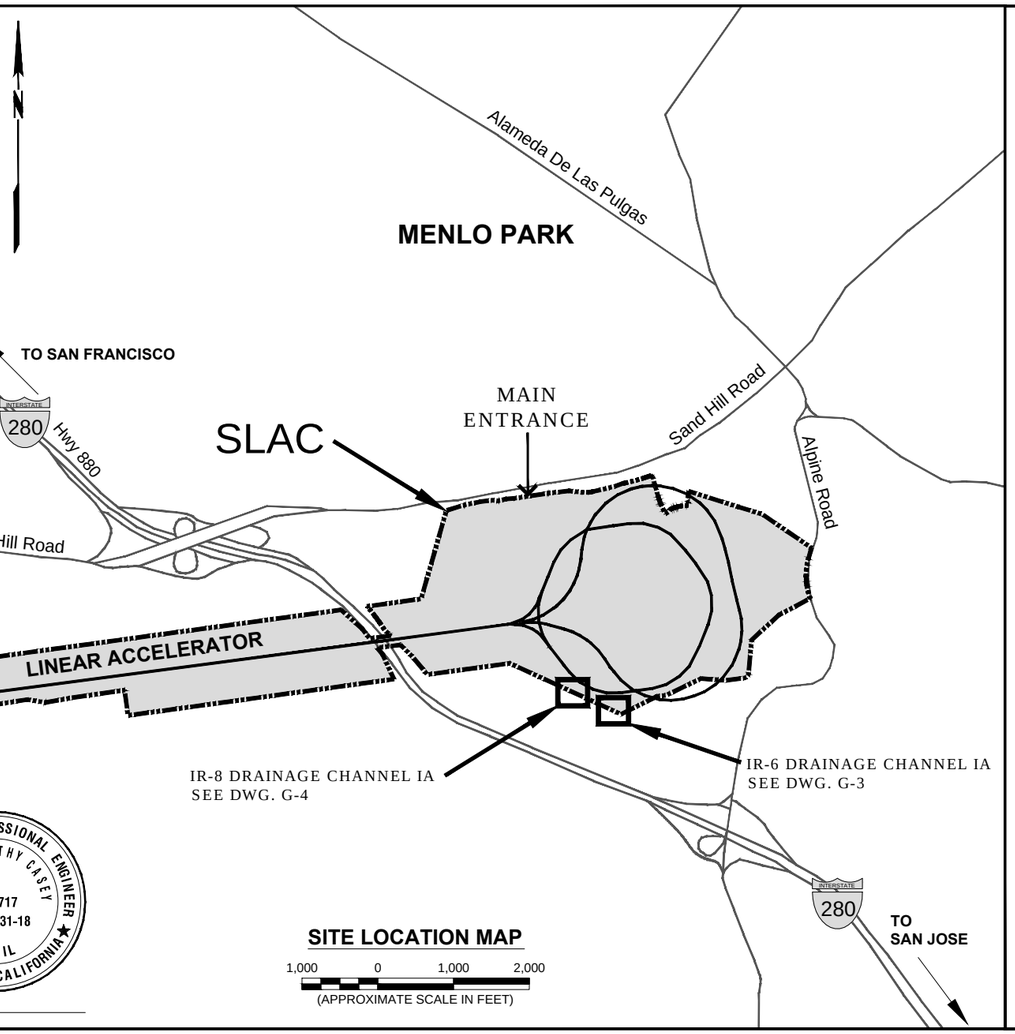
PREPARED BY

ERLER & KALINOWSKI, INC.



VICINITY MAP

(NOT TO SCALE)



SITE LOCATION MAP

1,000 0 1,000 2,000

(APPROXIMATE SCALE IN FEET)

REGISTERED PROFESSIONAL ENGINEER
JOHN THOMAS DE WITT
C 55468
EXP. 12-31-18
CIVIL
STATE OF CALIFORNIA

DATE SIGNED: _____

REGISTERED PROFESSIONAL ENGINEER
RYAN TIMOTHY CASEY
C 84717
EXP. 3-31-18
CIVIL
STATE OF CALIFORNIA

DATE SIGNED: _____

LIST OF DRAWINGS

G-1 TITLE SHEET, VICINITY MAP, AND SITE LOCATION MAP
G-2 SITE ACCESS AND ROUTING MAP
G-3 EXCAVATION PLAN - IR-6 DRAINAGE CHANNEL IA
G-4 EXCAVATION PLAN - IR-8 DRAINAGE CHANNEL IA
G-5 RESTORATION PLAN - IR-6 DRAINAGE CHANNEL IA
G-6 RESTORATION PLAN - IR-8 DRAINAGE CHANNEL IA
G-7 CONSTRUCTION BEST MANAGEMENT PRACTICES

GENERAL NOTES

1. ALL LOCATIONS ARE APPROXIMATE.
2. CONDUCT ALL WORK IN ACCORDANCE WITH SLAC EXCAVATION AND DEMOLITION PERMITS AND OTHER SLAC REQUIREMENTS.
3. WORK ON THIS PROJECT MAY BE HAZARDOUS. ALL ON-SITE PERSONNEL SHALL HAVE RECEIVED HEALTH AND SAFETY TRAINING AND MONITORING AS REQUIRED UNDER LAWS AND REGULATIONS, INCLUDING OSHA AND CAL-OSHA STANDARDS, AS WELL AS SLAC-SPECIFIC REQUIREMENTS.
4. SURVEY DATA WILL BE PROVIDED BY CLIENT. UNLESS OTHERWISE STATED BY CLIENT, VERTICAL ELEVATIONS ARE IN FEET AND THE VERTICAL DATUM FOR ELEVATIONS IS NAVD88.
5. INITIAL EXCAVATION LIMITS AND DEMOLITION EXTENTS WILL BE MARKED BY CLIENT REPRESENTATIVE. FINAL EXCAVATION EXTENTS WILL BE BASED ON CONFIRMATION SOIL SAMPLING RESULTS, AS DIRECTED BY CLIENT REPRESENTATIVE.
6. PROTECT ALL STORM DRAINS IN AND ADJACENT TO WORK AREAS AT ALL TIMES.
7. PROTECT ALL CONCRETE AND UNLINED DRAINAGE CHANNELS ADJACENT TO WORK AREAS.
8. OPERATE WATER DIVERSION INFRASTRUCTURE AT ALL TIMES DURING THE WORK, INCLUDING NON-WORKING HOURS. MAINTAIN DRY CONDITIONS WITHIN THE EXCAVATION AREAS AT ALL TIMES.
9. ALL FOOD SCRAPS, PAPER WRAPPERS, FOOD CONTAINERS, CANS, BOTTLES, AND OTHER TRASH SHALL BE DEPOSITED IN COVERED OR CLOSED TRASH CONTAINERS. NO PETS ARE ALLOWED AT THE SITE.
10. DAILY EXCAVATION ACTIVITIES MAY BEGIN NO LESS THAN 30 MINUTES AFTER SUNRISE, AND SHALL END NO LESS THAN 30 MINUTES BEFORE SUNSET.
11. CONTRACTOR SHALL CONTROL FOR DUST GENERATION DURING THE WORK, PER THE SPECIFICATIONS.

LEGEND AND REFERENCE SYMBOLS

- SLAC NATIONAL ACCELERATOR LABORATORY BOUNDARY
- 228 — TOPOGRAPHIC CONTOUR (1-FOOT INTERVAL)
- EXISTING FENCE
- XX — NEW FENCE SCREEN
- M-3 (2.0) — PLANNED EXCAVATION AREA WITH DEPTH (FT BGS)
- RIP-RAP
- STOCKPILE AREA
- AREA OF WORK
- ACCESS ROUTE
- CHANNEL CENTERLINE
- CONTROL POINT
- WATER DIVERSION PIPING

EXISTING UTILITIES:

- CA — COMPRESSED AIR
- FM — FORCE MAIN LINE
- SD — STORM DRAIN LINE
- VCP — VITRIFIED CLAY PIPE

ABBREVIATIONS

(E)	EXISTING
BMP	BEST MANAGEMENT PRACTICES
CAL-OSHA	CALIFORNIA DIVISION OF OCCUPATIONAL SAFETY AND HEALTH
CP	CONTROL POINT
CY	CUBIC YARDS
FM	FORCE MAIN
FT	FEET
FT BGS	FEET BELOW GROUND SURFACE
IA	INVESTIGATION AREA
IR	INTERACTION REGION
NAVD	NATIONAL GEODETIC VERTICAL DATUM
OWS	OIL-WATER SEPARATOR
PVC	POLYVINYL CHLORIDE
RA	REMOVAL ACTION
SD	STORM DRAIN
SF	SQUARE FEET
SSMH	SANITARY SEWER MANHOLE
(T)	TEMPORARY
(TYP)	TYPICAL
VCP	VITRIFIED CLAY PIPE

DRAFT

NOT FOR CONSTRUCTION

Erler & Kalinowski, Inc.
Consulting Engineers and Scientists
1870 OGDEN DRIVE
BURLINGAME, CALIFORNIA 94010-5306
(650) 292-9100 ♦ FAX (650) 552-9012

ENVIRONMENTAL CLEANUP OF IR-6 AND IR-8 DRAINAGE CHANNELS
SLAC NATIONAL ACCELERATOR LABORATORY, MENLO PARK, CA

TITLE SHEET, VICINITY MAP, AND SITE LOCATION MAP

							DATE
							APPRO
							DESCRIPTION
							REV

DATE: FEB2017
SCALE: AS SHOWN
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DESIGNED: RC
APPROVED: JTD
JOB NO.: B40001.85

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SHEET NUMBER

G-1

1 OF 7

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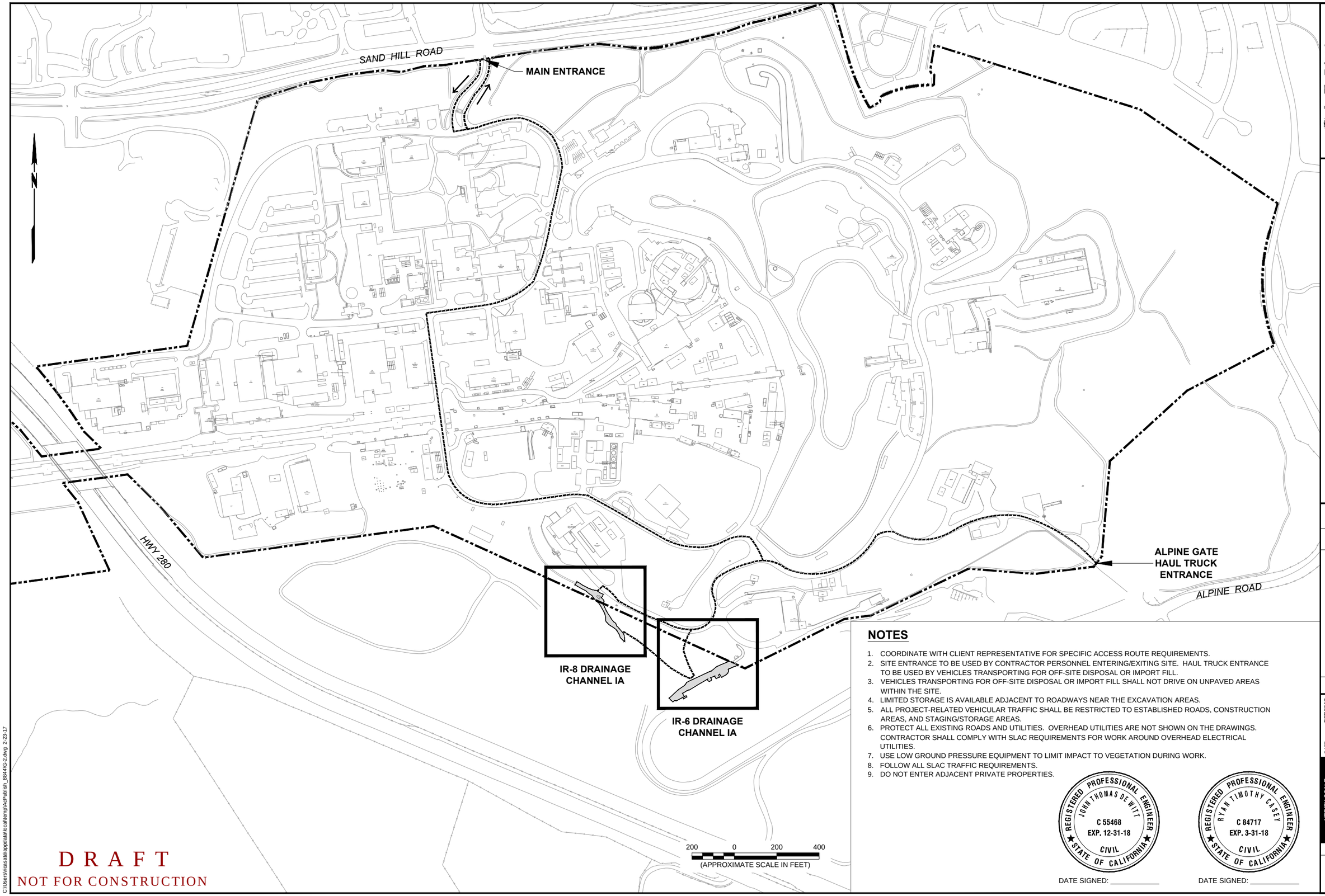

NOTES

1. COORDINATE WITH CLIENT REPRESENTATIVE FOR SPECIFIC ACCESS ROUTE REQUIREMENTS.
2. SITE ENTRANCE TO BE USED BY CONTRACTOR PERSONNEL ENTERING/EXITING SITE. HAUL TRUCK ENTRANCE TO BE USED BY VEHICLES TRANSPORTING FOR OFF-SITE DISPOSAL OR IMPORT FILL.
3. VEHICLES TRANSPORTING FOR OFF-SITE DISPOSAL OR IMPORT FILL SHALL NOT DRIVE ON UNPAVED AREAS WITHIN THE SITE.
4. LIMITED STORAGE IS AVAILABLE ADJACENT TO ROADWAYS NEAR THE EXCAVATION AREAS.
5. ALL PROJECT-RELATED VEHICULAR TRAFFIC SHALL BE RESTRICTED TO ESTABLISHED ROADS, CONSTRUCTION AREAS, AND STAGING/STORAGE AREAS.
6. PROTECT ALL EXISTING ROADS AND UTILITIES. OVERHEAD UTILITIES ARE NOT SHOWN ON THE DRAWINGS. CONTRACTOR SHALL COMPLY WITH SLAC REQUIREMENTS FOR WORK AROUND OVERHEAD ELECTRICAL UTILITIES.
7. USE LOW GROUND PRESSURE EQUIPMENT TO LIMIT IMPACT TO VEGETATION DURING WORK.
8. FOLLOW ALL SLAC TRAFFIC REQUIREMENTS.
9. DO NOT ENTER ADJACENT PRIVATE PROPERTIES.

REGISTERED PROFESSIONAL ENGINEER
JOHN THOMAS DE WITT
C 55468
EXP. 12-31-18
CIVIL
STATE OF CALIFORNIA

DATE SIGNED: _____

REGISTERED PROFESSIONAL ENGINEER
RYAN TIMOTHY CASEY
C 84717
EXP. 3-31-18
CIVIL
STATE OF CALIFORNIA

DATE SIGNED: _____

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Consulting Engineers and Scientists
1870 OGDEN DRIVE
BURLINGAME, CALIFORNIA 94010-5306
(650) 292-9100 ♦ FAX (650) 552-9012

ENVIRONMENTAL CLEANUP OF IR-6 AND IR-8 DRAINAGE CHANNELS
SLAC NATIONAL ACCELERATOR LABORATORY, MENLO PARK, CA

SITE ACCESS AND ROUTING MAP

	DESCRIPTION	APPRO	DATE
REV			

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SHEET NUMBER
G-2
2 OF 7

CP #9215

CP #9265

CP #189

STORAGE AND STOCKPILE AREA

HYDRODYNAMIC SEDIMENTATION UNIT (HSU) LOCATION (UNDERGROUND)

6" VCP

6" VCP

ACCESS TO SITE (SEE NOTE 7)

FENCE

PROTECT (E) CONCRETE CHANNEL

PROTECT (E) OWS

(T) PRIMARY WATER DIVERSION

PROTECT (E) FENCE

M-1 (1.0) (SEE NOTE 13)

OPTIONAL ACCESS ROUTE

FENCE

8" VCP

8" VCP

8" VCP

8" VCP

8" VCP

PROTECT (E) SSMH

M-3 (3.0)

M-2 (2.0)

MH91

(T) WATER DIVERSION PIPING ROUTE

(T) FENCE SCREEN (SEE NOTE 6)

(T) SUMP PIT

M-4 (1.0)

M-6 (1.0)

M-5 (1.0)

M-7 (3.0)

AREA OF WORK

(T) WATER DIVERSION PIPING ROUTE

PROTECT (E) FENCE

PRIVATE PROPERTY

REMOVE (E) CONCRETE APRON

PROTECT (E) SD INLETS

SD

SD

DRAFT

NOT FOR CONSTRUCTION

20 0 20 40

(APPROXIMATE SCALE IN FEET)

NOTES

1. COORDINATE WITH CLIENT REPRESENTATIVE AND BIOLOGIST FOR SPECIFIC EXCAVATION AND BIOLOGICAL PROTECTION REQUIREMENTS.
2. REMOVE, CLEAN, AND RE-INSTALL RIP-RAP IN SUB-AREA M-2 OR REPLACE IN KIND.
3. REMOVE AND REPLACE GEOTEXTILE FABRIC IN KIND IN AREAS DISTURBED DURING THE WORK.
4. PROVIDE TRAFFIC CONTROL PER SLAC REQUIREMENTS AND CONTRACTOR'S TRAFFIC CONTROL PLAN, AS NEEDED TO CONDUCT THE WORK.
5. INSTALL TEMPORARY WATER DIVERSION INFRASTRUCTURE AND MAINTAIN AT ALL TIMES DURING THE WORK TO MAINTAIN DRY CONDITIONS WITHIN THE EXCAVATION AREAS. ROUTE WATER DIVERSION PIPING AS SHOWN.
6. INSTALL TEMPORARY SCREEN ON (E) FENCE BETWEEN SLAC PROPERTY AND PRIVATE PROPERTY, PER THE SPECIFICATIONS.
7. PLACE GRAVEL ON STEEP ACCESS ROUTE. GRADE INTO SITE AT COMPLETION OF WORK.
8. PROTECT EXISTING STORM DRAIN INLETS AT ALL TIMES.
9. REMOVE ANY OBSTRUCTIONS AND RE-INSTALL OR REPAIR FOLLOWING COMPLETION OF WORK. REPLACE T-POST DEBRIS FENCE IN AREA M-7 AT COMPLETION OF WORK.
10. PROTECT ALL EXISTING UTILITIES NOT DESIGNATED AS "TO BE DEMOLISHED."
11. DURING RAINFALL EVENTS, COORDINATE WITH CLIENT REPRESENTATIVE TO PROTECT EXPOSED EXCAVATION AREAS FROM STORMWATER RUN-OFF, PER THE SPECIFICATIONS.
12. EXCAVATION ACTIVITIES SHALL NOT OCCUR DURING RAINFALL EVENTS, OR WITHIN 24 HOURS FOLLOWING A RAINFALL EVENT.
13. REMOVE EXISTING FENCE IN AREA M-1 AND INSTALL/MAINTAIN TEMPORARY FENCING AND SIGNAGE ALONG FENCE LINE WHEN ACCESS NOT IN USE. SIGNAGE TO READ: "NO UNAUTHORIZED ACCESS" IN BOTH DIRECTIONS. REPLACE PROPERTY LINE FENCE AT COMPLETION OF WORK.
14. AT THE END OF EACH WORK DAY, THE CONTRACTOR SHALL PLACE A WOODEN EGRESS RAMP WITHIN EXCAVATION SUB-AREA M-7 TO ALLOW TRAPPED SPECIES TO EXIT THE AREA.

SUB-AREA ID	CUT FILL CALCULATIONS			
	CUT			FILL (CY)
	AREA (SF)	DEPTH (FT)	VOLUME (CY)	
M-1	70	1	3	3
M-2	9,500	2	700	700
M-3	70	3	10	10
M-4	1,800	1	70	70
M-5	700	1	30	30
M-6	100	1	4	4
M-7	400	3	40	40
TOTAL	12,600	-	860	860

REGISTERED PROFESSIONAL ENGINEER
JOHN THOMAS DE WITT
C 55468
EXP. 12-31-18
CIVIL
STATE OF CALIFORNIA

DATE SIGNED: _____

REGISTERED PROFESSIONAL ENGINEER
RYAN TIMOTHY CASEY
C 84717
EXP. 3-31-18
CIVIL
STATE OF CALIFORNIA

DATE SIGNED: _____

Erler & Kalinowski, Inc.
Consulting Engineers and Scientists
1870 OGDEN DRIVE
BURLINGAME, CALIFORNIA 94010-5306
(650) 292-9100 • FAX (650) 552-9012

ENVIRONMENTAL CLEANUP OF IR-6 AND IR-8 DRAINAGE CHANNELS
SLAC NATIONAL ACCELERATOR LABORATORY, MENLO PARK, CA

EXCAVATION PLAN
IR-6 DRAINAGE CHANNEL IA

REV	DESCRIPTION	APPRD	DATE

DATE: FEB2017
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G-3
3 OF 7

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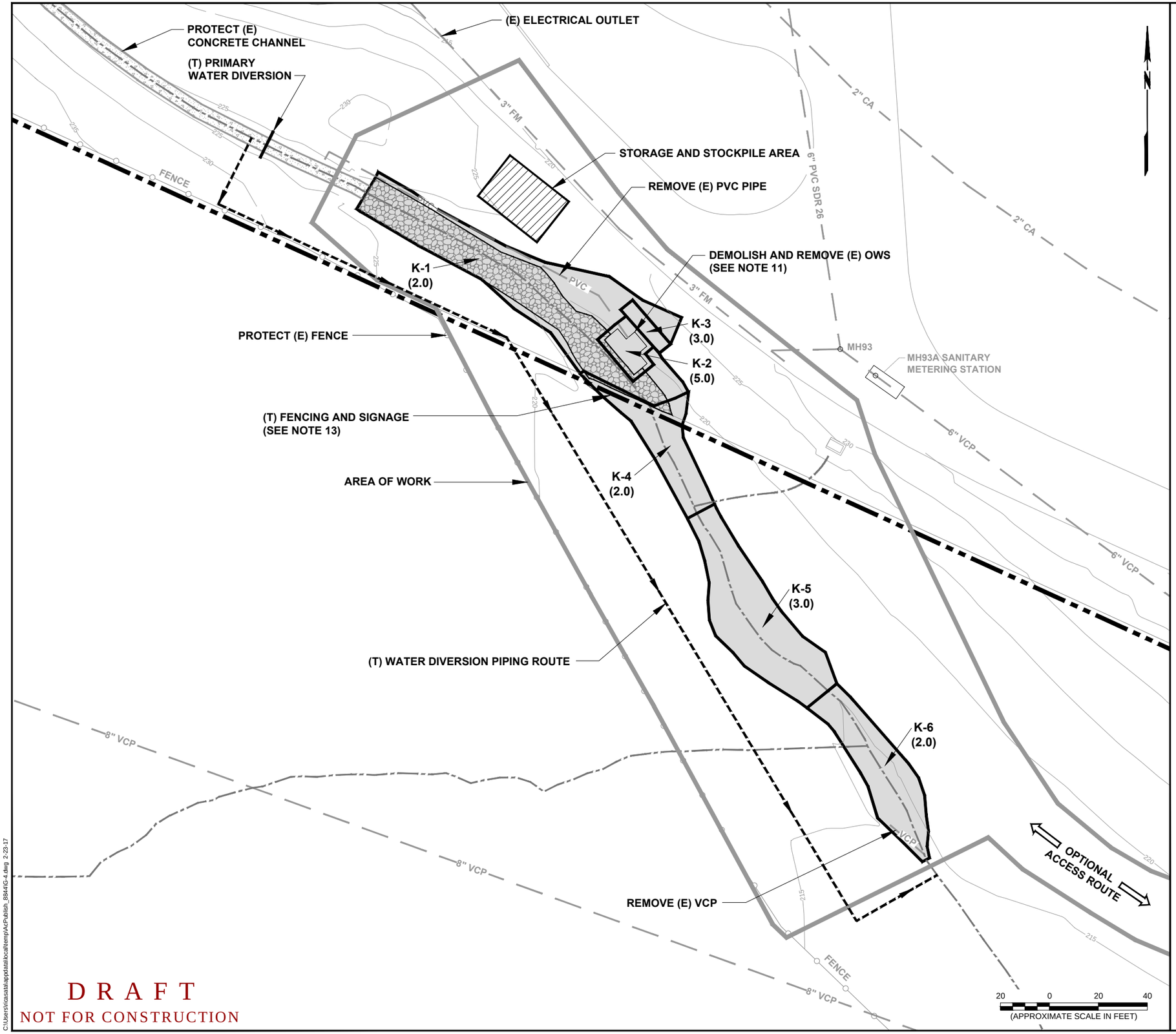

NOTES

1. COORDINATE WITH CLIENT REPRESENTATIVE AND BIOLOGIST FOR SPECIFIC EXCAVATION AND BIOLOGICAL PROTECTION REQUIREMENTS.
2. REMOVE, CLEAN, AND RE-INSTALL RIP-RAP OR REPLACE IN KIND AS SHOWN ON SHEET G-6. DISPOSE OF EXCESS RIP-RAP.
3. REMOVE AND REPLACE GEOTEXTILE FABRIC IN KIND IN AREAS DISTURBED DURING THE WORK.
4. PROVIDE TRAFFIC CONTROL PER SLAC REQUIREMENTS AND CONTRACTOR'S TRAFFIC CONTROL PLAN, AS NEEDED TO CONDUCT THE WORK.
5. INSTALL TEMPORARY WATER DIVERSION INFRASTRUCTURE AND OPERATE AT ALL TIMES DURING THE WORK TO MAINTAIN DRY CONDITIONS WITHIN THE EXCAVATION AREAS. ROUTE WATER DIVERSION PIPING AS SHOWN TO MAINTAIN WET CONDITIONS IN WETLANDS DOWNSTREAM OF EXCAVATION AREA.
6. PROTECT EXISTING STORM DRAIN INLETS AT ALL TIMES.
7. REMOVE ANY OBSTRUCTIONS AND RE-INSTALL OR REPAIR FOLLOWING COMPLETION OF WORK.
8. PROTECT ALL EXISTING UTILITIES NOT DESIGNATED AS "TO BE DEMOLISHED."
9. DURING RAINFALL EVENTS, COORDINATE WITH CLIENT TO PROTECT EXPOSED EXCAVATION AREAS FROM STORMWATER RUN-OFF, PER THE SPECIFICATIONS.
10. EXCAVATION ACTIVITIES SHALL NOT OCCUR DURING RAINFALL EVENTS, OR WITHIN 24 HOURS FOLLOWING A RAINFALL EVENT.
11. DEMOLISH AND REMOVE OIL-WATER SEPARATOR, ASSOCIATED UTILITIES, AND STRUCTURES, AS DIRECTED BY CLIENT REPRESENTATIVE.
12. REMOVE, LOAD, TRANSPORT, AND DISPOSE/RECYCLE DEMOLITION DEBRIS.
13. REMOVE EXISTING PROPERTY LINE FENCE AND INSTALL/MAINTAIN TEMPORARY FENCING AND SIGNAGE ALONG FENCE LINE WHEN ACCESS NOT IN USE. SIGNAGE TO READ: "NO UNAUTHORIZED ACCESS" IN BOTH DIRECTIONS. REPLACE PROPERTY LINE FENCE AT COMPLETION OF WORK.
14. AT THE END OF EACH WORK DAY, THE CONTRACTOR SHALL PLACE WOODEN EGRESS RAMPS WITHIN ANY EXCAVATION SUB-AREAS DEEPER THAN 1 FOOT TO ALLOW TRAPPED SPECIES TO EXIT THE AREA.

SUB-AREA ID	CUT FILL CALCULATIONS			
	CUT			FILL (CY)
	AREA (SF)	DEPTH (FT)	VOLUME (CY)	
K-1	3,100	2	230	210
K-2	320	5	60	50
K-3	150	3	20	20
K-4	940	2	70	60
K-5	1,900	3	210	170
K-6	1,300	2	100	80
TOTAL	7,700	-	690	590

REGISTERED PROFESSIONAL ENGINEER
JOHN THOMAS DE WITT
C 55468
EXP. 12-31-18
CIVIL
STATE OF CALIFORNIA

DATE SIGNED: _____

REGISTERED PROFESSIONAL ENGINEER
RYAN TIMOTHY CASEY
C 84717
EXP. 3-31-18
CIVIL
STATE OF CALIFORNIA

DATE SIGNED: _____

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Consulting Engineers and Scientists
1870 OGDEN DRIVE
BURLINGAME, CALIFORNIA 94010-5306
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ENVIRONMENTAL CLEANUP OF IR-6 AND IR-8 DRAINAGE CHANNELS
SLAC NATIONAL ACCELERATOR LABORATORY, MENLO PARK, CA

EXCAVATION PLAN
IR-8 DRAINAGE CHANNEL IA

REV	DESCRIPTION	APPRD	DATE

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APPROVED: JTD
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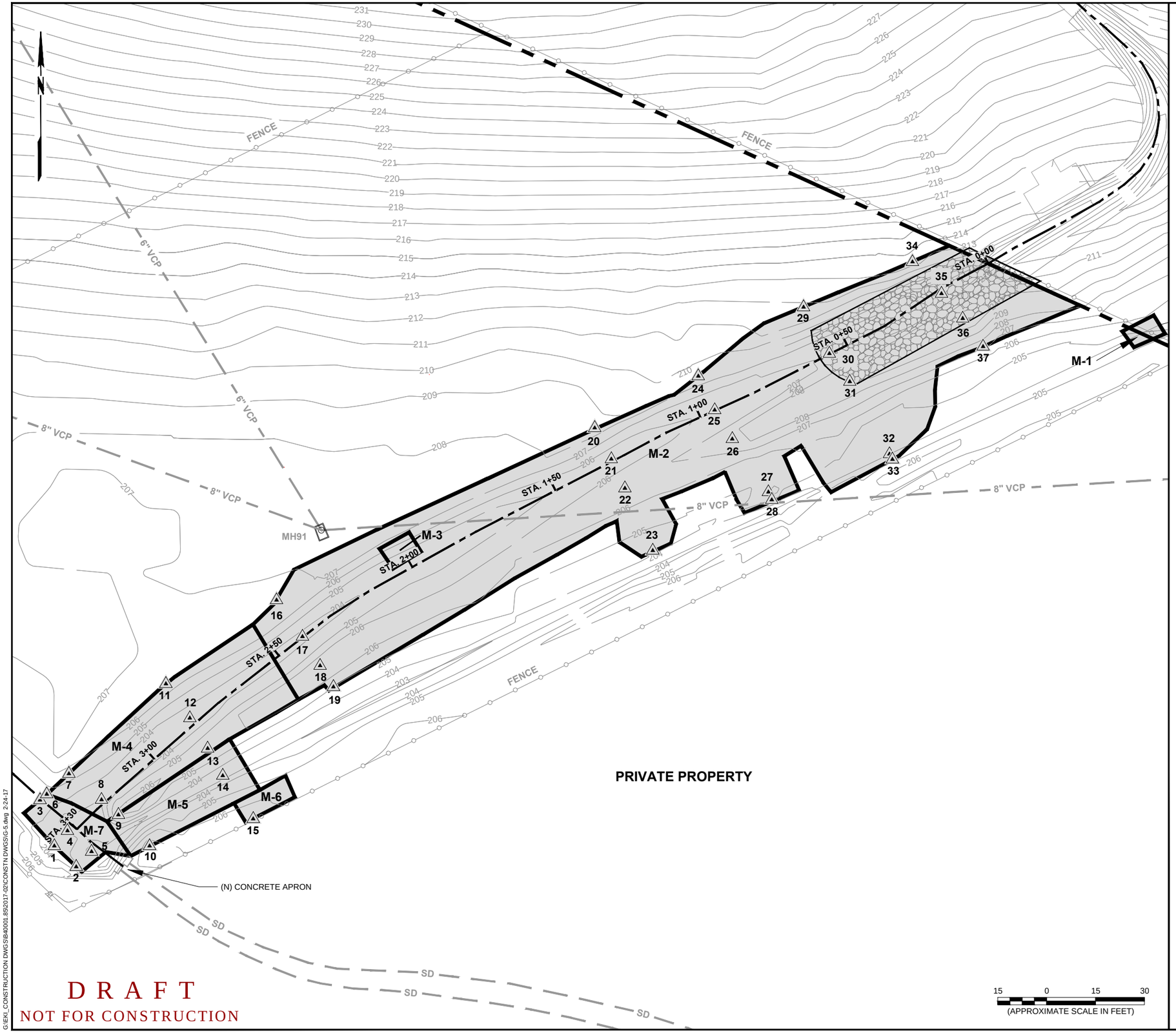
4 OF 7



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NOTES

1. BACKFILL AND RESTORE EXCAVATION AREAS AND DRAINAGE CHANNELS PER THE SPECIFICATIONS.
2. RESTORE DRAINAGE CHANNELS TO MATCH EXISTING ELEVATIONS AS SHOWN.
3. RESTORE ALL EXCAVATION AREAS BY HAND BROADCASTING SEED AND INSTALLING SEED-FREE COIR MATTING PER THE SPECIFICATIONS.
4. RESTORE ALL DISTURBED AREAS ADJACENT TO THE EXCAVATION AREAS BY HYDROSEEDING AND INSTALLING JUTE MATTING ON SLOPED ACCESS ROUTES PER THE SPECIFICATIONS.
5. RESTORE CONCRETE CULVERT APRON ADJACENT TO STORM DRAIN INLETS PER THE SPECIFICATIONS.

RESTORATION POINT ID	NORTHING	EASTING	ELEVATION
1	1977285.981	6067681.272	203.5
2	1977279.604	6067687.998	203.5
3	1977300.096	6067676.874	204.5
4	1977290.644	6067685.310	202.5
5	1977284.262	6067692.685	202.0
6	1977301.875	6067678.954	204.5
7	1977308.159	6067685.735	205.5
8	1977300.177	6067695.758	203.0
9	1977295.548	6067700.926	206.0
10	1977285.982	6067710.492	207.5
11	1977335.740	6067715.507	206.5
12	1977325.248	6067722.835	203.5
13	1977315.914	6067728.312	205.5
14	1977307.567	6067732.937	203.0
15	1977294.314	6067742.275	206.0
16	1977361.428	6067749.449	206.5
17	1977350.243	6067757.395	204.0
18	1977341.294	6067762.795	206.5
19	1977334.814	6067766.884	205.0
20	1977414.271	6067847.036	208.5
21	1977404.706	6067852.127	205.5
22	1977395.757	6067856.293	206.5
23	1977376.626	6067864.856	204.0
24	1977430.163	6067878.819	208.5
25	1977419.749	6067883.833	206.5
26	1977410.877	6067889.233	208.0
27	1977394.579	6067900.322	206.0
28	1977392.208	6067901.344	205.0
29	1977451.310	6067911.111	212.0
30	1977437.074	6067919.027	207.5
31	1977428.463	6067925.277	209.0
32	1977406.245	6067937.448	204.5
33	1977404.612	6067938.365	204.5
34	1977465.199	6067944.513	213.5
35	1977455.477	6067953.402	208.5
36	1977447.838	6067959.930	210.0
37	1977439.227	6067966.180	207.0
CP #189	1977607.350	6067801.060	243.13
CP #9215	1977675.150	6067576.810	243.49
CP #9265	1977616.280	6067717.220	245.64

NOTES:

1. CONTROL POINT LOCATIONS CP #189, CP #9215, AND CP #9265 ARE SHOWN ON FIGURE G-3.
2. VERTICAL DATUM FOR ELEVATION IS NAVD88.
3. HORIZONTAL DATUM FOR ALL POINTS IS NAD83, STATE PLANE, ZONE 3.

REGISTERED PROFESSIONAL ENGINEER
JOHN THOMAS DE WITT
C 55468
EXP. 12-31-18
CIVIL
STATE OF CALIFORNIA

DATE SIGNED: _____

REGISTERED PROFESSIONAL ENGINEER
RYAN TIMOTHY CASEY
C 84717
EXP. 3-31-18
CIVIL
STATE OF CALIFORNIA

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Erler & Kalinowski, Inc.
Consulting Engineers and Scientists
1870 OGDEN DRIVE
BURLINGAME, CALIFORNIA 94010-5306
(650) 292-9100 ♦ FAX (650) 552-9012

ENVIRONMENTAL CLEANUP OF IR-6 AND IR-8 DRAINAGE CHANNELS
SLAC NATIONAL ACCELERATOR LABORATORY, MENLO PARK, CA

RESTORATION PLAN
IR-6 DRAINAGE CHANNEL IA

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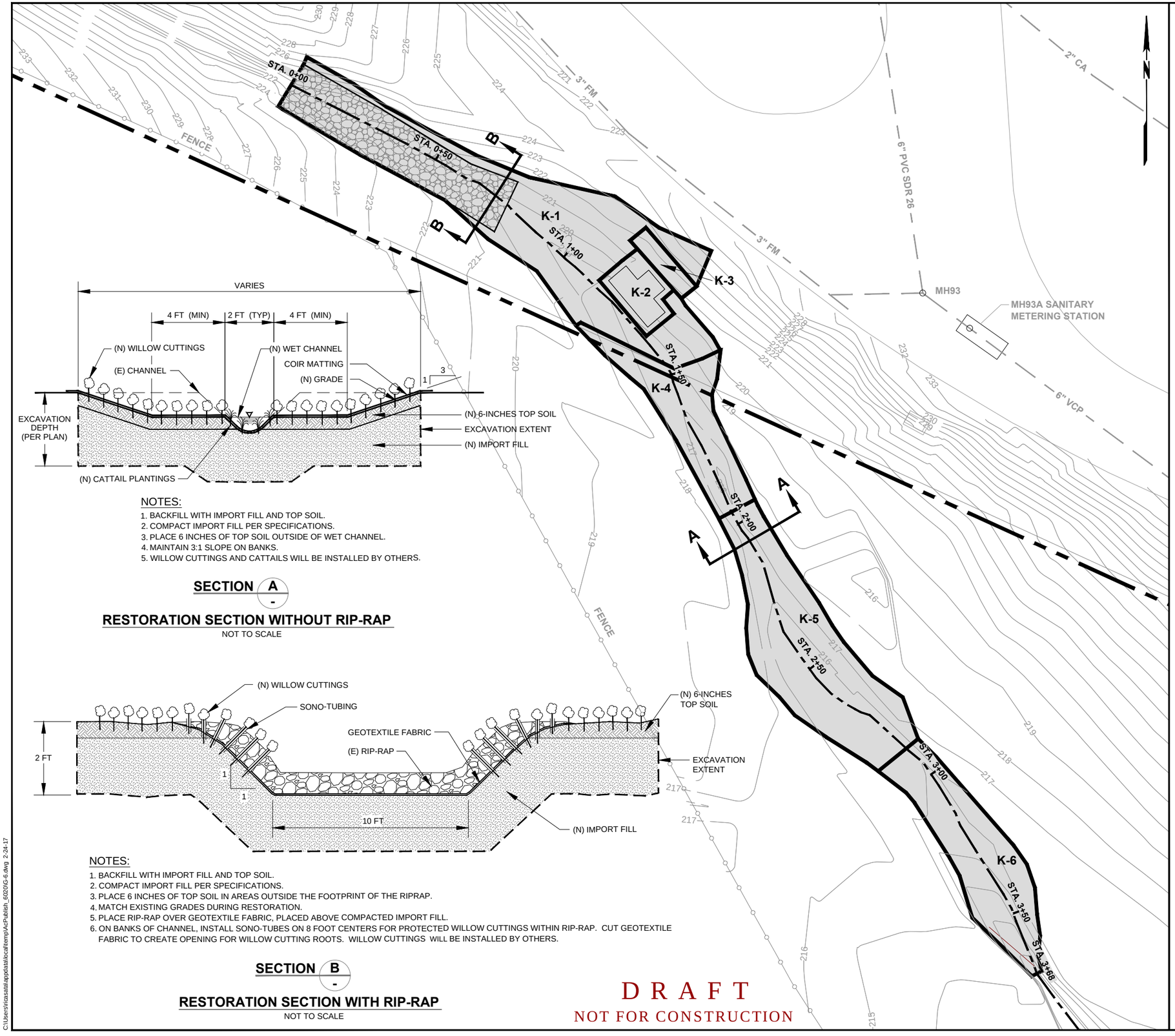

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(APPROXIMATE SCALE IN FEET)

NOTES

1. BACKFILL AND RESTORE EXCAVATION AREAS AND DRAINAGE CHANNELS PER THE SPECIFICATIONS AND AS SHOWN IN SECTIONS A AND B.
2. RESTORE ALL EXCAVATION AREAS BY HAND BROADCASTING SEED AND INSTALLING SEED-FREE COIR MATTING PER THE SPECIFICATIONS.
3. RESTORE ALL DISTURBED AREAS ADJACENT TO THE EXCAVATION AREAS BY HYDROSEEDING AND INSTALLING JUTE MATTING ON SLOPED ACCESS ROUTES PER THE SPECIFICATIONS.

NOTES:

1. BACKFILL WITH IMPORT FILL AND TOP SOIL.
2. COMPACT IMPORT FILL PER SPECIFICATIONS.
3. PLACE 6 INCHES OF TOP SOIL OUTSIDE OF WET CHANNEL.
4. MAINTAIN 3:1 SLOPE ON BANKS.
5. WILLOW CUTTINGS AND CATTAILS WILL BE INSTALLED BY OTHERS.

SECTION A - RESTORATION SECTION WITHOUT RIP-RAP

NOT TO SCALE

NOTES:

1. BACKFILL WITH IMPORT FILL AND TOP SOIL.
2. COMPACT IMPORT FILL PER SPECIFICATIONS.
3. PLACE 6 INCHES OF TOP SOIL IN AREAS OUTSIDE THE FOOTPRINT OF THE RIPRAP.
4. MATCH EXISTING GRADES DURING RESTORATION.
5. PLACE RIP-RAP OVER GEOTEXTILE FABRIC, PLACED ABOVE COMPACTED IMPORT FILL.
6. ON BANKS OF CHANNEL, INSTALL SONO-TUBES ON 8 FOOT CENTERS FOR PROTECTED WILLOW CUTTINGS WITHIN RIP-RAP. CUT GEOTEXTILE FABRIC TO CREATE OPENING FOR WILLOW CUTTING ROOTS. WILLOW CUTTINGS WILL BE INSTALLED BY OTHERS.

SECTION B - RESTORATION SECTION WITH RIP-RAP

NOT TO SCALE

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REGISTERED PROFESSIONAL ENGINEER
JOHN THOMAS DE WITT
C 55468
EXP. 12-31-18
CIVIL
STATE OF CALIFORNIA

DATE SIGNED: _____

REGISTERED PROFESSIONAL ENGINEER
RYAN TIMOTHY CASEY
C 84717
EXP. 3-31-18
CIVIL
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1870 OGDEN DRIVE
BURLINGAME, CALIFORNIA 94010-5306
(650) 292-9100 ♦ FAX (650) 552-9012

ENVIRONMENTAL CLEANUP OF IR-6 AND IR-8 DRAINAGE CHANNELS
SLAC NATIONAL ACCELERATOR LABORATORY, MENLO PARK, CA

RESTORATION PLAN
IR-8 DRAINAGE CHANNEL IA

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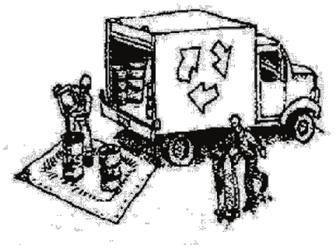
SAN MATEO COUNTYWIDE
Water Pollution Prevention Program
Clean Water. Healthy Community.

Construction Best Management Practices (BMPs)

Construction projects are required to implement the stormwater best management practices (BMP) on this page, as they apply to your project, all year long.

Materials & Waste Management



Non-Hazardous Materials

- ❑ Berm and cover stockpiles of sand, dirt or other construction material with tarps when rain is forecast or if not actively being used within 14 days.
- ❑ Use (but don't overuse) reclaimed water for dust control.

Hazardous Materials

- ❑ Label all hazardous materials and hazardous wastes (such as pesticides, paints, thinners, solvents, fuel, oil, and antifreeze) in accordance with city, county, state and federal regulations.
- ❑ Store hazardous materials and wastes in water tight containers, store in appropriate secondary containment, and cover them at the end of every work day or during wet weather or when rain is forecast.
- ❑ Follow manufacturer's application instructions for hazardous materials and be careful not to use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours.
- ❑ Arrange for appropriate disposal of all hazardous wastes.

Waste Management

- ❑ Cover waste disposal containers securely with tarps at the end of every work day and during wet weather.
- ❑ Check waste disposal containers frequently for leaks and to make sure they are not overfilled. Never hose down a dumpster on the construction site.
- ❑ Clean or replace portable toilets, and inspect them frequently for leaks and spills.
- ❑ Dispose of all wastes and debris properly. Recycle materials and wastes that can be recycled (such as asphalt, concrete, aggregate base materials, wood, gyp board, pipe, etc.)
- ❑ Dispose of liquid residues from paints, thinners, solvents, glues, and cleaning fluids as hazardous waste.

Construction Entrances and Perimeter

- ❑ Establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from site and tracking off site.
- ❑ Sweep or vacuum any street tracking immediately and secure sediment source to prevent further tracking. Never hose down streets to clean up tracking.

Equipment Management & Spill Control

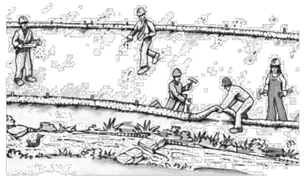
Maintenance and Parking

- ❑ Designate an area, fitted with appropriate BMPs, for vehicle and equipment parking and storage.
- ❑ Perform major maintenance, repair jobs, and vehicle and equipment washing off site.
- ❑ If refueling or vehicle maintenance must be done onsite, work in a bermed area away from storm drains and over a drip pan or drop cloths big enough to collect fluids. Recycle or dispose of fluids as hazardous waste.
- ❑ If vehicle or equipment cleaning must be done onsite, clean with water only in a bermed area that will not allow rinse water to run into gutters, streets, storm drains, or surface waters.
- ❑ Do not clean vehicle or equipment onsite using soaps, solvents, degreasers, or steam cleaning equipment.

Spill Prevention and Control

- ❑ Keep spill cleanup materials (e.g., rags, absorbents and cat litter) available at the construction site at all times.
- ❑ Inspect vehicles and equipment frequently for and repair leaks promptly. Use drip pans to catch leaks until repairs are made.
- ❑ Clean up spills or leaks immediately and dispose of cleanup materials properly.
- ❑ Do not hose down surfaces where fluids have spilled. Use dry cleanup methods (absorbent materials, cat litter, and/or rags).
- ❑ Sweep up spilled dry materials immediately. Do not try to wash them away with water, or bury them.
- ❑ Clean up spills on dirt areas by digging up and properly disposing of contaminated soil.
- ❑ Report significant spills immediately. You are required by law to report all significant releases of hazardous materials, including oil. To report a spill: 1) Dial 911 or your local emergency response number, 2) Call the Governor's Office of Emergency Services Warning Center, (800) 852-7550 (24 hours).

Earthmoving

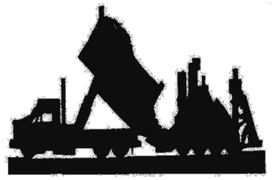


- ❑ Schedule grading and excavation work during dry weather.
- ❑ Stabilize all denuded areas, install and maintain temporary erosion controls (such as erosion control fabric or bonded fiber matrix) until vegetation is established.
- ❑ Remove existing vegetation only when absolutely necessary, and seed or plant vegetation for erosion control on slopes or where construction is not immediately planned.
- ❑ Prevent sediment from migrating offsite and protect storm drain inlets, gutters, ditches, and drainage courses by installing and maintaining appropriate BMPs, such as fiber rolls, silt fences, sediment basins, gravel bags, berms, etc.
- ❑ Keep excavated soil on site and transfer it to dump trucks on site, not in the streets.

Contaminated Soils

- ❑ If any of the following conditions are observed, test for contamination and contact the Regional Water Quality Control Board:
  - Unusual soil conditions, discoloration, or odor.
  - Abandoned underground tanks.
  - Abandoned wells
  - Buried barrels, debris, or trash.

Paving/Asphalt Work



- ❑ Avoid paving and seal coating in wet weather or when rain is forecast, to prevent materials that have not cured from contacting stormwater runoff.
- ❑ Cover storm drain inlets and manholes when applying seal coat, tack coat, slurry seal, fog seal, etc.
- ❑ Collect and recycle or appropriately dispose of excess abrasive gravel or sand. Do NOT sweep or wash it into gutters.
- ❑ Do not use water to wash down fresh asphalt concrete pavement.

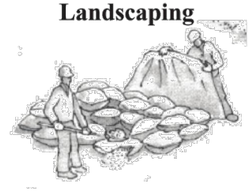
Sawcutting & Asphalt/Concrete Removal

- ❑ Protect nearby storm drain inlets when saw cutting. Use filter fabric, catch basin inlet filters, or gravel bags to keep slurry out of the storm drain system.
- ❑ Shovel, abosorb, or vacuum saw-cut slurry and dispose of all waste as soon as you are finished in one location or at the end of each work day (whichever is sooner!).
- ❑ If sawcut slurry enters a catch basin, clean it up immediately.

Concrete, Grout & Mortar Application

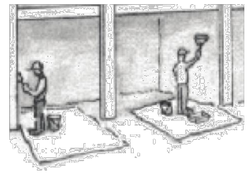
- ❑ Store concrete, grout, and mortar away from storm drains or waterways, and on pallets under cover to protect them from rain, runoff, and wind.
- ❑ Wash out concrete equipment/trucks offsite or in a designated washout area, where the water will flow into a temporary waste pit, and in a manner that will prevent leaching into the underlying soil or onto surrounding areas. Let concrete harden and dispose of as garbage.
- ❑ When washing exposed aggregate, prevent washwater from entering storm drains. Block any inlets and vacuum gutters, hose washwater onto dirt areas, or drain onto a bermed surface to be pumped and disposed of properly.

Landscaping



- ❑ Protect stockpiled landscaping materials from wind and rain by storing them under tarps all year-round.
- ❑ Stack bagged material on pallets and under cover.
- ❑ Discontinue application of any erodible landscape material within 2 days before a forecast rain event or during wet weather.

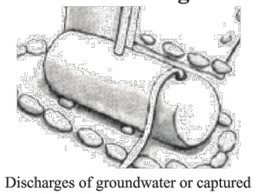
Painting & Paint Removal



Painting Cleanup and Removal

- ❑ Never clean brushes or rinse paint containers into a street, gutter, storm drain, or stream.
- ❑ For water-based paints, paint out brushes to the extent possible, and rinse into a drain that goes to the sanitary sewer. Never pour paint down a storm drain.
- ❑ For oil-based paints, paint out brushes to the extent possible and clean with thinner or solvent in a proper container. Filter and reuse thinners and solvents. Dispose of excess liquids as hazardous waste.
- ❑ Paint chips and dust from non-hazardous dry stripping and sand blasting may be swept up or collected in plastic drop cloths and disposed of as trash.
- ❑ Chemical paint stripping residue and chips and dust from marine paints or paints containing lead, mercury, or tributyltin must be disposed of as hazardous waste. Lead based paint removal requires a state-certified contractor.

Dewatering



- ❑ Discharges of groundwater or captured runoff from dewatering operations must be properly managed and disposed. When possible send dewatering discharge to landscaped area or sanitary sewer. If discharging to the sanitary sewer call your local wastewater treatment plant.
- ❑ Divert run-on water from offsite away from all disturbed areas.
- ❑ When dewatering, notify and obtain approval from the local municipality before discharging water to a street gutter or storm drain. Filtration or diversion through a basin, tank, or sediment trap may be required.
- ❑ In areas of known or suspected contamination, call your local agency to determine whether the ground water must be tested. Pumped groundwater may need to be collected and hauled off-site for treatment and proper disposal.

NOTES

1. Cover all stockpiles when not in use to limit erosion and sediment generation.
2. Anchor cover as needed to limit wind erosion.

Storm drain polluters may be liable for fines of up to $10,000 per day!

DRAFT
NOT FOR CONSTRUCTION

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Erler & Kalinowski, Inc.
Consulting Engineers and Scientists
1870 OGDEN DRIVE
BURLINGAME, CALIFORNIA 94010-5306
(650) 292-9100 ♦ FAX (650) 552-9012

ENVIRONMENTAL CLEANUP OF IR-6 AND IR-8 DRAINAGE CHANNELS
SLAC NATIONAL ACCELERATOR LABORATORY, MENLO PARK, CA

CONSTRUCTION BEST MANAGEMENT PRACTICES

REV	DESCRIPTION	APPRD	DATE

DATE: FEB2017
SCALE: AS SHOWN
DRAWN: CCR
DESIGNED: RC
APPROVED: JTD
JOB NO.: B40001.85

VERIFY SCALE
BAR IS ONE HALF INCH ON ORIGINAL DRAWING.
0 1/2"
IF NOT ONE HALF INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHEET NUMBER
G-7
7 OF 7

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Environmental Cleanup of IR-6 and IR-8 Drainages
SLAC National Accelerator Laboratory
Biological Assessment
for the California Red-legged Frog

Project #3934-02

Prepared for:

SLAC National Accelerator Laboratory

Prepared by:

H. T. Harvey & Associates

February 2, 2017

983 University Avenue, Building D • Los Gatos, CA 95032 • Ph: 408.458.3200 • F: 408.458.3210

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Appendices

Appendix A. U.S. Fish and Wildlife Service Species List A-1
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List of Preparers

Stephen Rottenborn, Ph.D., Principal-In-Charge
Ginger Bolen, Ph.D., Senior Wildlife Ecologist

Section 1. Introduction

The purpose of this Biological Assessment (BA) is to review proposed activities for the Environmental Cleanup of the IR-6and IR-8 Drainages Project at the SLAC National Accelerator Laboratory (SLAC) in sufficient detail to determine the extent to which the proposed action may affect (a) any threatened, endangered, or candidate animal or plant species and/or its habitat and (b) designated critical habitat of those species.

This BA has been prepared in accordance with legal requirements set forth under Section 7 of the Federal Endangered Species Act (FESA) (16 United States Code 1536[c]). Federally listed species consist of all organisms determined by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) to be endangered, threatened, or a candidate for endangered or threatened status. Implementation of FESA for listed terrestrial species and non-anadromous fish is coordinated by the USFWS, and implementation of FESA for listed anadromous fish species is coordinated by the NMFS.

The proposed action for which the initiation of consultation is being requested from the USFWS is the U.S. Army Corps of Engineers' (USACE) issuance of a Clean Water Act Section 404 Nationwide Permit to SLAC authorizing construction activities within jurisdictional waters. This document addresses potential effects only for species that are federally listed as threatened or endangered, are proposed under FESA for such designation, or are designated as a candidate for listing.

1.1 Covered Species

Consistent with Section 7 implementing regulations (50 CFR 402.12[b][2]), a list of endangered, threatened, proposed, and candidate species (USFWS list) in the Project area was downloaded from the USFWS IPaC website on January 10, 2017 (Appendix A). H. T. Harvey & Associates biologists analyzed the potential for each of these species to occur on the Project site based on a review of relevant literature, database searches, and information provided by SLAC.

Although the project is not covered by the Stanford Habitat Conservation Plan (HCP) (Stanford 2013), the HCP describes the potential areas of occurrence of federally listed species on Stanford lands, including SLAC. According to the HCP, the California tiger salamander (*Ambystoma californiense*) is known to breed in several ponds on Stanford lands but the Project area is beyond the maximum known dispersal capabilities of the species (1.3 miles [mi]) (Orloff 2007). The Central California Coast steelhead (*Oncorhynchus mykiss*) does not occur in the Project area, as there is no direct connection between the channel within the Project area and San Francisquito Creek, which does support steelhead. The San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) is not thought to occur at Stanford, as individuals in the HCP area have long been considered intergrades between the San Francisco garter snake and the more widespread red-sided garter snake (*T. s. infernalis*). Further, no common garter snakes (*Thamnophis sirtalis* sensu lato) have been documented in the Project area since the early 1980s (Launer 2009). Thus, the California tiger salamander, Central California Coast steelhead, and San

Francisco garter snake are determined to be absent from the Project area. The only federally listed species that may occur within the Project area is the California red-legged frog (*Rana draytonii*), which is listed as threatened under FESA; however, the California red-legged frog has never been observed in the Project area, despite multiple surveys.

1.2 Critical Habitat

The action described in this BA does not fall within designated or proposed critical habitat for any federally listed animal or plant species subject to the jurisdiction of the USFWS or NMFS.

1.3 Programmatic Biological Opinion

On June 18, 2014, the USFWS (2014) issued a Programmatic Biological Opinion (PBO) to the USACE for projects issued permits under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, including authorizations under 22 Nationwide Permits that may affect the threatened California red-legged frog in nine San Francisco Bay Area counties in California. Actions authorized by the USACE that may be appended to the PBO consist of a variety of activities that may result in the incidental take of the California red-legged frog on 1.0 acre (ac) or less per project of suitable upland red-legged frog habitat, including areas within 300 feet (ft) of the top of bank of a creek, stream, waterbody, or wetland, or up to 1.0 ac of aquatic habitat/waters of the United States, or a combination of uplands and wetlands that is not larger than 1.0 ac in size. The Project is consistent with the suitability criteria for use of the PBO as follows:

1. The Action Area contains suitable habitat for California red-legged frog foraging, movement, or other essential behaviors and the USACE is assuming the species will be affected by the proposed action.
2. The Project will result in no permanent impacts on potential California red-legged frog habitat. The Project may result in temporary impacts to approximately 1.0 ac of California red-legged frog habitat, and may be appended to the PBO if it satisfies the following criteria: the action has minimal effects on the frog, the action is consistent with the intent of the PBO, and appropriate conservation measures are included. Because the Project would result in no permanent impacts on potential red-legged frog habitat and a maximum of 1.07 ac of temporary impacts, we expect that the USACE and USFWS will determine that Project activities satisfy these criteria.
3. Activities authorized under the USACE permit may adversely affect the California red-legged frog through mortality, injury, harassment, capture, trap or harm, or temporary disturbance or permanent loss of the species' aquatic and upland habitats. The Project will not occur in locations where the populations are so small and/or isolated that even the minor effects described in the PBO may have substantial adverse effects to the long-term survival and viability of the species within the recovery unit.
4. The measures to reduce and/or avoid adverse effects on the California red-legged frog described in the Conservation Measures of the PBO will be fully implemented by SLAC.

5. Nationwide and other permits appended to this PBO for the Project are not interdependent or interrelated with other projects being proposed or implemented by the USACE through SLAC, other government agencies, or other parties.
6. The USACE, through SLAC , will provide the following information to the USFWS:
    - USACE Permit Application including Assessor's Parcel Number(s), Universal Transverse Mercator (UTM) coordinates, and street address of the project;
    - USACE-verified jurisdictional determination;
    - written description of the Project activities, including the location and size of construction areas, borrow sites, laydown areas, parking areas, disposal sites, and other associated activities;
    - a 7.5-minute U.S. Geological Survey (USGS) topographic map or similar high-quality color topographic map clearly marked with the precise location of the Project site, construction areas, borrow sites, laydown areas, parking areas, disposal sites, restoration sites, California red-legged frog relocation sites, and other associated activities;
    - a map showing known listed plant populations and listed animal sightings, from the California Department of Fish and Wildlife's (CDFW's) California Natural Diversity Data Base (CNDDB), and other sources, recorded within the Action Area and within a 5-mi radius of the Project site (see Figures 4 and 5);
    - a map (scale 1" =100') delineating the major vegetation communities present on and adjacent to the Project site;
    - color photographs of the major vegetation communities present on the Project site, with the locations of where they were taken indicated on the vegetation map (see Appendix B and Figures 3A and 3B);
    - one plan view and a minimum of one typical cross section indicating water bodies, vegetation types, work areas, roads, restoration sites, refueling, storage, parking, and staging areas; and
    - the names and complete curriculum vitae of the biologist(s) who are being proposed to conduct preconstruction surveys, and monitor and handle California red-legged frogs.

Section 2. Consultation to Date

On January 10, 2017, H. T. Harvey & Associates biologists downloaded a list of federally threatened and endangered species potentially occurring in the Project area from the USFWS IPaC website (Appendix A). No other consultation on the Project with the USFWS or NMFS has occurred to date.

Section 3. Project Description

The proposed action is the Environmental Cleanup of IR-6 and IR-8 Drainages by SLAC. This description of the proposed action includes information regarding the Project's location; a description of its physical components including operation and maintenance activities; and a description of the conservation measures that are incorporated to avoid, minimize, and compensate for effects on federally listed, proposed, and candidate species, and designated critical habitat, regulated by the USFWS and NMFS.

3.1 Project Location

The Project site is approximately 3.91 ac, and is located in the San Francisquito watershed in Menlo Park, San Mateo County, California. Figure 1 shows the Project location situated southeast of the intersection of Interstate 280 and Sand Hill Road. The Project site occurs in the *Palo Alto* U.S. Geological Survey (USGS) 7.5-minute quadrangle, in Township 6 South, Range 3 West, Section 16 (Figure 2). Assessor Parcel Nos. 074-480-230, 074-480-200, 074-480-370, 074-480-340 occur within the Project site. The Project site is on property owned by Stanford University. The northern portion of the Project site is within the boundary of the SLAC National Accelerator Laboratory (SLAC), which is on property leased by Stanford University to the United States Department of Energy (DOE). SLAC is operated for DOE by Stanford University. DOE provides funding for SLAC operations and for environmental investigation and cleanup activities at the site.. The Project site is bound to the north and northeast by SLAC. The property to the south and west is owned by Stanford University and leased to the Portola Valley Training Center.

The Project site gradually slopes to a lower elevation from north to south, but overall there is little natural topographic variation across the site. Elevation ranges from approximately 200 to 240 feet (National Geodetic Vertical Datum of 1929 [NGVD29]) (see Figure 2). The 30-year climate normal (from 1981-2010) indicate that the Biological Study Area (BSA) receives approximately 23 inches of rain annually, with the majority falling between October and April, and temperature ranges from a low of 47.9 ◦F to a high of 71.3 ◦F (PRISM Climate Group 2016).

3.2 Project Site Conditions

The Project site encompasses two stormwater drainage channels that support various habitats as shown in Figures 3A and 3B. A perennial drainage channel (IR-8) receives stormwater runoff from the SLAC Campus Area during the rainy season, and groundwater discharge that is actively pumped into the channel from SLAC tunnel underdrain systems year-round. The wetland and riparian vegetation at the Project site are present only in the IR-8 drainage and confluence with the IR-6 drainage, and are artificially induced by the year-round groundwater flow pumped from the tunnel sub-drains. Water in the IR-8 drainage flows from north to south, and converges with the intermittent drainage channel (IR-6) at the IR-6/8 confluence area.

The intermittent IR-6 drainage channel includes a primary channel that receives stormwater flow from the RY-SSRL area at SLAC, and a parallel secondary channel that receives a stormwater flow from a smaller area near the southern edge of SLAC. There is an earthen berm approximately 3 to 4 feet high between the primary and secondary drainages. Water in the IR-6 drainages flows toward the IR-6/8 confluence area, where two culvert inlets are located. During large rain events, water may back up into the intermittent IR-6 drainage channel from the confluence. The combined flow of the IR-6 and IR-8 drainages is then conveyed to a tributary of San Francisquito Creek via flow into the culverts at the IR-6/8 confluence.

Both the IR-6 and IR-8 drainages begin with a concrete-lined channel which outfalls into rip-rap at the start of the earthen channels. The concrete-lined channels will not be altered for this Project. Rip-rap is present for approximately the first 60 feet of the earthen portion of the IR-6 primary channel, and approximately the first 150 feet of the earthen portion of the IR-8 drainage. The Project work area includes the earthen portions (including the rip-rap areas) of the IR-6 drainages, the IR-8 drainage, and the IR-6/8 confluence area and soil on either side of the drainages, as well as access routes to these areas (Figures 3A and 3B).

A concrete oil-water separator (OWS) is located just east of the IR-8 drainage, approximately 120 feet from the start of the unlined channel, as shown on Figure 3A. The OWS was installed in approximately 1979 but is currently not in service, and it may never have been used. There is a 6-inch diameter pipe from the end of the concrete-lined channel to the OWS, but the pipe is currently plugged at its inlet in the channel. The OWS is approximately 6.5 feet deep and is installed with roughly half the OWS below ground and half above ground. The OWS is within the planned limits of excavation in the IR-8 drainage, and therefore will be demolished and removed as part of this Project, and the area currently with the OWS will be restored.

The IR-6 primary and secondary drainages only receive stormwater and, therefore, they are normally dry in the summer months. The IR-8 drainage receives stormwater in the rainy season as well as approximately two gallons per minute of groundwater collected and pumped by the SLAC tunnel underdrain systems throughout the year. Due to the pumped groundwater from the underdrain systems, water flows in the IR-8 drainage year-round. Therefore, the center-line (or thalweg) of the IR-8 drainage is perennially wet creating artificially-induced aquatic habitat and wetland habitats. Appendix A provides several recent photographs of the Project site.

Perennial marsh wetlands dominated by cattails (*Typha* sp.) were identified on the Project site within the earthen portion of the IR-8 drainage during a wetland delineation survey (see H.T. Harvey & Associates 2017a in the Electronic Materials). The riparian woodland corridor along the IR-8 drainage includes a dense canopy of small arroyo willow (*Salix lasiolepis*) saplings, and trees that range from 6 to 12 inches in diameter-at-breast-height. Other riparian shrubs include poison oak (*Toxicodendron diversilobum*), and mulefat (*Baccharis salicifolia*) in some areas. Outside of the riparian corridor, uplands are comprised of a sparse tree canopy dominated by coast live oaks (*Quercus agrifolia*). Patches of upland trees were interspersed with ruderal grasslands and coyote brush (*Baccharis pilularis*). Small developed areas covered by hardscape also occur in the site. Total sizes of the biotic habitats in the Project site are presented in Table 1.

Table 1. Biotic Habitat and Other Features Acreages/Linear Feet in the Project Site

Habitats	Acres	Linear Feet
Concrete-lined perennial drainage channel (IR-8)	0.03	370
Perennial drainage channel (IR-8) (non-wetlands)	0.10	500
Intermittent primary drainage channel (IR-6)	0.04	330
Intermittent secondary drainage channel (IR-6)	0.04	360
Perennial marsh wetlands (within IR-8)	0.02	234
Lined intermittent primary drainage channel (IR-6)	<0.01	43
Lined intermittent secondary drainage channel (IR-6)	<0.01	18
Culvert	<0.01	48*
Riparian	0.67	725
Uplands	2.71	
Developed	0.26	
TOTAL	**3.91**	**NA**

* Length within the project boundary as shown on Figure 3B. Only a portion of this is within the actual excavation footprint.

3.3 Purpose and Need

The information provided below was taken from various documents including: Group 3 Removal Action Work Plan, Addendum 1, IR-6 and IR-8 Drainage Channel Investigation Areas, Draft January 2017 with associated figures; and Draft Technical Specifications for Group 3 Removal Action Addendum, and Draft Construction Drawings.

This cleanup work is required in accordance with Order No. R2-2009-0072 (Order) adopted in October 2009 for the U.S. Department of Energy (DOE) and Stanford University by the San Francisco Bay Regional Water Quality Control Board (Water Board). As mentioned previously, the purpose of this Project is to remove soil that contains polychlorinated biphenyls (PCBs) from two Investigation Areas (IAs) defined in the Order for SLAC, including:

- IR-6 Drainage Channel IA (which includes the IR-6/8 confluence area); and,
- IR-8 Drainage Channel IA

3.4 Construction Activities

3.4.1 Proposed Construction Activities

The Project area includes the rip-rap lined and earthen reaches of the IR-6 and IR-8 drainages, as well as the IR-6/8 confluence area.

Excavation within IR-6 Drainage Channel. Excavation activities for the IR-6 drainage channel area will involve, at a minimum, site preparation, removal of rip-rap, removal of surface vegetation, excavation of soil to the extent feasible where PCB concentrations exceed cleanup goals, confirmation sampling for PCBs, surveying of the final extent of excavation, backfilling with clean imported granular fill and topsoil, replacement of rip-rap, restoration, and disposal of excavated soil. Work will be conducted within the primary and secondary channels of IR-6. Planned excavation limits for the IR-6 drainage channel area are shown on Figure 3B.

Primary Channel. The initial scope of the excavation in the primary channel and berm covers the length of the primary channel (approximately 330 ft), varies in width from approximately 25 ft to 40 ft, and is 2 ft deep in the upper 250 ft of the channel and 1 ft deep in the rest of the channel. The excavation depth will be extended to 3 ft, where PCBs were detected at 1 mg/kg in a sample collected at 2 ft below ground surface. The estimated volume planned for removal from the primary channel and berm is approximately 800 bank cubic yards (BCY).

Secondary Channel. Much of the secondary drainage was excavated in 2011, and areas remaining with PCBs above cleanup goals are included in the planned Project. The excavation in the secondary channel includes the downstream (western) end of the drainage, as shown on Figure 3B. The initial scope of the excavation in this area covers a length of approximately 45 ft and varies in width from approximately 13 ft to 20 ft. The initial excavation in this area is planned for 1 ft below ground surface in this area. Additional areas not excavated in 2011 are also included in the planned excavation scope, including a small area on the upstream (eastern) end and areas within the central stretch of the secondary drainage (see Figure 3B). The depth of the excavation in these areas is planned to be 2 feet. The total estimated volume planned for removal from the secondary channel is approximately 50 BCY.

Excavation within IR-8 Drainage Channel. Planned excavation limits for the IR-8 drainage channel area are shown on Figure 3A. The initial scope of the excavation includes excavating the upper portion of the unlined channel (a) to 2 ft below the rip-rap in the upper 150 ft of the unlined channel; (b) to 2 ft below ground surface between approximately 150 to 200 ft and 290 to 360 ft from the start of the channel; and (c) to 3 ft below ground surface between 200 to 290 ft from the start of the channel. Excavation widths vary from approximately 10 ft to 35 ft, depending on the lateral extent of PCBs above a certain threshold. The excavation will be extended to approximately 5 feet below ground surface beneath and adjacent to the OWS and 3 feet below ground surface or less, as needed, in the area east of the OWS. The estimated volume planned for removal from the IR-8 channel is approximately 650 BCY. Confirmation sampling will be performed for PCBs following excavation to determine if additional excavation is needed in any particular area. This work also includes demolition and removal of the OWS located in the upper portion of IR-8 (Figure 3A).

Excavation within IR-6/8 Confluence Area. Planned excavation limits for the IR-6/8 confluence area are shown on Figure 3B. The initial scope of the excavation conservatively covers a length of approximately 32 ft, varies in width from approximately 9 ft to 17 ft, to a depth of 3 ft below ground surface and is a continuation of the excavation proposed at the lower end of the IR-6 channel. The estimated volume planned for removal from the IR-6/8 confluence area is approximately 50 BCY.

Removal and Replacement of Rip-rap from IR-6/8 Drainage Channels. The upper 60 ft of the unlined portion of the IR-6 primary drainage channel and the upper 150 ft of the unlined portion of the IR-8 drainage channel currently have rip-rap. The rip-rap will be removed and either cleaned and stored on-site for re-use, or disposed off-site. During restoration activities either cleaned or new the rip-rap will be replaced in the same area of the channels where rip-rap was removed with the exception that only the upper portion, approximately 75 ft, of IR-8 will be restored with rip-rap, while converting the remaining 75 ft from rip-rap to soil exposure.

Tree Removal. Some trees within the removal action excavation areas will require removal to facilitate the excavations. Tree removal and replacement, if needed, will be coordinated with the SLAC Arborist.

Water Diversions. The excavations in the IR-6 and IR-8 drainage channels are planned for the summer to limit the amount of water flow in the channels. However, the IR-8 drainage channel has a small, year-round base flow. The channel flow will be temporarily diverted around excavation areas to conduct the planned excavation. For the excavation in the northern stretch of the IR-8 drainage channel, a 3-ft high cofferdam will be installed upstream and the water will be pumped around the excavation area to the channel downstream of the proposed excavation area. For the excavation in the IR-6/8 confluence area, a sump will be installed upstream of the confluence area and water will be pumped to one of the two culverts at the outlet of the IR-6/8 confluence area. Once excavation and restoration activities have been completed in each area, the diversion structures will be removed and the channel flow restored to its natural flow. Water will continue to flow through the portion of the IR-8 drainage that is not planned for excavation.

3.4.2 Proposed Restoration Activities

Following excavation activities, the excavation footprints covering the primary and secondary IR-6 drainages will be restored to pre-existing conditions by backfilling with suitable, clean soil to match existing topography, hydroseeding with native grasses, and covering with erosion control mats.

The excavation footprint covering the IR-8 drainage will result in temporary impacts on wetland, riparian, and upland habitats. The excavation footprint will be restored by backfilling with suitable, clean soil and include a broadened cross-sectional area of the channel, to expand the area suitable to support wetland habitat. The excavation footprint will be seeded with native grasses and covered with erosion control mats. Wetland vegetation will be restored by installing transplanted cattails from adjacent populations on lands owned by Stanford University. The remaining area within the excavation footprint, including the 150-ft long reach of rip-rap to be removed, cleaned, and replaced (in the upper 75 feet) will be restored to willow riparian habitat through installation of willow cuttings. Restoration activities are described in a separate Restoration and Monitoring Plan.

3.5 Project Equipment and Access

All heavy equipment will operate from the top of bank. Access to the Project site will be from the main entrance to SLAC on Sand Hill Road or the southeastern entrance to SLAC from Alpine Road, and then on interior roads at SLAC to the Project location.

3.6 Project Schedule

Soil excavation and channel reconstruction is anticipated to occur in Summer 2017. Habitat restoration activities include seeding all disturbed areas with an appropriate mix of native grasses and forbs will immediately follow completion of construction activities. Transplanting cattails from adjacent populations on lands owned by Stanford University and planting of willow cuttings and/or container stock follow in the rainy season/winter when the survival rate of such plantings is highest and plants are most likely to succeed.

3.7 Conservation Measures Incorporated into the Project

The Project incorporates a range of conservation measures to minimize undesired effects on the environment. The Project will implement the applicable conservation measures identified in the 2014 PBO (USFWS 2014), and provided verbatim below, to avoid and minimize effects on the California red-legged frog.

- For any project with greater than 0.5 ac of permanent impacts to suitable aquatic California red-legged frog habitat, and for any project with greater than 0.5 ac of suitable upland California re-legged frog habitat, the USACE will ensure harm to the California red-legged frog [*resulting from the*] Nationwide or other permit action is minimized by the submittal of an appropriate habitat compensation proposal and, if appropriate, a restoration, monitoring, and management plan, at least thirty (30) calendar days prior to the date of initial ground disturbance. [*Because the Project will not permanently impact any suitable habitat, no habitat compensation is proposed*].
- The USACE will ensure the applicant implements the conservation measures of this PBO, and the appendage. The USACE will ensure the applicant designates a point of contact for the Project. The point of contact will maintain a copy of this biological opinion and the appendage onsite for the duration of the construction period. Their name and telephone number will be provided to the USFWS no more than thirty (30) calendar days prior to the date of initial ground disturbance. At least fourteen (14) calendar days prior to the date of initial ground disturbance, the USACE will ensure the applicant submits a signed letter to the USFWS verifying that they possess a copy of this PBO and the appendage, and have read and fully understand their responsibilities.
- If verbally requested before, during, or upon completion of ground disturbance and construction activities, the applicant will ensure the USFWS, CDFW, and/or their designated agents can immediately and without delay, access and inspect the Project site for compliance with the Project description, conservation measures, and reasonable and prudent measures of this PBO and appendage, and to evaluate Project effects on the California red-legged frog and its habitat.
- A USFWS-approved biologist(s) will be onsite during all activities that may result in take of the California red-legged frog. The qualifications of the biologist(s) will be submitted to the USFWS for review and written approval at least thirty (30) calendar days prior to the date earthmoving is initiated at the Project site. The USFWS-approved biologist(s) will keep a copy of this PBO and the appendage in their possession when onsite.
- No more than twenty-four (24) hours prior to the date of initial ground disturbance, a preconstruction survey for the California red-legged frog will be conducted by a USFWS-approved biologist at the Project site. The survey will consist of walking the Project limits and within the Project site to ascertain the possible presence of the species. The USFWS-approved biologist will investigate all potential areas that could be used by the California red-legged frog for feeding, breeding, sheltering, movement, and other essential behaviors. This includes an adequate examination of mammal burrows, such as California ground squirrels [*Spermophilus beecheyi*] or gophers [*Thomomys* spp.]. If any adults, subadults, juveniles, tadpoles, or eggs are

found, the USFWS-approved biologist will contact the USFWS to determine if moving any of the individuals is appropriate. In making this determination the USFWS will consider if an appropriate relocation site exists. If the USFWS approves moving animals, the USACE through the applicant will ensure the USFWS-approved biologist is given sufficient time to move the animals from the work site before ground disturbance is initiated. Only USFWS-approved biologists will capture, handle, and monitor the California red-legged frog.

- The USFWS-approved biologist(s) will be given the authority to freely communicate verbally, by telephone, electronic mail, or in writing at any time with construction personnel, any other person(s) at the Project site, otherwise associated with the Project, the USFWS, the CDFW, or their designated agents. The USFWS-approved biologist will have oversight over implementation of all the conservation measures in this PBO, and, through the applicant, will have the authority and responsibility to stop Project activities if they determine any of the associated requirements are not being fulfilled. If the USFWS-approved biologist(s) exercises this authority, the USFWS will be notified by telephone and electronic mail within twenty-four (24) hours.

- The USFWS-approved biologist will conduct employee education training for employees working on earthmoving and/or construction activities. Personnel will be required to attend the presentation, which will describe the California red-legged-frog; avoidance, minimization, and conservation measures; legal protection of the animal; and other related issues. All attendees will sign an attendance sheet along with their printed name, company or agency, email address, and telephone number. The original sign-in sheet will be sent to the USFWS within seven (7) calendar days of the completion of the training.

- The USACE through the applicant will minimize adverse effects on the California red-legged frog by limiting, to the maximum extent possible, the number of access routes, construction areas, equipment staging, storage, parking, and stockpile areas. Prior to the date of initial ground disturbance at the Project site, equipment staging areas, site access routes, construction equipment and personnel parking areas, debris storage areas, and any other areas that may be disturbed will be identified, surveyed by the USFWS-approved biologist, and clearly identified with 5-ft tall bright orange plastic fencing. The fencing will be inspected by the USFWS-approved biologist and maintained daily by the applicant until the last day that construction equipment are at the Project.

- To the extent practicable, initial ground-disturbing activities will be avoided between November 1 and March 31 because that is the time period when California red-legged frogs are most likely to be moving through upland areas. When ground-disturbing activities must take place between November 1 and March 31, the USACE through the applicant will ensure that daily monitoring by the USFWS-approved biologist is completed for the California red-legged frog.

- To minimize harassment, injury death, and harm in the form of temporary habitat disturbances, all Project-related vehicle traffic will be restricted to established roads, construction areas, equipment staging, storage, parking, and stockpile areas. These areas will be included in preconstruction surveys and, to the maximum extent possible, established in locations disturbed by previous activities to prevent further adverse effects. Project-related vehicles will observe a 20-mi per hour speed limit within construction areas, except on

County roads, and State and Federal highways. Off-road traffic outside of designated and fenced Project work areas will be prohibited.

- The USACE through the applicant will ensure bio-swales and bio-filtration are installed at the Project site adjacent to roadways to avoid and minimize sediment loading and point source pollutants.
- A stormwater pollution prevention plan (SWPPP) and erosion control best management practices (BMPs) will be developed and implemented to minimize any wind- or water-related erosion and will be in compliance with the requirements of the USACE. The applicant will include provisions in construction contracts for measures to protect sensitive areas and prevent and minimize stormwater and non-stormwater discharges. Protective measures will include, at a minimum, those listed below.
    - No discharge of pollutants from vehicle or equipment cleaning will be allowed into any storm drains or water courses.
    - Vehicle and equipment fueling and maintenance operations will be at least 50 ft away from water courses, except at established commercial gas stations or established vehicle maintenance facilities.
    - Concrete waste and water from curing operations will be collected in washouts and will be disposed of and not allowed into water courses.
    - Spill containment kits will be maintained onsite at all times during construction operations and/or staging or fueling of equipment.
    - Dust control measures will include use of water trucks and organic tackifiers to control dust in excavation-and-fill areas, covering temporary access road entrances and exits with rock (rocking), and covering of temporary stockpiles when weather conditions require.
- If a work site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh not larger than 5 millimeters to prevent California red-legged frogs from entering the pump system. Water shall be released or pumped downstream at an appropriate rate to maintain downstream flows during construction. Upon completion of construction activities, any barriers to flow shall be removed in a manner that would allow flow to resume with the least disturbance to the substrate.
- The USACE through the applicant will maintain all construction equipment to prevent leaks of fuels, lubricants, or other fluids.
- Each encounter with the California red-legged frog will be treated on a case-by-case basis in coordination with the USFWS, but the general procedure is as follows: (1) the animal will not be disturbed if it is not in danger; or (2) the animal will be moved to a secure location if it is in any danger. These procedures are further described below:
    - When a California red-legged frog is encountered in the Action Area, all activities which have the potential to result in the harassment, injury, or death of the individual will be immediately halted. The USFWS-approved biologist will then assess the situation in order to select a course of action that will avoid or minimize adverse effects to the animal. To the maximum extent possible, contact with the frog will be avoided and the applicant will allow it to move out of the potentially hazardous situation to a secure location on its own volition. This procedure applies to situations where a California red-

legged frog is encountered while it is moving to another location. It does not apply to animals that are uncovered or otherwise exposed or in areas where there is not sufficient adjacent habitat to support the species should the individual move away from the hazardous location.

- California red-legged frogs that are in danger will be relocated and released by the USFWS-approved biologist outside the construction area within the same riparian area or watershed. If relocation of the frog outside the fence is not feasible (i.e., there are too many individuals observed per day), the biologist will relocate the animals to a USFWS preapproved location. Prior to the initial ground disturbance, the applicant will obtain approval of the relocation protocol from the USFWS in the event that a California red-legged frog is encountered and needs to be moved away from the Project site. Under no circumstances will a California red-legged frog be released on a site unless the written permission of the landowner has been obtained by the applicant.
- The USFWS-approved biologist will limit the duration of the handling and captivity of the California red-legged frog to the minimum amount of time necessary to complete the task. If the animal must be held in captivity, it will be kept in a cool, dark, moist, aerated environment, such as a clean and disinfected bucket or plastic container with a damp sponge. The container used for holding or transporting the individual will not contain any standing water.
- The applicant will immediately notify the USFWS once the California red-legged frog and the site is secure.

- Uneaten human food and trash attracts crows (*Corvus brachyrhynchos*), ravens (*Corvus corax*), coyotes (*Canis latrans*), and other predators of the California red-legged frog. A litter control program will be instituted at the Project site. All workers will ensure their food scraps, paper wrappers, food containers, cans, bottles, and other trash are deposited in covered or closed trash containers. The trash containers will be removed from the Project site at the end of each working day.

- All grindings and asphaltic-concrete waste may be temporally stored within previously disturbed areas absent of habitat and at a minimum of 150 ft from any culvert, pond, creek, stream crossing, or other waterbody. On or before the date of Project completion, the waste will be transported to an approved disposal site.

- Restoration and re-vegetation work for temporary effects will be implemented using native California plant species collected on-site or from local sources (i.e., local ecotype). Native or non-native plant species and material from non-local sources will be utilized only with prior written authorization from the USFWS. All topsoil from natural lands will be removed, cached, and returned to the site according to USFWS-approved restoration protocols.

- The USACE through the applicant will not apply insecticides or herbicides at the Project site during construction or long-term operational maintenance where there is the potential for these chemical agents to enter creeks, streams, waterbodies, or uplands that contain potential habitat for the California red-legged frog.

- No pets will be permitted at the Project site, to avoid and minimize the potential for harassment, injury, and death of the California red-legged frog.

- No firearms will be allowed at the Project site except for those carried by authorized security personnel, or local, State, or Federal law enforcement officials to avoid and minimize the potential for harassment, injury, and death of the California red-legged frog.
- For onsite storage of pipes, conduits and other materials that could provide shelter for California red-legged frogs, an open-top trailer will be used to elevate the materials above ground. This is intended to reduce the potential for animals to climb into the conduits and other materials.
- To the maximum extent practicable, no construction activities will occur during rain events or within 24-hours following a rain event. Prior to construction activities resuming, a USFWS-approved biologist will inspect the Action Area and all equipment/materials for the presence of California red-legged frogs. The animals will be allowed to move away from the Project site of their own volition or moved by the USFWS-approved biologist.
- To the maximum extent practicable, night-time construction will be minimized or avoided by the applicant. Because dusk and dawn are often the times when the California red-legged frog is most actively moving and foraging, to the maximum extent practicable, earthmoving and construction activities will cease no less than 30 minutes before sunset and will not begin again prior to no less than 30 minutes after sunrise. Except when necessary for driver or pedestrian safety, to the maximum extent practicable, artificial lighting at a Project site will be prohibited during the hours of darkness.
- Plastic monofilament netting (erosion control matting), loosely woven netting, or similar material in any form will not be used at the Project site because California red-legged frogs can become entangled and trapped in them. Any such material found on site will be immediately removed by the USFWS-approved biologist, construction personnel, or the applicant. Materials utilizing fixed weaves (strands cannot move), polypropylene, polymer or other synthetic materials will not be used except in geotextile materials that are covered by other materials.
- Dust control measures will be implemented during construction, or when necessary in the opinion of the USFWS-approved biologist, USFWS, CDFW, or their authorized agent. These measures will consist of regular truck watering of construction access areas and disturbed soil areas with water or organic soil stabilizers to minimize airborne dust and soil particles generated from graded areas. Regular truck watering will be a requirement of the construction contract. Watering guidelines for truck watering will be established to avoid any excessive run-off that may flow into contiguous or adjacent areas containing potential habitat for the California red-legged frog.
- Trenches or pits one (1) ft or deeper that are going to be left unfilled for more than forty-eight (48) hours will be securely covered with boards or other material to prevent the California red-legged frog from falling into them. If this is not possible, the applicant will ensure wooden ramps or other structures of suitable surface that provide adequate footing for the California red-legged frog are placed in the trench or pit to allow for their unaided escape. The USFWS-approved biologist will inspect the trenches and pits prior to their being filled to ensure there are no California red-legged frogs in them. The trench or pit will be examined by the USFWS-approved biologist each workday morning at least one hour prior to initiation of

work and in the late afternoon no more than one hour after work has ceased to ascertain whether any individuals have become trapped. If the escape ramps fail to allow the animal to escape, the USFWS-approved biologist will remove and transport it to a safe location, or contact the USFWS for guidance.

- The USFWS-approved biologist(s) will permanently remove any aquatic exotic wildlife species, such as bullfrogs [*Lithobates catesbeianus*] and crayfish [*Pacifastacus* spp.] from the Project site, to the maximum extent possible.
- The USACE will ensure the applicant reports any information to the USFWS about take or suspected take of listed wildlife species not exempted by this PBO. The USFWS will be notified via electronic mail and telephone within twenty-four (24) hours from the time the information is received by the applicant. Notification will include the species, number of individuals, sex (if known), date, time, location of the incident or of the finding of a dead or injured animal, how the individual was taken, photographs of the specific animal, and names of the persons who observe the take and/or found the animal. The individual animal will be preserved, as appropriate, and held in a secure location until instructions are received from the USFWS regarding the disposition of the specimen or the USFWS takes custody of the specimen.

Section 4. Action Area

Section 7 of the FESA requires that federal agencies consult with the USFWS before they take an action (including issuance of a permit) that may affect listed species or critical habitat. The consultation must encompass the "Action Area", which is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The Project has the potential to impact waters of the U.S. within IR-6 and IR-8. Although much of the Project will occur in upland areas, outside jurisdictional waters of the U.S. regulated by the USACE, all Project activities will be performed as a single effort, and thus the Action Area for this Section 7 consultation encompasses not only the immediate waters of the U.S. impact areas, but all Project activity areas. The Action Area thus includes staging, access, and activity locations, as well as immediately adjacent areas that are subject to indirect effects of the Project.

Section 5. Federally Threatened and Endangered Species

Federally listed, proposed, and candidate species regulated by the USFWS and NMFS that could potentially occur within the Action Area were identified by reviewing a number of sources, including the following:

- the Standard HCP (Stanford 2013);
- California red-legged frog survey reports for the SLAC site (Launer 2005, 2006, and 2009);
- Rarefind data (CNDDB 2017) (Figures 4 and 5);
- *Federal Register* notices and other information published by the USFWS and NMFS; and
- a USFWS species list for the Project area (Appendix A).

In addition, a reconnaissance-level field survey of the Project site was conducted by H. T. Harvey & Associates herpetologist Jeff Wilkinson on September 29, 2016 and by senior ecologist Patrick Stone on December 7, 2016. Neither of H. T. Harvey's surveys or other surveys by Stanford have observed the California red-legged frog. Based on the results of the reconnaissance-level surveys and a review of the information described above, it was determined that the California red-legged frog is the only federally listed, proposed, or candidate species that could potentially be affected by Project activities. This species is discussed in detail below.

5.1 California Red-legged Frog

5.1.1 Distribution

The historic distribution of the California red-legged frog extended from the city of Redding in the Central Valley and Point Reyes National Seashore along the coast, south to Baja California, Mexico. However, the species' current distribution is much reduced. The species is predominantly extirpated from the southern Transverse and Peninsular ranges, and there are only five or six known populations in the Sierra foothills, and only two extant populations in southern California (Fellers 2005). In the central California Coast Ranges, California red-legged frogs are still present throughout much of their former range, although the number of extant populations has been reduced substantially (Fellers 2005).

5.1.2 Habitat and Biology

The California red-legged frog inhabits perennial freshwater pools, streams, and ponds. The species has been observed in a number of aquatic and terrestrial habitats throughout its historic range. Larvae, juveniles, and adult frogs have been collected from natural lagoons, dune ponds, pools in or next to streams, streams, marshlands, sag ponds, and springs, as well as human-created stock ponds, secondary and tertiary sewage treatment ponds, wells, canals, golf course ponds, irrigation ponds, sand and gravel pits (containing water), and large reservoirs (Jennings 1988). The key to this species' occurrence in these habitats is the presence of

perennial, or near perennial, water and a general lack of introduced aquatic predators such as centrarchid fishes (e.g., largemouth bass [*Micropterus salmoides*], green sunfish [*Lepomis cyanellus*], and bluegill [*Lepomis macrochirus*]), crayfish, and bullfrogs. As long as there is standing water at least several inches deep, and introduced aquatic predators are rare or nonexistent, conditions are at least potentially suitable for red-legged frogs. If the aquatic habitat favors introduced aquatic predators, then red-legged frogs will probably disappear over time unless there is a nearby breeding site available that excludes introduced predators. Adults need dense shrubby or emergent riparian vegetation closely associated with deep (more than 2.3 ft deep) still or slow-moving water (USFWS 2009). Preferred breeding habitat consists of deep perennial pools with emergent vegetation such as cattails, tules (*Scirpus* spp.), or sedges (*Carex* spp.) for attaching egg clusters (Hayes and Jennings 1988, Fellers 2005), as well as shallow benches to act as nurseries for juveniles (Jennings and Hayes 1994). However, California red-legged frogs have also been observed to inhabit stock ponds, sewage treatment ponds, and artificial (i.e., concrete) pools completely devoid of vegetation (Storer 1925). Continued survival of frogs in all aquatic habitats seems to be based on the continued presence of ponds, springs, or pools that are disjunct from perennial streams. Such habitats provide the continued basis for successful reproduction and recruitment year after year into nearby drainages that may lose frog populations due to stochastic events such as extreme flooding or droughts. Non-breeding frogs may be found adjacent to streams and ponds in grasslands and woodlands. They use small mammal burrows in or under vegetation, willow (*Salix* spp.) root wads, the undersides of old boards and other debris within the riparian zone, and large cracks in the bottom of dried ponds as refugia (Jennings and Hayes 1994, USFWS 2002). Individuals may also occasionally use ground squirrel burrows as refugia (Tatarian 2008).

Red-legged frogs become sexually mature at an age of 2 to 4 years, with females requiring longer to develop (Cook 1997). Adults have been observed to breed from late November through early May after the onset of warm rains (Storer 1925, Jennings and Hayes 1994). Females attach an egg mass of 2,000 to 6,000 moderate-sized (0.08 to 0.11 inch diameter) eggs to an emergent vegetation brace, such as tule stalks, annual grasses (Poaceae), or willow roots just below the water surface (Storer 1925).

Embryos of California red-legged frogs hatch in 1 to 4 weeks, and the resulting larvae require 3 to 5 months to attain metamorphosis (Cook 1997). Larvae are thought to graze on algae, but they are rarely observed because they are often concealed in submergent vegetation or detritus (Jennings and Hayes 1994). Most larvae metamorphose into juvenile frogs between July and September. Post-metamorphic frogs grow rapidly by feeding on a wide variety of invertebrates. Adult frogs apparently eat a variety of animal prey, including invertebrates, small fishes, frogs, and small mammals (Hayes and Tennant 1985, Arnold and Halliday 1986). Juvenile frogs are often observed sunning themselves during the day in the warm, surface-water layer associated with floating and submerged vegetation (Hayes and Tennant 1985). Adult frogs are largely nocturnal and are known to sit on stream banks or on the low hanging limbs of willow trees over pools of water where they can detect small mammal prey (Hayes and Tennant 1985, Jennings and Hayes 1994).

California red-legged frogs do not have a distinct breeding migration. Some frogs remain at breeding sites all year while others disperse. Red-legged frogs are often found in summer months in summer foraging habitat

that would not be suitable for breeding; these individuals presumably move seasonally between summer foraging habitat and winter breeding habitat. Movements may occur along riparian corridors, but some individuals move directly from one site to another through normally inhospitable habitats (e.g., heavily grazed pastures or oak-grassland savannas) (USFWS 2002, Fellers 2005, Fellers and Kleeman 2007). Evidence from marked and radio-tagged frogs on the San Luis Obispo County coast suggests that frog movements, via upland habitats, of about 1 mi are possible over the course of a wet season (USFWS 2002). A radio-tracking study in Marin County found a range of migration distances (0.02 to 0.87 mi, straight-line) (Fellers and Kleeman 2007), and migrating frogs in northern Santa Cruz County traveled straight-line distances of 0.12 to 1.74 mi (Bulger et al. 2003). The distance moved is highly site-dependent, as influenced by the local landscape (Fellers and Kleeman 2007). The USFWS (2010) considered 1 mi a more typical dispersal distance for the species in its critical habitat designation.

5.1.3 Threats

Current working hypotheses to explain the decline of the California red-legged frog include climate change, increased exposure to UV-B and pesticides, historical over-harvesting, habitat destruction, and introduced species. These factors may work synergistically to decrease the California red-legged frogs' chances for persistence (Hayes and Jennings 1988, Fisher and Shaffer 1996, Kiesecker et al. 2001, Blaustein and Kiesecker 2002, Doubledee et al. 2003). Recent studies of California red-legged frog distribution have found an association between declines of the frog and landscape-level factors, such as upwind pesticide use and extent of urbanization (Davidson et al. 2001, 2002; Davidson 2004; D'Amore et al. 2009).

5.1.4 Habitat Status and Distribution in the Action Area

California red-legged frogs have been documented in San Francisquito Creek west of I-280, approximately 0.5 mi from the Project site (CNDDB 2017). This reach of the San Francisquito Creek is considered aquatic dispersal, foraging, and breeding habitat for California red-legged frogs (Stanford University 2013) as adults and larvae have been observed within the creek on multiple occasions since 1997 (CNDDB 2017).

However, no suitable aquatic breeding habitat for California red-legged frogs is present on the Project site because the drainage channels (IR-6 and IR-8) within the Project boundary are too shallow and/or do not hold pools of water long enough for successful breeding. Drainage channel IR-6 is not considered aquatic dispersal habitat for California red-legged frogs due to the lack of flowing and standing water (except during and shortly after storm events), riparian vegetation, and emergent vegetation. Drainage channel IR-8 is considered marginal habitat for California red-legged frogs due to the lack of deeper pools and questionable water quality (Launer 2009). It provides aquatic dispersal/foraging habitat for California red-legged frogs due to the presence of a perennial flow of water, at least two sets of pools of at least 1.5 ft deep, emergent vegetation within the pools, and a riparian corridor on both sides of the channel. However, because the pools are relatively shallow, they do not provide suitable breeding habitat, and it is expected that this aquatic habitat would only be used by newly metamorphosed or juvenile frogs that dispersed to the Project site from off-site breeding habitat (if it is used at all). Dispersal of red-legged frogs to channel IR-8 on the Project site is expected to occur infrequently, if at

all, because it is surrounded by development (e.g., buildings, roads, and parking lots). Numerous crayfish were observed in the IR-8 channel during surveys conducted in March 2007 (SLAC 2007).

The flow in drainage channel IR-8 exits the Project site through two corrugated metal pipe culverts under the Portola Valley Training Center (horse training center) and daylights into a sedimentation pond enclosed by a fence on the training center. A culverted pipe exits the sedimentation pond under a road on the southern edge of the training center and daylights into a small channel to San Francisquito Creek. On September 29, 2016 during the site visit by H. T. Harvey & Associates herpetologist J. Wilkinson, no water was flowing through this second culvert.

I-280 constitutes an overland dispersal barrier between known red-legged frog occurrences and the Project site (i.e., frogs cannot disperse across the highway itself). However, because I-280 spans over San Francisquito Creek, there is some potential for California red-legged frogs from the west side of the interstate to disperse via San Francisquito Creek to the east side of the interstate. Therefore, California red-legged frogs could potentially disperse to the location where the aforementioned culvert daylights into the small channel to San Francisquito Creek. However, because the culvert is at least 6 ft above a plunge pool in the channel and apparently lacks water except during storm events (i.e., as overflow from the sedimentation pond on the Portola Valley Training Center), the culvert does not present a movement corridor that would attract California red-legged frogs. The sedimentation pond may provide dispersal/foraging habitat for California red-legged frogs due to the perennial nature of the water in the pond. However, as with the culvert that daylights into San Francisquito Creek, the culvert that daylights into the sedimentation pond is 4 to 6 ft above the standing water and frogs would be required to actively climb up and into the culvert from the sedimentation pond. Though this is not a complete barrier to dispersal, it is an impediment.

Thus, although California red-legged frogs have been recorded in San Francisquito Creek within 1 mi of the Project site, the likelihood of California red-legged frogs dispersing from San Francisquito Creek up through a culvert, through a sedimentation pond, and up into another culvert to the Project site is considered very low. Further, in the unlikely event that California red-legged frogs were to disperse into channel IR-8 on the Project site, the channel does not provide breeding habitat or high-quality adult foraging/dispersal habitat due to the lack of deep pools. Although it may provide suitable dispersal/foraging habitat for metamorphosed or juvenile frogs, metamorphosed and juvenile frogs typically use this type of habitat when it is located fairly close to the breeding habitat from which they dispersed. They are not known to, and most likely would not, disperse such a long distance through aforementioned impediments to reach such marginal habitat within drainage channel IR-8. Therefore, it is unlikely that California red-legged frogs occur on the Project site, and this is consistent with the fact that California red-legged frogs have not been observed at the Project site.

Section 6. Effects

The following section describes the potential direct and indirect effects of the Project on the California red-legged frog. As defined by FESA, direct effects are the immediate effects of the project on the species or its habitat. Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur [50 CFR §402.02].

6.1 California Red-legged Frog

Proposed Project activities will result in temporary impacts on up to 1.07 ac of potential aquatic, riparian, and upland habitat for the California red-legged frog, including 0.02 ac of perennial wetlands, 0.10 ac of drainage channel, 0.09 ac of riparian habitat, and 0.86 ac of upland habitat. Habitat impacts are considered temporary because no hardscape or other artificial surfaces will replace the existing habitats, and the work areas will be restored to habitat conditions similar to those currently existing. For example, in areas that will be impacted by soil removal, restoration, and bank stabilization, habitat restoration will ensure that these areas continue to provide cover for potential foraging or dispersing frogs following Project completion. Areas subject to construction access and staging will quickly regenerate to provide suitable habitat for potential frogs.

Project activities associated with the proposed Project could result in direct impacts on individual California red-legged frogs due to injury or mortality as a result of vehicle traffic, equipment use, and worker foot traffic. In addition, individuals may be crushed in their refugia by the passage of heavy equipment or trapped and suffocated. Red-legged frogs could also be adversely affected by the spill of hazardous materials and degradation of water quality resulting from unregulated discharge of contaminants or sediment in aquatic habitats during construction. Such impacts could potentially occur only during construction activities. Further, to avoid and minimize potential effects on the California red-legged frog during construction, the Project will implement the PBO-required conservation measures described in Section 3.7 above.

The number of individual California red-legged frogs that may be impacted would be very low, if any will be affected at all, because of the limited extent and marginal quality of habitat on the Project site and the restriction of work to the dry season, when frogs are relatively sedentary and would thus not be moving through IR-8 or surrounding uplands. Implementation of the avoidance and minimization measures described in Section 3.7 would avoid and minimize potential effects on California red-legged frogs, as described in the PBO. With implementation of these measures, the Project activities will not jeopardize the continued existence of the California red-legged frog.

Section 7. Cumulative Effects

Cumulative effects are those that result from past, present, and reasonably foreseeable future projects, combined with the potential impacts of the proposed Project. Historically, cumulative impacts on biological resources (e.g., wetlands and other waters, natural communities, and sensitive species) have resulted from a variety of past projects throughout the Stanford area. These projects have included institutional (i.e., Stanford and SLAC), residential, commercial, and industrial development; agricultural conversion; local and regional transportation projects; and maintenance and capital improvement projects. These land use activities have degraded habitat and species diversity through consequences such as displacement and fragmentation of habitats and species populations, alteration of hydrology, erosion, sedimentation, disruption of wildlife migration corridors, changes in water quality, and the introduction or promotion of non-native predators and competitors.

Many of the reasonably foreseeable future Projects that are located on Stanford University lands are covered under the Stanford HCP, and the Biological Opinion for the HCP assessed the cumulative effects of such projects on federally listed species in the Project vicinity. Non-Stanford projects in the Project vicinity are expected to undergo California Environmental Quality Act (CEQA) review and most, if not all, of the projects will be subject to permitting under Fish and Game Code 1602, Clean Water Act Section 404/401, and/or the FESA Section 7 consultation process. Through these CEQA and permitting requirements, those cumulative projects are expected to avoid, minimize, and compensate for impacts on the California red-legged frog and its critical habitat; thus minimizing any additional cumulative impacts on these species. Further, provided that this Project successfully incorporates the conservation measures included in the Project description, the Project will not contribute to any substantial cumulative effects on biological resources.

Section 8. Conclusion and Determination

8.1 Conclusion

California red-legged frogs are not expected to breed in the Action Area. However, the Project site provides suitable dispersal/foraging habitat for this species. Implementation of conservation measures included as part of the Project description will help to minimize the potential for impacts on the California red-legged frog. Nevertheless, Project activities could potentially result in the take of a very small number of individuals through the standard FESA definition of take (i.e., "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect") or through the destruction or modification of habitat resulting in the death or injury of individuals of this species. Therefore, Project activities are likely to adversely affect the California red-legged frog. However, these activities will not jeopardize the continued existence of the California red-legged frog, considered either alone or cumulatively in concert with other projects, as the Project will have very limited effects, if any, on populations of this species. With implementation of conservation measures incorporated into the Project, these activities are not expected, directly or indirectly, to reduce appreciably the likelihood of either the survival or recovery of this listed species.

8.2 Determination

Based on the above analysis, it is determined that implementation of the proposed Project **may affect, and is likely to adversely affect** the California red-legged frog[1]. However, the Project will not jeopardize the continued existence of any of this species.

The action addressed by this BA does not fall within designated critical habitat for the California red-legged frog. Thus, the Project will have **no effect on critical habitat for the California red-legged frog.**

[1] This USFWS determination is made conservatively, and the terminology "likely to adversely affect" is used here only because the possibility of an occasional dispersant frog cannot be definitively eliminated. In reality, however, the Project is not expected to adversely affect any red-legged frogs. As discussed in the foregoing, no suitable aquatic breeding habitat for California red-legged frogs is present on the Project site nor have there been sightings of the frog based on several Project site biological surveys. Further, drainage channel IR-6 is not considered aquatic dispersal habitat for California red-legged frogs due to the lack of flowing and standing water, riparian vegetation, and emergent vegetation. Drainage channel IR-8 is considered marginal habitat for California red-legged frogs due to the lack of deeper pools and questionable water quality (Launer 2009). Dispersal of red-legged frogs to channel IR-8 on the Project site is expected to occur infrequently, if at all, because it is surrounded by development (e.g., buildings, roads, and parking lots).

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N:\Projects3900\3934-01\Reports\BAFig 1 Vicinity Map.mxd mlagarde

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Ecological Consultants

Figure 1. Vicinity Map
Biological Assessment
SLAC National Accelerator Laboratory,
Environmental Cleanup of IR-6 and IR-8 Drainages (3934-02)
February 2017

N:\Projects\3900\3934-01\Reports\BA\Fig 2 USGS Quad Map.mxd mlagarde

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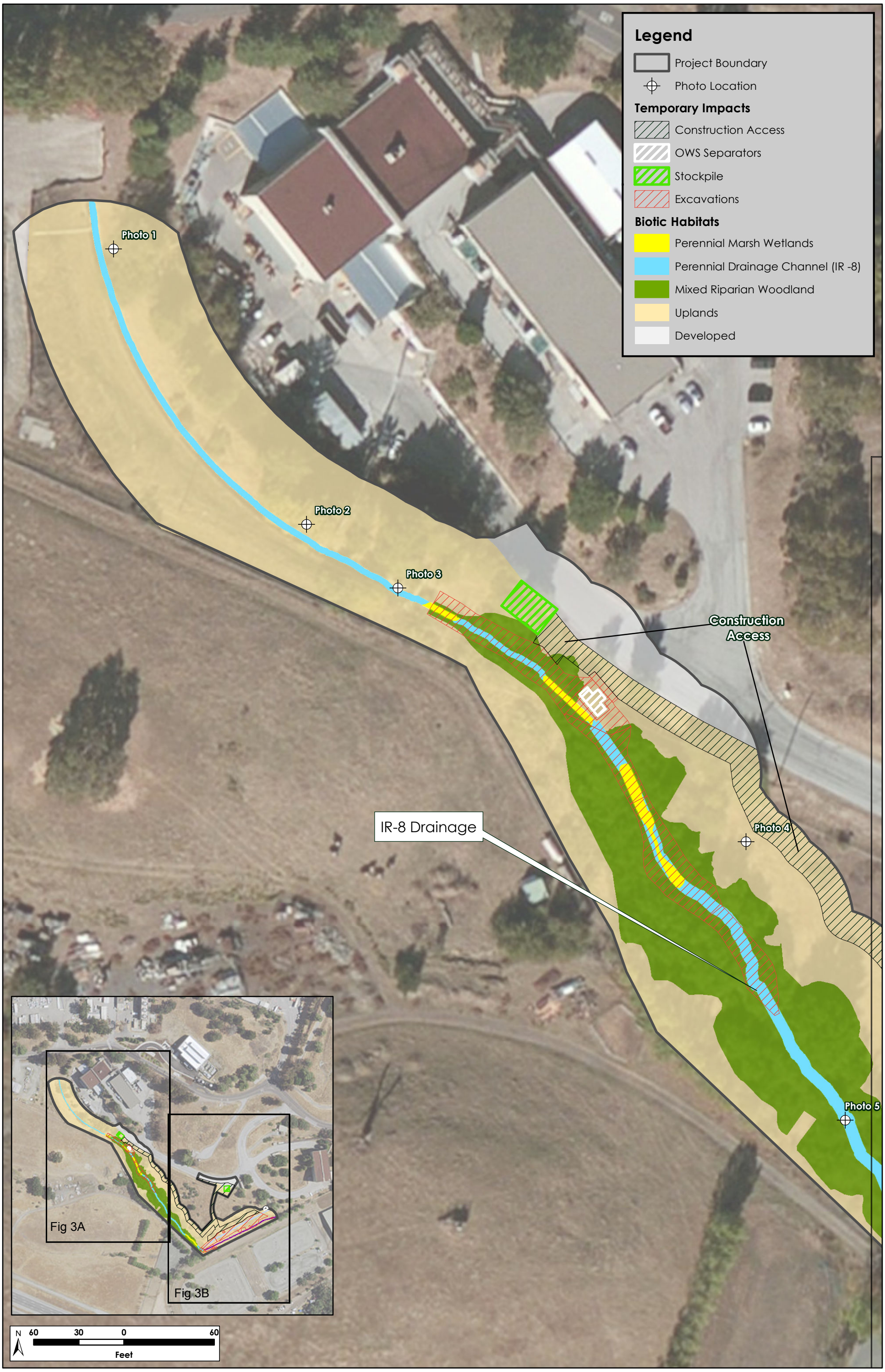
Ecological Consultants

Figure 2. USGS Topographic Map
Biological Assessment
SLAC National Accelerator Laboratory,
Environmental Cleanup of IR-6 and IR-8 Drainages (3934-02)
February 2017



N:\Projects3900\3934-01\Reports\BA\Fig 3A Biotic Habs and Impacts.mxd

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Figure 3A. Biotic Habitats and Impacts

Biological Assessment
SLAC National Accelerator Laboratory,
Environmental Cleanup of IR-6 and IR-8 Drainages (3934-02)
February 2017

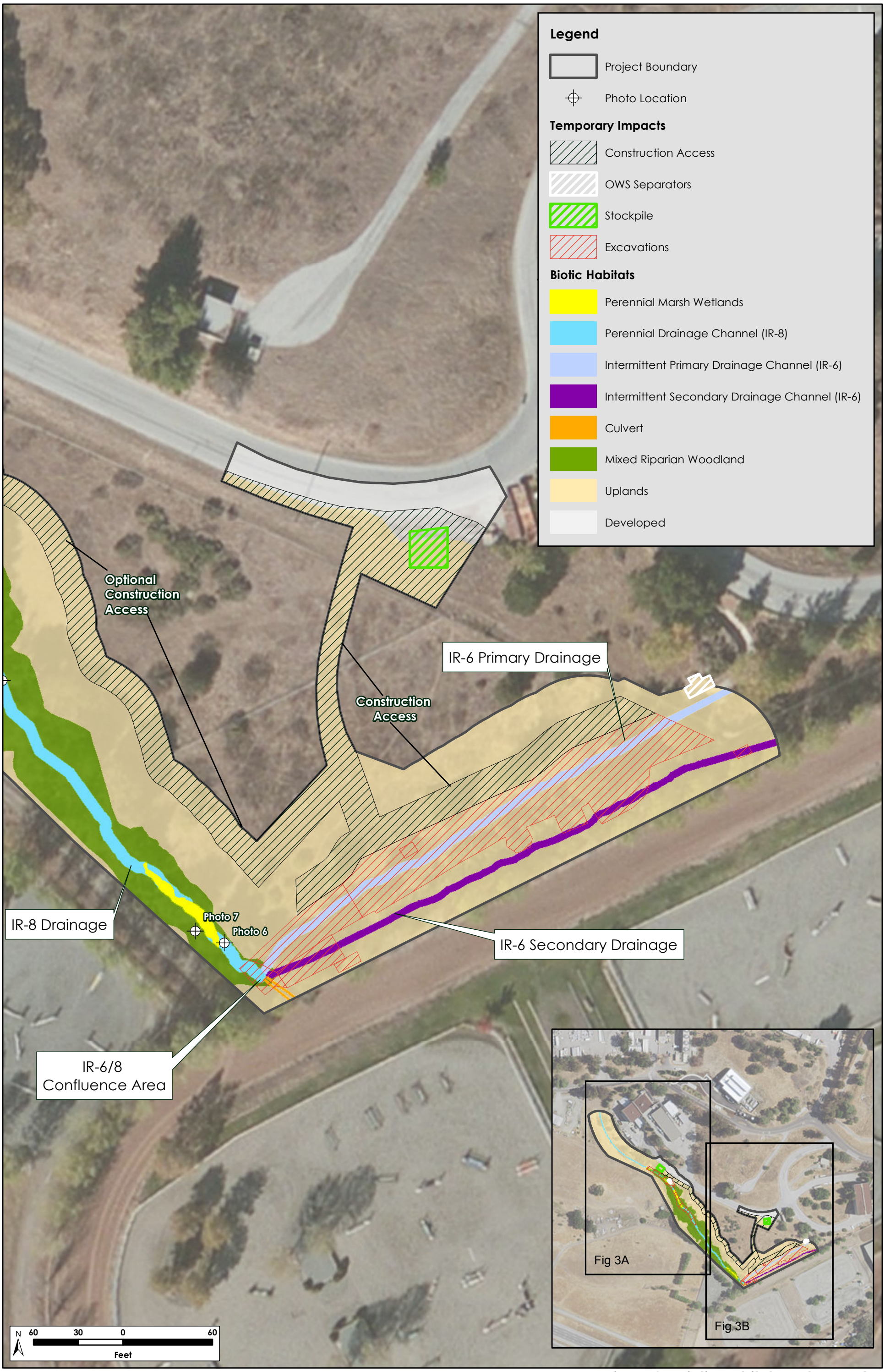

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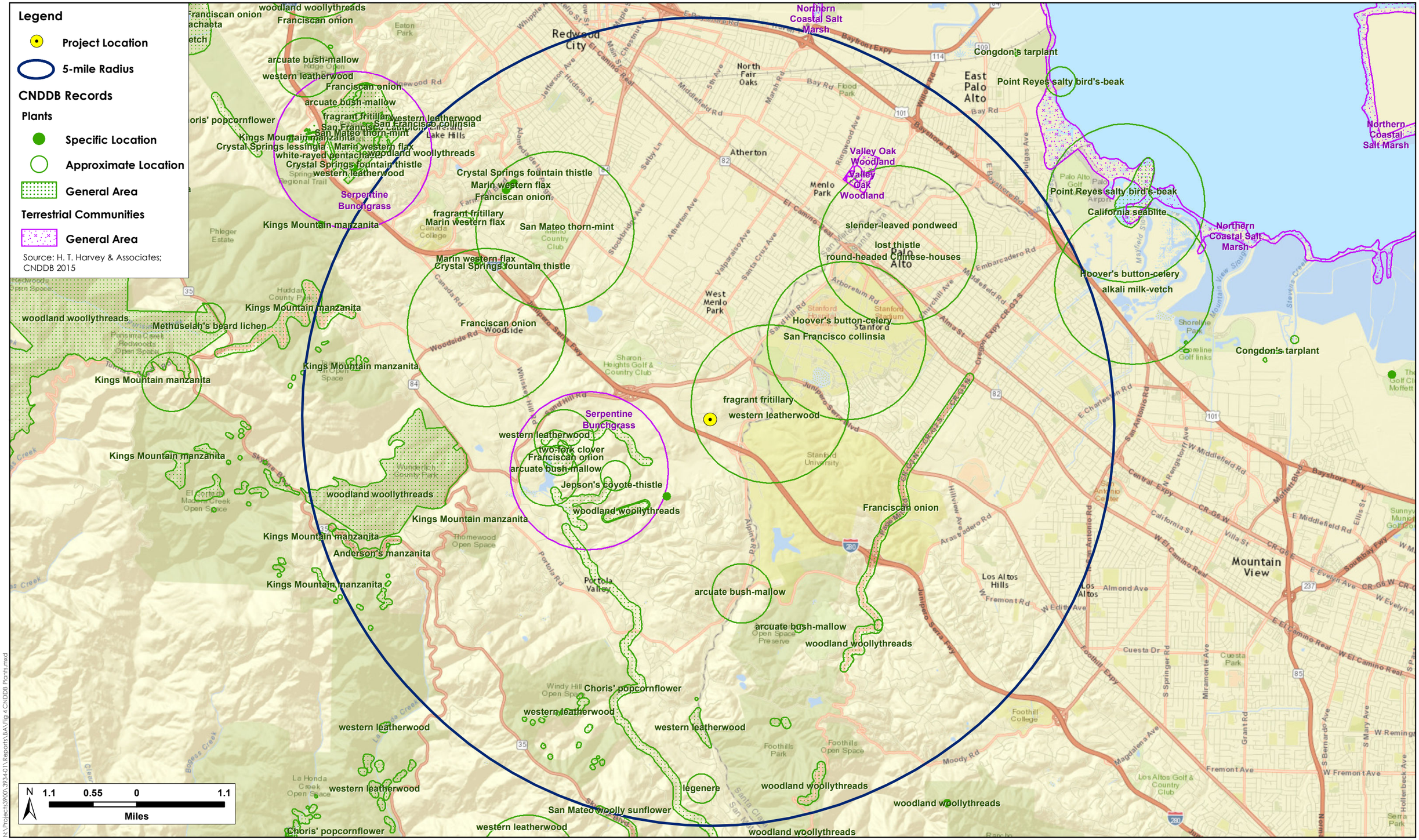
Figure 3B. Biotic Habitats and Impacts
Biological Assessment
SLAC National Accelerator Laboratory,
Environmental Cleanup of IR-6 and IR-8 Drainages (3934-02)
February 2017



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H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 4. CNDDB Plant Records
Biological Assessment
SLAC National Accelerator Laboratory, Environmental Cleanup of IR-6 and IR-8 Drainages (3934-02)
February 2017

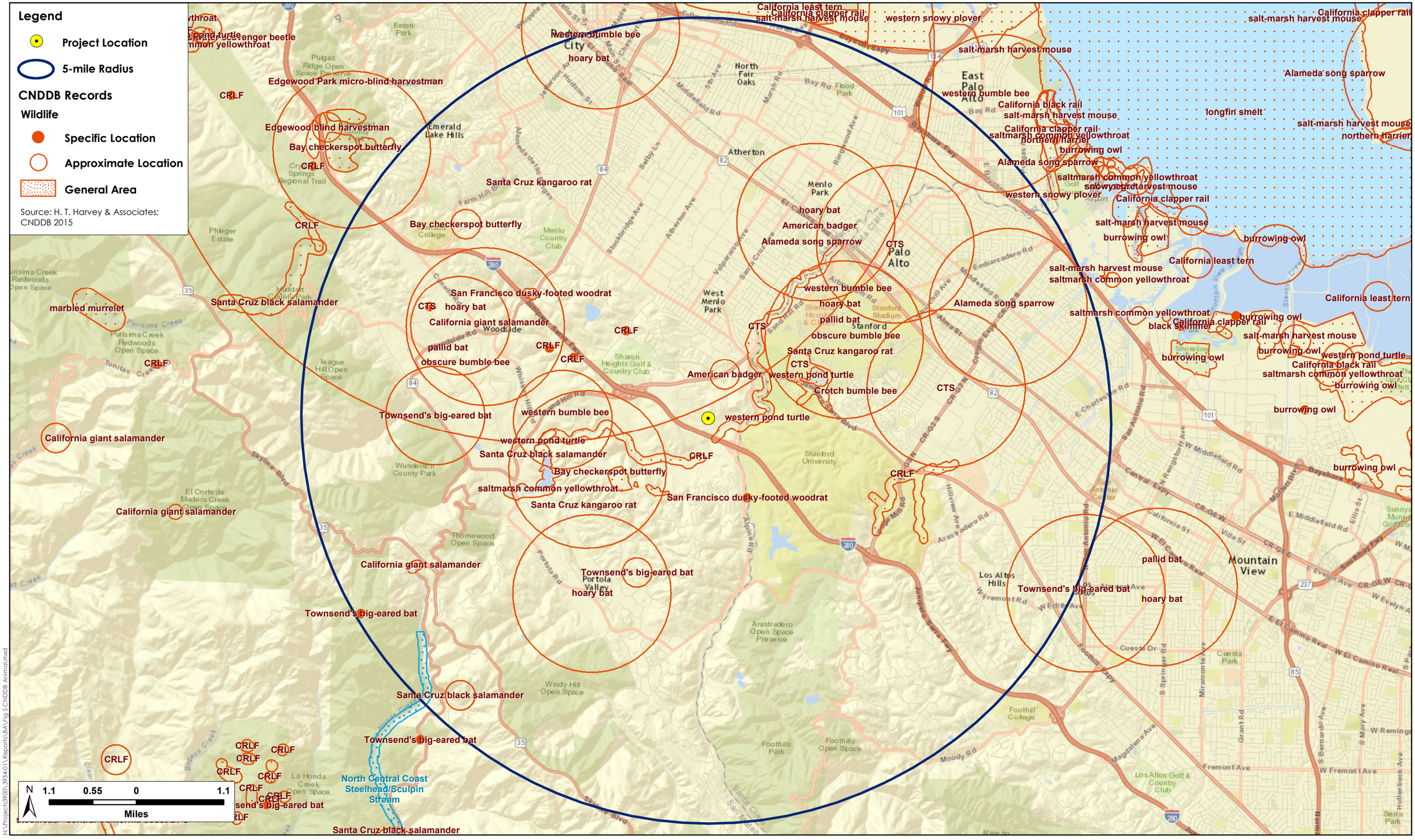

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Figure 5. CNDDB Animal Records

Biological Assessment
SLAC National Accelerator Laboratory, Environmental Cleanup of IR-6 and IR-8 Drainages (3934-02)
February 2017

Appendix A. U.S. Fish and Wildlife Service Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
FEDERAL BUILDING, 2800 COTTAGE WAY, ROOM W-2605
SACRAMENTO, CA 95825
PHONE: (916)414-6600 FAX: (916)414-6713

Consultation Code: 08ESMF00-2017-SLI-0776 January 10, 2017
Event Code: 08ESMF00-2017-E-01688
Project Name: Stanford Linear Accelerator Center IR-6/8 Drainage Soil Cleanup Project

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2)

of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment

Official Species List

Provided by:

Sacramento Fish and Wildlife Office
FEDERAL BUILDING
2800 COTTAGE WAY, ROOM W-2605
SACRAMENTO, CA 95825
(916) 414-6600

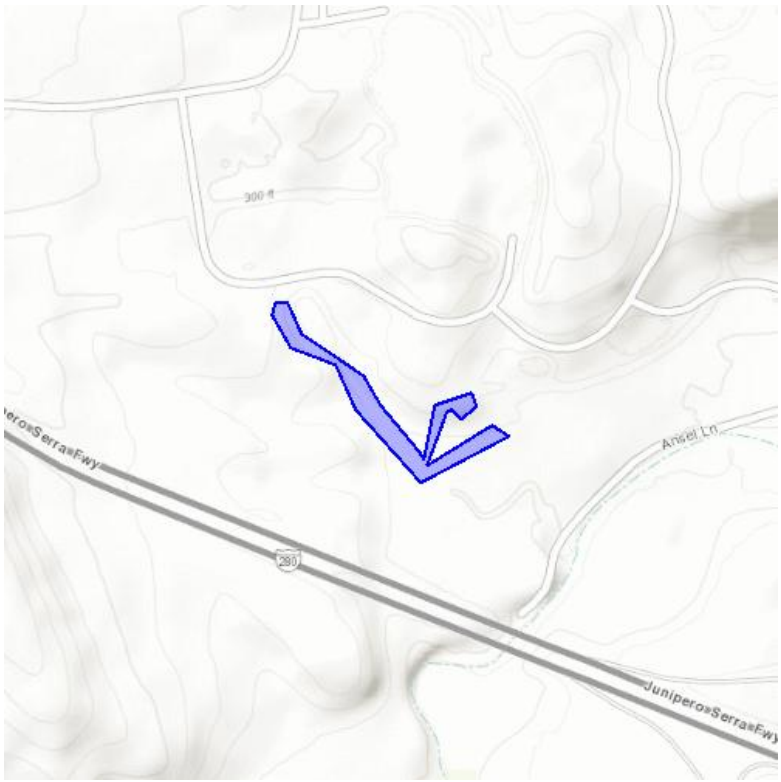
Consultation Code: 08ESMF00-2017-SLI-0776
Event Code: 08ESMF00-2017-E-01688

Project Type: ** OTHER **

Project Name: Stanford Linear Accelerator Center IR-6/8 Drainage Soil Cleanup Project
Project Description: The purpose of this Project is to remove soil that contains elevated concentrations of polychlorinated biphenyls (PCBs) from the two Investigation Areas (IAs) and their confluence.

Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

Project Location Map:



Project Coordinates: MULTIPOLYGON (((-122.20085569028016 37.413772953827326, -122.20023239853619 37.413931199417455, -122.20014554859519 37.41375267242843, -122.20041119468081 37.41358628844915, -122.20055935988059 37.41371210974418, -122.20065135978078 37.41369178580932, -122.20097322486257 37.412977588237815, -122.19990543719177 37.41349702459678, -122.19961420305484 37.41335905960035, -122.20106517073876 37.41275440539896, -122.20215849276431 37.41370397161498, -122.20249055037132 37.41428424673451, -122.20322628027135 37.41452365844892, -122.20352255713809 37.414941636432665, -122.20347148777365 37.41511206513028, -122.20327734947206 37.41511206513028, -122.20304743059388 37.41469004034595, -122.20203076598412 37.41415846904982, -122.20173443558453 37.41375672023074, -122.20110604790537 37.413164255132905, -122.20103448642479 37.413050661349466, -122.20085569028016 37.413772953827326)))

Project Counties: San Mateo, CA

Endangered Species Act Species List

There are a total of 17 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Amphibians	**Status**	**Has Critical Habitat**	**Condition(s)**
California red-legged frog *(Rana draytonii)* Population: Wherever found	Threatened	Final designated	
California tiger Salamander *(Ambystoma californiense)* Population: U.S.A. (Central CA DPS)	Threatened	Final designated	
Birds			
California Clapper rail *(Rallus longirostris obsoletus)* Population: Wherever found	Endangered		
California Least tern *(Sterna antillarum browni)* Population: Wherever found	Endangered		
Marbled murrelet *(Brachyramphus marmoratus)* Population: U.S.A. (CA, OR, WA)	Threatened	Final designated	
western snowy plover *(Charadrius nivosus ssp. nivosus)* Population: Pacific Coast population DPS-	Threatened	Final designated	

U.S.A. (CA, OR, WA), Mexico (within 50 miles of Pacific coast)			
Yellow-Billed Cuckoo *(Coccyzus americanus)* Population: Western U.S. DPS	Threatened	Proposed	
Fishes			
Delta smelt *(Hypomesus transpacificus)* Population: Wherever found	Threatened	Final designated	
steelhead *(Oncorhynchus (=salmo) mykiss)* Population: Northern California DPS	Threatened	Final designated	
Flowering Plants			
Fountain thistle *(Cirsium fontinale var. fontinale)* Population: Wherever found	Endangered		
Marin dwarf-flax *(Hesperolinon congestum)* Population: Wherever found	Threatened		
San Mateo thornmint *(Acanthomintha obovata ssp. duttonii)* Population: Wherever found	Endangered		
Showy Indian clover *(Trifolium amoenum)* Population: Wherever found	Endangered		
Insects			
Bay Checkerspot butterfly *(Euphydryas editha bayensis)*	Threatened	Final designated	

Population: Wherever found			
San Bruno Elfin butterfly *(Callophrys mossii bayensis)* Population: Wherever found	Endangered		
Mammals			
Salt Marsh Harvest mouse *(Reithrodontomys raviventris)* Population: wherever found	Endangered		
Reptiles			
San Francisco Garter snake *(Thamnophis sirtalis tetrataenia)* Population: Wherever found	Endangered		

Critical habitats that lie within your project area

There are no critical habitats within your project area.

Appendix B. Site Photos

Photo 1. A downstream view of the concrete-lined portion of the perennial drainage channel. November 2016.

Photo 2. A lateral view of the earthen portion of the perennial drainage channel. November 2016.

Photo 3. **An upstream view of the earthen portion of the intermittent primary drainage channel. November 2016.**

Photo 4. **The culvert (C1 and C2) inlets at the confluence of the perennial and intermittent primary drainage channels. November 2016.**

Photo 5. Perennial marsh wetland dominated by cattails. November 2016.

Photo 6. Dense riparian vegetation overhanging a perennial marsh wetland. November 2016.

Photo 7. Upland habitat (coyote brush and coast live oaks). November 2016.

H. T. HARVEY & ASSOCIATES

Ecological Consultants

Environmental Cleanup of IR-6 and IR-8 Drainages
SLAC National Accelerator Laboratory
San Mateo County, California
Preliminary Identification of Waters of the United States

Project # 3934-02

Prepared for:

SLAC National Accelerator Laboratory

Prepared by:

H. T. Harvey & Associates

February 2, 2017

Executive Summary

H. T. Harvey & Associates biologists surveyed the 3.91 acre (ac) Biological Study Area (BSA), containing two stormwater drainages in Menlo Park, San Mateo County, California, for jurisdictional features that may be subject to regulation under the Clean Water Act administered by the U.S. Army Corps of Engineers (USACE). SLAC National Accelerator Laboratory (SLAC) has completed past maintenance projects in and plans a final remediation and restoration project at the stormwater drainages. In October 2016, the BSA was surveyed to identify potential waters of the United States that are subject to Section 404 of the Clean Water Act, including wetlands and other waters (also referred to as "jurisdictional waters"). This *Preliminary Identification of Waters of the United States* describes and discusses the features delineated during the on-site determination.

The results of the on-site determination are based upon existing conditions present at the time of the wetland delineation survey. The 30-year normal annual precipitation (1981-2010) for the BSA is an estimated 23.67 inches, with the majority falling between October and April (PRISM Climate Group 2016). The survey took place at the beginning of the 2016/2017 wet season. Following a dry period of several months, the BSA received approximately 2.28 inches during the week prior to the survey (from October 14, 2016 through October 17, 2016), (PRISM Climate Group 2016). This amount of rainfall greatly exceeds the monthly normal for October (1.08 inches); however, the boundaries of wetlands and drainage channels remained clear due to the presence of strongly hydrophytic vegetation and active hydrology indicators, and the recent precipitation did not affect the survey results.

Approximately 0.23 ac of jurisdictional waters were identified in the BSA, comprising 0.02 ac of Clean Water Act Section 404 wetlands and 0.21 ac of Section 404 other waters situated below the ordinary high-water (OHW) marks of the stormwater drainage channels and within culverts carrying water to and from the drainage channels. The perennial drainage channel (also referred to as "IR-8") receives stormwater runoff from the SLAC campus, and groundwater discharge that is actively pumped into the channel from the SLAC tunnel underdrain systems year-round. The wetland and riparian vegetation at the Project site are present only in the IR-8 drainage and confluence with the IR-6 drainage, and are artificially induced by the year-round groundwater flow pumped from the tunnel sub-drains. Water in the perennial drainage channel flows through the BSA from north to south, and converges with the intermittent drainage channel (referred to as "IR-6").

The intermittent drainage channel includes a primary channel that receives stormwater flow from the RY-SSRL area at SLAC, and a parallel secondary channel that receives a stormwater flow from a smaller area near the southern edge of SLAC. There is an earthen berm approximately 3 to 4 feet high between the primary and secondary drainages. Water in the IR-6 drainages flows toward the IR-6/8 confluence area, where there are two culvert inlets. During large rain events, water may backflow from the confluence into the intermittent IR-6 primary and secondary drainage channels. The combined flow of the IR-6 and IR-8 drainages is then conveyed to a tributary of San Francisquito Creek via flow into the culverts at the IR-6/IR-8 confluence.

The remaining land in the BSA (3.68 ac of upland habitat) does not meet the definition of wetlands or other waters potentially subject to USACE jurisdiction. The table below lists the acreage and linear feet calculations for potentially jurisdictional waters in the Biological Study Area (BSA).

Summary of Jurisdictional Waters in the Biological Study Area

Habitats	Acres	Linear Feet
Jurisdictional Waters (total)	**0.23**	**1903**
Jurisdictional Other Waters (total)	**0.21**	**1669**
Concrete-Lined perennial drainage channel (IR-8)	0.03	370
Perennial drainage channel (IR-8)	0.1	500
Intermittent primary drainage channel (IR-6)	0.04	330
Intermittent secondary drainage channel (IR-6)	0.04	360
Concrete-Lined intermittent primary drainage channel (IR-6)	<0.01	43
Lined intermittent secondary drainage channel (IR-6)	<0.01	18
Culvert	<0.01	48
Jurisdictional Wetlands (total)	**0.02**	**234**
Perennial marsh wetlands	0.02	234
Non-jurisdictional Areas (total)	**3.68**	**NA**
Riparian	0.67	725
Uplands	2.71	1500
Developed	0.26	440
BSA TOTAL	**3.91**	**NA**

Note:

* Values are approximate because of rounding.

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List of Preparers

Patrick Boursier, Ph.D., Principal-in-Charge
Maya Goklany, M.S., Plant Ecologist
Gregory Sproull, M.S., Plant Ecologist

Section 1. Introduction

1.1 Biological Study Area Description

The Biological Study Area (BSA) is approximately 3.91 acres (ac), and is located in the San Francisquito watershed within and adjacent to the SLAC National Accelerator Laboratory (SLAC) in Menlo Park, San Mateo County, California (Figure 1). It is situated in the *Palo Alto* U.S. Geological Survey (USGS) 7.5-minute quadrangle, in Township 6 South, Range 3 West, Section 16 (Figure 2). The BSA gradually slopes to a lower elevation from north to south, but overall there is little natural topographic variation across the site. Elevation ranges from approximately 200 to 240 feet (National Geodetic Vertical Datum of 1929 [NGVD29]) (see Figure 2). The 30-year climate normal (from 1981-2010) indicate that the BSA receives approximately 23.67 inches of rain annually, with the majority falling between October and April, and temperature ranges from a low of 47.9 ◦F to a high of 71.3 ◦F (PRISM Climate Group 2016).

The Project site is on property owned by Stanford University. The northern portion of the Project site is within the boundary of SLAC, which is on property leased by Stanford University to the United States Department of Energy (DOE). SLAC is operated for DOE by Stanford University. DOE provides funding for SLAC operations and for environmental investigation and cleanup activities at the site. The Project site is bound to the north and northeast by SLAC. The property to the south and west is owned by Stanford University and leased to the Portola Valley Training Center.

The BSA encompasses two stormwater drainage channels, and adjacent uplands, including a mixed riparian woodland corridor, mixed oak woodland, ruderal grassland, and developed habitat. A perennial drainage channel (also referred to as "IR-8") receives stormwater runoff from the SLAC during the rainy season, and groundwater discharge that is actively pumped into the channel from SLAC tunnel underdrain systems year-round. Water in the IR-8 drainage flows from north to south, and converges with the intermittent drainage channel (referred to as "IR-6") at the IR-6/8 confluence area.

The intermittent IR-6 drainage channel includes a primary channel that receives stormwater flow from the storm drain system at SLAC, and a parallel secondary channel that receives a stormwater flow from a smaller area near the southern edge of SLAC. There is an earthen berm approximately 3 to 4 feet high between the primary and secondary drainages. Water in the IR-6 drainages flows toward the IR-6/8 confluence area, where two culvert inlets are located. During large rain events, water may backflow into the intermittent IR-6 drainage channel from the confluence. The combined flow of the IR-6 and IR-8 drainages is then conveyed to a tributary of San Francisquito Creek via flow into the culverts at the IR-6/8 confluence area.

The two main soil types that underlie the BSA include: (1) Accelerator-Fagan association, 5-15% slopes, and (2) Accelerator-Fagan-Urbanland complex, 5-15% slopes (Figure 3; Appendix A). Urban Land and Botella Loam are also included within the BSA but are minor components. Table 1 provides a summary of the soil

units mapped in the BSA, along with their associated textures, drainage classification, and hydric soil status. Both soil types are derived from residuum weathered from sandstone and siltstone, and can range from non-saline to very slightly saline. They are soils that typically occurs on farmland of statewide importance, which include non-irrigated lands that are used for Christmas trees, pumpkins, oats, hay, other grains, and dryland pasture (California Department of Conservation 2014).

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Figure 1. Vicinity Map
Preliminary Identification of Waters of the U.S.
SLAC National Accelerator Laboratory,
Environmental Cleanup of IR-6 and IR-8 Drainages (3934-02)
February 2017

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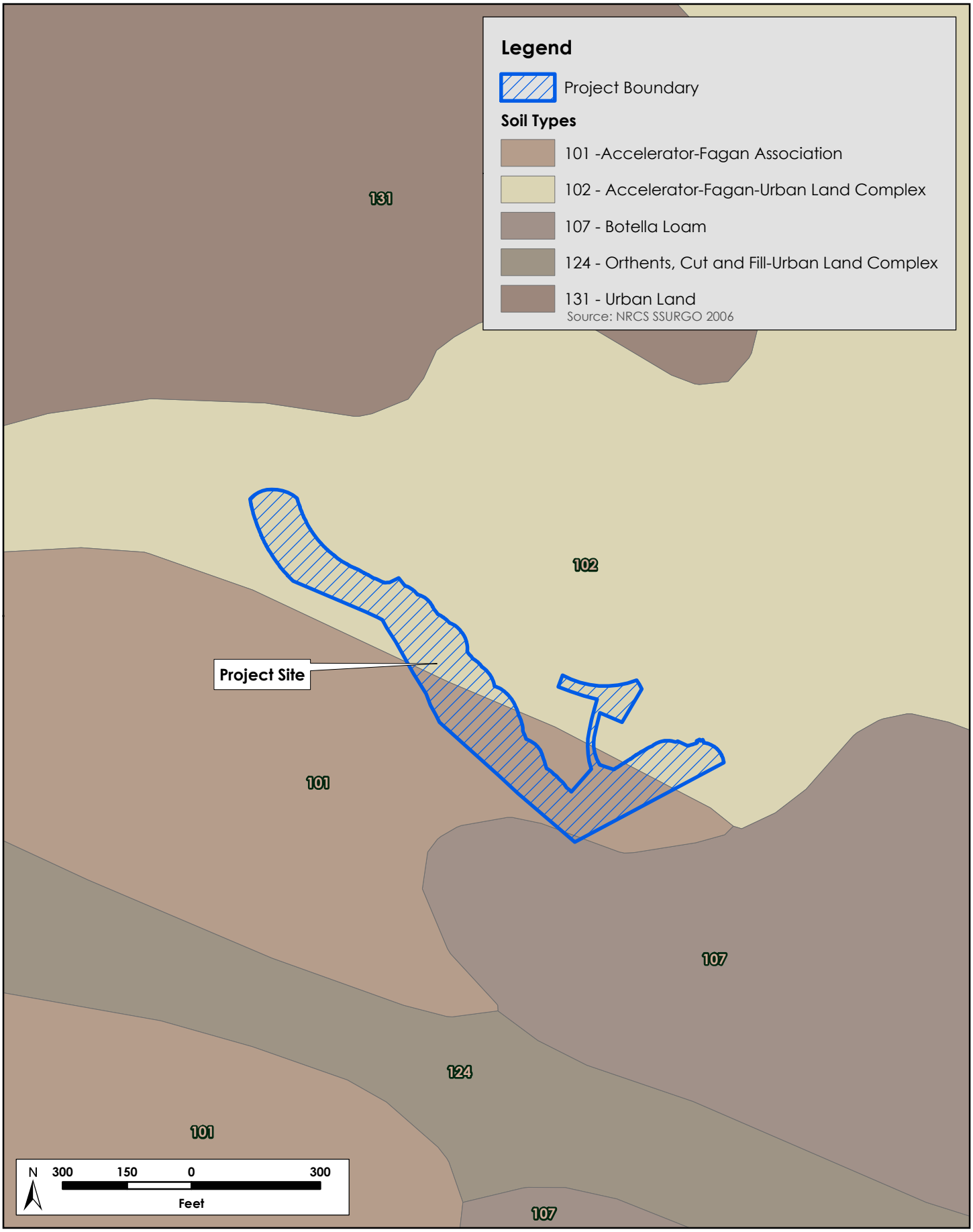
Figure 2. USGS Topographic Map
Preliminary Identification of Waters of the U.S.
SLAC National Accelerator Laboratory,
Environmental Cleanup of IR-6 and IR-8 Drainages (3934-02)
February 2017



N:\Projects3900\3934-01\Reports\PrelimIDofWaters\Fig 3 NRCS Soils Map.mxd mchilds

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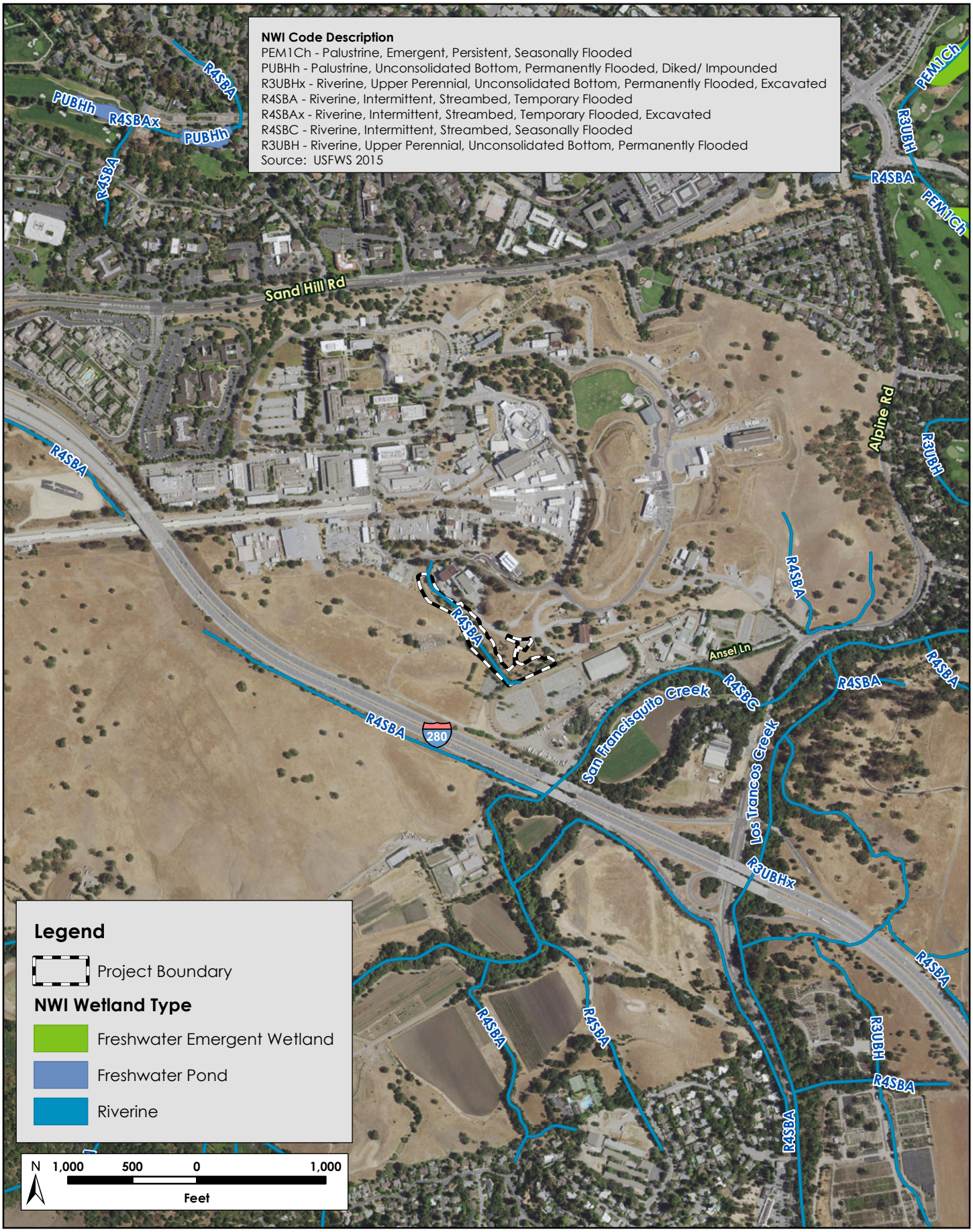
Figure 3. NRCS Soils Map
Preliminary Identification of Waters of the U.S.
SLAC National Accelerator Laboratory
Environmental Cleanup of IR-6 and IR-8 Drainages (3934-01)
February 2017

Table 1. Soil Type, Texture, Drainage Classification, and Hydric Status for the Two Soil Types Occurring in the Biological Study Area[1]

Soil Symbol	Soil Name	Soil Texture	Drainage Classification	Hydric Status
101	Accelerator-Fagan association, 5-15% slopes	Accelerator component: gravelly clay loam Fagan component: clay loam	well drained	No
102	Accelerator-Fagan-Urbanland association, 5-15% slopes	Accelerator component: gravelly clay loam Fagan component: clay loam Urbanland component: human transported material	well drained	No

[1] Data was obtained from the Natural Resource Conservation Service (NRCS) Web Soil Survey (2016). The BSA is outside the limits of the survey covered by the *Soil Survey of San Mateo County, California* (Soil Conservation Service 1961).

The U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) has assigned the Cowardin code "R4SBA" to the perennial drainage channel (riverine, intermittent, streambed, temporarily flooded) (Figure 4). No other features in the BSA appear in the NWI.



N:\Projects3900\3934-01\Reports\PrelimIDofWaters\Fig 4 NWI Map.mxd mchilds

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Figure 4. National Wetland Inventory Map
Preliminary Identification of Waters of the U.S.
SLAC National Accelerator Laboratory
Environmental Cleanup of IR-6 and IR-8 Drainages (3934-01)
February 2017

1.2 Survey Purpose

The BSA was surveyed at the beginning of the 2016/2017 wet season to identify potential waters of the United States (jurisdictional waters), including wetlands and other waters. The results of the on-site determination are based upon existing conditions present at the time of the wetland delineation survey. Following a dry period of several months, the BSA received approximately 2.28 inches during the week prior to the survey (from October 14, 2016 through October 17, 2016), (PRISM Climate Group 2016). This amount of rainfall greatly exceeds the monthly normal for October (1.08 inches); however, the boundaries of wetlands and drainage channels remained clear due to the presence of strongly hydrophytic vegetation and active hydrology indicators, and the recent precipitation did not affect the survey results.

Section 2. Survey Methods

2.1 Identification of Jurisdictional Waters

H.T. Harvey & Associates plant ecologists Maya Goklany, M.S. and Gregory Sproull, M.S. walked the entire BSA On October 20, 2016 to determine all potentially jurisdictional waters (wetlands and other waters) on the site and to map these features using a submeter Global Positioning System (Trimble Geo7X™ GPS unit). The vegetation, soils, and hydrology of the BSA were examined following the guidelines outlined in (1) the *Corps of Engineers Wetlands Delineation Manual* (Corps Manual) (Environmental Laboratory 1987), and (2) the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (Regional Supplement) (USACE 2010a).

This report was also compiled in accordance with guidance provided in *Information Needed for Verification of Corps Jurisdiction* (USACE San Francisco District 2007), *Draft Map and Drawing Standards for the South Pacific Division Regulatory Program* (USACE 2012a), and *Final Map and Drawing Standards for the South Pacific Regulatory Division Regulatory Program* (USACE 2012b). These documents list information that must be submitted as part of a request for a jurisdictional determination: locality map (Figure 1), USGS quadrangle sheets (Figure 2), study area and aerial photograph (Figures 4 and 5), applicable sections of the current soil survey report (Appendix A), color photos (Appendix B), data forms (Appendices C and D), written rationale for sample point choice, and delineation survey results and discussion.

The BSA was examined for topographic features, drainages, alterations to site hydrology or vegetation, and areas of significant recent disturbance. A determination was then made as to whether normal environmental conditions were present at the time of the delineation survey. Data were used to document which portions of the study area were wetlands. The survey utilized the three-parameter approach to identifying wetlands based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology using the "Routine Determination Method, On-Site Inspection Necessary (Section D)" outlined in the Corps Manual, and using the updated data forms, vegetation sampling methods, and hydric soil and hydrology indicators developed for the Regional Supplement (USACE 2010a).

Before the delineation survey was conducted, topographic maps and historical aerial photos of the BSA were obtained and reviewed from several sources, such as the USGS (Figure 2), Natural Resource Conservation Service (NRCS) (Figure 3), NWI (Figure 4), Google Earth Pro software (Google Inc. 2016), and National Environmental Title Research (NETR 2016). Overall, the approach used to identify wetlands included identifying vegetation within the BSA to the lowest taxonomic level possible, recording the percent cover of each plant species in plots installed at the sampling location, and determining whether dominant plant species are hydrophytic.

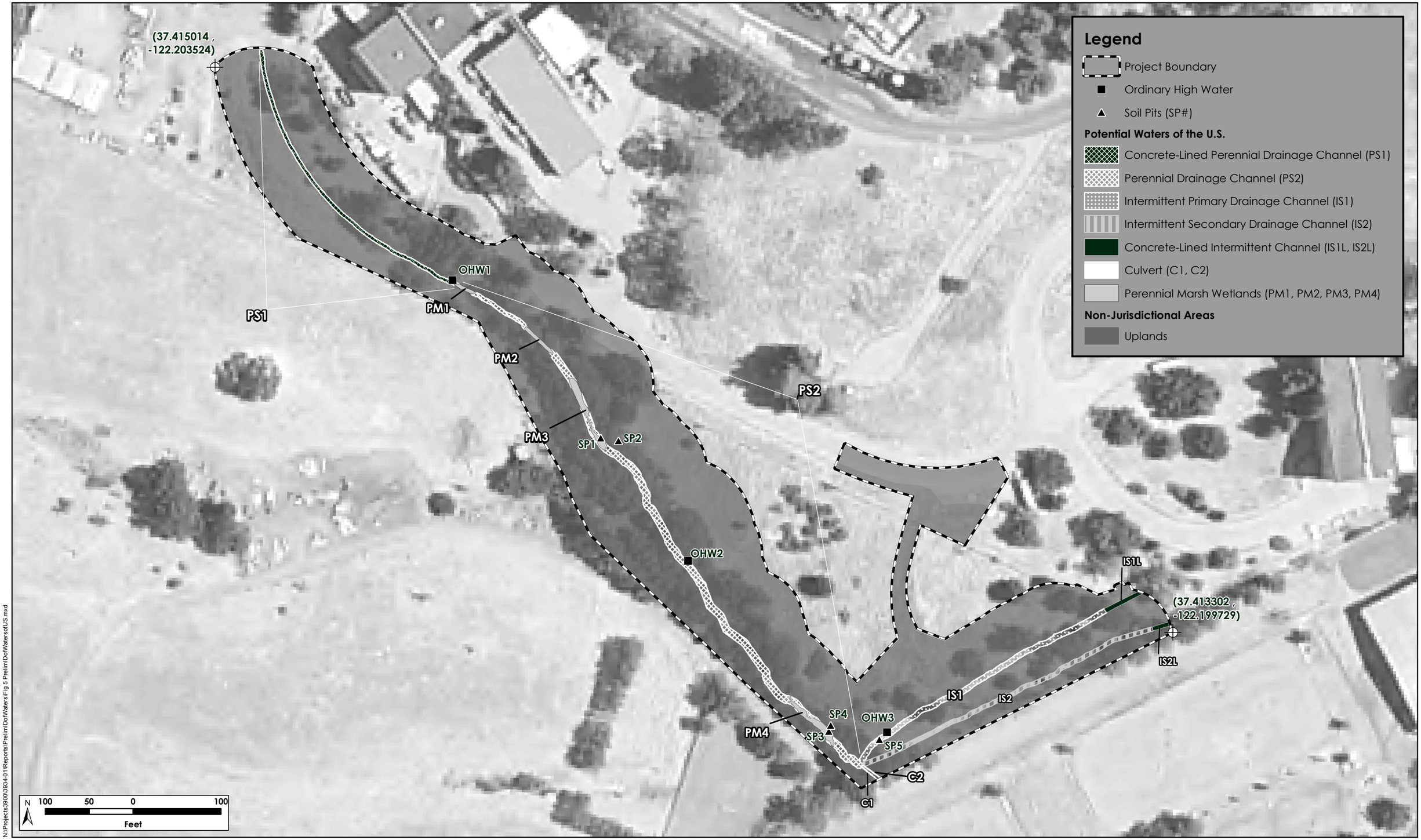

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Figure 5. Preliminary Identification of Waters of the U.S.
Preliminary Identification of Waters of the U.S.
SLAC National Accelerator Laboratory
Environmental Cleanup of IR-6 and IR-8 Drainages (3934-01)
February 2017

Due to SLAC health and safety requirements regarding soil potentially containing polychlorinated biphenyls (PCBs), H.T. Harvey surveyors M. Goklany and G. Sproull were not permitted to handle soil and/or dig soil pits in the BSA. Jacki Lee, a representative from Erler & Kalinowski, Inc., assisted with this portion of the wetland delineation survey as she had clearance from SLAC to handle the soil using protective gloves and dig pits up to 11.5 inches in depth. Soil pits were installed at locations chosen by M. Goklany which allowed the surveyors to identify hydric indicators and wetland hydrology. Features meeting wetland criteria for each parameter were mapped in the field using a Trimble Geo7X™ GPS unit. A brief overview of the USACE methodology specifically applicable to the identification of jurisdictional waters on the site is summarized below.

2.2 Identification of Section 404 Wetlands

2.2.1 Vegetation

Plants observed at each of the sample sites were identified to species, when possible, using *The Jepson Manual, Vascular Plants of California, Second Edition* (Baldwin et al. 2012). A list of species for each sample location was compiled, and a visual estimate of the percent cover of plant species was made following guidance provided in the Regional Supplement. The wetland indicator status of each species was obtained from the *Western Mountains, Valleys, and Coast 2016 Regional Wetland Plant List* (Lichvar et al. 2016). It was then determined which of the sample locations supported wetland vegetation using the applicable indicator (i.e., 1: Rapid Test, 2: Dominance Test, 3: Prevalence Test, or 4: Morphological Adaptations) as described in the Regional Supplement.

Wetland indicator species are designated according to their frequency of occurrence in wetlands. The five basic levels of wetland indicator groups, indicator symbol, and the frequency of occurrence of species in wetlands are presented in Table 2.

Table 2. Wetland Indicator Status Categories for Vascular Plants

Indicator Category	Symbol	Frequency (Percent) of Occurrence in Wetlands [1]
Obligate	OBL	>99
Facultative wetland	FACW	67–99
Facultative	FAC	34–66
Facultative upland	FACU	1–33
Upland [2]	UPL	<1%

Wetland indicator species are hydrophytes classified as OBL or FACW that occur "in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present" (Environmental Laboratory 1987). Plants

[1] Based on information contained in the Corps Manual.
[2] Plant species that are not listed in Lichvar et al. (2016) are considered UPL species

species found in both uplands and periodically saturated wetlands have a FAC wetland indicator status. A complete list of the vascular plants observed in the BSA and their current indicator status is presented in Appendix E.

2.2.2 Soils

Soil profiles were examined for hydric soil indicators. Diagnostic features include numerous indicators defined and described by the National Technical Committee for Hydric Soils (NRCS 2010). These indicators include the presence of Histosols (A1) (organic soils), black histic (A3), hydrogen sulfide odor (A4), depleted matrix (F3), redox dark surface (F6), and mottling indicated by the presence of gleyed or bright spots of colors (in the former case, blue grays; in the latter case, orange red, or red brown) in the soil horizons observed, among other features. Munsell Soil Notations (Munsell 2009) were recorded for the soil matrix for each soil sample. The last digit of the Munsell Soil Notation refers to the chroma of the sample. This notation consists of numbers beginning with 0 for neutral grays and increasing at equal intervals to a maximum of about 20. Soil matrix chroma values that are 1 or less, or 2 or less when mottling is present, are typical of soils that have developed under anaerobic conditions. The first digit of the Munsell soil notation refers to the value of the sample, with numbers ranging from 2 for saturated colors to a maximum of about 8 for faded or light colors. Hydric soils often show low-value colors when soils have accumulated sufficient organic material to indicate development under wetland conditions, but they can show high-value colors when iron depletion has occurred, which removes color value from the soil matrix.

2.2.3 Hydrology

Each of the sample sites was examined for positive field indicators (primary and secondary) of wetland hydrology following the guidance provided in the Regional Supplement. Primary indicators might include visual observation of surface water (A1), high water table (A2), soil saturation (A3), water-stained leaves (B9), and hydrogen sulfide odor (C1). Secondary indicators might include drainage patterns (B10), geomorphic position (D2), or a passing score for the FAC-neutral test (D5).

2.3 Identification of Section 404 Other Waters

Historically, in non-tidal waters, USACE jurisdiction extends to the ordinary high water (OHW) mark; which is defined in Title 33, Code of Federal Regulations (CFR), Part 328.3 as "the line on the shore established by the fluctuations of water and indicated by physical characteristics, such as a clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation or the presence of litter and debris." This guidance is based on the identification of the OHW marks by examining physical evidence of surface flow in the channel; as there is no hydrologic definition of the OHW marks.

Regulatory Guidance Letter No. 05-05 (USACE 2005) deals specifically with the topic of OHW mark identification, and lists the following physical characteristics that should be considered when making an OHW determination: (1) natural line impressed on the bank; (2) shelving; (3) changes in the character of the soil; (4) destruction of

terrestrial vegetation; (5) wracking; (6) vegetation matted down, bent, or absent; (7) sediment sorting; (8) leaf litter disturbed or washed away; (9) scour; (10) deposition; (11) multiple observed flow events; (12) bed and banks; (13) water staining; and (14) and change in plant community.

Just as with the Corps Manual, development of the definition of the OHW marks and description of the field indicators to be used were based primarily on environmental conditions present in areas of the U.S. with consistent annual rain distribution; such is the case for the majority of the Western Mountains, Valley, and Coast region. Channel geomorphology in these areas has responded by developing field characteristics that reflect a system in relative equilibrium, and precipitation events are more likely to cause the development of "ordinary" features commonly used by USACE in identifying the lateral extent of streams.

The BSA is located within the southernmost portion of Western Mountains, Valley, and Coast region and thus, has a higher degree of seasonal and inter-annual variability in precipitation that is similar to that of the Arid West. The USACE has refined its methods and indicators for delineating the OHW marks in these two regions, and has published *A Field Guide to the Identification of the OHWM in the Arid West Region of the Western U.S.: A Delineation Manual* (Lichvar and McColley 2008), and *A Guide to OHWM Indicators in Non-Perennial Streams in the Western Mountains, Valley and Coast Region of the U.S.* (Mersel and Lichvar 2014). The guidance provided in both of these publications was also used to determine the lateral extent of "other waters" by the presence of one or more natural geomorphic field indicators, taking into consideration such factors as size of watershed, channel slope, landscape setting, elevation, gradient, land use practices, and soil type. An Arid West data form was completed during the delineation survey to document the results (USACE 2010b; Appendix D).

Section 3. Survey Results and Discussion

Approximately 0.23 ac (1903 linear feet) of jurisdictional waters were identified within the BSA: approximately 0.02 ac (234 linear feet) of Section 404 wetlands and 0.21 ac (1669 linear feet) of other waters (Table 3). Figure 5 depicts the habitats mapped in the BSA, which include perennial marsh wetlands, perennial drainage channel, intermittent primary drainage channel, intermittent secondary drainage channel, culvert, and upland habitat types. As required by USACE reporting requirements, this figure is presented in black and white. Five formal sample locations (soil pits) were recorded across the BSA during October 2016 delineation survey (SP1-SP5, Appendix C; Figure 5), in addition to three data forms to document the OHW marks of the drainage channels in the BSA (OHW1-OHW3, Appendix D). Figure 5 depicts the locations of soil pits and OHW data forms.

Table 3. Summary of Potentially Jurisdictional Waters in the Biological Study Area

Habitats	Acres	Linear Feet
Jurisdictional Waters (total)	**0.23**	**1903**
Jurisdictional Other Waters (total)	**0.21**	**1669**
Concrete Lined perennial drainage channel (IR-8)	0.03	370
Perennial drainage channel (IR-8)	0.1	500
Intermittent primary drainage channel (IR-6)	0.04	330
Intermittent secondary drainage channel (IR-6)	0.04	360
Concrete Lined intermittent primary drainage channel (IR-6)	<0.01	43
Lined intermittent secondary drainage channel (IR-6)	<0.01	18
Culvert	<0.01	48
Jurisdictional Wetlands (total)	**0.02**	**234**
Perennial marsh wetlands	0.02	234
Non-jurisdictional Areas (total)	**3.64**	**NA**
Riparian	0.67	725
Uplands	2.71	1500
Developed	0.26	440
BSA TOTAL	**3.91**	**NA**

Note:

[1] Values are approximate because of rounding.

Information pertinent to the identification of jurisdictional wetlands and other waters assembled during this investigation is presented in six appendices attached to this report. Please note that Appendix F has been provided as an electronic attachment in Microsoft Excel format, in accordance with USACE guidelines. The unique identifiers listed in Appendix F are also shown on Figure 5.

- Appendix A— Custom Soil Resource Report for San Mateo County (Eastern Part), California
- Appendix B— Photos of the BSA
- Appendix C— USACE Western Mountains, Valley, and Coast Region Wetland Delineation Data Forms
- Appendix D— USACE Arid West OHW Mark Data Forms
- Appendix E— Plants Observed
- Appendix F—Aquatic Resources Table

3.1 Observations/Rationale/Assumptions

- The results of the on-site determination of jurisdictional waters are based on the conditions present at the time of the surveys. The conditions on the BSA were observed during the delineation surveys and are reported here along with pertinent background and historical information.
- The 30-year normal annual precipitation (1981-2010) for the BSA is an estimated 23.67 inches, with the majority falling between October and April (PRISM Climate Group 2016). The survey took place at the beginning of the 2016/2017 wet season. Following a dry period of several months, the BSA received approximately 2.28 inches during the week prior to the survey (from October 14, 2016 through October 17, 2016), (PRISM Climate Group 2016). This amount of rainfall greatly exceeds the monthly normal for October (1.08 inches); however, the boundaries of wetlands and drainage channels remained clear due to the presence of strongly hydrophytic vegetation and active hydrology indicators, and the recent precipitation did not affect the survey results.
    - As a result of the survey timing at the beginning of the 2016/2017 wet season, much of the vegetation was senescent and lacked the reproductive anatomy that is required for identification to species, and in some cases, genera. Senesced grasses at upland sampling locations SP2 and SP4 (Figure 5 and Appendix C) were not included in the dominance and prevalence index tests for hydrophytic vegetation because an indicator status could not be assigned.
- Jurisdictional other waters on the BSA all function to convey stormwater runoff from SLAC and surrounding lands, and include a freshwater, perennial drainage channel with concrete-lined and earthen reaches of channel bed (PS1 and PS2 Figure 5; Photos 1-2, Appendix B), intermittent primary and secondary drainage channels (IS1, IS2, IS1L and IS2L Figure 3; Photos 3-5, Appendix E), and two culverts (C1 and C2, Figure 3; Photos 6-7, Appendix B). The perennial drainage channel conveys pumped groundwater year-round. Previous studies have demonstrated that the perennial IR-8 drainage is not connected to the groundwater table (M. Goklany, personal communication John DeWitt, October 20, 2016); however, it does receive groundwater that is actively pumped from SLAC tunnel underdrain systems. Water in IR-8 flows through the BSA from north to south, and converges with the intermittent IR-6 drainage channels (IS1 and IS-2, Figure 5) at a confluence where there are two culvert inlets (Photo 7, Appendix B).

- The existing condition of the drainage channels during the October 2016 survey allowed for the unobstructed observation of OHW mark indicators, such as water stains and algae growth, distinct changes in plant communities, matted vegetation, and surface relief, which includes knick points and other distinct micro-topographic features (OHW1-3, Figure 5 and Appendix D). Such indicators are formed during regular channel forming storm events, such as the 2- to 5-year events.

- Jurisdictional wetlands on the BSA include perennial marshes within the OHW marks of the perennial drainage channel (Figure 5 Photos 8-9, Appendix B). Two wetland sample points were collected across the BSA (SP1 and SP3, Figure 5 and Appendix C). Wetlands were identified by the presence of cattail (*Typha* sp., OBL), a saturated soil profile (A3), and drift deposits (B3). One submerged patch of creeping bentgrass (*Agrostis stolonifera*, FAC) was also mapped as a perennial marsh wetland; however, the taxonomic identity of this species would need to be confirmed at a time of year when its' reproductive parts are fully developed. SLAC limited digging soil pits below a depth of 11.5 inches without an additional permit, and thus, the full profiles could not be examined. Nevertheless, one hydric soil indicator (hydrogen sulfide odor, (A4) was observed at SP1; Furthermore, the absence of other hydric indicators may also be a result of sediment removal from the bed of the perennial drainage channel in 2005.
    - The perennial drainage channel and perennial marsh wetlands are shaded by the attendant riparian tree canopy which is primarily composed of small arroyo willow trees (*Salix lasiolepis*, FACW). Although arroyo willow occurs within the 900 square ft sample plot installed for the analysis of hydrophytic vegetation in the tree and shrub layers (see SP1 and SP3, Appendix C), this species was dropped from the dominance and prevalence index tests because arroyo willow is a deep rooted phreatophyte that is able to tap into a groundwater table below 12 inches, which is the maximum depth that allows an area to meet the "high water table" primary hydrology indicator (A2) during the wet season (USACE 2010a).

- SLAC has implemented maintenance projects along the bed and banks of the drainage channels, and attendant riparian habitat in the BSA. Each of the drainage channels have concrete-lined and earthen reaches. Over time, sediment builds up in limited portions near the end of the IR-8 concrete lined channel, and is periodically removed to prevent debris jams. Cattails and other quickly establishing plant species may establish within 1-2 years following this routine maintenance. In 2005, approximately 60 cubic yards of sediment and vegetation were removed from the upper 150-foot reach of the unlined IR-8 drainage channel as part of a multifaceted project to restore the natural contours of the bed and banks of the drainage channels, conduct substrate sampling, and install geotextile fabric and riprap to secure the earthen channel and banks.

3.2 Areas Meeting the Regulatory Definition of Jurisdictional Waters

3.2.1 Identification of Section 404 Potentially Jurisdictional Wetlands

Perennial Marsh Wetland. Approximately 0.02 ac (234 linear feet) of perennial marsh wetland were identified on the BSA within the earthen portion of the perennial drainage channel (PM1-PM4, Figure 5). Two of five soil sample locations were installed in wetlands (SP1 and SP3, Figure 5 and Appendix C; Photos 11-12,

Appendix B), all of which had a perennial hydrophyte community dominated by cattails and primary hydrology indicators. Sample location SP1 was installed near the OHW mark of the perennial drainage channel. The soil profile did not exhibit distinct horizons and soil texture was a loamy sand. A strong hydrogen sulfide odor was emitted from the soil pit during sampling, which was a clear indicator of hydric soil (A4). Although the soil pit location was not submerged, approximately 4 inches of clear, flowing surface water (A1) was observed immediately adjacent to the pit. In addition, drift deposits were noted at this location (B3), the soil profile was saturated with moisture throughout, and a water table (A2) was recorded at 5 inches below the ground surface. As previously mentioned, the perennial drainage channel and wetlands that it supports are not connected to groundwater (M. Goklany, personal communication, October 20, 2016), and the high water table is likely a result of lateral seepage from the adjacent area of flowing water that is pumped from below the SLAC tunnels.

The second wetland sampling location (SP3) was installed on a pile of sediment mounded several inches above the existing water line the perennial drainage channel at the time of the survey. A dense patch of cattails was rooted in the mound; however, much of this vegetation had died back, possibly as a result of the drought in the San Francisco Bay region during the years prior (USACE 2014). Once again, the soil profile did not exhibit distinct horizons, and soil texture was a clay loam. Hydric soil indicators were not observed at SP3, and hydric indicators, such as redox dark surface (F6) may not have had sufficient time to develop in the sediments. Surface water (A1) and a high water table (A2) were not observed at SP3; however, the soil profile was saturated with moisture from a depth of 10 inches to the ground surface (A3) and drift deposits on the sediment mound were noted (B3).

3.2.2 Identification of Section 404 Potentially Jurisdictional Other Waters

Perennial drainage channel. The concrete-lined portion of the IR-8 perennial drainage channel covers 0.03 ac (370 linear feet) in the BSA (PS1, Figure 5), and the earthen (non-wetland) portion is 0.10 ac (500 linear ft) (PS2, Figure 5). OHW data forms were recorded in each reach of the channel (OHW1-2, Figure 5 and Appendix D). For its entire length, the lateral extent of the channel generally corresponded with the OHW marks, and conveyed flowing water at a variable depth from just several inches to several feet at the time of the 2016 survey. The channel banks were variable, some are moderately-sloped and in other areas there was a more gradual rise to the floodplain. The northernmost reach is lined with concrete and the OHW marks were clearly defined by water stains and algae (Photo 13, Appendix B; OHW1, Appendix D). The southernmost reach of the perennial drainage channel has a soil substrate, and the OHW line was identified by indicators that are formed during regular storm events (every 2- to 5-years), such as a changes in plant community from hydrophytic vegetation in the low-flow channel to upland, herbaceous species on the banks, and surface relief, such as knick points and breaks in slopes (OHW2, Figure 5 and Appendix D).

Intermittent primary drainage channel. The majority of the IR-6 primary drainage channel (0.04 ac and 330 linear ft) has an earthen bed (IS1, Figure 5). Less than 0.01 ac and 43 linear ft upstream of the eastern end the earthen bed within the study area limits is lined with concrete (IS1L, Figure 5). The primary channel flows from east to west through the BSA and functions to convey stormwater runoff from developed areas at SLAC via a storm drain system that outfalls at the head of the channel (Photos 3 and 5, Appendix B). Occasionally the

western end of the channel may receive backflow from the confluence area where it converges with the IR-8 perennial drainage channel (Photo 7, Appendix B). One OHW data form was recorded in the earthen portion of the IR-6 primary channel (OHW3, Figure 5 and Appendix D). Water was not present at the time of the survey, but the rains during the week prior to the 2016 survey brought flows to the channel, which was evident from matted vegetation at- and below the OHW marks (Photo 14, Appendix B). For its entire length, the lateral extent of the channel generally corresponded with the OHW marks. One upland sampling location was also installed in the channel bed (SP5, Figure 5 and Appendix C). Vegetation in the channel bed and on the lower banks included Italian rye grass (*Festuca perennis*, FAC) and wild oats (*Avena* sp., UPL). Soil was a gravelly sandy loam and the soil profile lacked well developed horizons and hydric indicators. An earthen berm along the top of the southern bank of the intermittent primary drainage channel separates it from the intermittent secondary drainage channel (described below).

Intermittent secondary drainage channel. The majority of the IR-6 secondary drainage channel (0.04 ac and 360 linear ft) has an earthen bed (IS2, Figure 5). Less than 0.01 ac and 18 linear ft of the eastern end within the study area limits are lined with concrete (IS2L, Figure 5). This channel functions to collect stormwater runoff from the surrounding areas and water that backs up from the IR-6/8 confluence area (Photos 4-5, Appendix B). The IR-6 secondary drainage channel has manmade earthen berms on the north and south sides, and discharges to the confluence with the other drainage channels in the BSA. Two culverts discharge water from the confluence area to a tributary of San Francisquito Creek (see C1 and C2, Figure 5), and discussion below. The intermittent secondary drainage channel conveys flows from a relatively small drainage area and there was no water in the channel at the time of the survey. The OHW marks were identified solely based on the knick point at the toe of the bank slopes; however, data was not collected along this feature. As a result of the limited flows in this feature, upland vegetation (primarily non-native annual grasses) has colonized the channel bed and banks.

Culvert. There are two culverts on the BSA that together comprise less than 0.01 ac (48 linear ft) (C1-C2, Figure 5). Culverts are corrugated metal pipes that are 24 and 36 inches in diameter. Culverts C1 and C2 convey water from the drainage channels to a tributary of San Francisquito Creek (Photo 7, Appendix B). The inlets of C1 and C2 are situated slightly above the OHW elevation of the confluence.

3.2.3 Areas Not Meeting the Regulatory Definition of Waters of the United States

The remainder of the BSA (approximately 3.64 ac) does not meet the regulatory definitions of jurisdictional waters (Figure 5). Three sample locations were installed in uplands (SP2, SP4, and SP5, Figure 5 and Appendix C). Hydrophytic vegetation, hydric hydric soil indicators, and indicators of wetland hydrology were not observed in uplands. Sampling locations SP2 and SP4 were installed in the riparian corridor of the perennial drainage channel (Photos 15-16, Appendix B), which had dense tree canopy of arroyo willows and thick shrub layer of arroyo willows, poison oak (*Toxicodendron diversilobum*, FAC), and mulefat (*Baccharis salicifolia*, FAC) in some areas (Photo 17, Appendix B). Both of these woody species have the ability to tap into deep groundwater tables, and as such, they were not considered indicative of hydrophytic vegetation (as mentioned above). Furthermore, the herbaceous layer of the riparian corridor consisted of upland plant species, such as various non-native annual grasses (e.g. wild oats), Italian thistle (*Carduus pycnocephalus*, UPL), and annual fireweed

(*Epilobium brachycarpum*, UPL). Sample location SP5 was installed in the bed of the intermittent primary drainage channel, as mentioned above. Outside of the riparian corridor, uplands were comprised of a sparse tree canopy dominated by coast live oaks (*Quercus agrifolia*, UPL). Patches of trees were interspersed with coyote brush (*Baccharis pilularis*, UPL) and grasslands, which were contiguous with the herbaceous layer of the riparian habitat (Photos 18-19, Appendix B). Small developed areas covered by hardscape also occur in the BSA and were mapped as uplands.

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Appendix A. Custom Soil Resource Report for San Mateo County (Eastern Part), California

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for San Mateo County, Eastern Part, and San Francisco County, California

December 20, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

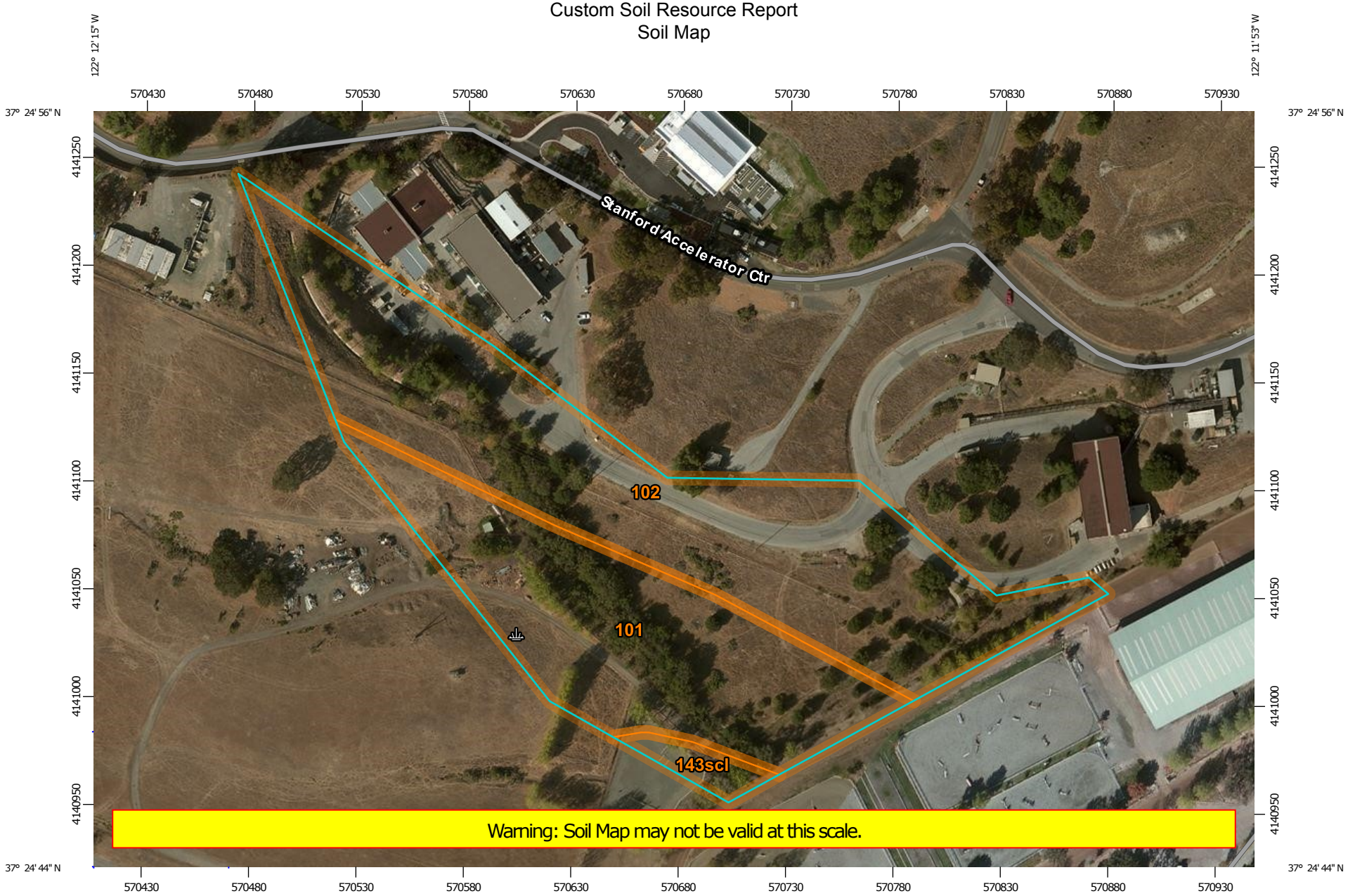
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,470 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 35 70 140 210

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Mateo County, Eastern Part, and San Francisco County, California
Survey Area Data: Version 12, Sep 12, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 26, 2010—Nov 3, 2013

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

San Mateo County, Eastern Part, and San Francisco County, California (CA689)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
101	Accelerator-Fagan association, 5 to 15 percent slopes	3.7	37.8%
102	Accelerator-Fagan-Urban land complex, 5 to 15 percent s lopes	5.8	59.6%
143scl	Flaskan sandy clay loam, 5 to 9 percent slopes	0.2	2.6%
Totals for Area of Interest		**9.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that

have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Mateo County, Eastern Part, and San Francisco County, California

101—Accelerator-Fagan association, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: h9gg
Elevation: 200 to 500 feet
Mean annual precipitation: 25 to 30 inches
Mean annual air temperature: 55 to 57 degrees F
Frost-free period: 275 to 330 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Accelerator and similar soils: 45 percent
Fagan and similar soils: 30 percent
Minor components: 9 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Accelerator

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and siltstone

Typical profile

H1 - 0 to 23 inches: loam
H2 - 23 to 29 inches: clay loam
H3 - 29 to 41 inches: gravelly clay loam
H4 - 41 to 45 inches: weathered bedrock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Fagan

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandstone and/or shale

Typical profile

H1 - 0 to 5 inches: loam
H2 - 5 to 26 inches: clay loam
H3 - 26 to 43 inches: clay
H4 - 43 to 47 inches: weathered bedrock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

102—Accelerator-Fagan-Urban land complex, 5 to 15 percent s lopes

Map Unit Setting

National map unit symbol: h9gh
Elevation: 100 to 400 feet
Mean annual precipitation: 25 to 30 inches
Mean annual air temperature: 55 to 57 degrees F
Frost-free period: 275 to 330 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Accelerator and similar soils: 35 percent
Urban land: 25 percent
Fagan and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Accelerator

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and siltstone

Typical profile

H1 - 0 to 23 inches: loam
H2 - 23 to 29 inches: clay loam
H3 - 29 to 41 inches: gravelly clay loam
H4 - 41 to 45 inches: weathered bedrock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C
Hydric soil rating: No

Description of Fagan

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 5 inches: loam
H2 - 5 to 26 inches: clay loam
H3 - 26 to 43 inches: clay
H4 - 43 to 47 inches: weathered bedrock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 10 percent
Hydric soil rating: No

Botella

Percent of map unit: 5 percent
Hydric soil rating: No

143scl—Flaskan sandy clay loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2pclt
Elevation: 100 to 830 feet
Mean annual precipitation: 14 to 24 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 275 to 325 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Flaskan, sandy clay loam, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Flaskan, Sandy Clay Loam

Setting

Landform: Stream terraces, alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metamorphic and sedimentary rock and/or alluvium derived from metavolcanics

Typical profile

Ap - 0 to 5 inches: sandy clay loam
A - 5 to 18 inches: sandy clay loam
AB - 18 to 30 inches: sandy clay loam
Bt1 - 30 to 45 inches: gravelly clay loam
Bt2 - 45 to 51 inches: gravelly sandy clay loam
C - 51 to 59 inches: very gravelly sandy clay loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Pachic haploxerolls, loamy-skeletal
Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Stevenscreek
Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Minlum
Percent of map unit: 5 percent
Landform: Hills, terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

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Appendix B. Photos of the BSA

Photo 1. A downstream view of the concrete-lined portion of the perennial drainage channel (PS1), which conveyed several inches of flowing freshwater in October 2016.

Photo 2. A lateral view of the earthen portion of the perennial drainage channel PS2 from the October 2016 survey.

Photo 3. An upstream view of the earthen portion of the intermittent primary drainage channel (IS1) from the October 2016 survey.

Photo 4. A downstream view of the earthen portion of the intermittent secondary drainage channel (IS2) from the October 2016 survey.

Photo 5. **A view across the intermittent drainage channels. From left to right, this image shows the intermittent primary drainage channel (IS1), earthen berm, and intermittent secondary drainage channel (IS2). Photo was taken in November 2016.**

Photo 6. **A culvert outlet north of the BSA that empties into the perennial drainage channel from the October 2016 survey.**

Photo 7. **The culvert (C1 and C2) inlets at the confluence area where the perennial and intermittent drainage channels merge. Photo was taken during the October 2016 survey.**

Photo 8. **A perennial marsh wetland dominated by cattails. Photo was taken during the October 2016 survey.**

Photo 9. Dense riparian vegetation overhangs the perennial marsh wetland in the photo, which is situated below the OHW of the perennial drainage channel. This photo was taken during a reconnaissance survey of the BSA in September 2016.

Photo 10. A perennial marsh wetland dominated by a partially submerged grass. This grass lacked the reproductive parts needed to identify it to genera/species, but is most likely creeping bentgrass.

Photo 11. Wetland sampling location SP1. Photo was taken during the October 2016 survey.

Photo 12. Wetland sampling location SP3. The majority of the hydrophytic vegetation (cattails) in this area were dead at the time of the October 2016 survey.

Photo 13. Field indicators of the OHW marks along the concrete-lined portion of the perennial drainage channel (PS1L) were water stains and algae. Photo was taken during the October 2016 survey.

Photo 14. Vegetation in the intermittent primary drainage channel was matted down in one direction from recent water flow, and provided a clear indicator of the OHW line. Photo was taken during the October 2016 survey.

Photo 15. Upland sampling location SP2. Photo was taken during the October 2016 survey.

Photo 16. Upland sampling location SP4. Photo was taken during the October 2016 survey.

Photo 17. Attendant riparian habitat along the perennial drainage channel. Photo was taken during the October 2016 survey.

Photo 18. Scattered coast live oak trees and coyote brush along the intermittent drainage channels, which had been colonized by upland herbaceous plants. Photo was taken during the October 2016 survey.

Photo 19. Upland habitat in the BSA. Photo was taken during the October 2016 survey.

Appendix C. Western Mountains, Valleys, and Coast Wetland Delineation Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project Site: Environmental Cleanup of IR-6 and IR-8 Drainages SLAC National Accelerator Laboratory (SLAC) City/County: Menlo Park/San Mateo Sampling Date: 10/20/2016

Applicant/Owner: State: CA Sampling Point: SP1

Investigator(s): Maya Goklany Section, Township, Range: Section 16, Township 6 South, Range 3 West

Landform (hillslope, terrace, etc.): Channel bed Local relief (concave, convex, none): none Slope (%): 0-1

Subregion (LRR): C Lat: 37.413869 Long: -122.20201 Datum: NAD83

Soil Map Unit Name: Accelerator-Fagan-Urbanland association, 5-15% slopes NWI classification: R4SBA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐, significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐, naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?**	**Yes ☒ No ☐**
Hydric Soil Present?	Yes ☒	No ☐		
Wetland Hydrology Present?	Yes ☒	No ☐		

Remarks: The sample location is near the ordinary high water (OHW) mark of a perennial drainage channel (IR-8) that receives stormwater runoff from the SLAC Campus Area and groundwater that is pumped from the linear accelerator tunnel underdrain system. Water is then conveyed through a culvert to a tributary of San Francisquito Creek. IR-8 replaces a historical watercourse that is evident in aerial imagery from 1948 to 1970 (National Environmental Title Research [NETR] 2016). The survey took place at the beginning of the 2016/1017 wet season, and 2.28 inches of precipitation fell from 10/14 through 10/17.

VEGETATION – Use scientific names of plants

Tree Stratum (Plot size: 30' x 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix lasiolepis*	60	yes	FACW
2.			
3.			
4.			
50% = 30, 20% = 12	60	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30' x 30)			
1.			
2.			
3.			
4.			
5.			
50% = _____, 20% = _____	0	= Total Cover	
Herb Stratum (Plot size: 5' x 5')			
1. *Typha sp.*	40	yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
50% = 20, 20% = 8	40	= Total Cover	
Woody Vine Stratum (Plot size: 30' x 30')			
1.			
2.			
50% = _____, 20% = _____	0	= Total Cover	

% Bare Ground in Herb Stratum 0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1 =	
FACW species		x2 =	
FAC species		x3 =	
FACU species		x4 =	
UPL species		x5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks: Vegetation and sediment have been removed from the streambed as part of maintenance and restoration of the IR-8 channel. Cattails have established in the channel since then. For this wetland delineation survey, we did not consider arroyo willows alone to be indicative of hydrophytic vegetation because they are are deep-rooted phreatophytes that are able to tap the groundwater table. As such, arroyo willow was dropped from the hydrophytic vegetation test(s).

Project Site: Environmental Cleanup of IR-6 and IR-8 Drainages

SOIL Sampling Point: SP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-11	10YR 2/1	100					Loamy sand	Very moist throughout profile

[1]Type: C= Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☒ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): ____

Hydric Soils Present? **Yes** ☒ **No** ☐

Remarks: Clearance received to dig pits to a depth of 11.5 inches or less. A strong hydrogen sulfide odor was detected while digging this soil pit.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☒ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☒ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☒ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☒ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stresses Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☒ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	☒	No	☐	Depth (inches):	4
Water Table Present?	Yes	☒	No	☐	Depth (inches):	5
Saturation Present? (includes capillary fringe)	Yes	☒	No	☐	Depth (inches):	11

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Surface water was present in adjacent areas; however, the soil pit was placed outside of this portion of the channel.The high water table is likely a result of lateral seepage from inundated portions of the channel, as previous studies show that the IR-8 channel is not connected to the groundwater table.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project Site: Environmental Cleanup of IR-6 and IR-8 Drainages SLAC National Accelerator Laboratory (SLAC) City/County: Menlo Park/San Mateo Sampling Date: 10/20/2016

Applicant/Owner: State: CA Sampling Point: SP2

Investigator(s): Maya Goklany Section, Township, Range: Section 16, Township 6 South, Range 3 West

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): convex Slope (%): 0-5

Subregion (LRR): C Lat: 37.413868 Long: -122.201897 Datum: NAD83

Soil Map Unit Name: Accelerator-Fagan-Urbanland association, 5-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐, significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐, naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☒	**Is the Sampled Area within a Wetland?**	**Yes** ☐	**No** ☒
Hydric Soil Present?	Yes ☐	No ☒			
Wetland Hydrology Present?	Yes ☐	No ☒			

Remarks: The sample location is in the active floodplain of IR-8, above the top of bank, in the attendant riparian habitat. The survey took place at the beginning of the 2016/1017 wet season, and 2.28 inches of precipitation fell from 10/14 through 10/17. Despite the recent rain, it has been confirmed that the IR-8 channel is perennially inundated by those with several years of observations of the site.

VEGETATION – Use scientific names of plants

Tree Stratum (Plot size: 30' x 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus agrifolia*	25	yes	NL (UPL)
2. *Salix lasiolepis*	35	yes	FACW
3.			
4.			
50% = 30, 20% = 12	60	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30' x 30')			
1. *Quercus agrifolia*	<1	no	NL (UPL)
2. *Baccharis pilularis*	3	no	NL (UPL)
3. *Salix lasiolepis*	30	yes	FACW
4. *Rubus armeniacus*	<1	no	FAC
5.			
50% = 17, 20% = 7	33	= Total Cover	
Herb Stratum (Plot size: 5' x 5')			
1. *Carduus pycnocephalus*	4	no	NL (UPL)
2. *Quercus agrifolia*	<1	no	NL (UPL)
3. *Senesced grasses*	30	yes	-
4. *Avena sp.*	30	yes	NL (UPL)
5.			
6.			
7.			
8.			
9.			
10.			
11.			
50% = 32, 20% = 13	64	= Total Cover	
Woody Vine Stratum (Plot size: 30' x 30')			
1.			
2.			
50% = _____, 20% = _____	0	= Total Cover	

% Bare Ground in Herb Stratum 10

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x1 =	0
FACW species	0	x2 =	0
FAC species	1	x3 =	3
FACU species	0	x4 =	0
UPL species	64	x5 =	320
Column Totals:	65 (A)		323 (B)

Prevalence Index = B/A = 4.97

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☒ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ☐ **No** ☒

Remarks: There is a substantial amount of thatch and woody debris on the ground surface. Arroyo willows are deep-rooted phreatophytes that are able to tap the groundwater table, and thus, despite their wetland indicator status we did not consider the presence of this species in the tree and shrub canopy at SP2 to be indicative of hydrophytic vegetation. As such, arroyo willow was dropped from the hydrophytic vegetation tests. Some grasses were senescent, and lacked the floral parts necessary for identification to genera/species. The "senesced grasses" were also dropped from the hydrophtytic vegetation tests since an indicator status could not be assigned.

Project Site: Environmental Cleanup of IR-6 and IR-8 Drainages

SOIL

Sampling Point: SP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-11	10YR 3/2	100					Loamy sand	Very slightly moist throughout profile.
								More compacted below 6"

[1]Type: C= Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): ____

Hydric Soils Present? **Yes** ☐ **No** ☒

Remarks: Clearance received to dig pits to a depth of 11.5 inches or less. No hydric indicators were observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stresses Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	☐	No	☒	Depth (inches):	____
Water Table Present?	Yes	☐	No	☒	Depth (inches):	____
Saturation Present? (includes capillary fringe)	Yes	☐	No	☒	Depth (inches):	____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Only one secondary indicator of wetland hydrology was observed (FAC-neutral test). As mentioned, arroyo willows are deep-rooted phreatophytes that are able to tap the groundwater table, and thus, despite their wetland indicator status we did not consider the presence of this species in the tree and shrub canopy at SP2 to be indicative of hydrophytic vegetation.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project Site: ~~Environmental Cleanup of IR-6 and IR-8 Drainages~~ City/County: Menlo Park/San Mateo Sampling Date: 10/20/2016

Applicant/Owner Stanford :Linear Accelerator National Laboratory State: CA Sampling Point: SP3

Investigator(s): Maya Goklany Section, Township, Range: Section 16, Township 6 South, Range 3 West

Landform (hillslope, terrace, etc.): Channel bed Local relief (concave, convex, none): convex Slope (%): 0-1

Subregion (LRR): C Lat: 37.412959 Long: -122.201108 Datum: NAD83

Soil Map Unit Name: Accelerator-Fagan association, 5-15% slopes NWI classification: R4SBA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐, significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐, naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?**	**Yes ☒ No ☐**
Hydric Soil Present?	Yes ☒	No ☐		
Wetland Hydrology Present?	Yes ☒	No ☐		

Remarks: The sample location is within the OHW marks of IR-8, which receives stormwater runoff from the SLAC, and groundwater that is pumped from the linear accelerator tunnel underdrain system. Water is then conveyed through a culvert to a tributary of San Francisquito Creek. IR-8 replaces a historical watercourse that is evident in aerial imagery from 1948 to 1970 (National Environmental Title Research [NETR] 2016). The survey took place at the beginning of the 2016/1017 wet season, and 2.28 inches of precipitation fell from 10/14 through 10/17.

VEGETATION – Use scientific names of plants

Tree Stratum (Plot size: 30' x 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus agrifolia*	15	yes	NL (UPL)
2. *Salix lasiolepis*	25	yes	FACW
3.			
4.			
50% = 20, 20% = 8	40	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30' x 30')			
1. *Salix lasiolepis*	20	yes	FACW
2.			
3.			
4.			
5.			
50% = 10, 20% = 4	20	= Total Cover	
Herb Stratum (Plot size: 5' x 5')			
1. *Typha sp.*	100	yes	OBL
2. *Carduus pycnocephalus*	1	no	NL (UPL)
3. *Epilobium brachycarpum*	<1	no	NL (UPL)
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
50% = 51, 20% = 21	101	= Total Cover	
Woody Vine Stratum (Plot size: 30' x 30')			
1.			
2.			
50% = ____, 20% = ____	0	= Total Cover	

% Bare Ground in Herb Stratum 0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	50	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x1 =	100
FACW species		x2 =	
FAC species		x3 =	
FACU species		x4 =	
UPL species	17	x5 =	85
Column Totals:	117 (A)		185 (B)

Prevalence Index = B/A = 1.58

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☒ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☒ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks: Vegetation and sediment have been removed from the streambed as part of maintenance and restoration of the IR-8 channel. For this wetland delineation survey, we did not consider arroyo willows alone to be indicative of hydrophytic vegetation because they are are deep-rooted phreatophytes that are able to tap the groundwater table. As such, arroyo willow was dropped from the hydrophytic vegetation tests. The cattails present at this location do indicate that true hydrophyticvegetation has been present here in the recent past; however, many of these cattails were dead at the time of the survey (but still rooted in the ground), possibly a result of the San Francisco Bay Area region experiencing several consecutive years of below average rainfall recently (USACE 2014).

Project Site: Stanford Linear Accelerator IR-6 and IR-8 Drainage Soil Remediation

SOIL

Sampling Point: SP3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-11	10YR 2/1	100					Clay loam	Soil is very moist throughout profile.

[1]Type: C= Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☒ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): ____

Hydric Soils Present? **Yes** ☒ **No** ☐

Remarks: Clearance received to dig pits to a depth of 11.5 inches or less. No hydric indicators were observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☒ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☒ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stresses Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☒ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): ____

Water Table Present? Yes ☐ No ☒ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 10

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: The sample location is on a sediment deposit in the center of the channel, and as such, it is slightly elevated above the adjacent areas that were inundated during the survey.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project Site: Environmental Cleanup of IR-6 and IR-8 | City/County: Menlo Park/San Mateo | Sampling Date: 10/20/2016

Applicant/Owner: Drainages SLAC National Accelerator | State: CA | Sampling Point: SP4

Investigator(s): Laboratory (SLAC) Maya Goklany | Section, Township, Range: Section 16, Township 6 South, Range 3 West

Landform (hillslope, terrace, etc.): Channel bank | Local relief (concave, convex, none): none | Slope (%): 0-5

Subregion (LRR): C | Lat: 37.412991 | Long: -122.201064 | Datum: NAD83

Soil Map Unit Name: _____ | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐, significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐, naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☒	**Is the Sampled Area within a Wetland?**	**Yes ☐ No ☒**
Hydric Soil Present?	Yes ☐	No ☒		
Wetland Hydrology Present?	Yes ☐	No ☒		

Remarks: The sample location is on the bank of a perennial drainage channel (IR-8) in the attendant riparian habitat. The survey took place at the beginning of the 2016/1017 wet season, and 2.28 inches of precipitation fell from 10/14 through 10/17.

VEGETATION – Use scientific names of plants

Tree Stratum (Plot size: 30' x 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus lobata*	6	no	FACU
2. *Quercus agrifolia*	18	yes	NL (UPL)
3. *Salix lasiolepis*	25	yes	FACW
4. _____			
50% = 25, 20% = 10	49	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30' x 30')			
1. *Baccharis salicifolia*	3	yes	FAC
2. *Salix lasiolepis*	12	yes	FACW
3. _____			
4. _____			
5. _____			
50% = 8, 20% = 3	15	= Total Cover	
Herb Stratum (Plot size: 5' x 5')			
1. *Phalaris sp.*	3	no	-
2. *senesced grasses*	20	yes	-
3. _____			
4. _____			
5. _____			
6. _____			
7. _____			
8. _____			
9. _____			
10. _____			
11. _____			
50% = 12, 20% = 5	23	= Total Cover	
Woody Vine Stratum (Plot size: 30' x 30')			
1. _____			
2. _____			
50% = _____, 20% = _____		= Total Cover	

% Bare Ground in Herb Stratum 0

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	50	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x1 =	_____
FACW species	0	x2 =	_____
FAC species	3	x3 =	9
FACU species	6	x4 =	24
UPL species	18	x5 =	90
Column Totals:	27 (A)		123 (B)

Prevalence Index = B/A = 4.56

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☒ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☐ No ☒

Remarks: The majority of the grasses at this location were senescent and unidentifiable (including Phalaris sp.), and were not included in the hydrophytic vegetation tests because an indicator status could not be assigned. There was a thick layer of thatch and woody debris on the ground surface. Arroyo willows are deep-rooted phreatophytes that are able to tap the groundwater table, and thus, despite their wetland indicator status we did not consider the presence of this species in the tree and shrub canopy at SP4 to be indicative of hydrophytic vegetation. As such, arroyo willow was also dropped from the hydrophytic vegetation tests.

Project Site: Environmental Cleanup of IR-6 and IR-8 Drainages

SOIL Sampling Point: SP4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/2	100					sandy clay	5% gravel
2-11	10YR 3/4	70					clay loam	5% gravel
	!)YR 3/2	30					clay loam	

[1]Type: C= Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): _____

Hydric Soils Present? **Yes** ☐ **No** ☒

Remarks: Clearance received to dig pits to a depth of 11.5 inches or less. No hydric soil indicators were observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stresses Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	☐	No	☒	Depth (inches):	_____
Water Table Present?	Yes	☐	No	☒	Depth (inches):	_____
Saturation Present? (includes capillary fringe)	Yes	☐	No	☒	Depth (inches):	_____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No indicators of wetland hydrology.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project Site: Environmental Cleanup of IR-6 and IR-8 Drainages City/County: Menlo Park/San Mateo Sampling Date: 10/20/2016
Applicant/Owner: SLAC National Accelerator Laboratory (SLAC) State: ____ Sampling Point: SP5
Investigator(s): Maya Goklany Section, Township, Range: Section 16, Township 6 South, Range 3 West
Landform (hillslope, terrace, etc.): Channel bed Local relief (concave, convex, none): none Slope (%): 0-5
Subregion (LRR): C Lat: 37.41295 Long: -122.200872 Datum: NAD83
Soil Map Unit Name: Accelerator-Fagan association, 5-15% slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐, significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐, naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☒	**Is the Sampled Area within a Wetland?**	**Yes ☐ No ☒**
Hydric Soil Present?	Yes ☐	No ☒		
Wetland Hydrology Present?	Yes ☐	No ☒		

Remarks: **The sample location is in the channel bed of an** intermittent primary drainage channel (also referred to as "IR-6") that collects stormwater runoff and flows toward a confluence with IR-8 where there are 2 culvert inlets. During large rain events, water may backflow into the intermittent primary drainage channel from the confluence. The survey took place at the beginning of the 2016/1017 wet season, and 2.28 inches of precipitation fell from 10/14 through 10/17. Recent flows were evident in IR-6, and vegetation below the OHWs was matted down.

VEGETATION – Use scientific names of plants

Tree Stratum (Plot size: 30' x 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus agrifolia*	8	yes	NL (UPL)
2. *Quercus lobata*	10	yes	FACU
3. *Salix lasiolepis*	12	yes	FACW
4.			
50% = 15, 20% = 6	30	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30' x 30')			
1. *Baccharis pilularis*	25	yes	NL (UPL)
2.			
3.			
4.			
5.			
50% = 13, 20% = 5	25	= Total Cover	
Herb Stratum (Plot size: 5' x 5')			
1. *Festuca perennis*	68	yes	FAC
2. *Avena sp.*	15	no	NL (UPL)
3. *Dittrichia graveolens*	2	no	NL (UPL)
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
50% = 43, 20% = 17	85	= Total Cover	
Woody Vine Stratum (Plot size: 30' x 30')			
1.			
2.			
50% = ____, 20% = ____	0	= Total Cover	
% Bare Ground in Herb Stratum 0			

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	25	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x1 =	0
FACW species	0	x2 =	0
FAC species	68	x3 =	204
FACU species	10	x4 =	40
UPL species	50	x5 =	250
Column Totals:	128 (A)		494 (B)

Prevalence Index = B/A = 3.86

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☒ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☐ No ☒**

Remarks: Herbaceous material is senescent, aside from stinkwort. Vegetation is matted in the channel bed. Arroyo willows are deep-rooted phreatophytes that are able to tap the groundwater table, and thus, despite their wetland indicator status we did not consider the presence of this species in the tree canopy at SP5 to be indicative of hydrophytic vegetation. As such, arroyo willow was dropped from the hydrophytic vegetation tests. In addition, there is no attendant riparian habitat along IR-6, although the 30' x 30' sample plot extends to the confluence banks, which do support riparian vegetation.

Project Site: Environmental Cleanup of IR-6 and IR-8 Drainages

SOIL Sampling Point: SP5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	2.5Y 5/2	50					loamy sand	70 percent gravel
	10YR 3/2	25					loamy sand	10 percent gravel
	10YR 3/3	25						

[1]Type: C= Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ____

Hydric Soils Present? **Yes** ☐ **No** ☒

Remarks: Clearance received to dig pits to a depth of 11.5 inches or less. No hydric soil indicators were observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stresses Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	☐	No	☒	Depth (inches):	____
Water Table Present?	Yes	☐	No	☒	Depth (inches):	____
Saturation Present? (includes capillary fringe)	Yes	☐	No	☒	Depth (inches):	____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Vegetation in channel bed (below the OHW marks) was matted from flows after recent rains, but no other hydrology indicators were observed.

Appendix D. Arid West Ordinary High Water Forms

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: SLAC Soil Remediation Project
Project Number: 3934-02
Stream: IR-8 (OHW1)
Investigator(s): Maya Goklany

Date: Oct. 20, 2016 **Time:** 930 AM
Town: Menlo Park **State:** CA
Photo begin file#: **Photo end file#:**

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [X] / N [ ] Is the site significantly disturbed?

Location Details: Concrete-lined portion of perennial drainage channel

Projection: **Datum:** NAD83
Coordinates:

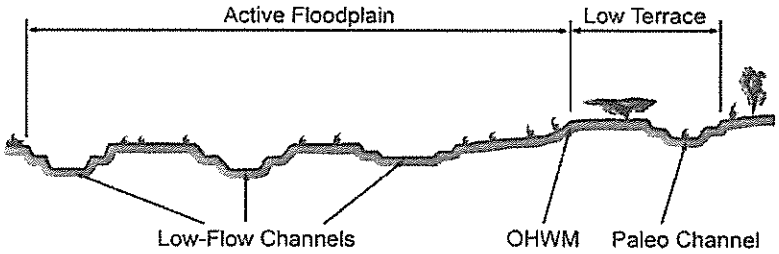
Potential anthropogenic influences on the channel system: IR-8 recieves stormwater runoff and groundwater pumped from the linear accelerator tunnel. Water flow is perennial although the site recieved several inches of rain recently. Some rip-rap on banks downstream.

Brief site description: IR-8 flows from north to south. The attendant riparian vegetation includes willows. Coast live oak, valley oak, and coast redwoods occur in uplands. The concrete-lined channel is sharply incised. A culvert outlet is north of the sample point.

Checklist of resources (if available):

- [X] Aerial photography
  Dates: 1948 - 2016
- [X] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [X] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

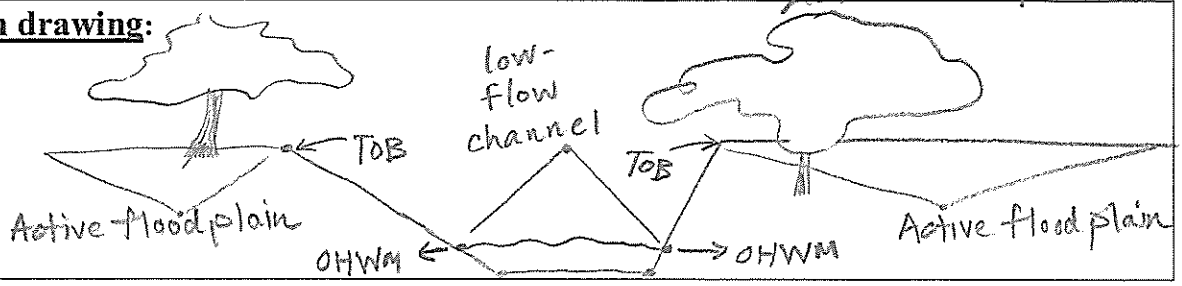


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [ ] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: 3934-02 **Cross section ID:** IR-8 OHW1 **Date:** Oct. 20, 2016 **Time:** 930 AM

Cross section drawing:



OHWM

GPS point: _____

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☐ Change in vegetation cover
- ☐ Break in bank slope
- ☒ Other: water stains
- ☐ Other: _____

Comments:
Water staining evident along the OHWM in the concrete-lined portion of IR-8. Some accumulated sediment in channel bed. Low-flow channel corresponds to OHWM's.

Floodplain unit:

☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: Clay loam soil above top of bank (TOB)
Total veg cover: 73 % Tree: 25 % Shrub: 3 % Herb: 45 %
Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☒ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☒ Surface relief (elevation)
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:
Active floodplain above the top of the banks along the concrete lined portion of the channel. Upland vegetation, such as annual grasses, Valley & Coast live oaks, Coast redwood, and coyote brush occur in the floodplain. Ripanan vegetation overhangs the IR-8 channel downstream. Corresponds to the 100-yr flood zone.

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: SLAC Soil Remediation Project
Project Number: 3934-02
Stream: IR-8 (OHW2)
Investigator(s): Maya Goklany

Date: Oct. 20, 2016 **Time:** 11:30 am
Town: Menlo Park **State:** CA
Photo begin file#: **Photo end file#:**

Y ☒ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ☒ Is the site significantly disturbed?

Location Details: Earthen portion of perennial drainage channel

Projection: **Datum:** NAD 83
Coordinates:

Potential anthropogenic influences on the channel system: IR-8 recieves stormwater run off and groundwater is pumped from the linear accelerator tunnel overdrain system. Restoration projects have been implemented along the bed/banks/riparian corridor of IR-8 to remove sediment & recontour the terrain.

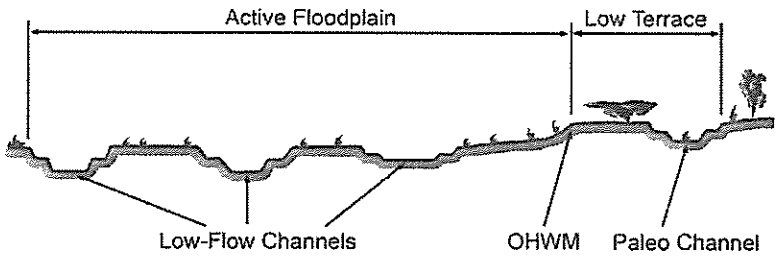
Brief site description: This reach is immediately south of the concrete-lined portion of IR-8. The channel bed & banks have a soil substrate, and several patches of cattails occur below the OHW marks. The channel is approximately 8 feet wide. Attendant riparian habitat includes dense arroyo willows. Several inches of flowing water are present in the channel.

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☐ Vegetation maps
- ☒ Soils maps
- ☒ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
- ☐ History of recent effective discharges
- ☐ Results of flood frequency analysis
- ☐ Most recent shift-adjusted rating
- ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

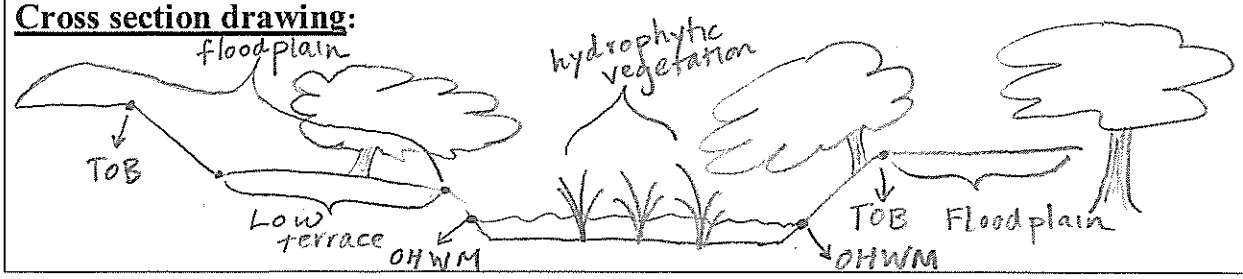


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   ☒ Mapping on aerial photograph ☒ GPS
   ☐ Digitized on computer ☐ Other:

Project ID: 3934-02 **Cross section ID:** OHW2 **Date:** Oct. 20, 2016 **Time:** 1130 am

Cross section drawing:



OHWM (corresponds to the low-flow channel)

GPS point: 37.413499/-122.20164

Indicators:

- ☐ Change in average sediment texture
- ☒ Change in vegetation species
- ☐ Change in vegetation cover
- ☒ Break in bank slope
- ☒ Other: matted vegetation
- ☐ Other: _____

Comments:
Vegetation is matted along the OHW line Cattails are present in patches in the low-flow channel, whereas the low-terrace is devoid of herbaceous vegetation. The channel banks support grasses (senescent at the time of the survey) and arroyo willows occur in the riparian corridor and overhang the channel.

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☒ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:
Average sediment texture: clay loam soil
Total veg cover: 100 % Tree: 35 % Shrub: 65 % Herb: 15 %
Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☒ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☒ Surface relief (elevation)
- ☒ Other: matted vegetation
- ☐ Other: _____
- ☐ Other: _____

Comments:
Knick points mark the low terrace and the toe of slope below the top of the banks. The low terrace likely becomes inundated in 10-year flood events, whereas the upper banks and the areas above the top of banks would only flood in 100-yr events. Changes in vegetation across the channel cross section are described above

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: SLAC Soil Remediation Project
Project Number: 3934-02
Stream: IR-6 (OHW3)
Investigator(s): Maya Goklany

Date: Oct. 20, 2016 **Time:** 1230 pm
Town: Menlo Park **State:** CA
Photo begin file#: **Photo end file#:**

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details: intermittent primary drainage channel

Projection: **Datum:** NAD83
Coordinates:

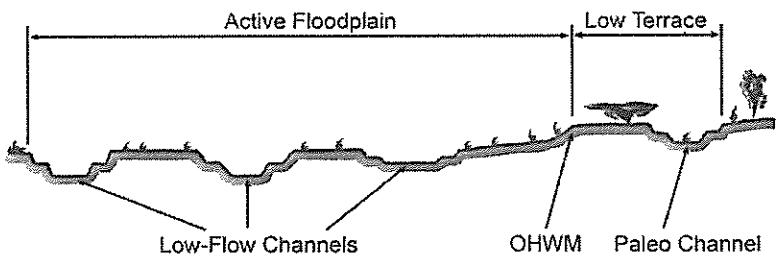
Potential anthropogenic influences on the channel system: The IR-6 drainage channel recieves stormwater runoff. It was excavated in uplands and non-native soil was used to construct an earthen berm to separate the primary - from secondary drainage channel. IR-6 flows toward the confluence with IR-8, where there are 2 culverts that carry the combined flow to a tributary of San Francisquito Creek. Recent flows were evident in IR-6 from the rains during the week prior to the survey, but there was no longer water in the channel

Brief site description:

Checklist of resources (if available):

- [X] Aerial photography
  Dates: 1948 - 2016
- [X] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [X] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

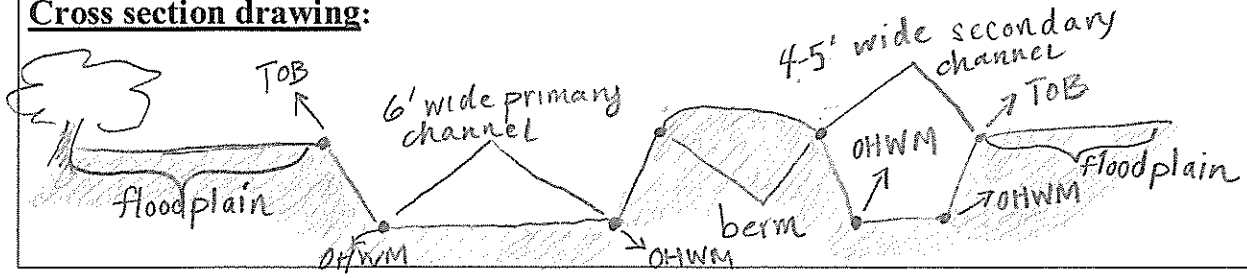


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [ ] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: 3934-02 **Cross section ID:** OHW3 **Date:** Oct. 20, 2016 **Time:** 1230 pm

Cross section drawing:



OHWM (for the IR-6 primary drainage channel)

GPS point: 37.412971, -122.20084

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☐ Change in vegetation cover
- ☒ Break in bank slope
- ☐ Other: matted vegetation
- ☐ Other: _____

Comments: The OHWMs correspond to the low-flow channels, and were identified by matted vegetation from recent flows. The primary channel only has water during- and immediately after rain events, and the secondary channel likely only has water during large events when the berm is overtopped. Italian ryegrass and upland grasses and forbs have colonized the channel bed/banks, such as stinkwort and wild oats.

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: clay loam soil with gravels (cobbles/pebbles)
Total veg cover: 100 % Tree: 30 % Shrub: 7 % Herb: 80 %
Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☒ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☒ Surface relief (elevation),
- ☒ Other: matted vegetation
- ☐ Other: _____
- ☐ Other: _____

Comments:

Woody vegetation, such as Coast live oak, valley oak, and coyotebrush, occurs above the top of bank in the 100-year floodplain, but there is no true attendant riparian habitat that contributes allochthonous material to the channels.

Appendix E. Plants Observed

Family	Common Name	Scientic Name	Indicator Status
Salicaceae	arroyo willow	*Salix lasiolepis*	FACW
Typhaceae	cattail	*Typha sp.*	OBL
Fagaceae	coast like oak	*Quercus agrifolia*	UPL
Poaceae	wild oats	*Avena sp.*	UPL
Asteraceae	Italian thistle	*Carduus pyconocephalus*	UPL
Rosaceae	Himalayan blackberry	*Rubus armeniacus*	FAC
Asteraceae	coyotebrush	*Baccharis pilularis*	UPL
Onagraceae	annual fireweed	*Epilobium brachycarpum*	UPL
Anacardiaceae	poison oak	*Toxicodendron diversilobum*	FAC
Asteraceae	mulefat	*Baccharis salicifolia*	FAC
Poaceae	canarygrass	*Phalaris sp.*	NA
Poaceae	Italian ryegrass	*Festuca perennis*	FAC
Asteraceae	stinkwort	*Dittrichia graveolens*	UPL
Fagaceae	valley oak	*Quercus lobata*	FACU
Pinaceae	aleppo pine	*Pinus halepensis*	UPL
Myrtaceae	eucalyptus	*Eucalyptus* sp.	UPL
Poaceae	creeping bentgrass	*Agrostis stolonifera*	FAC
Asteraceae	bull thistle	*Cirsium vulgare*	FACU

Appendix F. Aquatic Resources Table

Waters_Name	Cowardin_Code	Measurement Type	Amount	Units	Measurement Type	Amount	Units	Waters Types	Latitude	Longitude	Local_Waterway
C1	Culvert	Area	<0.01	Acre	Linear	23	FOOT	Culvert	37.4128469	-122.2009101	Tributary to San Francisquito Creek
C2	Culvert	Area	<0.01	Acre	Linear	25	FOOT	Culvert	37.4128521	-122.2009014	Tributary to San Francisquito Creek
IS1	R4SB7Ax	Area	0.04	Acre	Linear	330	FOOT	RPW	37.4131397	-122.2004846	Tributary to San Francisquito Creek
IS1L	R4RB2AX	Area	<0.01	Acre	Linear	43	FOOT	RPW	37.4133947	-122.1999311	Tributary to San Francisquito Creek
IS2	R4SB7Ax	Area	0.04	Acre	Linear	360	FOOT	RPW	37.4130970	-122.2003725	Tributary to San Francisquito Creek
IS2L	R4RB2Ax	Area	<0.01	Acre	Linear	18	FOOT	RPW	37.4133217	-122.1997788	Tributary to San Francisquito Creek
PM1	PEM1Hx	Area	<0.01	Acre	Linear	22	FOOT	RPWWD	37.4143355	-122.2025268	Tributary to San Francisquito Creek
PM2	PEM1Hx	Area	<0.01	Acre	Linear	45	FOOT	RPWWD	37.4141804	-122.2022356	Tributary to San Francisquito Creek
PM3	PEM1Hx	Area	0.01	Acre	Linear	90	FOOT	RPWWD	37.4139632	-122.2020476	Tributary to San Francisquito Creek
PM4	PEM1Hx	Area	0.01	Acre	Linear	77	FOOT	RPWWD	37.4129978	-122.2011244	Tributary to San Francisquito Creek
PS1	R2SBHx	Area	0.10	Acre	Linear	370	FOOT	RPW	37.4146542	-122.2030397	Tributary to San Francisquito Creek
PS1L	R2RBHx	Area	0.03	Acre	Linear	500	FOOT	RPW	37.4135149	-122.2016459	Tributary to San Francisquito Creek

H. T. HARVEY & ASSOCIATES
Ecological Consultants

SLAC National Accelerator Laboratory
Environmental Cleanup of IR-6 and IR-8 Drainages
Restoration and Monitoring Plan

Project 3934-02

Prepared for:

SLAC National Accelerator Laboratory
2575 Sand Hill Road
Menlo Park, CA 94025

Prepared by:

H. T. Harvey & Associates

February 2, 2017

983 University Avenue, Building D • Los Gatos, CA 95032 • Ph: 408.458.3200 • F: 408.458.3210

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Contributors

Patrick Boursier, Ph.D., Principal-in-Charge
Dan Stephens, B.S., Principal Restoration Ecologist
Matt Quinn, M.S., Senior Restoration Ecologist
Kelly Hardwicke, Ph.D., Senior Plant Ecologist
Maya Goklany, M.S., Plant Ecologist
Ginger Bolen, Ph.D. Senior Wildlife Ecologist
Heather Ogston, B.A., Senior Technical Editor

Responsible Parties

SLAC National Accelerator Laboratory (SLAC) is the project proponent for the Environmental Cleanup of IR-6 and IR-8 Drainages Project. Adam Ng is the contact person for SLAC.

Adam Ng
SLAC National Accelerator Laboratory
2575 Sand Hill Road
Menlo Park, CA 94025
650.926.4673
asng@slac.stanford.edu

H. T. Harvey & Associates prepared this restoration and monitoring plan. Matt Quinn is the contact person for H. T. Harvey & Associates.

H. T. Harvey & Associates
c/o Matt Quinn, Senior Restoration Ecologist
983 University Ave., Bldg. D
Los Gatos, CA 95032
Phone: 408.458.3225
mquinn@harveyecology.com

Section 1.0 Project Requiring Mitigation

1.1 Project Summary

The Environmental Cleanup of IR-6 and IR-8 Drainages Project is intended to be a final remedial action to address the cleanup requirements of Water Board Order R2-2009-0072. The Order requires investigation and remediation of chemical and radiologic impacts on soil and groundwater resulting from the operation of the SLAC National Accelerator Laboratory (SLAC) in San Mateo County, California (Water Board 2009).

The Project site is on property owned by Stanford University. The northern portion of the Project site is within the boundary of the SLAC, which is on property leased by Stanford University to the United States Department of Energy (DOE). SLAC is operated for DOE by Stanford University. DOE provides funding for SLAC operations and for environmental investigation and cleanup activities at the site. The Project site is bound to the north and northeast by SLAC. The property to the south and west is owned by Stanford University and leased to the Portola Valley Training Center.

The IR-6 and IR-8 drainages collect stormwater runoff from two hardscape areas within SLAC (Research Yard-SSRL and Campus Area, respectively). In the past, these hardscape areas were the source of polychlorinated biphenyls (PCBs). The PCBs have moved from these hardscape areas with suspended sediment in the stormwater and have been detected in soil and sediment in the IR-6 and IR-8 drainages. Thus, the PCBs are legacy impacts from the former use of transformers and other oil-filled electrical equipment in the Research Yard and Campus Area at SLAC. Spills, releases, and known sources of PCBs in those areas have been remediated, and remaining PCB-transformers have been retro-filled or replaced.

Although the IR-6 and IR-8 drainages are, for the most part, unlined earthen channels, there are concrete-lined and riprap-lined sections at the upstream extent of each. The IR-6 drainage channel receives only stormwater from its drainage basin and the vegetation in the channel is similar to adjacent upland vegetation. The IR-6 drainage also includes an earthen, secondary channel that receives stormwater flow from a smaller area near the southern edge of SLAC. The IR-8 drainage channel receives stormwater as well as approximately two gallons per minute of groundwater pumped from the SLAC tunnel underdrain systems year-round. Because groundwater is pumped from the underdrain systems, the IR-8 drainage channel conveys flows year-round. Therefore, the center line of the IR-8 drainage channel is perennially wet, supporting patches of perennial wetland and adjacent willow (*Salix* sp.)-dominated riparian habitat.

The project will involve excavating the soil and sediment with residual PCBs, removing trees and other vegetation from the excavation footprints and access areas, placing clean import fill and topsoil within the excavation footprints, and restoring all disturbed areas. The project site is delineated into three specific excavation areas: the IR-6 drainage, the IR-8 drainage, and the IR-6/8 confluence. The IR-6 drainage and IR-6/8 confluence will be reconstructed and restored to match current conditions. The IR-8 drainage will be

reconstructed to match existing drainage patterns (i.e. flow line) but will include a broadened cross-sectional area of the low-flow channel, expanding the area that is suitable for supporting perennial wetlands through transplanting and natural recruitment. A 150-foot-long reach of riprap will be removed, cleaned, and replaced along only the upper 75 feet of the drainage, allowing conversion of the remaining 75 feet to earthen channel. The remaining footprint of excavation within the IR-8 drainage will then be restored to willow-dominated riparian habitat.

A concrete oil-water separator (OWS) is located just east of the IR-8 drainage, approximately 120 feet from the start of the unlined channel, as shown on Figure 3. The OWS was installed in approximately 1979 but is currently not in service, and it may never have been used. There is a 6-inch diameter pipe from the end of the concrete-lined channel to the OWS, but the pipe is currently plugged at its inlet in the channel. The OWS is approximately 6.5 feet deep and is installed with roughly half the OWS below ground and half above ground. The OWS is within the planned limits of excavation in the IR-8 drainage, and therefore will be demolished and removed as part of this Project, and the area currently with the OWS will be restored.

Soil excavation and channel reconstruction is anticipated to occur in summer 2017. Habitat restoration will follow completion of construction activities and include seeding all disturbed areas with appropriate native grasses and forbs, transplanting cattails (*Typha* sp.) from adjacent populations to portions of the IR-8 drainage, planting willow cuttings in soil-filled sonotubes within the 75-foot reach of riprap-lined drainage, and planting willow cuttings throughout the excavation footprints of the IR-8 drainage and IR-6/8 confluence areas.

The project will require the following resource agency permits or approvals:

- California Department of Fish and Wildlife (CDFW) Streambed Alteration Agreement
- Regional Water Quality Control Board (RWQCB) Clean Water Act Section 401 Certification
- U.S. Army Corps of Engineers (USACE) Clean Water Act Section 404 Nationwide Permit
- U.S. Fish and Wildlife Service (USFWS) Programmatic Biological Opinion (request for project to be appended)

1.2 Purpose of This Restoration and Monitoring Plan

This restoration and monitoring plan (RMP) describes the planned restoration of habitats located in the jurisdictions of CDFW, RWQCB, and USACE, as well as of unregulated uplands that will be disturbed during construction. This RMP describes the restoration approach and standards for success, and details how restored and enhanced habitats will be established, maintained, and monitored. The restoration will be implemented after soil cleanup and drainage reconstruction activities are complete.

1.3 Location

The project site is located in the San Francisquito Creek watershed in San Mateo County, California (Figure 1). It is situated in the Palo Alto U.S. Geological Survey (USGS) 7.5-minute quadrangle (Figure 2).

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Figure 1. Vicinity Map
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N:\Projects3900\3934-01\Reports\NationwidePermit\Fig 2 USGS Quad Map.mxd mchilds

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Figure 2. USGS Topographic Map
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Section 2.0 Type, Functions, and Values of the Impact Area

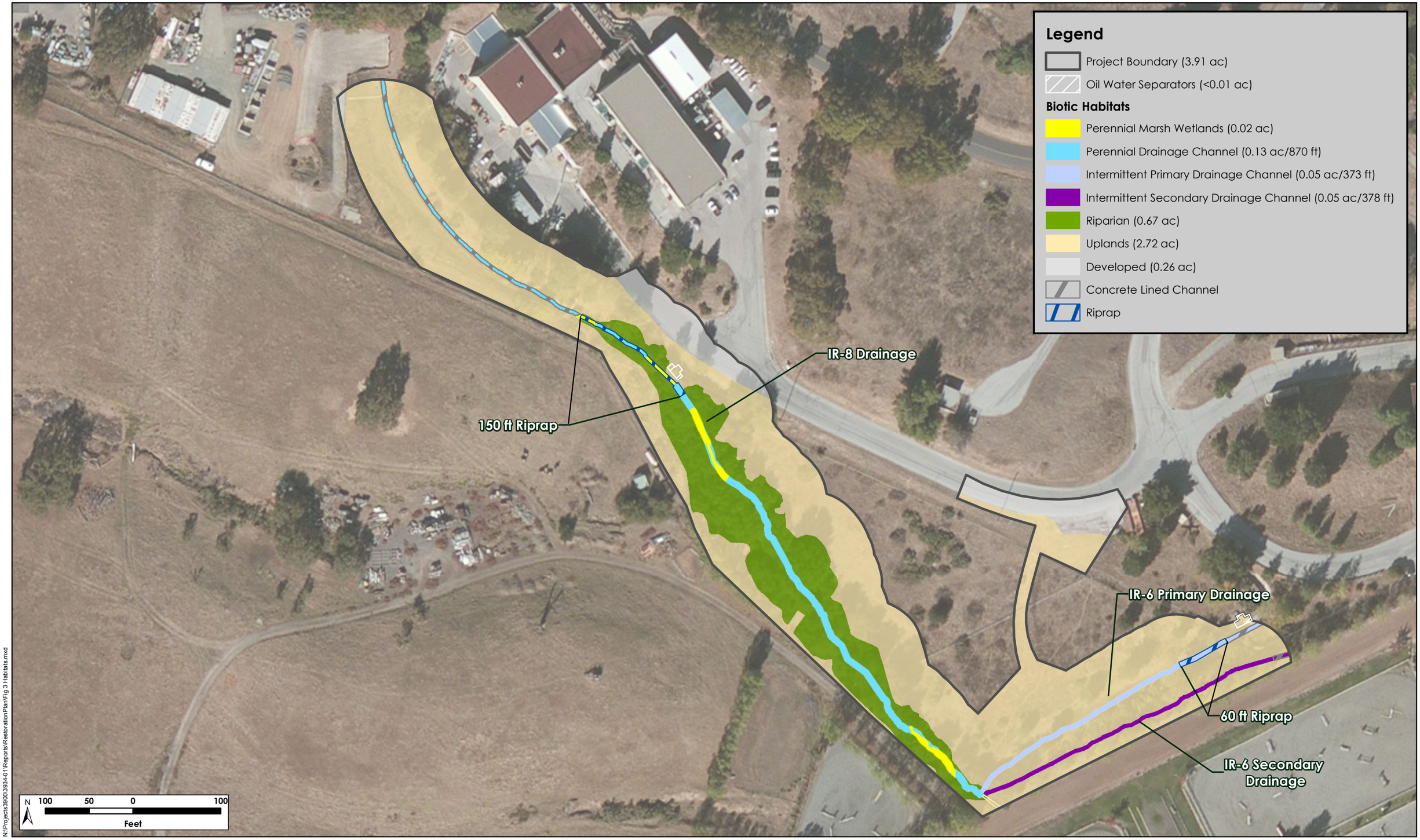
2.1 Overview

The project involves removing soil impacted with residual chemicals from the former use of transformers and other oil-filled electrical equipment in the Research Yard and Campus Area at SLAC. Spills, releases, and known sources of PCBs have been remediated. The project is a final remedial action to address cleanup requirements. The soil cleanup area is concentrated along two constructed drainage channels (IR-6 and IR-8).

The IR-6 drainage conveys intermittent flows in primary and secondary channels. The primary IR-6 drainage channel includes an approximately 150-foot-long concrete-lined reach that transitions to an approximately an approximately 330-foot-long unlined earthen channel where the first 60 feet is covered in rip-rap. The secondary channel is entirely earthen, is approximately 375 long, and is located approximately 10 to 30 feet south of the primary channel. The primary and secondary channels run parallel to each other and merge just before reaching a confluence with the IR-8 drainage. The IR-6 primary channel conveys seasonal stormwater flows from a stormwater drainage system that delivers water to the concrete-lined upper reach. The IR-6 secondary channel conveys stormwater flow from a smaller area near the southern edge of SLAC. These intermittent primary and secondary channels support upland vegetation and do not support wetland or riparian habitats that are subject to resource agency jurisdiction (*jurisdictional habitats*) (Figure 3).

The IR-8 drainage channel conveys seasonal stormwater, as well as approximately two gallons per minute of groundwater collected by the SLAC tunnel underdrain systems. Because groundwater is pumped from the tunnel underdrain systems, the IR-8 drainage channel conveys flows year-round. The drainage consists of an approximately 370-foot-long concrete-lined reach that transitions to an approximately 700-foot-long unlined earthen channel in which the upper approximately 150 feet is covered with rip-rap. There is also an abandoned OWS adjacent to the riprap portion of the drainage that will be removed as part of the project. The perennial flows in this drainage support patches of perennial cattail-dominated wetland and adjacent willow-dominated riparian habitat (Figure 3). The vast majority of willows within the excavation footprint are young, small trees (6 inches in diameter at breast height [dbh] and smaller).

The IR-6/8 confluence area conveys flows from both drainages through two culverts that eventually drain to San Franscisquito Creek. This area supports willow-dominated riparian habitat (Figure 3).



N:\Projects\3900\3934-01\Reports\RestorationPlan\Fig 3 Habitats.mxd

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Figure 3. Biotic Habitats
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SLAC National Accelerator Laboratory,
Environmental Cleanup of IR-6 and IR-8 Drainages (3934-02)
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The project site areas from which soils will be excavated include the portions of the earthen reaches of the IR-6 and IR-8 drainages (including rip-rap areas), and the IR-6/8 confluence area (Figure 3). Perennial wetland and willow riparian habitat adjacent to the impact areas along the IR-8 drainage and the IR-6/8 confluence area will be protected during construction and restoration activities. In addition, appropriate measures will be taken to protect any individual trees identified by the SLAC arborist to be protected. Environmentally Sensitive Area (ESA) fencing, or similar, will be installed around habitats and trees to be protected to ensure that no construction-related disturbance occurs in these areas.

2.2 Impact Assessment

The project will result in temporary impacts on channel, perennial wetland, and riparian habitats. The IR-6 primary and secondary drainages convey only intermittent, seasonal flows, which are discharges from the stormwater drainage system. There are no perennial wetland or riparian habitats along these drainages, but they do constitute channel habitat that will be temporarily affected during soil excavation (Figure 4). The IR-8 drainage and IR-6/8 confluence area convey perennial flows and support channel, perennial wetland, and riparian habitats. These habitats will be temporarily affected during soil excavation, vegetation clearing, and tree removal (Figure 4).

Temporary impacts were calculated based on the acreages of the different habitats as well as the number of trees that will be removed from riparian habitat.

The anticipated impacts on channel and perennial wetland habitats are considered temporary because the channel habitat in the IR-6 and IR-8 drainages will be reconstructed to match current drainage patterns and the wetlands in the IR-8 drainage will be immediately restored through transplanting cattails. The IR-8 low-flow channel will be recreated to broaden the low-flow channel's cross-sectional area, providing additional area suitable for perennial wetland habitat. It is anticipated that the wetland plantings will establish quickly and provide habitat comparable to current conditions within one growing season.

Anticipated impacts on riparian habitats in the IR-8 drainage and IR-6/8 confluence area are considered temporary based on the following factors:

- The majority of vegetation removed will consist of very young sapling willows, less than 6 inches dbh.
- A total of 19 willows of 6–12 inches dbh will be removed, and the restoration areas will be planted with at least 86 willow cuttings, providing a greater than 4:1 replacement ratio by stem count.
- The excavation footprint/impact area in the IR-8 drainage and IR-6/8 confluence area totals only 13% of the surface area of riparian habitat along the drainage and is almost entirely encompassed by willow riparian habitat. This surrounding habitat will be protected and will continue to provide existing functions and values while the restored area recovers.

- The reconstruction of the excavation footprints has been designed to provide soil conditions suitable to support robust reestablishment of willow riparian habitat.
- Owing to perennial flows, the lateral extent of existing riparian habitat, and the project design, it is anticipated that the planted willow cuttings will begin providing habitat functions and values within 1 year of installation.

In sum, temporary impacts would affect 445 linear feet (ln ft) of intermittent drainage channel, 275 ln ft of perennial drainage channel, 0.016 acre of perennial wetland habitat and 0.09 acre of riparian habitat (Table 1 and Figure 4).

Table 1. Regulated Habitat Impacts

Habitat Type	Impact (linear feet)	Impact (acres)
Intermittent drainage channel	445	-
Perennial drainage channel	275	-
Perennial wetland	-	0.016
Riparian	-	0.09

2.3 Characterization of the Impact Areas

2.3.1 Channel Habitat

The IR-6 drainage primary and secondary channels do not support any wetland or riparian vegetation and provide only channel habitat (Figures 3 and 4). The IR-8 drainage channel thalweg and immediately adjacent areas are mostly unvegetated but do support perennial flows and patches of perennial wetland vegetation, as described below (Figure 4).

2.3.2 Perennial Wetland Habitat

There are three distinct patches of perennial wetland habitat in the channel of the IR-8 drainage (Figure 4). All three patches are dominated by cattails.

2.3.3 Riparian Habitat

There is a dense corridor of riparian habitat along the entire unlined reach of the IR-8 drainage and IR-6/8 confluence area, dominated by young, arroyo willow trees (*Salix lasiolepis*) (Figure 4). The riprap-lined reach of IR-8 has a few very small saplings that have recruited within the rock and some slightly larger willows that are rooted outside the extent of rock.

N:\Projects3900\3934-01\Reports\RestorationPlan\Fig 4 Habitat Impacts.mxd

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Figure 4. Biotic Habitat Impacts
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2.3.4 Topography, Climate, and Hydrology

The project site slopes gently from north to south, with elevations ranging from approximately 200 to 240 feet (National Geodetic Vertical Datum of 1929 [NGVD 29]) (Figure 2). The 30-year climate normal (from 1981to 2010) indicates that the area receives approximately 24 inches of rain annually, with the majority falling between October and April, and the average temperature ranges from a low of 47.9°F to a high of 71.3°F (PRISM Climate Group 2016).

The IR-6 drainage's primary and secondary channels convey intermittent, seasonal flows, mostly consisting of discharges from the SLAC stormwater drainage system. The IR-8 drainage channel conveys perennial flows because approximately two gallons per minute of groundwater, collected by SLAC tunnel underdrain systems, is pumped to the drainage. These flows are augmented by seasonal stormwater inputs. Flows from both drainages collect in the IR-6/8 confluence area and are conveyed through two culverts and then downstream earthen drainages to San Francisquito Creek.

2.3.5 Soil/Substrate

The project site is underlain by two soil types: (1) Accelerator-Fagan association, 5–15% slopes, and (2) Accelerator-Fagan-Urbanland complex, 5–15% slopes (NRCS 2016). Both soil types are mixed gravelly clay loams and clay loams derived from residuum weathered from sandstone and siltstone, and can range from nonsaline to very slightly saline.

2.3.6 Wildlife

Riparian habitats in California generally support exceptionally rich animal communities and contribute a disproportionately high amount to landscape-level species diversity. In addition to supporting diverse wildlife, riparian communities provide movement corridors for some species, connecting a variety of habitats throughout a region. The value of the riparian woodlands on the project site is somewhat limited due to the small size and isolated nature of the habitat. Nevertheless, this community provides breeding, foraging, and roosting habitat for an array of animals, including a variety of migrating and breeding birds. Trees with cavities or loose bark may provide roosting habitat for bats, which also may forage aerially on insects over the channels, and leaf litter and fallen branches associated with the riparian community provide cover for a variety of reptiles and amphibians. Small mammals, such as the Botta's pocket gopher (*Thomomys bottae*) and deer mouse (*Peromyscus maniculatus*), may burrow or find refuge in dense grass or brushy thickets and the taller trees provide daytime roosts for nocturnal species such as the raccoon (*Procyon lotor*). The aquatic habitats on the project site do not support fish due to the presence of culverts immediately downstream, which act as barriers to fish dispersal to the site. The shallow nature of the channels also limits their suitability for many other aquatic species, although the Sierran chorus frog (*Pseudacris sierra*) may breed on the site. The cattail-dominated perennial marsh wetlands are expected to support small numbers of breeding song sparrows (*Melospiza melodia*), and in winter provide foraging habitat and cover for Lincoln's (*Melospiza lincolnii*), white-crowned (*Zonotrichia leucophrys*), and golden-crowned sparrows (*Zonotrichia atricapilla*).

2.4 Special-Status Species

The *SLAC National Accelerator Laboratory Environmental Cleanup of IR-6 and IR-8 Drainages Biological Assessment* assesses the Project's potential impacts on federally listed threatened, endangered, and candidate species (H. T. Harvey & Associates 2017a). The only special-status species that has been observed to occur in the Project vicinity is San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*) (a state species of special concern). Special-status species that have the potential to occur in the Project vicinity (but have not been observed and are not considered likely) are the California red-legged frog (*Rana draytonii*) (federally listed as threatened and a state species of special concern) and western pond turtle (*Actinemys marmorata*) (a state species of special concern). These species' occurrence in the Project area is summarized below.

The project site includes perennial wetland areas (~0.02 acre) along the IR-8 drainage that provide marginally suitable aquatic habitat for the California red-legged frog and surrounding riparian and annual grassland habitats support upland habitat for this species. California red-legged frogs are known to occur in San Francisquito Creek approximately 0.5 mile south of the site; however, the project site is not considered occupied habitat under the Stanford Habitat Conservation Plan (Stanford 2013). No California red-legged frogs were observed in the IR-8 drainage during surveys conducted in 1998 (Stanford 1998), 2005 (Launer 2005), 2006 (Launer 2006), and 2009 (Launer 2009), or during a survey and habitat assessment conducted by H. T. Harvey & Associates senior herpetologist Dr. Jeff Wilkinson in October 2016. Multiple impediments to dispersal (i.e., Interstate 280, the SLAC development and facilities, and a major equestrian training center) are present between the site and areas known to support the species. Although frogs have not been observed in IR-8 and they are not likely to occur on the project site, the site is within potential dispersal distances from occupied areas, and there is a small chance that a transient red-legged frog could disperse through IR-8 and into the project site.

Western pond turtles have not been observed on the project site during the aforementioned surveys conducted by Stanford biologists (Launer 2009) or during the survey conducted by H. T. Harvey & Associates senior herpetologist Dr. Jeff Wilkinson in October 2016, and the drainages on the site provide only marginally suitable aquatic habitat for the species due to the short length of time that they hold water and their shallow nature. Although western pond turtles have been found in the nearby San Francisquito Creek, dispersal of individuals to the project site is expected to occur infrequently, if at all, due to the presence of numerous impediments to dispersal as described for the red-legged frog above. Nevertheless, the potential for individual turtles to occasionally occur on the project site cannot be ruled out.

The riparian community on the project site provides suitable habitat for the San Francisco dusky-footed woodrat, and nests of this species were observed on the project site during the reconnaissance survey.

Section 3.0 Restoration Approach

3.1 Introduction

This RMP provides a conceptual plan for the on-site restoration and enhancement of jurisdictional channel, perennial wetland, and riparian habitats to compensate for the temporary impacts that will result from removal of contaminated soil. All areas disturbed during soil excavation will be restored by placing clean fill and topsoil. Restored site conditions have been designed to recreate channel habitat to match current drainage patterns. Restoration of perennial wetland and riparian habitats will be accomplished by transplanting wetland plants from adjacent populations and directly planting willow cuttings. In addition, all disturbed upland habitat will be restored through seeding with an appropriate native grass and forb seed mix.

Conservation measures to mitigate potential impacts on the California red-legged frog, the only federally listed species with potential to occur on the site, are provided in the Programmatic Biological Opinion (PBO) issued to the USACE for projects issued permits under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, including authorizations under 22 Nationwide Permits that may affect the threatened California red-legged frog in nine San Francisco Bay Area counties in California (USFWS 2014).

3.2 Restoration Goals

The goal of this RMP is to restore jurisdictional channel, perennial wetland, and riparian habitats, as well as unregulated uplands that are disturbed during removal of contaminated soil along the IR-6 and IR-8 drainages. The restoration has been designed to fully compensate for temporary impacts on jurisdictional habitats and to quickly restore the existing habitat functions and values at the project site. Existing habitats outside the impact areas will be clearly delineated and protected with ESA fencing, or similar, to ensure that no construction-related disturbance occurs outside the identified impact areas.

Table 2 summarizes the habitat impacts and the restoration to be provided.

Table 2. Regulated Habitat Impacts and Restoration

Habitat Type	Total Impacts (linear feet or acres)	Restoration Provided (linear feet or acres)
Intermittent drainage channel	445 ln ft	445 ln ft
Perennial drainage channel	275 ln ft	275 ln ft
Perennial wetland	0.016 acre	0.02 acre
Riparian	0.09 acre	0.11 acre

Restoration of perennial wetland habitat will involve transplanting cattails from adjacent populations on Stanford-owned lands to provide an approximately 20% increase in initial perennial wetland habitat as compared to impacted wetland acreage. In addition, the IR-8 drainage restoration area has been designed to broaden the cross-sectional area of the channel to facilitate expansion of perennial wetland habitat through natural recruitment.

Restoration of riparian habitat will involve directly planting willow cuttings harvested from within the IR-8 drainage. The willow riparian restoration design provides for an approximately 20% increase in the surface area that will support high-quality willow riparian habitat as compared to the impacted riparian habitat acreage.

The restoration of the temporarily affected channel, perennial wetland, and riparian habitat will ensure no net loss of habitat functions or values.

3.3 Restoration Site Location and Ownership Status

All restoration will be implemented on lands owned by Stanford University; a portion of the land is under lease by SLAC.

3.4 Conceptual Channel, Wetland, and Riparian Restoration Design

The project has been designed to remove soil that contains elevated concentrations of PCBs and replace it with clean fill and topsoil to facilitate restoration of channel, perennial wetland, and riparian habitat functions and values. Following restoration, the site will contain less hardscape (75 feet of riprap-lined channel will be converted to earthen channel and an oil-water separator will be removed from along the IR-8 drainage) and will support approximately 20% more perennial wetland and riparian habitat acreage than is currently located in the impact areas. In addition to restoring jurisdictional habitats, all uplands disturbed by access and staging activities will be restored to match current conditions. Figure 5 provides an overview of the habitat restoration areas on the project site.

3.4.1 IR-6 Drainage

The IR-6 drainage excavation and restoration will consist of the following activities:

(1) clearly delineate excavation, access, and staging areas to ensure protection of adjacent habitats during construction;

(2) remove, clean (remove accumulated sediments), and replace approximately 60 feet of riprap in the primary drainage (alternatively, removed riprap may be disposed off-site and replaced with new riprap);

(3) replace, if necessary, any existing geotextile underlying riprap that is damaged during work;

(4) clear vegetation, excavate, and properly dispose of excavated soil from the primary and secondary drainages excavation areas;

(5) place clean fill and topsoil to reconstruct a stable channel and match current grades and topography and cover with erosion control matting; and

(6) revegetate the entire excavation footprint and access and staging areas by seeding with an appropriate upland native grass and forb mix.

Specific details regarding each component are provided by the Implementation Plan (Section 4.0 of this report), in the *Group 3 Removal Action Work Plan, Addendum 1 IR-6 and IR-8 Drainage Channel Areas* (G3WP Addendum 1) (EKI 2017a in prep.), and in the *Technical Specifications and Drawings for Group 3 Removal Action Addendum 1 IR-6 and IR-8 Drainage Channel Investigation Areas* (Technical Specs and Drawings) (EKI 2017b in prep.). This approach will restore the area to pre-project (current) conditions.

3.4.2 IR-8 Drainage

The IR-8 drainage excavation and restoration will consist of the following components:

(1) clearly delineate excavation, access, and staging areas and install ESA fencing, or similar, to protect adjacent perennial wetland and riparian habitats;

(2) Divert water around excavation areas so excavation can be dry, but downstream of excavation remains wet;

(3) clear vegetation from, excavate, and properly dispose of soil from excavation areas;

(4) remove, clean (remove accumulated sediments), and replace approximately 75 feet of riprap with sonotubes to facilitate willow joint planting (Figure 6); alternatively, removed riprap may be disposed off-site and replaced with new riprap;

(5) replace, if necessary, any existing geotextile underlying riprap that is damaged during work;

(6) remove the remaining approximately 75 feet of riprap and restore the channel in this location to an unlined, earthen channel;

(7) remove the oil-water separator;

(8) place clean fill and topsoil to reconstruct a stable channel to match pre-project (current) drainage patterns and floodplain elevations, except in the portion of the channel described in (9) and shown on Figure 6;

(9) broaden the channel cross section to create additional area suitable for supporting perennial wetland habitat throughout the IR-8 drainage excavation area, with the exception of the 75 foot reach where riprap is replaced (Figure 6);

(10) seed the entire excavation footprint in jurisdictional habitats with a quick-to-establish native wetland and riparian grass to aid in erosion control;

(11) cover the seeded excavation footprint with biodegradable erosion control fabric;

(12) revegetate portions of the channel with native cattails transplanted from nearby populations (Figure 6);

(13) revegetate the entire remaining footprint of the excavation area outside the low-flow channel with willow cuttings (including in the 75 feet of newly unlined, earthen channel, in the 75 feet of replaced riprap, and the area made available by removing the oil-water separator);

(14) revegetate access and staging areas outside the excavation area by seeding with an appropriate upland native grass and forb mix.

Specific details regarding each component are provided by the Implementation Plan (Section 4.0 of this report), the G3WP Addendum 1 (EKI 2017a in prep.), and the Technical Specs and Drawings (EKI 2017b in prep.). This approach will restore the disturbed areas to match pre-project (current) drainage patterns while supporting perennial wetland and riparian habitats.

3.4.3 IR-6/8 Confluence

The IR-6/8 confluence area excavation and restoration will consist of the following components:

(1) clearly delineate excavation, access, and staging areas and install ESA fencing, or similar, to protect adjacent perennial wetland and riparian habitats;

(2) Divert water around excavation areas so excavation can be dry, and discharge water into culvert downstream of excavation area;

(3) clear vegetation from, excavate, and properly dispose of contaminated soil;

(4) place clean fill and topsoil to reconstruct a stable channel and match current grades and topography;

(5) seed the entire excavation footprint in jurisdictional habitats with quick-to-establish native wetland and riparian grass to aid in erosion control;

(6) cover the seeded excavation footprint with biodegradable erosion control fabric; and

(7) revegetate the entire footprint of the excavation area outside the low-flow channel with willow cuttings.

Specific details regarding each component are provided by the Implementation Plan (Section 4.0 of this report), the G3WP Addendum 1 (EKI 2017a in prep), and the Technical Specs and Drawings (EKI 2017b in prep.). This approach will restore the confluence area to match pre-project (current) drainage patterns while supporting riparian habitat.

N:\Projects3900\3934-01\Reports\RestorationPlan\Fig 5 Restoration Areas.mxd

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Figure 5. Restoration Areas
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SLAC National Accelerator Laboratory,
Environmental Cleanup of IR-6 and IR-8 Drainages (3934-02)
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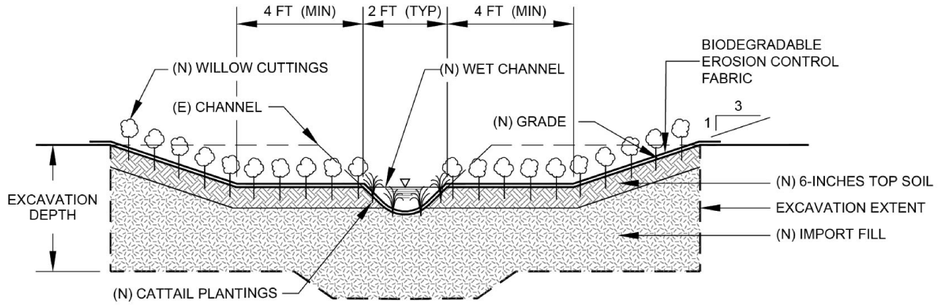
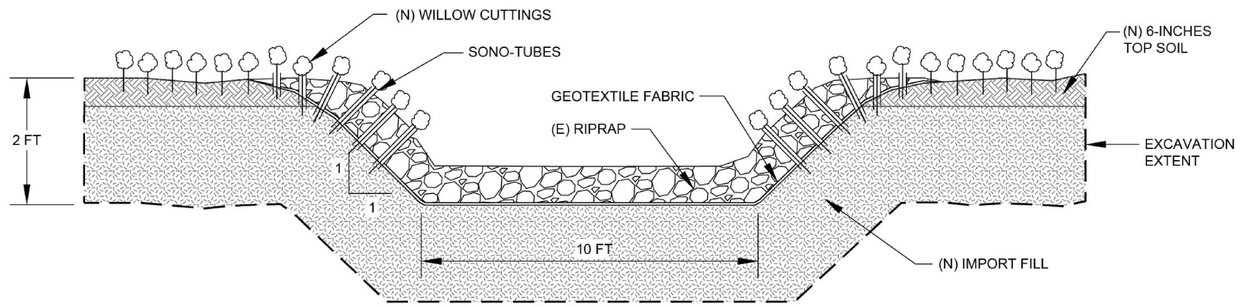
Legend
(E) - Existing
(N) - New



RESTORATION TYPICAL SECTION WITHOUT RIP-RAP
NOT TO SCALE



RESTORATION TYPICAL SECTION WITH RIP-RAP
NOT TO SCALE

N:\Projects3900\3934-01\Reports\RestorationPlan\Fig 6 Cross-Sections.mxd

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Figure 6. IR-8 Drainage Typical Restoration Cross-sections
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3.5 Time Lapse

Current drainage patterns and channel habitats will be restored immediately. Perennial wetlands are expected to be restored to similar habitat functions and values within one growing season. Riparian habitats are anticipated to quickly begin to provide significant habitat functions and values because perennial flows, adjacent habitat, and the project design are conducive to quick reestablishment. Additionally, the adjacent habitat will be protected and will continue providing functions and values as the restoration plantings mature. Therefore, it is anticipated that the planted willows will begin providing habitat functions and values within 1 year of installation.

3.6 Existing Functions and Values of the Channel, Wetland, and Riparian Restoration Site

As described above, temporarily affected channel, perennial wetland, and riparian habitats will be restored on site, coincident with the excavation/impact footprints. Therefore, the existing functions and values of the restoration site are the same as described under Section 2.0, "Type, Functions, and Values of the Impact Area." The key areas that will be different after restoration are in IR-8 and include the 150-foot-long reach of riprap-lined channel, the channel cross-sectional area along excavated areas of IR-8, and the area supporting the former oil-water separator. The riprap-lined reach provides limited biological functions and values; however, a few sapling willows have colonized the rock and there is a small patch of perennial wetland vegetation in the channel bed. The restoration design calls for only the upper 75 feet of riprap to be replaced; the lower 75 feet will be converted to unlined earthen channel. The riprap portion to remain will be interplanted with willow cuttings installed in soil-filled sonotubes, and the lower, unlined channel will be restored to perennial wetland and willow riparian habitat by transplanting cattails and directly planting willow cuttings. The IR-8 channel will have a broadened cross-sectional area that will facilitate natural expansion of perennial wetland habitat while keeping the current drainage pattern intact. The former oil water separator is an abandoned, concrete block structure that will be removed; this area will be restored to willow riparian habitat.

3.6.1 Wetland Delineation

A wetland delineation was conducted in the project area to identify the current extent and distribution of potential jurisdictional waters, such as wetlands and other waters of the United States (H.T. Harvey & Associates 2017b)

3.7 Type, Function, and Values of Habitats to Be Restored

Channel, perennial wetland, and riparian habitats will be restored and enhanced through implementation of this RMP. The restored habitats will all provide functions and values similar to those of the existing habitats. As described above, additional areas along the IR-8 drainage will be converted to enhance habitat value: willows will be joint planted in the remaining 75 feet of riprap-lined channel, 75 feet will be converted from riprap-lined channel to unlined earthen channel and restored to perennial wetland and willow riparian habitat, the channel

cross-sectional area will be broadened to facilitate natural expansion of perennial wetland habitat, and the former oil-water separator will be removed and the area converted to willow riparian habitat.

3.7.1 Soils and Hydrology

The soils to be imported and placed in the restoration areas are suitable for the successful reestablishment of perennial wetland and willow riparian habitats. Additional details on the import soils are included in "Site and Topsoil Preparation" (Section 4.4 of this report) as well as the Technical Specs and Drawings (EKI 2017b in prep.). Hydrology will be the same as the existing condition, which supports all the target habitats to be restored.

3.7.2 Vegetation

The target perennial wetland and riparian species composition was determined based on observations of the current distribution of dominant native species in the project area. The target composition is more fully described in the Planting and Seeding Plan (Section 4.5).

3.7.3 Wildlife

The planned restoration will reestablish high quality perennial wetland and riparian habitats that will be comparable to the pre-project conditions. As a result, these restored habitats are expected to support wildlife habitat functions and values at least as great as those that currently exist. All the species that currently use the site, as described in Section 2.3.6 above, will use the restored habitats.

Section 4.0 Implementation Plan

4.1 Wildlife Avoidance and Minimization Measures

Avoidance and minimization measures to protect wildlife will be implemented during restoration construction work and will be consistent with the conditions of the Project's biological opinion or appended programmatic biological opinion. Avoidance and minimization measures will include specific measures regarding the California red-legged frog, western pond turtle, dusky-footed woodrat, and nesting migratory birds. Pre-construction nesting bird surveys will be conducted prior to the start of work during the nesting bird breeding season.

4.2 Restoration Construction Schedule

Restoration is expected to begin in late 2017, after the IR-6 and IR-8 drainages have been reconstructed. Transplanting of wetland plants and installation of willow cuttings is anticipated to occur in Winter 2017/early 2018. The order of events for restoration implementation is roughly as follows:

1. Complete reconstruction of excavation portions of IR-6 and IR-8 drainages and IR-6/8 confluence area by placing clean fill and topsoil. This step also includes installation of soil-filled sonotubes within the 75-foot reach of riprap-lined channel remaining along IR-8.
2. Apply a native upland seed mix across IR-6 excavation area and all disturbed upland areas associated with access and staging.
3. Apply native wetland and riparian grass seed across the IR-8 and IR-6/8 confluence restoration areas and install biodegradable erosion control fabric.
4. Install native plantings in wetland and riparian restoration areas of the IR-8 drainage, as described in the Planting and Seeding Plan below.
5. Prepare the biological as-built report.

4.3 Implementation Monitoring

A qualified biologist/ecologist will monitor restoration implementation to ensure that the site is installed as described in this plan.

4.4 Site and Topsoil Preparation

The project has been designed to replace the excavated soil with clean fill and topsoil and reconstruct stable channels. Import fill and topsoil will be tested for physical and chemical parameters at a qualified laboratory to ensure that the soils are horticulturally suitable for supporting target wetland and riparian vegetation.

Imported fill material will meet the following minimum specifications: it will (1) not contain rocks or lumps greater than 6 inches in greatest dimension, with no more than 15% larger than 2.5 inches; (2) not contain construction debris; (3) not contain environmental contaminants; (4) have an organic content of less than 2%. Import fill will be placed in 8-inch lifts and compacted to no greater than 85% relative compaction.

Imported topsoil will meet the following minimum specifications: it will (1) have organic matter content of 5–10%; (2) target a well-drained, sandy loam texture with no rocks greater than 2.5 inches and overall gravel content of less than 10%; (3) have a pH between 5.8 and 7.6; (4) be certified weed-seed free. Import topsoil will be placed in a single 6-inch lift to match finish grade design elevations and compacted to no greater than 85% relative compaction. Topsoil will be lightly scarified to a depth of 2–3 inches prior to seeding and installation of biodegradable erosion control fabric.

Areas subject to riprap replacement (i.e., 60 feet of the IR-6 drainage and the 75 feet of riprap to remain in the IR-8 drainage) will be prepared by placing import fill and covering the footprint of riprap replacement with an appropriate geotextile fabric (either replacing existing fabric or using new material, if necessary). Riprap replacement on IR-6 will match existing conditions. Riprap replacement on IR-8 will include installation of sonotubes, which will be filled with topsoil to facilitate planting with willow cuttings.

Detailed specifications for import fill, import topsoil, and riprap replacement will be included in the final Technical Specs and Drawings (EKI 2017 in prep.).

Disturbed upland areas that are not subject to excavation/grading (i.e., access and staging areas) will be lightly scarified to a depth of 2–3 inches before seeding.

4.5 Planting and Seeding Plan

Figure 5 shows a plan view of the entire project site, identifying the specific restoration areas where the associated planting and seeding approaches described below will be applied.

IR-6 Drainage. The IR-6 drainage will be revegetated by hydroseeding the entire footprint of the excavation/impact area with an upland native grass and forb seed mix (see Section 4.7).

Access and Staging Areas. All access and staging areas will be revegetated by hydroseeding the areas with an upland native grass and forb seed mix, similar to that used in the IR-6 drainage.

IR-8 Drainage. The IR-8 drainage will be revegetated by: (1) broadcast seeding, with erosion control fabric; (2) transplanting wetland plants; (3) joint planting of willows in riprap; and (4) directly planting willow cuttings. These components are detailed below.

1. Broadcast seeding and erosion control fabric. The entire footprint of excavation in IR-8, except for the 75-foot-long riprap-lined reach, will be broadcast-seeded with a quick-to-establish native wetland and riparian grass (see Section 4.7). The soil surface will be lightly scarified to a depth of ½ - 1 inch prior to seeding. Following seed application, the seeded area will be lightly raked to improve seed-soil contact. All seeded areas will then be covered with biodegradable erosion control fabric, installed per the manufacturer's specifications.

2. Transplanting wetland plants. Cattail plugs will be harvested from nearby populations on lands owned by Stanford. Plugs will comprise both above- and below-ground biomass and will be harvested so as to maximize the amount of intact root/rhizome material. Plugs will measure approximately 6 inches by 6 inches and will be kept moist until replanted. Plugs will be installed with approximately 4-foot on-center spacing within the designated wetland restoration areas. Plugs will be installed so that all root/rhizome material is below ground.

3. Joint planting of willows in riprap. A single line of 12-inch-diameter sonotubes will be installed along both banks of the 75-foot-long riprap-lined reach. Installation of sonotubes will be completed during replacement of riprap and will require cutting the geotextile fabric to allow roots access to underlying soil and groundwater. Sonotubes will be located approximately 1–2 feet above the ordinary high-water elevation and will be backfilled with topsoil. A single willow cutting will be installed in each sonotube. Cuttings will be approximately 24–30 inches long and 1–2 inches in diameter.

4. Direct planting of willow cuttings. The remaining excavation/impact footprint will be revegetated with willow cuttings installed with approximately 8-foot on-center spacing. Cuttings will be approximately 24–30 inches long and 1–2 inches in diameter.

IR-6/8 confluence area. The IR-6/8 confluence area will be revegetated by: (1) broadcast seeding, with erosion control fabric, and (2) directly planting willow cuttings. The approaches for seeding and direct planting will be the same as described for the IR-8 drainage.

Table 3 provides the surface area and quantities of plants required for restoring jurisdictional perennial wetland and riparian habitats.

Table 3. Habitat Restoration Area Plant Quantities

Habitat Type	Restoration Area (acres)	Plant Quantities
Perennial wetland	0.02	63 cattail plugs
Riparian	0.11	86 willow cuttings

4.6 Plant Procurement

All wetland plant propagules (cattail transplants) will be collected from populations located on adjacent lands owned by Stanford. All riparian plant propagules (willow cuttings) will be collected from trees in the project area (the IR-8 drainage) or from adjacent willow riparian habitats on lands owned by Stanford.

4.7 Seed Mixes

Removing contaminated soil and reconstructing the excavation footprints will result in substantial ground disturbance. Two seeding approaches will be applied throughout the excavation/impact and access and staging areas to assist with restoration and erosion control:

1. Meadow barley (*Hordeum brachyantherum*), a native wetland and riparian grass, will be broadcast-seeded and lightly raked in the disturbance areas of the IR-8 drainage and IR-6/8 confluence at a rate of 20 pounds of pure live seed (PLS) per acre (PLS, described in Table 4 below).

2. A mix of native upland grasses and forbs will be hydroseeded across the remaining disturbed areas, including the IR-6 drainage and all access and staging areas (Table 4). The upland seed mix may be slightly revised according to availability.

Table 4. Upland Native Grass and Forb Mix

Scientific Name[1]	Common Name[1]	Application Rate (pounds of PLS[2] per acre)
Bromus californica	California Brome	10
Elymus glaucus	Blue wildrye	10
Eschscholzia californica	California poppy	1
Festuca microstachys	Small fescue	6

[1] Names derived from the Jepson Manual, Second Edition (Baldwin et al. 2012).

[2] PLS (pure live seed) = the proportion of total seed that is pure and viable. To find the total weight of raw seed needed to achieve the application rate in the table, find %PLS as follows: [(% purity of seed lot) (% germination rate of species)/100]. Then, divide the application rate in the table (pounds) by the %PLS (expressed as a decimal) to find total weight of raw seed applied per acre for each species.

4.8 Plant Installation

Wetland transplants (cattail plugs) will be harvested and installed in late winter/early spring. Ideal timing is immediately following the first signs of growth. Cattail plugs will be installed in the wetland restoration areas shown on Figure 5. Plugs will be planted in a zone slightly above and below the ordinary high-water elevation. No plugs will be installed within the thalweg of the drainage.

Plugs will be approximately 6 inches by 6 inches and will include as much intact below-ground biomass (roots/rhizomes) as possible. Excavated planting holes will be approximately 8 by 8 inches. Cattail plugs will

be installed with approximately 4-foot on-center spacing and such that all roots/rhizomes are below ground. Soil excavated from each planting hole will be lightly compacted around each plug.

Willow cuttings will be harvested and installed in January or February, when trees are dormant and rainfall has saturated the soils in the restoration areas shown on Figure 5. Cuttings will be harvested from numerous trees to obtain diverse genetic material. No more than 10% of the canopy will be harvested from any single tree. Cuttings will be approximately 24–30 inches long and 1–2 inches in diameter. Cuttings will be harvested with the bottom cut at a 45-degree angle to ensure that they can be properly installed with the bottom in the ground. Following harvest, cuttings will be stored in buckets of water, so that the lower ½ - ¾ of the cuttings are submerged. They will be stored no longer than 48 hours before being installed. Cuttings will be installed so that the upper third (8–10 inches) of each cutting is exposed aboveground. To facilitate cutting installation, narrow pilot holes only slightly wider than the cutting will be excavated (e.g., using a digging bar) or drilled (e.g., using an auger), and the soil will be compacted firmly around each cutting to eliminate voids between the soil and the cutting. Cuttings will not be driven into the ground using a hammer or mallet. Cuttings will be installed in the same manner for both the joint planting in sonotubes and direct planting in the remaining excavation footprint.

4.9 Irrigation

Owing to the perennial flows, the extent of existing wetland and riparian habitat, the timing of plant installation, and the quality of import soils to be placed along the IR-8 drainage and IR-6/8 confluence area, it is anticipated that no irrigation will be required. However, if ongoing monitoring detects signs of drought stress, particularly for the willow riparian restoration areas, supplemental irrigation may be required.

4.10 Foliage Protection

Based on observations of limited herbivory and browse on existing vegetation, it is anticipated that herbivory and browse of the restoration plantings will be minimal; therefore, no foliage protection measures are included in this RMP. However, if ongoing monitoring detects severe signs of herbivory and browse, remedial measures will be taken to protect the plantings.

4.11 Biological As-Built Report

Within 8 weeks after restoration implementation (including willow planting) is complete, a biological as-built report will be prepared by a qualified biologist/ecologist and submitted to the permitting resource agencies (i.e., CDFW, RWQCB, and USACE). The report will describe any significant deviations in the as-built condition from the conceptual design plans described in this RMP. For example, deviations may include changes to the riparian restoration site configuration, revegetation plan, or any features added to the restoration design that were not included in this plan. Future analysis of the riparian restoration site will be based on the as-built report. The as-built report will contain photodocumentation of site conditions following installation.

Section 5.0 Maintenance Plan

5.1 Overview

The willow plantings installed throughout the restoration areas will require maintenance for 3 years after installation (*plant establishment period*) to establish and become self-sustaining. Riparian maintenance will include dead plant replacement, weed control, and potentially irrigation.

It is anticipated that perennial wetland habitat will establish relatively quickly from the transplanted cattail plugs, as well as through natural recruitment. Because of cattail's tendency to aggressively establish where there is perennial water, weed control is the only maintenance planned for the wetland restoration areas. However, if there is severe die-off of cattails, remedial replanting efforts will be implemented.

Regular monitoring visits will be conducted per the Monitoring Plan (see Section 6) by a qualified biologist/ecologist, who will provide feedback to guide maintenance activities.

5.2 Dead Plant Replacement

During the first 3 years, all dead willow plantings will be replaced. This will facilitate rapid establishment of the target riparian habitat. Survival rates of planted willows will be assessed to determine which, if any, of the plantings require replacement (see Section 6.0).

5.3 Weed Control

Invasive plant species are defined as species rated by the California Invasive Plant Council (Cal-IPC) as having a "high" ecological impact in the most current version of *California Invasive Plant Inventory* (Cal-IPC 2016). These species will be controlled throughout all the restoration areas and kept below 5% cover during the 3-year plant establishment period. Control methods will consist of manual removal by hand pulling, string trimming, brush cutting, and herbicide application, if necessary. If herbicides are used, the contractor will obtain and follow recommendations from a certified pest control advisor and use only herbicides that are registered for use near aquatic environments. Measures will be taken during all invasive plant control activities to protect preexisting, planted, and naturally recruited native plant species.

5.4 Irrigation

No irrigation is anticipated to be necessary for perennial wetland or riparian habitat restoration. However, if there are signs that severe drought stress is the cause of substantial die-off, remedial measures will be implemented to provide supplemental irrigation.

5.5 Schedule

The restoration areas will be maintained regularly throughout the plant establishment period. During the first 3 years, maintenance events will occur as needed to meet the performance and success criteria specified in the Monitoring Plan (Section 6.0). The timing of maintenance events will depend on factors such as precipitation patterns and the rate of weed growth/spread. Maintenance activities and frequency will be informed by regular monitoring visits (at least twice per year) by a qualified biologist/ecologist.

Section 6.0 Monitoring Plan

6.1 Overview

This Monitoring Plan defines the performance and final success criteria that will be used to assess the progress of restored perennial wetland and riparian habitats toward attaining this RMP's long-term habitat goal. Performance criteria are interim targets that provide quantitative indicators of the trajectory of vegetation establishment and inform vegetation maintenance measures. However, failure to meet performance criteria does not necessarily indicate failure of the restoration site and will not necessarily result in extended monitoring.

Achievement of the final success criteria is required to (1) demonstrate that the site is on track to fulfill the long-term habitat goal and (2) obtain sign-off from the permitting resource agencies. If the final success criteria are not met, SLAC will consult with the agencies to identify appropriate remedial measures acceptable to the agencies.

6.1.1 Long-Term Habitat Goal and Success Criteria

The long-term habitat goal of this RMP is to fully compensate for jurisdictional channel, perennial wetland and riparian habitats that will be temporarily impacted during project implementation.

This Monitoring Plan presents objective, measurable performance and final success criteria for measuring progress toward the long-term habitat goal. At maturity, the restoration areas are expected to consist of dense, native-plant-dominated perennial wetland and riparian habitats established in and along a geomorphically stable, reconstructed earthen drainage. However, the proposed monitoring duration is much shorter than the time it typically takes for an ecosystem to reach maturity. Therefore, the target habitats will be considered to be on a successful restoration trajectory when monitoring, as described in this section, demonstrates that final success criteria have been met. It is anticipated that the project site conditions (i.e., hydrology, soils, and geomorphology) will support rapid reestablishment of the target habitats.

6.1.2 Monitoring Schedule and Process

Monitoring will occur throughout the restoration areas. The restoration areas will be monitored annually by a qualified biologist/ecologist over a 5-year period. Monitoring data will be collected and compared to the success criteria to determine whether the plan to restore 0.02 acre of perennial wetland and 0.11 acre of riparian habitat has been realized. In addition to the monitoring data, this Monitoring Plan will inform maintenance actions and potential remedial measures needed to ensure the success of the restoration.

SLAC will use the Year 5 final success criteria and an overall assessment of site performance by a qualified biologist/ecologist to apply for sign-off from the permitting resource agencies. If the final success criteria of

the restoration project have not been met by Year 5, SLAC will continue to monitor until they have been met and/or consult with the agencies to identify appropriate remedial measures.

6.2 Monitoring Performance and Success Criteria

Wetland Habitat. Percent cover of wetland vegetation in restoration areas will be used as the indicator of long-term habitat establishment.

Riparian Habitat. Survival of planted willows will be used as a performance indicator in the first 3 years of monitoring to provide an understanding of the plant establishment trajectory. Percent cover of native riparian species and of invasive plant species will be used as indicators of longer-term target habitat establishment and as the metrics of final success criteria. Native woody plant health and vigor, natural recruitment, and channel stability also will be assessed, and photodocumentation will be conducted to supplement quantitative monitoring data. Methods for assessing the performance and success criteria are described in Section 6.3.

6.2.1 Performance Criteria

Willow Survival. Survival of all installed willow plants will be monitored during the first 3 years. Survival results will be used to inform dead plant replacement, and all dead plants will be replaced in Years 1–3. All replacement plants will originate from within the IR-8 drainage or adjacent Stanford owned lands, if possible. If adequate quantities of replacement plants cannot be sustainably collected from these locations then other populations within San Mateo County will be acceptable. Replacement plantings will be installed between January 1 and February 15. In years when replanting occurs, a written summary of the replanting will be included in monitoring reports to document the numbers of individual plants installed.

Riparian Habitat Percent Cover. Percent cover of planted and naturally recruited native riparian species in the riparian restoration areas will be monitored in Years 1–5 to quantify the change in riparian habitat cover over time. The performance criterion is that percent cover of native species will show an increasing trend over time, with a positive slope indicating that the final success criterion will be attained.

Invasive Plant Species Cover. Overall cover of nonnative, invasive plant species in all restoration areas with a Cal-IPC Inventory rating of high will be assessed in Years 1–5. The performance criterion is that the percent cover of invasive plants will not exceed 5%.

Wetland Habitat Percent Cover. Percent cover of wetland species in the wetland restoration areas will be monitored in Years 1–5. The performance criterion is an increasing or stable trend indicating that the final success criterion will be attained.

Native Woody Plant Health and Vigor and Natural Recruitment. Native woody plant health and vigor and natural recruitment will be assessed in Years 1–5, but no specific performance criteria are associated with these indicators.

Channel Stability. Channel stability in the reconstructed channel areas will be qualitatively assessed in Years 1–5 to detect signs of active erosion or channel migration. There is no metric associated with this assessment; however if active erosion or channel migration is observed, remedial measures will be designed and submitted to the permitting resource agencies for approval before implementation.

6.2.2 Final Success Criteria

Riparian Habitat Percent Cover. The average percent cover of combined native riparian species within the riparian restoration areas must be at least 50% in Year 5.

Invasive Plant Species Cover. The percent cover of invasive plants in all restoration areas must not exceed 5% in Year 5.

Wetland Habitat Percent Cover. The percent cover of transplanted and naturally recruited wetland plants in the wetland restoration areas must be at least 75% of the percent cover of the reference perennial wetland habitat. Reference perennial wetland habitat consists of any wetlands present along the IR-8 drainage outside the excavation/impact area.

Riparian Habitat Restoration Extent. The extent of riparian restoration area will be mapped, calculated, and presented in the Biological As-Built Report to confirm that at least 0.11 acre of riparian habitat is installed to fully compensate for temporary project impacts. As the riparian restoration areas are "infilling" existing riparian habitat, as long as the other final success criteria are met in Year-5, the documentation of restoration extent provided in the Biological As-built Plan will also serve as final success criterion for this metric.

Wetland Delineation/Habitat Restoration Extent. The extent of perennial wetland restoration area will be mapped, calculated, and presented in the Biological As-Built Report to confirm that at least 0.02 acre of wetland habitat is installed to fully compensate for temporary project impacts. Assuming that the restoration area receives average precipitation, a wetland delineation will be conducted in Year 5 along the entire IR-8 drainage to determine the extent of jurisdictional wetlands at that time. If the total wetland acreage in Year 5 is less than the original pre-project acreage (0.02 ac), the delineation will be repeated in successive years to confirm that no net loss of wetlands has occurred.

6.3 Monitoring Methods

6.3.1 Plant Survival

The survival of installed willow plantings will be determined by counting all willow cuttings installed in the restoration areas. The number of individuals will be tallied and compared to number of installed plantings documented in the Biological As-Built Report. Survival will used to inform dead plant replacement in Years 1 through 3.

> Percent survival of willow plantings = (number of willow plantings alive at monitoring / total number of willows planted during initial installation) * 100

6.3.2 Riparian Habitat Percent Cover

Percent cover of planted willows and naturally recruited native woody species will be determined using the line intercept method (Bonham 1989). For each sampling event, fixed-length 50-foot-long transects will be randomly located in the riparian restoration areas. The total number of transects to be measured will be determined each monitoring year based on the site's vegetative cover. The number of transects monitored will be the number at which additional transects do not substantially change the average cover value (Kershaw 1973).

The percent cover by individual species will be calculated from all transects measured, using the following formula:

> Percent cover of species A = (sum of intercept lengths for species A / total length of transects) * 100

The average percent cover of combined native species will be calculated using the following formula:

> Average percent cover of species = (sum of percent cover of species along each transect / number of transects)

The results will be compared to the appropriate percent cover performance and final success criteria. Comparisons between monitoring years will be presented in successive monitoring reports.

6.3.3 Invasive Plant Species Cover

Percent cover of nonnative, invasive plant species with a Cal-IPC Inventory rating of high will be visually estimated in all restoration areas. Total estimated cover of invasive plant species will be compared to the invasive plant species cover performance and final success criteria.

6.3.4 Wetland Habitat Percent Cover

Monitoring of wetland vegetation percent cover will be conducted by a qualified biologist/ecologist at the end of the seasonal wetland vegetation growing season (i.e., in early summer). Percent cover of planted and naturally recruited wetland vegetation will be determined by species using the quadrat sampling method (Bonham 1989) along permanent transects placed in the perennial wetland restoration areas. Transect endpoints will be field-marked with metal U-posts. The number of quadrats employed will be based on the variability of the site's vegetative cover, and will be determined by evaluating the average cover value of wetland indicator species obtained over an increasing number of quadrats. The number of quadrats used will be the point where additional samples do not substantially change the average cover value obtained (Kershaw 1973). Cover within each quadrat will be estimated to the nearest whole percent. Wetland vegetation will be defined as species with a facultative, facultative wetland, or obligate wetland indicator rating in the *Western Mountains, Valleys, and Coast 2016 Regional Wetland Plant List* (Lichvar et al. 2016). (Table 5).

Table 5. Wetland Indicator Status, Codes, and Definitions

Wetland Indicator Status	Status Code	Definition
Obligate Wetland	OBL	Almost always occur in wetlands
Facultative Wetland	FACW	Usually occur in wetlands, but may occur in nonwetlands
Facultative	FAC	Occur in wetlands or nonwetlands
Facultative Upland	FACU	Usually occur in nonwetlands, but may occur in wetlands
Not on List	NOL	Not on the National Wetland Plant List

Source: Lichvar et al. 2016.

The number of wetland species observed during quadrat sampling will be tallied and reported. Percent cover of wetland vegetation will also be determined for reference wetland habitat, which consists of wetlands along the IR-8 drainage outside of the excavation/impact areas. The average cover of wetland vegetation calculated for the restored wetlands will then be compared to the reference wetlands to determine if performance and final success criteria are being met.

6.3.5 Health and Vigor

Overall plant health and vigor of all installed willow plantings will be assessed by considering such factors as plant color, bud development, new growth, herbivory, drought stress, fungal/insect infestation, and physical damage. Health and vigor will be measured using the numerical and qualitative scale shown in Table 6. Health and vigor for each species will be ascertained by averaging the numerical values for each species. Health and vigor will be compared between species and years.

Table 6. Plant Health and Vigor Categories

Qualitative Values	Numerical Values	Observations
High health and vigor	1–3	67–100% healthy foliage, trunk, root crown
Medium health and vigor	4–6	34–66% healthy foliage, trunk, root crown
Low health and vigor	7–9	0–33% healthy foliage, trunk, root crown

6.3.6 Channel Stability

A qualified hydrologist/geomorphologist or biologist/ecologist will conduct one annual reconnaissance site visit after the rainy season in Years 1–5. In addition, during Years 1–3, a site visit will occur following any substantial rain event that may result in significant erosion. A substantial rain event is defined as greater than 2 inches of rain over 24 hours observed at a nearby weather station. The site will be qualitatively assessed for stability of the reconstructed channel reaches through observations of conditions such as, channel incision, sediment deposition, eroding banks, channel migration, and nick point development. Photodocumentation of the site, as described in Section 6.3.9 below, will also be used to capture the condition of the reconstructed channel reaches so that annual comparisons of channel conditions can be made to the as-built conditions. If

the hydrologist/geomorphologist or biologist/ecologist documents channel instability then appropriate remedial actions will be identified and implemented to ensure channel stability.

6.3.7 Riparian Habitat Restoration Extent

The extent of riparian restoration area will be mapped, calculated, and presented in the Biological As-Built Report to confirm at least 0.11 acre of riparian habitat is installed.

6.3.8 Wetland Delineation/Habitat Restoration Extent

Assuming that the area receives average precipitation, the surface area of jurisdictional wetlands will be confirmed by conducting a wetland delineation in Year 5, following the guidelines outlined in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (USACE 2010). The delineation will cover the entire IR-8 drainage to quantify the total wetland acreage present. If the total wetland acreage in Year 5 is less than the original pre-project (current) acreage (0.02 ac), the delineation will be repeated in successive years to confirm that no net loss of wetlands has occurred.

6.3.9 Photodocumentation

Photodocumentation of the restoration areas will be conducted following restoration implementation and in Years 1–5. Photographs also will be taken to record any event that may significantly affect the success of the restoration, such as flood, fire, or vandalism. The locations of photodocumentation points will be selected following restoration implementation and will be identified in the Biological As-Built Report.

6.3.10 Site Maintenance

Maintenance inspections will be performed two times per year in Years 1–3. A qualified biologist/ecologist will inspect the site to ensure that maintenance activities are biologically appropriate and providing the best opportunity for the site to meet performance criteria. The monitoring biologist/ecologist will assess the need for plant replacement, general weed control, and invasive plant species control.

6.4 Monitoring Schedule

The monitoring schedule is presented in Table 7. Riparian monitoring will be conducted between July and October and wetland monitoring between April and June of the indicated monitoring year.

Table 7. Mitigation Monitoring Schedule

Monitoring Topic	Year 1	Year 2	Year 3	Year 4	Year 5 (Final)
Plant survival	X	X	X		
Riparian percent cover	X	X	X	X	X

Monitoring Topic	Year 1	Year 2	Year 3	Year 4	Year 5 (Final)
Invasive plant species cover	X	X	X	X	X
Health and vigor	X	X	X	X	X
Natural recruitment	X	X	X	X	X
Channel stability	X	X	X	X	X
Wetland percent cover	X	X	X	X	X
Wetland delineation					X
Photodocumentation	X	X	X	X	X
Site maintenance	X	X	X	X	X

6.5 Reporting

Annual monitoring reports will be submitted to the permitting resource agencies (CDFW, RQWCB, and USACE) by December 31 of each monitoring year (Years 1–5). Reports will include a description of the monitoring methods, a discussion of monitoring results, and a list of management recommendations, if any. Maps showing monitoring locations and copies of photodocumentation will be included in each report. Field data sheets will be available for review upon request.

6.6 Completion of Mitigation

At a minimum, monitoring will be conducted over a 5-year period. If the monitoring biologist/ecologist determines that the restoration areas have successfully met the final success criteria the Year 5 report will document completion of the project. If remedial measures were implemented, as described in Section 6.7, and additional monitoring and reporting was required in order to meet the final success criteria, then SLAC will submit a letter to the permitting resource agencies with the final monitoring report requesting final "sign-off" on the project.

6.7 Contingencies and Remedial Actions

If performance criteria indicate the site will not meet final success criteria or the final success criteria are not met in Year-5, SLAC will prepare an analysis of the cause(s) of failure and propose remedial actions to the permitting resource agencies.

6.8 Statement of Financial Commitment

SLAC is responsible for the successful restoration of channel, perennial wetland, and willow riparian habitat removed during implementation of the Environmental Cleanup of IR-6 and IR-8 Drainages Project, including monitoring and required remedial actions.

Section 7.0 References

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