APPENDIX F: Jurisdictional Wetlands and Waters of the United States

Delineation of Potential Jurisdictional Wetlands and Waters of the U.S.

Erosion Protection System Maintenance at the San Antonio Road West Bridge

Vandenberg Air Force Base, Santa Barbara County, California

August 2016

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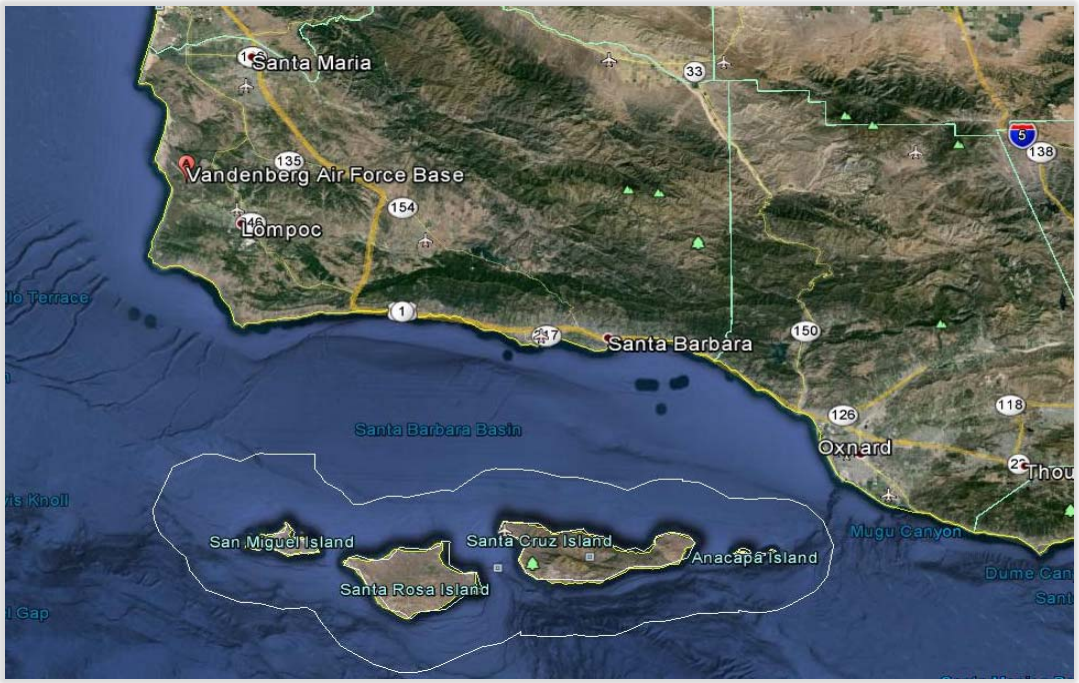
1.0 Introduction

The 30th Space Wing at Vandenberg Air Force Base (VAFB) (Figure 1) is the Air Force Space Command organization responsible for commercial and Department of Defense space and missile launch activities on the west coast of the United States. The Wing supports West Coast launch activities for the U.S. Air Force (USAF), Department of Defense, Missile Defense Agency, National Aeronautics and Space Administration, foreign nations, and various private industry contractors. Satellite launches and ballistic missile testing occurs at VAFB. Reliable transportation corridors are critical to these missions.

San Antonio Creek originates in the Solomon Hills east of Los Alamos through north VAFB and into the Pacific Ocean for a total of approximately 32 miles through Santa Barbara County (CRCD 2003). San Antonio Road West crosses San Antonio Creek near its intersection with Richmond Road on VAFB and serves as an access route into North VAFB. The San Antonio West Bridge was constructed in 1969 and repaired in 1983 to include the installation of riprap and gabions under the bridge (Appendix A and B).

The Proposed Project consists of repairing gabions, removing vegetation in the San Antonio Creek channel and its hydrologic floodplain, and installing a berm in an adjacent agricultural field to curb bank erosion (Section 1.1). These maintenance activities would ensure that creek flow, under normal and flood conditions, does not undermine the stability of the bridge. The purpose of this report is to identify and describe aquatic resources that may be subject to regulation under Section 404 of the Clean Water Act (CWA).



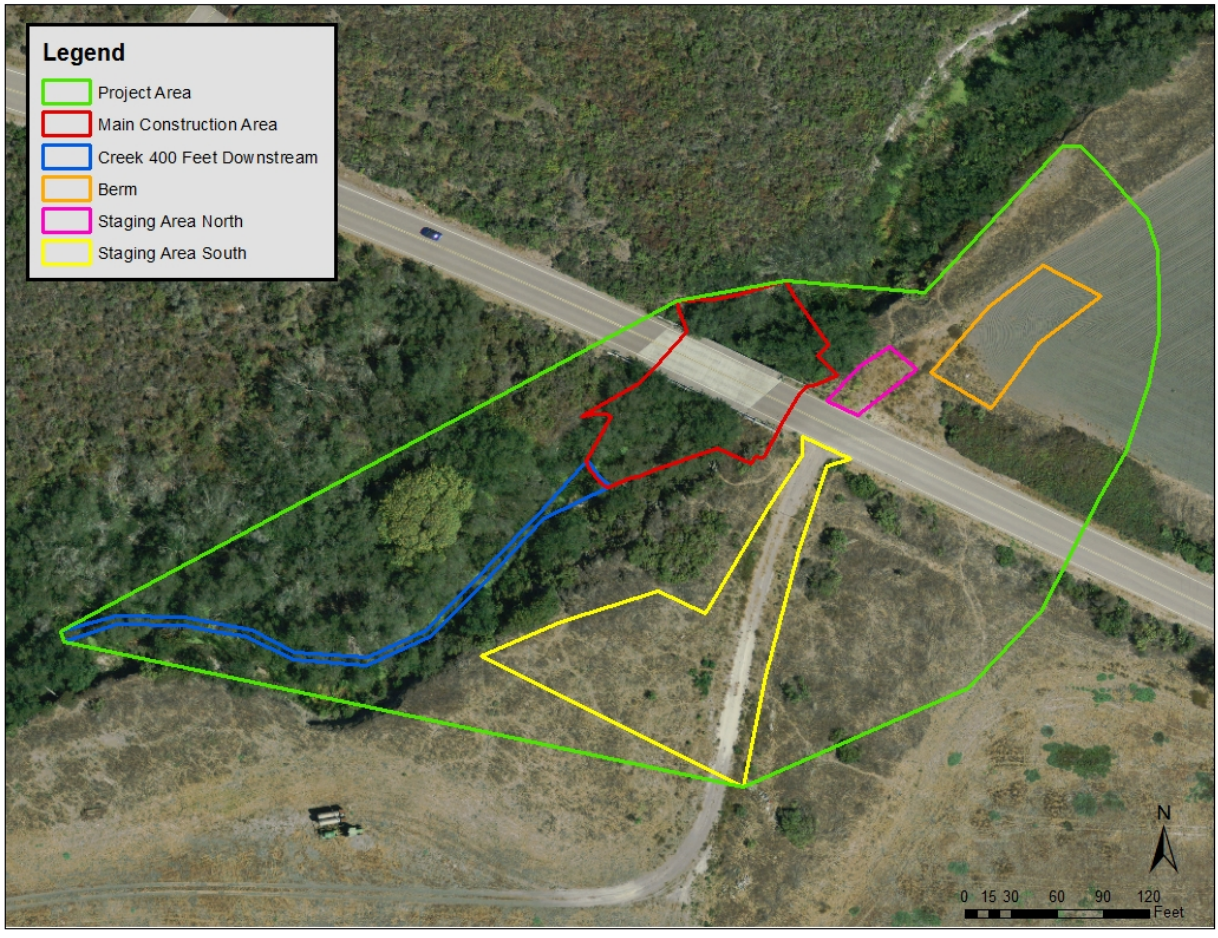
Source: Google Earth (May 4, 2015)

Figure 1 – Regional Location of Project Area

1.1 Project Description

The Proposed Project involves maintenance activities at the San Antonio Road West Bridge (Figure 2). This area includes some pre-disturbed areas. Specific aspects of the Proposed Project are as follows:

San Antonio Creek Diversion and Dewatering. The USAF has developed a tentative water diversion plan (Appendix C) that would dam and divert San Antonio Creek in order to dewater the Main Construction Area. This will facilitate the inspection, repair, and replacement, as required, of the gabions that underlie San Antonio Creek and its hydrologic floodplain within the Main Construction Area (Figure 2).



Source: VAFB GIS (2016), orthographic aerial photo from Vandenberg GeoBase Office (Sep 2013)

Figure 2 – Project Area Components

The USAF anticipates that San Antonio Creek would be dammed upstream (to restrict downstream flow) and downstream (to prevent backflow) of the Main Construction Area. Up to two culverts may be installed (one in each bay) to allow continued flow through the Main Construction Area. The USAF would direct San Antonio Creek to flow through the culvert that is located in the bay opposite from ground disturbing work. San Antonio Creek may be re-directed using either culvert multiple times, as needed. After the damming and culvert installation, the USAF would dewater the Main Construction Area to remove any ponded water remaining after creek diversion or groundwater encountered during the inspection, repair, and/or replacement of the gabions. The USAF would pump this water from the Main Construction Area onto an adjacent agricultural field to allow infiltration back into the watershed.

Repair/Replacement of Gabion Mattresses and Baskets. The USAF would inspect and replace/repair gabions in the San Antonio Creek and its hydrologic floodplain, which are primarily located under the San Antonio Road West Bridge. Not all gabions were visible in the 2012 inspection due to sediment build-up (Appendix B).

- Sediment Removal. The USAF would remove sediment from an approximate 0.1-acre area under the bridge deck to facilitate the inspection and/or replacement/repair of gabions. The gabions were originally installed 3 feet below ground surface (Appendix A, Sheet 1), but depth of gabions is not presently known and likely varies throughout the Main Construction Area since some gabions are presently not visible.

- Replacement. After sediment removal, the USAF would inspect and replace any failed or excessively worn wire fabric. The replacement of wire fabric should be of the same or better quality as the original and be galvanized to slow soil-water-metal interaction that wears the wire fabric.

- Repair. Repair will consist of adding additional rock-fill and securely attaching wire fabric over the damaged sections. Fastening methods would follow Caltrans Standard Plans D100A and D100B (Appendix D).

Vegetation Reduction. Existing vegetation could undermine the erosion control structures by growing into the gabions and breaking them open. Vegetation can also place stress on the bridge structure by causing ponding/pooling water. The USAF would perform mechanical and/or manual cutting of vegetation within the limitations discussed below. All vegetation removal would take place within the Main Construction Area (Figure 3).

- Mechanical and/or manual cutting (i.e., handsaw or chainsaw) of riparian vegetation would occur within an approximate 0.3-acre area under the bridge, extending outward approximately 60 and 80-feet to the northeast and southwest of the creek, respectively, and up to 16 to 18 feet in width (Figure 3).

- The USAF would only cut woody vegetative material with stems greater than or equal to 2 inches in diameter down to within 3 inches of the ground and/or water surface. Vegetation less than 2 inches will remain. The USAF anticipates cutting only willow riparian vegetation (willow trees) along the banks of San Antonio Creek since those trees tend to be the woody vegetation equal to or greater than 2-inches in diameter. Woody vegetation of other types and/or smaller dimensions are scattered throughout the Main Construction Area would not be cut and left in place (Figure 2).

- The USAF would carry out this work in and around San Antonio Creek and personnel may need to enter San Antonio Creek. The USAF would not dam and/or divert San Antonio Creek during vegetation reduction activities.

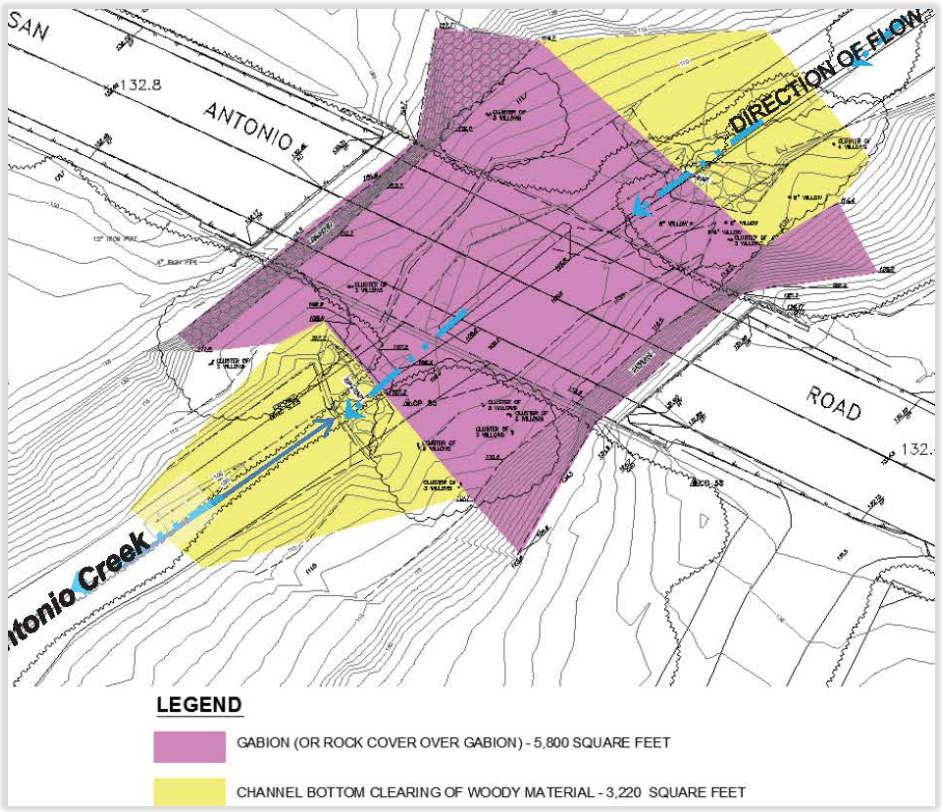
Bank Erosion Control Measure. The USAF would construct an earthen berm (Figure 4) between the creek bank and agricultural area to retain existing surface water runoff (stormwater) on the field, which would in effect redirect flow away from San Antonio Creek. The existing flow direction in the agricultural field is responsible for the bank erosion that is occurring near the bridge. This measure would tend to reduce existing bank erosion adjacent to the bridge and reduce stormwater pollutants entering San Antonio Creek.

The USAF anticipates that the berm would be located along the edge of the agricultural field, to address the flow from the agricultural field that contributes to the existing bank side erosion. The USAF anticipates that the berm would include a spillway to ensure structural integrity of the berm in the event of a major rain or flood event. If soil is required for construction, the USAF would use soil from existing borrow pits on VAFB (Figure 5).

Staging Areas. Two staging areas would be required to implement the Proposed Project and are located on opposite sides of San Antonio Road West (Figure 2). The southern staging area is approximately 0.4-acre and the northern area is approximately 0.12-acre. These areas would be cleared and grubbed prior to implementing the Proposed Project.

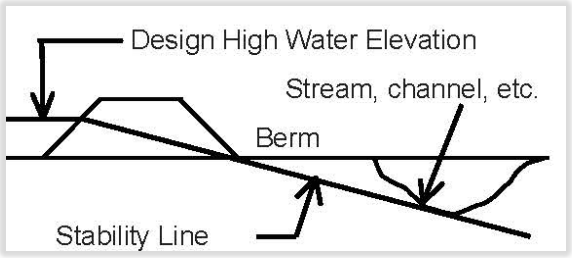
Maintenance Requirements. After the completion of the Proposed Project, the USAF would conduct periodic inspections to maintain the erosion protection system in good condition. It is possible that additional vegetation reduction will be required periodically, depending on the rate of regrowth and using the same criteria discussed above.

Equipment. The Proposed Project would require the use of a front loader (i.e., bobcat), crane, dump truck, soil container/bin, and shovels. The USAF would use a crane, located in one of the staging areas, to place the bobcat and container/bin under the bridge deck, within the San Antonio Creek hydrologic floodplain. The bobcat would loosen and load sediment from large patches of sediment under the bridge deck and place it into the container. In addition, personnel with shovels would loosen and remove sediment from smaller patches. The crane would then raise the container, as filled, and transfer the sediment to a dump truck waiting in the staging area. This process will continue until the all the sediment covering the gabions is removed and all gabions are exposed and able to be inspected and either repaired or replaced.



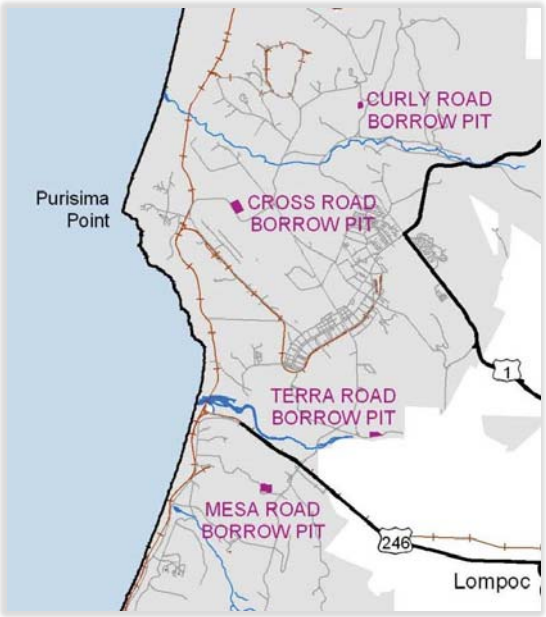
Source: Appendix B (note: woody vegetation exists in the gabion and channel bottom areas).

Figure 3 – Proposed Vegetation Removal Construction Plans



Source: USDA NRCS 2005.

Figure 4 – Typical Berm (for illustrative purposes)



Source: Final EA, Borrow Pits Expansion and Reactivation (2010).

Figure 5 – Location of Borrow Pits on VAFB

1.2 Responsible Parties

Table 1 presents the contact information for individuals coordinating with VAFB and USACE.

Table 1. Responsible Parties

Regulatory Agency	Lead Agency & Owner/Applicant
United States Army Corps of Engineers Los Angeles District Ventura Regulatory Field Office 2151 Alessandro Drive, Suite 110 Ventura, CA 93001 Contact: Theresa Stevens (805) 585-2154	**Vandenberg Air Force Base** **30th Space Wing (AFSPC)** 30 CES/CEIEA Installation Management Flight 1028 Iceland Avenue, Building 11146 Vandenberg AFB, CA 93437 Contact: Darryl York, Chief, Conservation Element (805) 605-8684

1.3 Project Area Description

In total, the Project Area covers approximately 3.41 acres, but the majority of this area would not be disturbed under the Proposed Project (Table 2). The Project Area includes five components (Figure 2):

(1) Main Construction Area: gabions under the bridge, extent of vegetation cut, and dewatering
(2) Berm: Northeast of bridge
(3) Staging Area - North
(4) Staging Area – South
(5) Downstream Portion of San Antonio Creek

The Downstream Portion of San Antonio Creek includes approximately 400 linear feet from the Main Construction Area and was included as the limit of potential effects from sedimentation and/or increased turbidity to assess impacts to Threatened and Endangered species in the Biological Assessment (USAF 2015). This distance is likely the farthest downstream sampling would be required by the Central Coast Regional Water Quality Control Board, as required in a past project involving San Antonio Creek.[1]

Table 2 – Proposed Project Acreage^

Proposed Project Areas	Acres	Square Feet
Main Construction Area (gabions, vegetation, and a portion of San Antonio Creek)	0.27	11,780
Berm	0.10	4,137
Staging Area – North	0.03	1,178
Staging Area – South	0.38	16,678
Downstream Creek: 400 linear feet	0.06	2,442
Total of Project Components Above	**0.84**	**36,215**
Total Project Area	**3.41**	**148,370**

^This table does not present impact acreage of potential Waters of the U.S.

Within the Main Construction Area, the bridge supports the two-lane San Antonio Road West that crosses approximately 20 feet above San Antonio Creek spanning 35 feet wide by 80 feet long. The bridge has a 35-foot (ft) by 2-ft concrete support pier in the middle while the banks are lined with gabions (Appendix E, Photographs 1-4). A 3-ft gabion base in disrepair lines the channel where sediment and rocks have accumulated. The buildup of sediment has allowed vegetation to grow along the sides with the creek flowing through the western portion below the bridge.

San Antonio Creek is the primary drainage feature within the Project Area. The USAF is in the process of mapping floodplains on VAFB; however, for this JD, the USAF assumes that the hydrologic floodplain of San Antonio Creek extends to the top of the bank. Storm drains and culverts do not exist within the Project Area.

Environmental conditions, including topography, soils, vegetation, and waters, are presented in Section 4.0.

[1] Tara Wiskowski, 30 CES/CEIEC, Water Program Manager, email message to author, October 7, 2015.

2.0 Regulatory Framework

It is important to understand the unique ecological functions and values of streams, waterways, and wetlands that are protected by federal statutes. These are described briefly in the sections below.

2.1 Federal Jurisdiction

Under Section 404 of the Clean Water Act (CWA), the United States Army Corps of Engineers (USACE) regulates the discharge of dredged and/or fill material into jurisdictional wetlands and waters of the United States (US).

2.1.1 Waters of the United States Defined

Waters of the US which are subject to USACE jurisdiction (33 CFR § 328.3) include:

> **(1)** All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
> **(2)** All interstate waters including interstate wetlands;
> **(3)** All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
>
> > **(i)** Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
> > **(ii)** From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
> > **(iii)** Which are used or could be used for industrial purpose by industries in interstate commerce;
>
> **(4)** All impoundments of waters otherwise defined as waters of the United States under the definition;
> **(5)** Tributaries of waters identified in paragraphs (a) (1) through (4) of this section;
> **(6)** The territorial seas;
> **(7)** Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1) through (6) of this section.
> **(8)** Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

The following provides the regulatory definitions and criteria to determine the geographic limits of relevant federal jurisdiction for non-tidal waters of the U.S. presented in this report. According to 33 CFR § 328.3(c), the limits of jurisdiction of non-tidal waters of the U.S. include:

- In the absence of adjacent wetlands, the jurisdiction extends to the ordinary high water mark, or
- When adjacent wetlands are present, the jurisdiction extends beyond the ordinary high water mark to the limit of the adjacent wetlands.
- When Waters of the United States consists only of wetlands, the jurisdiction extends to the limit of the wetlands.

The terms “adjacent” and “ordinary high water mark” are defined in 33 CFR § 328.3(c) and (e), respectively:

> The term “adjacent” means bordering, contiguous, or neighboring. Wetlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes, and the like are “adjacent wetlands.”
>
> The term “ordinary high water mark” means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

The definition of OHWM has been further defined in a Regulatory Guidance Letter issued by the USACE (USACE 2005), that details physical characteristics that should be considered when making an OHWM determination. There are no “required” physical characteristics that must be present to make an OHWM determination, though it is recommended that two or more of the following characteristics be identified to determine OHWM location, unless there is particularly strong evidence of one. Where discernible, the following physical characteristics are used to determine OHWM location: natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, presence of litter and debris, wracking, vegetation matted down, bent, or absent, sediment sorting, leaf litter disturbed or washed away, scour, deposition, multiple observed flow events, bed and banks, water staining, and/or change in plant community. The guidance document notes that this is not an exhaustive list of indicators.

2.1.2 Federal Wetlands Defined

Wetlands are defined in 33 CFR 328.3(b) as:

> The term “wetlands” means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

In order to identify wetlands, both the 1987 Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987; Wetland Delineation Manual) and the 2008 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (USACE

2008; Arid West Regional Supplement) have been issued for use by field personnel performing wetland delineations in the southwestern United States. The methodology presented in both of these publications includes that areas need to meet the following three parameters under normal circumstances to be considered a wetland: predominance of hydrophytic vegetation, hydric soils, and wetland hydrology.

Hydrophytic vegetation can be determined using either the dominance test, the prevalence index, or after consideration of morphological adaptations. The dominance test is passed when more than 50% of the dominant plant species across all strata are rated as obligate, facultative wetland, or facultative according to the most current plant list approved by the USACE (Lichvar *et. al.* 2016). The prevalence index utilizes a weighted-average wetland indicator status of all plant species within the sampling plot and is fully described in the Arid West Regional Supplement. Under certain conditions, morphological adaptations may be considered and utilized to revise the wetland status rating of plant species present as described in the Arid West Regional Supplement.

Hydric soil is defined by the National Technical Committee for Hydric Soils (NTCHS) as "a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Soil Survey Staff 1994). A hydric soil may be drained or undrained, and a drained soil may not continue to support hydrophytic vegetation yet still retain the appearance of a hydric soil. The Wetland Delineation Manual and Arid West Regional Supplement describe visual and textural indicators of hydric soils used in the field to determine the presence of hydric soils. In most situations, only one of these hydric soil indicators is required to make a positive hydric soil determination. Typically, once formed, the field indicators for hydric soil identification persist in the soil during both wet and dry periods. The Arid West Regional Supplement also covers potentially problematic soil conditions that should be considered on a case-by-case basis.

Wetland hydrology indicators provide evidence that a site has a continuing wetland hydrologic regime and that hydric soils and hydrophytic vegetation are not relicts of a past hydrologic regime. Hydrology indicators include inundation, saturation, surface soil cracks, water-stained leaves, water marks, and sediment deposits, among others. Hydrology indicators are the most transitory of wetland indicators and may be absent during the dry season or during drier-than-normal years. Therefore, it is important to note that lack of an indicator is not evidence for the absence of wetland hydrology. The Arid West Supplement identifies how to deal with difficult wetland hydrology situation in Chapter 5. In drought years, plant community and soil morphology are considered carefully when determining if wetland hydrology may be present under normal conditions (USACE 2008).

2.1.3 Federal Legal Summary

Two important U.S. Supreme Court decisions have limited the scope of federal jurisdiction of waters of the U.S. In the 2001, in *Solid Waste Agency of North Cook County (SWANCC) v. United States Army Corps of Engineers* the court ruled that the USACE could not assert jurisdiction over non-Traditional Navigable Water wetlands and waters solely on the presence of migratory birds. The *Rapanos v. United States* and *Carabell v. United States* (consolidated cases) decision addressed USACE authority to take jurisdiction over wetlands and waters that do not fall within Traditional Navigable Waters under the Clean Water Act. The following situations allow USACE jurisdiction over non-Traditional Navigable Waters and Wetlands if:

- The feature in question is a Relatively Permanent Water body or a wetland that directly abuts a Relatively Permanent Water, or
- The feature in question, in combination with all wetlands adjacent to it, as a significant nexus with a Traditional Navigable Water.
- Significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or an insubstantial effect on the chemical, physical, and/or biological, integrity of a TNW. Principal considerations when evaluating significant nexus include the volume, duration, and frequency of the flow of water in the tributary and the proximity of the tributary to a TNW, plus the hydrologic, ecologic, and other functions performed by the tributary and all of its adjacent wetlands (U.S. EPA and USACE 2007a).
- The U.S. Environmental Protection Agency (EPA) and the USACE have published a guidance document based on both the SWANCC and Rapanos Supreme Court Decisions (U.S. EPA and USACE 2007b). This document specifies that a “significant nexus” finding must be determined for the following waters:
- Non-navigable tributaries that do not typically flow year-round or have continuous flow at least seasonally (e.g., typically at least 3 months each year);
- Wetlands that are adjacent to such tributaries; and,
- Wetlands that are adjacent to but that do not directly abut a relatively permanent non-navigable tributary.
- The USACE will generally not assert jurisdiction over the following features:
- Swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow); and,
- Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water.

3.0 Methodology

Potential waters of the U.S. within the Project Area were delineated in accordance with the 1987 Corps of Engineers Wetlands delineation Manual using a combination of desktop literature review, field study/delineation, and post-processing using ArcGIS analysis. The Project Area includes the Main Construction Area, plus areas both upstream and downstream that would only experience effects due to increased sedimentation and noise. This larger area that has been identified as the Project Area was defined due to parameters that had to be analyzed in the Biological Assessment. For purposes of this Jurisdictional Determination, the Main Construction Area was thoroughly analyzed for both wetlands and waters, whereas the areas outside of the Main Construction Area, but within the Project Area were only analyzed for jurisdictional waters; no wetland delineations were performed for features outside of the Main Construction Area.

3.1 Literature Review

Prior to completion of field work, the following resources were reviewed to determine location(s) of potentially hydrologic features:

VAFB topographic lines and stream data (VAFB 2016)
National Wetlands Inventory (U.S. Fish and Wildlife Service [USFWS] 2016)
Northern Santa Barbara Area, CA (CA672) Soil Survey (U.S. Department of Agriculture, Natural Resources Conservation Service [USDA-NRCS] Soil Survey Geographic [SSURGO] 2014)
VAFB Vegetation Survey: Holland System (VAFB 2009)
High quality aerial imagery (VAFB Data 2016)

3.2 Delineation of Waters of the United States

Field delineations were performed on June 6 and July 12, 2016 by Luanne Lum and Tiffany Whitsitt. Potential waters of the U.S., including wetlands, was delineated within the Main Construction Area. Potential waters of the U.S., excluding wetlands, were delineated within the Project Area outside of the Main Construction Zone. This is because areas upstream and downstream within San Antonio Creek and the adjacent riparian area will only experience effects due to increased sedimentation and noise. These areas will not have any project related activities carried out in these areas. The methods used during the field efforts are described below. Photographs were taken and are presented in Appendix E.

3.2.1 Ordinary High Water Mark

The extent of non-wetland waters within the Project Area was determined based on the location of the OHWM, which was identified using the parameters outlined in the OHWM field guide as discussed in Section 2.1.1. The entire Project Area was examined for drainage features and any features exhibiting an OHWM were delineated utilizing a Trimble Geo 7X handheld GPS unit. OHWM boundaries within the Main Construction Area were mapped utilizing point data collection to ensure sub-foot accuracy. OHWM boundaries outside of the Main Construction Area, but within the overall Project Area were delineated by setting the GPS unit to collect positional data in a “streaming” method.

Additional data collected included general site conditions, topography, approximate water depth, and general flow patterns. After field collection was completed, data from the Trimble GPS unit was downloaded and viewed in ArcGIS. ArcGIS was utilized to calculate length, width, and acreage of jurisdictional features.

3.2.2 Adjacent Wetlands

Delineation of adjacent wetlands was performed within the Main Construction Area. Delineation was performed in accordance with procedures outlined in both the Wetland Delineation Manual (Environmental Laboratory 1987) and the Arid West Regional Supplement (USACE 2008). These procedures involve locating data points within topographic areas that are most likely to possess wetland features and then include additional data points as required, with most of the data points located within the potential wetland boundary.

When a location was determined to be at a topographic area that could likely possess wetland characteristics, a soil pit was dug by hand to a depth appropriate to determine presence or absence of hydric soils. The soil pit was the center of the sampled area. Data on vegetation, soils, and hydrology was then collected and described fully on a 2008 USACE Routine Wetland Determination Data Form – Arid West Region. Topography, landform, landscape position, and other site features, including slope, aspect, and drainage patterns, were noted at each site.

Hydrophytic vegetation was quantified as outlined in the guidance documents. Since the features at this site were confined by the incised banks and adjacent creek, the plots were linear in shape and sizes are as follows: tree stratum 10 by 60 feet, sapling/shrub stratum 10 by 40 feet, herb stratum 10 by 20 feet, and woody vine stratum 10 by 20 feet. The indicator status of each plant species identified was taken from the National Wetland Plant List (Lichvar *et. al.* 2016), the most current document approved by the USACE. Indicator status are either OBL, FACW, FAC, FACU, or UPL based on the following definitions (USACE 2012):

OBL (Obligate Wetland Plants) – Almost always occur in wetlands
FACW (Facultative Wetland Plants) – Usually occur in wetlands, but may occur in non-wetlands
FAC (Facultative Wetland Plants) – Occur in wetlands and non-wetlands
FACU (Facultative Upland Plants) – Usually occur in non-wetlands, but may occur in wetlands
UPL (Upland Plants) – Almost never occur in wetlands

Based on the indicator status, either the Dominance Test or Prevalence Index was calculated in accordance with the Arid West Regional Supplement. If either of these tests were passed, then the site was determined to have hydrophytic vegetation.

In order to properly document soil conditions, each soil pit was analyzed for characteristics including color, texture, and the presence of redox features, organic matter, and any other signs of hydric soils. A Munsell ® Soil Color Chart (Munsell Color 2009) was used in the field to identify the color of the soil matrix and any redox features present.

The sample area and associated soil pit were examined for signs of wetland hydrology in accordance with the Wetland Delineation Manual and Arid West Regional Supplement. If a single primary indicator or two secondary indicators were observed, then a positive determination for wetland hydrology was made, unless indications of problematic hydrology needed to be taken into consideration.

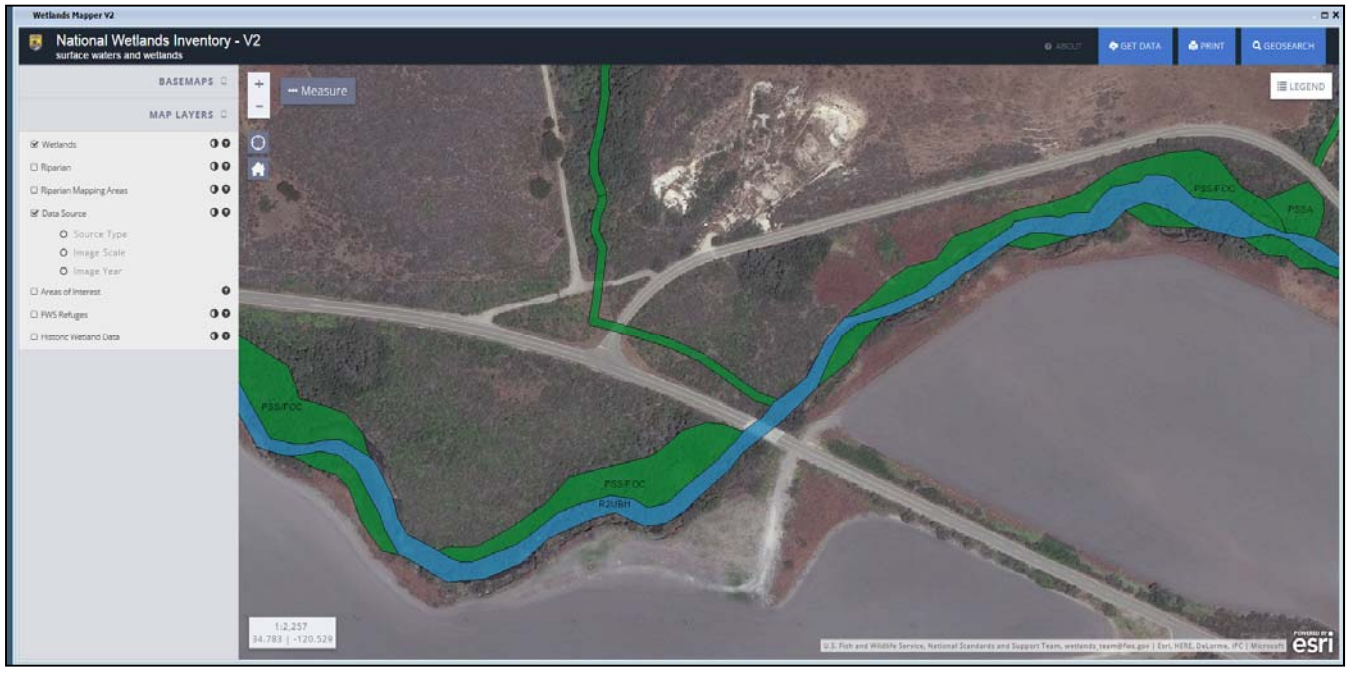
4.0 Technical Findings

Results of the literature review and jurisdictional delineation are described in the sections below.

4.1 Literature Review

4.1.1 Streams and Wetlands

Review of the VAFB stream data indicated the presence of one potential hydrological feature, the mainstem of San Antonio Creek, within the Project Area. San Antonio Creek is classified as a perennial stream within the Project Area. National Wetlands Inventory (NWI) data indicate that within the Project Area, San Antonio Creek is mapped as R2UBH (riverine, lower perennial, unconsolidated bottom, permanently flooded) and there are areas within the riparian corridor mapped as PSS/FOC (palustrine, scrub-shrub/ forested, seasonally flooded) features (USFWS 2016) (Figure 6). There is an additional linear feature on the NWI map that comes in from the north, and then extends laterally along the north side of San Antonio Road West before connecting with San Antonio Creek. This feature is classified as PSSAx (palustrine, scrub-shrub, temporarily flooded, excavated) by NWI (Figure 6).



Source: National Wetlands Inventory (USFWS 2016).

Figure 6 – National Wetlands Inventory Map

4.1.2 Topography

The Project Area in total covers an approximate 0.1-mile (530-foot) stretch of San Antonio Creek. The San Antonio Creek hydrologic floodplain is narrow, approximately 40 feet wide, and bounded by steep banks. As depicted, San Antonio Creek is located between 110 to 114 feet above sea level (ASL), with the top of bank located at 128 to 130 feet ASL; a 16 to 18-foot differential. Overall, the Project Area appears incised by San Antonio Creek (Figure 7 and 8).

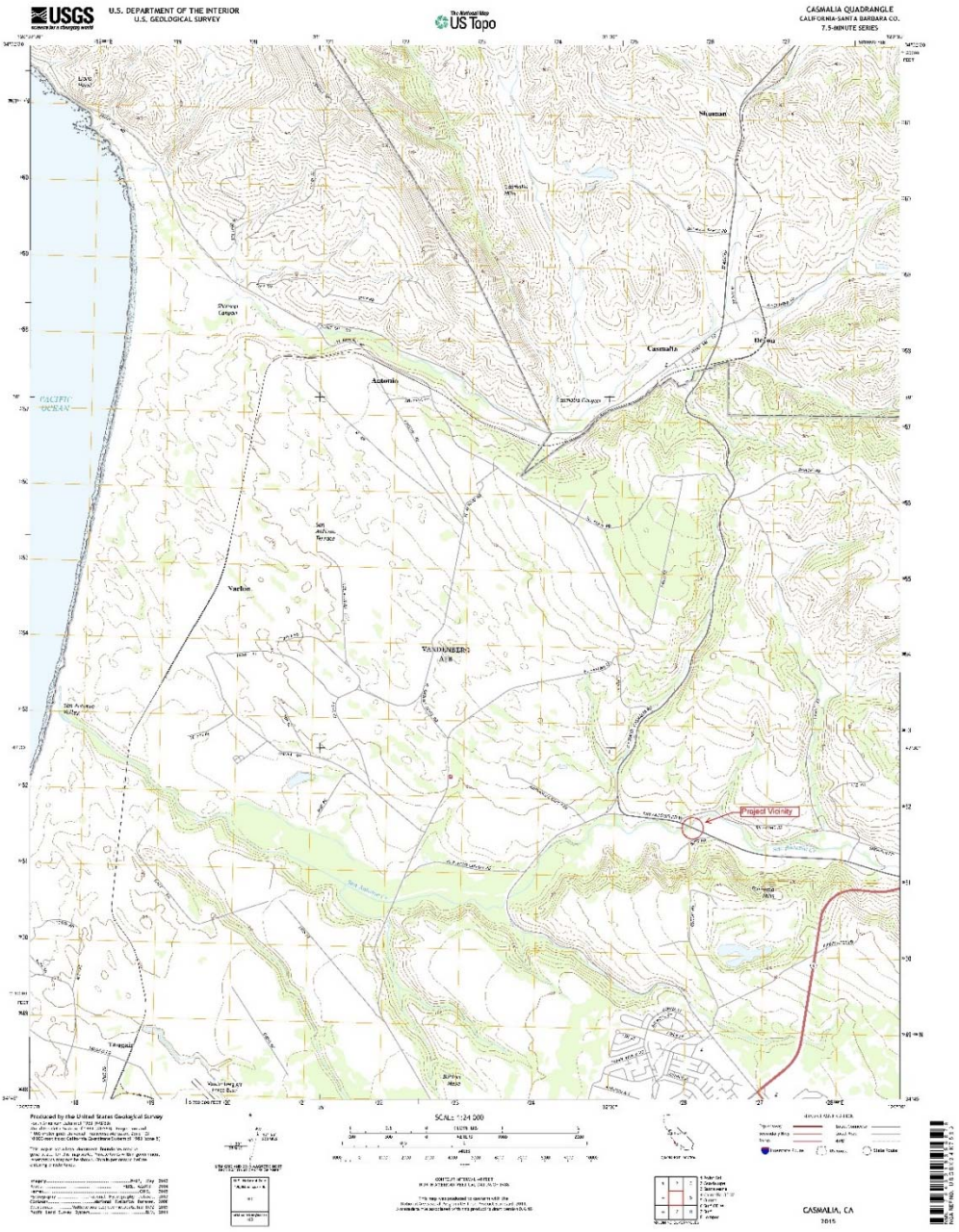


Figure 7 – Project Area Surrounding Land Topography

4.1.3 Soils

The Project Area is comprised of the following soil types: gullied land, Arnold sands and Agueda silty clay loam (Figure 9). As depicted, San Antonio Creek is located within gullied land, but VAFB GIS data may depict a past creek configuration because the soil boundaries are offset from San Antonio Creek. The soils in the Project Area have the following characteristics (USDA NRCS 1972):

Agueda silty clay loam: characterized by moderate permeability, slow surface runoff, and a low erosion hazard (none to slight). Absent vegetative cover, soils are susceptible to wind erosion and easily gullied by surface water runoff.

Arnold sands: characterized by rapid permeability, rapid surface runoff, and a high erosion hazard (soil is easily gullied).

Gullied land: characterized by deep gullies, some areas actively eroding, and areas with nearly vertical banks.

4.1.4 Vegetation Types

Vegetation types were classified basewide on VAFB in 2009 using a modified Holland system (VAFB 2009). Types are based on Holland vegetation types, as described in Preliminary Descriptions of the Terrestrial Natural Communities of California, published by Robert F. Holland in 1986, and Documented Flora of Vandenberg Air Force Base, Santa Barbara County, California, published by David J. Keil and V.L. Holland in 1998. Based on the 2009 vegetation classification, the Project Area consists of the following vegetation types: central coast arroyo willow riparian forest and scrub (1.2 acres), central coastal scrub (0.1 acres), non-native grasses and forbs (1.6 acres), and agriculture (0.3 acres) (Figure 10). These vegetation types and boundaries were confirmed during jurisdictional determination field surveys. Additionally, dominate species were noted as discussed below.

San Antonio Road West is a developed area within the Project Area and occupies 0.2 acres. The area beneath the bridge is open and accumulated sediment is moderately vegetated. Potential jurisdictional waters of the U.S. (Section 4.2) occur within central coast arroyo willow riparian forest and scrub. The following is a description of each vegetation type within the entire 3.4 acre project area (Figure 10) as observed during site visits in June and July 2016.

Central coast arroyo willow riparian forest and scrub

The main canopy consists of arroyo willow (*Salix lasiolepis*). Within the willow riparian understory, water flows within the San Antonio Creek channel with hydrophytic vegetation growing along the slower moving water areas. This region of the riparian understory is also the area where potential jurisdictional wetlands and waters of the U.S. occur. Section 4 describes potential waters of the U.S. in detail. The area inundated with slower moving water is primarily dominated by bur-reed (*Sparganium eurycarpum* ssp. *eurycarpum*). Common watercress (*Nasturtium officinale*) is dominant within San Antonio Creek south of the bridge where the canopy is slightly more open. Other associated species include tule (*Juncus* spp.), and duckweed (*Lemna* spp.) with a sparse scattering of broad-leaf cattail (*Typha latifolia*). Approximately 0.35 acres of the Project Area is inundated with flowing and slow moving water.

Plants that tolerate moist soils along the lower banks and shaded by the bridge and arroyo willow include common horsetail (*Equisetum arvense*), celery (*Apium graveolens*), brass buttons (*Cotula coronopifolia*), and seep monkeyflower (*Mimulus guttatus*).

The upland portions consists of drier soils that are shaded by the bridge and canopy of arroyo willow. Species typical of the understory in this region include mugwort (*Artemisia douglasiana*), mulefat (*Baccharis salicifolia* ssp. *salicifolia*), blackberry (*Rubus ursinus*), western poison oak (*Toxicodendron diversilobum*), and stinging nettle (*Urtica dioca* ssp. *holosericea*). Non-native plants include black mustard (*Brassica nigra*), sweet fennel (*Foeniculum vulgare*), and perennial pepperweed (*Lepidium latifolium*). Along the outer riparian edges, central coastal scrub plants encroach such as coyote brush (*Baccharis pilularis*) and California sagebrush (*Artemisia californica*).

The Main Construction Area will affect 0.24 acres of central coast arroyo willow riparian forest and scrub of which 0.18 acres is forested and 0.08 acres is inundated with flowing and slow moving water

Central coastal scrub

This vegetation type is dominated by coyote brush and California sagebrush within the Project Area. Other associated species include blackberry, western poison oak, and blue elderberry (*Sambucus mexicana*). This vegetation type is found in the far eastern portion of the Project Area with a small west end pocket and is outside of all areas that are anticipated to experience disturbance due to Project activities. Thus, this vegetation type is not expected to be affected by the Proposed Project.

Non-native grasses and forbs

The disturbances contributing to the non-native character of this vegetation type within the Project Area are the adjacent agricultural lands and the roadsides of San Antonio Road West. Black mustard and poison hemlock (*Conium maculatum*) are the dominant plants. Associated non-native invasive species include wild oats (*Avena fatua*), sweet fennel (*Foeniculum vulgare*), milk thistle (*Silybum marianum*), yellow star thistle (*Centaurea solstitalis*), purple star thistle (*Centaurea calcitrapa*), cheat grass (*Bromus tectorum*), and pepperweed. Telegraph weed (*Heterotheca grandiflora*), a native plant that favors disturbance especially along roadsides, is sparsely scattered in the area.

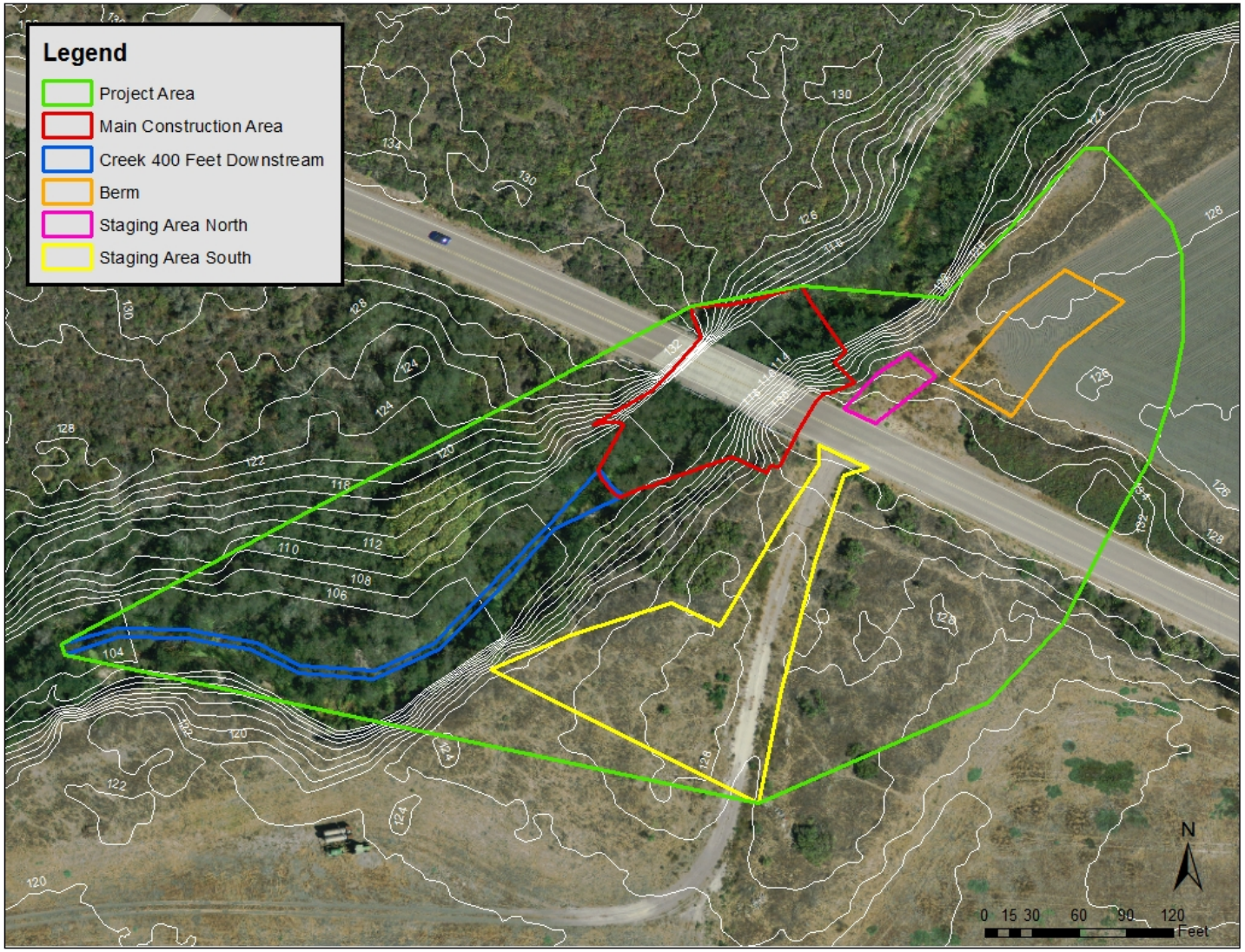
The Main Construction Area will affect approximately 0.012 acres, the north and south staging area will affect approximately 0.4 acres, and the erosion control berm will affect approximately 0.023 acres of non-native grasses and forbs vegetation type.

Agriculture

The agricultural field within the Project Area is currently active. Vegetation cover consists of planted crops. Approximately 0.07 acres of agricultural land will be affected by the berm.

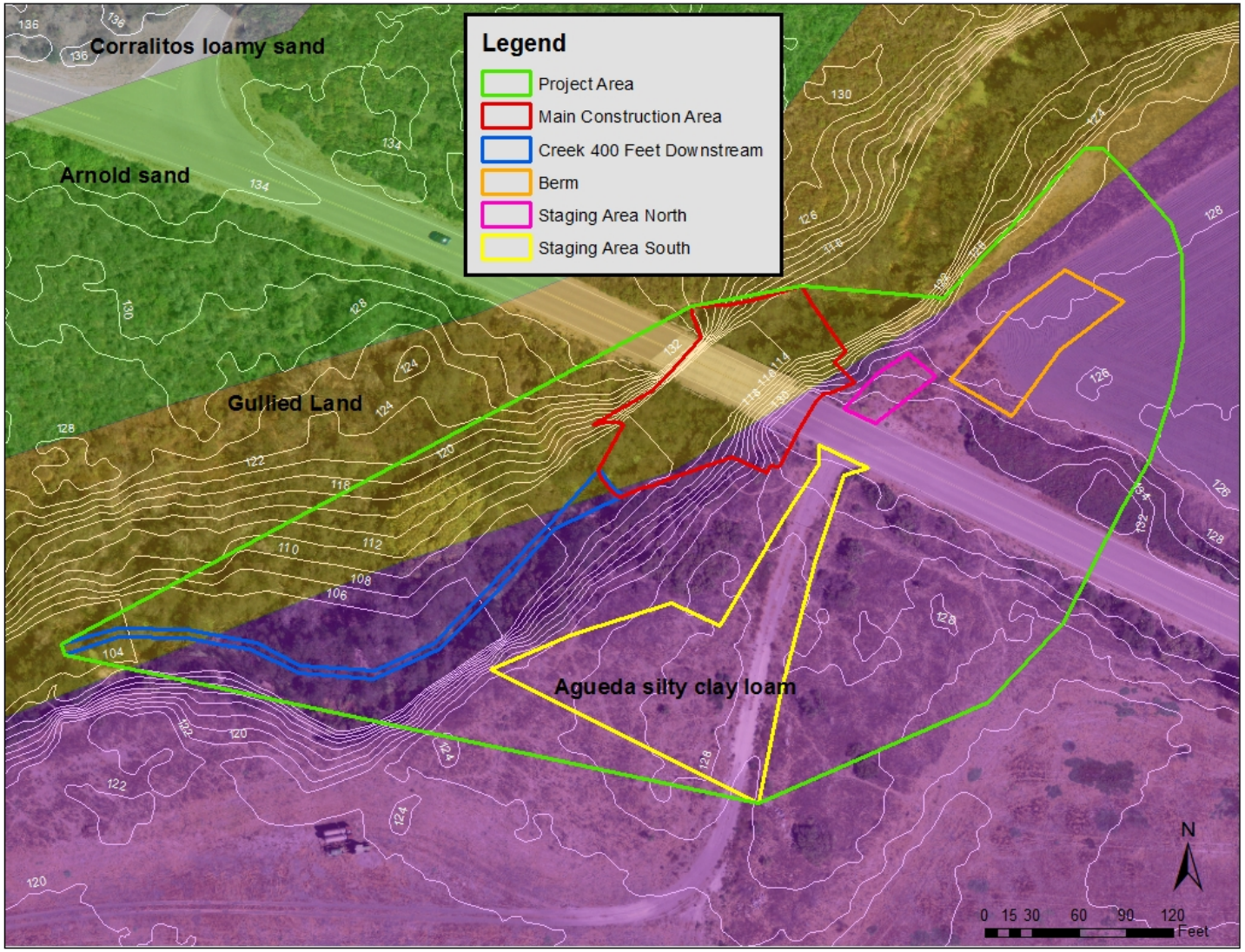
Developed

The primary development within the Project Area is San Antonio Road West roadway and supports no vegetative cover. Developed land occupies 0.21 acres within the Project Area, of this total the Main Construction Area may affect 0.018 acres of developed land.



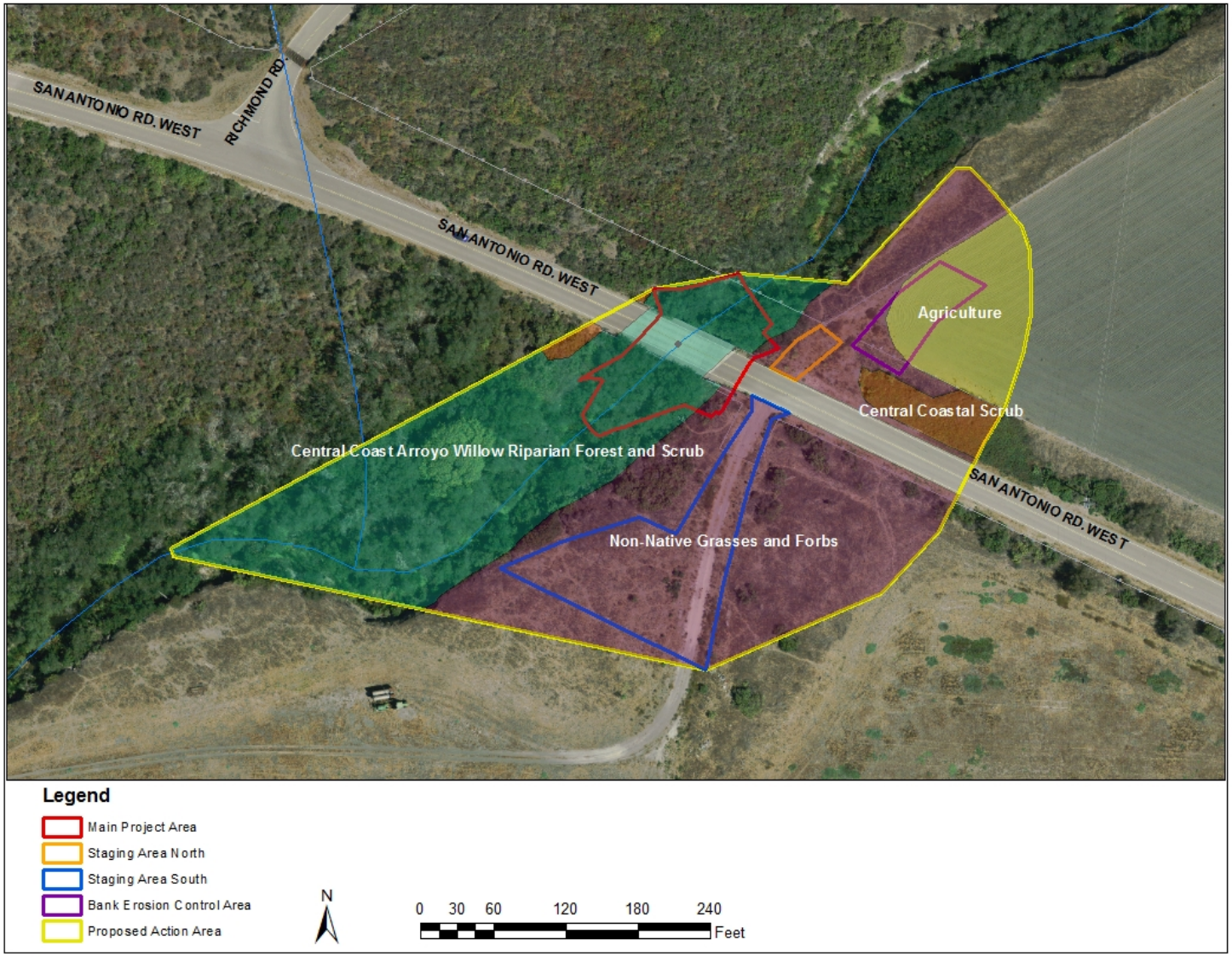
Source: VAFB GIS (July 2016). Orthographic aerial photo from Vandenberg GeoBase Office, Sept 2013

Figure 8 – Project Area Topography



Source: VAFB GIS (July 2016). Orthographic aerial photo from Vandenberg GeoBase Office, Sept 2013

Figure 9 – Project Area Soils



Source: VAFB GIS (July 2016). Orthographic aerial photo from Vandenberg GeoBase Office, Sept 2013

Figure 10 – Project Area Vegetation Types

4.2 Federal Jurisdictional Areas

This section presents the results of field delineation studies performed, as described in Section 3. Table 3 presents the plant species scientific and common names along with wetland indicator status present within each of the area assessed for wetland characteristics (Sampling Points) and other wetland species observed within the Main Construction Area, primarily within the OHWM of San Antonio Creek.

Table 3. Plants within Potentially Jurisdictional Areas

Scientific Name	**Common Name**	**Wetland Indicator Status**
Sampling Point 1		
Baccharis salicifolia ssp. *salicifolia*	Mulefat	FAC
Equisetum arvense	Common horsetail	FAC
Juncus sp.	Juncus	FAC/FACW
Rubus ursinus	Blackberry	FAC
Salix lasiolepis	Arroyo willow	FACW
Sparganium eurycarpum ssp. *eurycarpum*	Bur reed	OBL
Stachys chamissonis	Hedge nettle	OBL
Urtica dioica ssp. holosericea	Stinging nettle	FAC
Sampling Point 2		
Baccharis salicifolia ssp. *salicifolia*	Mulefat	FAC
Baccharis pilularis	Coyote brush	UPL
Juncus sp.	Juncus	FAC/FACW
Rubus ursinus	Blackberry	FAC
Salix lasiolepis	Arroyo willow	FACW
Sonchus asper	Prickly sow thistle	FAC
Toxicodendron diversilobum	Western poison oak	FACU
Sampling Point 3		
Artemisia californica	California sagebrush	UPL
Artemisia douglasiana	Mugwort	FAC
Baccharis pilularis	Coyote brush	UPL
Brassica nigra	Black mustard	UPL
Foeniculum vulgare	Sweet fennel	UPL
Lepidium latifolium	Perennial pepperweed	FAC
Salix lasiolepis	Arroyo willow	FACW
Scrophulaira californica	California figwort	FAC
Urtica dioica ssp. holosericea	Stinging nettle	FAC
Sampling Point 4		
Artemisia douglasiana	Mugwort	FAC
Baccharis pilularis	Coyote brush	UPL
Rubus ursinus	Blackberry	FAC
Salix lasiolepis	Arroyo willow	FACW
Toxicodendron diversilobum	Western poison oak	FACU
Unknown/Unidentifiable herb	Unknown	Unknown
Other OBL, FACW, or FAC Indicator Species Observed within the Main Construction Area		
Cotula coronopifolia	Brass buttons	OBL
Lemna sp.	Duckweed	OBL
Mimulus guttatus	Seep monkeyflower	OBL
Nasturtium officinale	Common watercress	OBL
Typha latifolia	Broadl-leaf cattail	OBL

4.2.1 Jurisdictional Drainages

San Antonio Creek is the only jurisdictional drainage feature within the Project Area (Figure 11). Field investigations and knowledge of this site indicate that the VAFB stream centerline data correctly identify this feature as a perennial stream. Furthermore, field investigations confirmed that the NWI map correctly classifies this portion of San Antonio Creek as R2UBH (riverine, lower perennial, unconsolidated bottom, permanently flooded).This drainage receives flow throughout the year from Barka Slough. San Antonio Creek is a perennial tributary to the Pacific Ocean, located approximately 7.07 miles downstream (VAFB 2016), and is therefore a water of the United States as defined under Clean Water Act regulations.

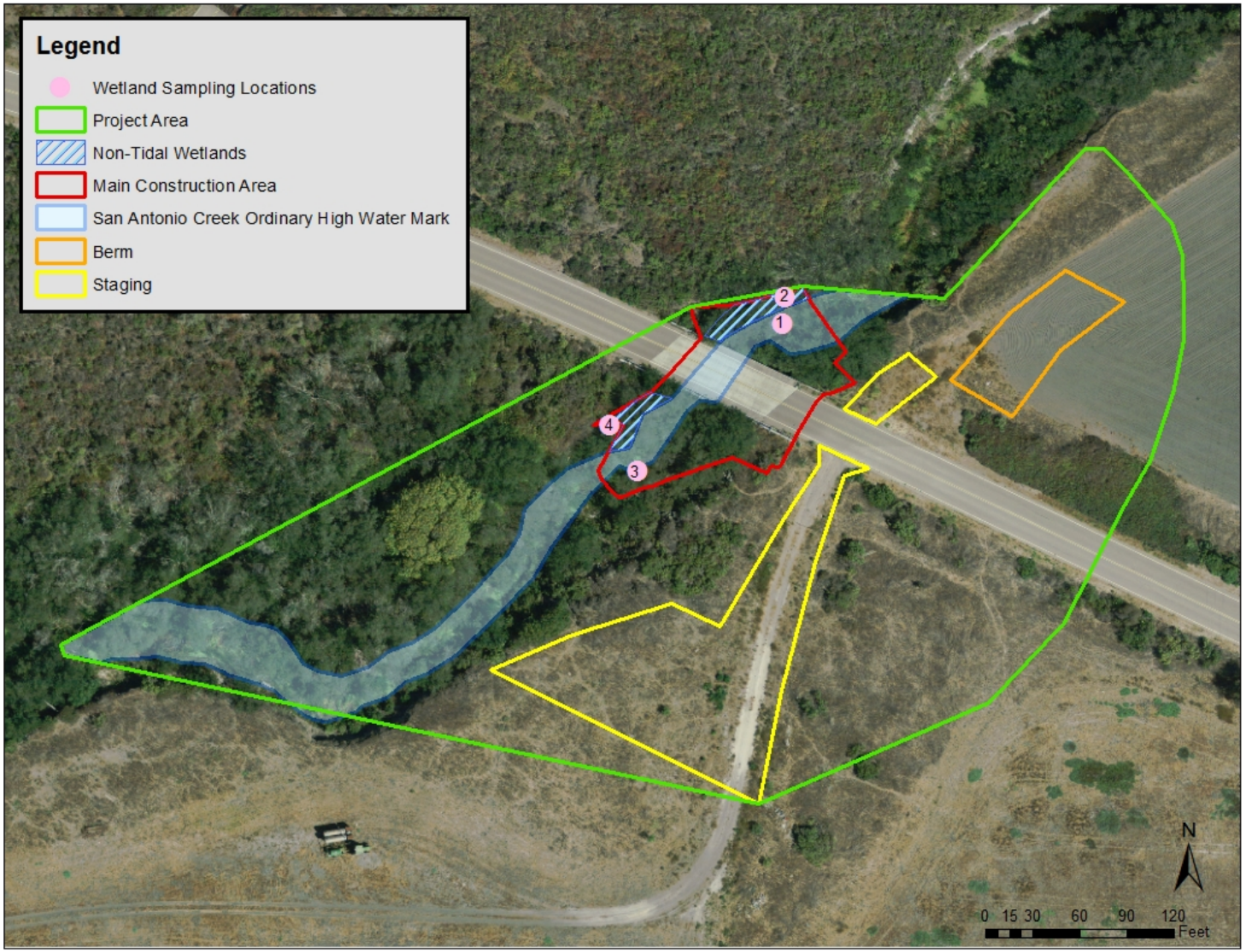
San Antonio Creek is a deeply incised system that is bordered by agricultural fields within the vicinity of the Project Area. The incised slopes vary from sheer erosional features with little to no vegetation, to more gently sloping banks that are vegetated with riparian vegetation. These banks tend to have one to two terraces present before reaching the upland areas. Upland areas adjacent to San Antonio Creek consist of active agriculture (to east) and central coastal scrub (to west).

Within the Project Area, the length of San Antonio Creek is approximately 606 feet and 0.35 acres. Of this total, 178 feet and 0.08 acres is present within the Main Construction Area. Throughout the Project Area, the width of the channel varies from 10 to 36 feet. Within the Main Construction Area, the width of the channel varies from 10 to 33 feet. Throughout the Project Area, San Antonio Creek exhibits a defined bed, bank, and channel, as well as an identifiable OHWM. Water flows slowly through this area, with a combination of pools and riffles (due to rip-rap). The OHWM is obscured in some areas due to the placement of rip-rap both upstream and downstream of the bridge. Features such as vegetation changes, drift deposits, and features present at topographically similar locations across the channel were utilized to identify the OHWM.

Table 4. Calculations for San Antonio Creek within OHWM

	Acreage	Length (feet)	Width (feet)
Project Area	0.35	606	10-36
Main Construction Area	0.08	178	10-33

The active channel upstream of the bridge feature exhibits a large pooled area that field observations indicate is due to the placement of rip-rap within the channel immediately upstream of the bridge feature. This pool averages between 2-4 feet in depth and is heavily vegetated with bur reed within the OHWM around the perimeter. Where the rip-rap has been placed, water flows through and vegetation is prevalent, as the rip rap has caused sediment to accumulate. Beneath the bridge structure, water typically only flows within the western half of the bridge structure (Appendix E, Photograph 2) with the eastern section not experiencing inundation regularly, only during high flow events (Appendix E, Photographs 3-4). There is a large amount of accumulated sediment within the eastern section of the bridge. Upstream of the bridge, the eastern bank is approximately 20 feet in height and heavily eroded and near vertical in most areas, averaging 35-50% slopes. The western bank upstream of the bridge has a gently sloping terrace that is approximately 2-5 feet above the OHWM and varies from 4-8 feet wide before it reaches a near vertical bank with a 40-50% slope.



Source: VAFB GIS (July 2016). Orthographic aerial photo from Vandenberg GeoBase Office, Sept 2013

Figure 11 – Jurisdictional Determination Map

Vegetation is common within the OHWM of San Antonio Creek and primarily consists of bur reed, watercress, and duckweed, with overhanging arroyo willow. Additionally, a noticeable hydrogen sulfide (H_2S) odor is present when the substrate, inundated with water during the time of investigation, is disturbed. Sediment along the bottom of San Antonio Creek is up to 1.5 feet deep in some locations. Texture is loam to sandy loam. Downstream of the bridge water depths average 1-2 feet.

The linear feature located west of San Antonio Creek and north of the roadway indicated on the NWI does not exhibit bed and bank or OHWM indicators. This feature is heavily vegetated with upland species including coyote brush, poison oak, and California sagebrush (Appendix E, Photograph #22). This feature is an upland swale due to the characteristics described and would only convey flow during significant rain events and appears to drain only uplands. Thus, this feature would likely not be jurisdictional under Clean Water Act regulations.

4.2.2 Potential Wetlands

Wetland delineations were performed within areas that topographically would likely collect water and develop hydric soil conditions. These areas were also generally assessed for presence of hydrophytic vegetation, with all sampling points established within central coast arroyo willow riparian forest and scrub vegetation. Topographic location and presence of hydrophytic vegetation were taken into consideration when locating soil pits. Four different sampling locations were assessed for wetland parameters (Figure 11) and are discussed in detail in the sections below. Completed Wetland Determination Data Form – Arid West Region are included in Appendix F. All sampling points were sited within the floodplain of San Antonio Creek.

The area beneath San Antonio Creek Bridge is completely underlain by either concrete or rock gabions, as described in Section 1 and displayed in Appendices A and B. Since this area has experienced significant manipulation and infrastructure placement, wetland delineations were not performed in these areas. Vegetation above the OHWM within this area was primarily comprised of California blackberry. Views of these areas can be seen in Appendix E (Photographs #1-4).

In practice, it is expected to have an upland data point associated with each wetland location to ensure that the appropriate boundary has been established for each wetland area. In the case of the San Antonio Creek system, the upland areas west of the potential wetland features were not accessible due to significant amounts of poison oak and heavy brush. The upland soils located east of the creek are likely not representative of natural conditions since this area has experienced heavy crop production and soil manipulation. Thus, observations of topography coupled with dominance of upland vegetation versus hydrophytic vegetation was determined to be adequate to establish potential wetland boundaries. Upland vegetation was dominated by poison oak (FACU), coyote brush (UPL), and California sagebrush (UPL). In all instances, locations defined as potential wetlands had a very steep bank (35-50% slopes) that established the boundary and confined the potential wetlands to the terraces within the incised stream banks associated with San Antonio Creek.

4.2.2.1 Sampling Point 1 (Wetland)

Sampling point 1 is located within the OHWM of San Antonio Creek. This location exhibited all three wetland parameters, but is mapped as a perennial stream for the purposes of this jurisdictional determination, since it occurs entirely below the OHWM. Sediment trapped by the rip-rap has aided in the prevalence of hydrophytic vegetation. This location exhibited gley soils and high water table. Sampling point 2 was established above the OHWM and is representative of the change in vegetation and soils between these two locations.

4.2.2.2 Sampling Point 2 (Wetland)

Sampling point 2 is located west of San Antonio Creek and north of the bridge. It is located along the streambed terrace that gently slopes between the OHWM and the steep vertical upper banks of San Antonio Creek. Three soil pits were dug laterally within this area to assess soil conditions from the boundary near the OHWM to the boundary near the steep terrace. The vegetation within the area assessed is homogenous and hydrology indicators did not change, so separate wetland data points and associated data were not collected. Additionally, soil color and texture were identical for all three soil pits, so the data presented on the wetland field data form is representative for this entire area.

No hydrologic indicators were present within this area, but this was determined to be due to normal conditions not being present (i.e. lack of rainfall). The procedures for identifying problematic hydrology were followed per the Arid West Regional Supplement (USACE 2008) and it was determined that not only was the site visit completed during the dry season, this area has also been in a prolonged drought cycle. The Palmer Drought Severity Index (PDSI) (Sprecher and Warne 2000) was analyzed using monthly data from the National Climatic Data Center (NOAA 2016). PDSI values can range between -6 and +6, with negative values indicating dry periods and positive values indicating wet periods. PDSI value of -2 indicates moderate drought, -3 indicates severe drought, and -4 indicates extreme drought. PDSI values for the Central Coast Region of California revealed that since November 2011 only twice have monthly values been positive values, all other values have been negative. Throughout 2015 and 2016 all values have ranged from -2 to -5. Since PDSI values for the Central Coast Region have been so low, it is obvious that this area has been affected by drought. Further, though the bridge and placement of rip-rap and gabions has influenced the behavior of water flow in the system, the hydrology hasn’t significantly been manipulated or diverted with placement of features such as drainage ditches, levees, or water diversions. Since this feature has hydrophytic vegetation and hydric soils, and meets the parameters of problematic hydrology (drought and dry season site visit), then this feature meets the parameters of a wetland.

This location passed the dominance test for hydrophytic vegetation and has hydric soils (depleted matrix). This feature is located adjacent to and above the OHWM of San Antonio Creek. This area is gently sloping (0-3%). The gentle slope of this area likely allows water to penetrate the soil and not flow as quickly into San Antonio Creek, allowing hydric soils to develop. This area could currently or historically be influenced by the water table associated with San Antonio Creek. A total of 0.018 acres of this potential wetland feature occurs within the Main Construction Area and will be affected by the proposed Project.

4.2.2.3 Sampling Point 3 (Upland)

Sampling point 3 is located east of San Antonio Creek and south of the bridge (Figure 11). It is located along the streambed terrace that gently slopes between the OHWM and the upper, incised vertical banks. One data point was collected that was representative of this area. Because Sampling Point 3 exhibited hydrophytic vegetation, but did not show evidence of hydric soils or hydrology, this point is not within a wetland as defined by USACE regulations. Further, because this sampling point was intentionally sited within the location that was deemed by the investigators as most likely to exhibit wetland characteristics within the southeast section of the Main Construction Area, the fact that it does not meet the USACE's wetland definition indicates that this area does not contain jurisdictional wetlands.

4.2.2.4 Sampling Point 4 (Wetland)

Sampling point 4 is located west of San Antonio Creek and south of the bridge (Figure 11). It is located within a fairly flat (0-1% slopes) terraced area that would be the most likely to possess wetland indicators. This location passed the dominance test for hydrophytic vegetation and has hydric soils (depleted matrix). No hydrologic indicators were present within this area, but this area also meets the parameters of problematic wetland hydrology, as discussed in Section 4.2.2.2. Since this area has both hydrophytic vegetation and hydric soils, and meets the parameters of problematic hydrology (drought and dry season site visit), then this feature meets the parameters of a wetland.

This feature is located adjacent to and above the OHWM of San Antonio Creek. The west side of this feature is confined by the steep (35-40%) slope that leads to the upland areas; this slope is primarily constructed of gabions. This feature is gently sloping (0-5%) down to the OHWM of San Antonio Creek. A total of 0.011 acres of this potential wetland feature occurs within the Main Construction Area and will be affected by the proposed Project.

5.0 Impacts to Waters of the U.S.

During proposed maintenance activities associated with this Proposed Project, only temporary effects to waters of the U.S. will occur per current USACE Headquarters guidance (Stevens, pers comm. 2016), no permanent impacts are proposed. These temporary impacts include dewatering, sediment removal, and repair/replacement of gabions. All temporary impacts will occur within the Main Construction Area (Figure 11) and will include impacts to San Antonio Creek, a water of the U.S., and two areas identified as potential jurisdictional non-tidal wetlands.

Within the OHWM, excavation and repair/replacement of gabions would occur within a portion of the dewatered area. Dewatering activities are anticipated to occur at the upstream and downstream extents of the defined Main Construction Area, encompassing the largest area of temporary impacts within the OHWM. Thus, the entire portion of San Antonio Creek OHWM that occurs within the Main Construction Area will potentially experience impacts, though it is likely that a smaller area could be dewatered depending on construction activity needs. Approximately 3,528 square feet (178 linear feet) of San Antonio Creek would be temporarily impacted by the Proposed Project (Table 5). Of this area, approximately 1600 square feet (120 cy) of sediment would be removed and approximately 95 cy of gabion material would be added (Table 6).

Table 5. Proposed Discharge of Dredge and/or Fill Material

Water Body Type	**Requested NWP Number: 3**			
	Permanent		Temporary	
	Area (square feet)	Length (feet)	Area (square feet)	Length (feet)
Non-tidal Wetlands	-	-	600	60
Perennial Creek	-	-	3,528	178
Total:	0	0	4,128	238

Table 6. Volume and Type of Material to be Removed and Discharged into Waters of the United States

Material Type	**Total Volume Removed/Dredged (cy)**	**Total Volume Discharged (cy)**
Rock Slope Protection (RSP)	-	-
Clean Spawning gravel	-	-
River rock	-	-
Soil/Dirt/Silt/Sand/Mud	170^	-
Concrete	-	-
Structure	-	-
Stumps/Root wads	-	-
Other: Gabions	-	130^^
Total:	170	130

^120 cy would occur within OHWM, 50 cy would occur within potential non-tidal wetlands
^^95 cy would occur within OHWM, 35 cy would occur within potential non-tidal wetlands

Areas identified as potential non-tidal wetlands of the U.S. would primarily experience impacts due to limited sediment removal and gabion repair/replacement. All temporary impacts to potential non-tidal wetlands would occur within the Main Construction Area and encompass approximately 600 square feet (60 linear feet) (Table 5). Within this area, 600 square feet (50 cy) of sediment would be removed and approximately 35 cy of gabion material would be added (Table 6).

Based on the Cowardin Classification, the aquatic features within the Main Construction Area that could be temporarily impacted by the Proposed Project are R2UBH (riverine, lower perennial, unconsolidated bottom, permanently flooded) and and PFO6J (palustrine, forested, deciduous, intermittently flooded). Within the OHWM, 0.08 acres (3,328 sq ft) of riverine non-wetland waters of the U.S. would be temporarily affected. Adjacent to riverine waters of the U.S., 0.01 (600 sq ft) acres of palustrine, forested non-tidal wetlands would be temporarily affected by the Proposed Project.

6.0 Conclusion

All impacts due to the Proposed Project will be temporary in nature and will include water diversion, sediment removal, and gabion repair. As described previously, impacts to potential waters of the U.S. will be entirely encompassed by the Main Construction Area. Within the entire Project Area, 0.35 acres (606 linear feet) of non-wetland waters of the U.S. and 0.01 acres (60 linear feet) of potential jurisdictional wetland waters occurs. Of this area, 0.08 acres (3,328 ft^2, 178 linear feet) of non-wetland waters of the U.S. and 0.01 acres (600 ft^2, 60 linear feet) of potential wetland-waters of the U.S. occurs within the Main Construction Area and would experience temporary effects.

These activities will require authorization under Section 404 of the CWA. This Project will likely be authorized under Nationwide Permit 3 (Maintenance). Since waters of the U.S. “may be” present within the Project Area as discussed in this Jurisdictional Determination, a PJD form and 404 applications will be submitted to USACE.

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Mitigation and Monitoring Plan for the San Antonio Road West Bridge Maintenance at Vandenberg Air Force Base, CA

9 May 2018

Prepared For:

30th Space Wing, Installation Management Flight
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Prepared By:

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Acronyms and Abbreviations

30 CES/CEIEA	Installation Management Flight Environmental Assets
ac	Acres
CFR	Code of Federal Regulations
cm	centimeter
CRLF	California red legged frog
CWA	Clean Water Act
Ft.	Foot/feet
GIS	Geographic Information System
ha	Hectares
M	Meter
MMP	Mitigation and Monitoring Plan
NRCS	Natural Resources Conservation Services
NWI	National Wetlands Inventory
OHWM	ordinary high water mark
PSSAx	palustrine, scrub-shrub, temporarily flooded, excavated
PSS/FOC	palustrine, scrub-shrub/ forested, seasonally flooded
R2UBH	riverine, lower perennial, unconsolidated bottom, permanently flooded
RWQCB	Central Coast Regional Water Quality Control Board
TWG	tidewater goby
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USDA	United States Department of Agriculture
UTS	unarmored threespine stickleback4
VAFB	Vandenberg Air Force Base

1.0 Project Description

1.1 Responsible Parties

1.1.1 Applicant/Permitee:

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1.2 Project Location and Introduction

This Mitigation and Monitoring Plan (CMMP) provides the concepts and direction for implementation and maintenance of the mitigation required to compensate for impacts to California State Waters associated with repairs to the San Antonio Road West Bridge.

The San Antonio Road West Bridge is located on Vandenberg Air Force Base (VAFB), Santa Barbara County, California (Figure 1), and is found on the United States Geological Survey Casmalia, California 7.5-minute topographic map. The site is dominated by riparian vegetation within the channel, throughout the bridge gabions, and on the creek banks. Due to the nature of the proposed action, the requirement for riparian vegetation removal, and subsequent maintenance to keep vegetation cleared under the bridge, willow forest restoration will take place off site. Onsite restoration will occur in areas of the proposed action area that incur temporary disturbance, caused from access, exclusionary fencing installation, and other temporary impacts not related to vegetation removal under the bridge itself. The off-site mitigation area is located adjacent to San Antonio Creek downstream of the proposed action area.

This CMMP is required by the Central Coast Regional Water Quality Control Board (RWQCB) water quality certification pursuant to Section 401 of the Clean Water Act (CWA).

The Main Construction Area will affect 0.16 acres (ac) (0.10 hectares [ha]) of central coast arroyo willow riparian forest and scrub. Permanent impacts to willow riparian habitat will be mitigated at a 3:1 ratio (area mitigated: area impacted). In total, 0.48 ac (0.19 ha) of willow riparian habitat will be enhanced in the designated mitigation area. No compensatory mitigation is needed for the temporary impacts to the surface water (streambed) portion of the jurisdictional waters. The surface water will be unchanged and aquatic vegetation will self-restore.

Mitigation success will be assessed through performance standards specific to the site for the establishment of willows. VAFB will monitor the site for a minimum of five years or until success criteria are met. Annual and final monitoring reports will be provided.

The mitigation area is immediately adjacent to an existing willow riparian area that abuts a farm field (Figure 2 and Figure 3). Because permanent impacts cannot be mitigated at the San Antonio Road West Bridge project area, they will be mitigated through the planting of willow poles and understory species container plants, and invasive species control at the edge of the existing wetland transitional zone within the mitigation area.

This mitigation plan describes the site preparation, installation methods, and maintenance required until the performance standards are met.

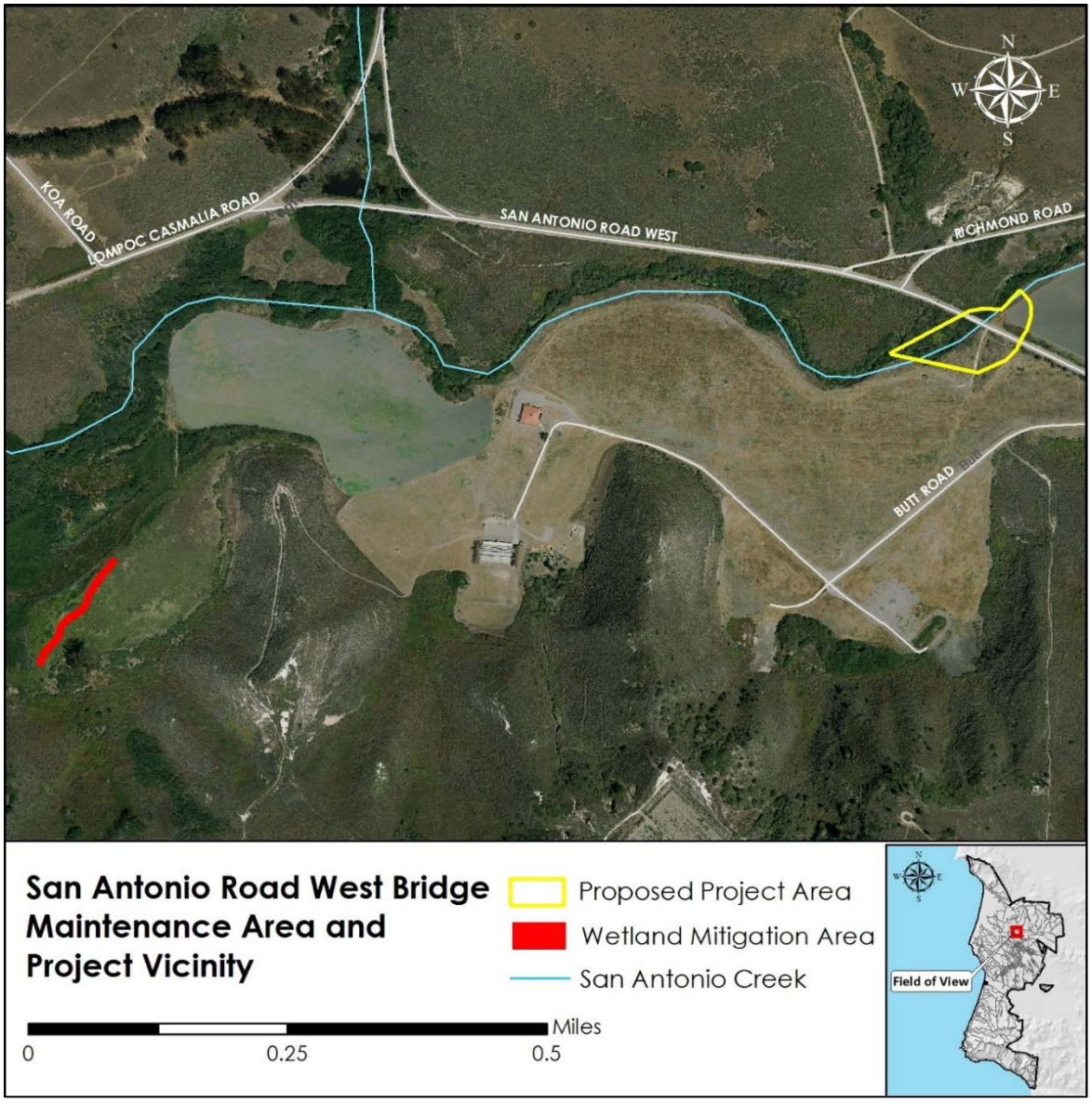

Figure 1. Project area and Mitigation Area.

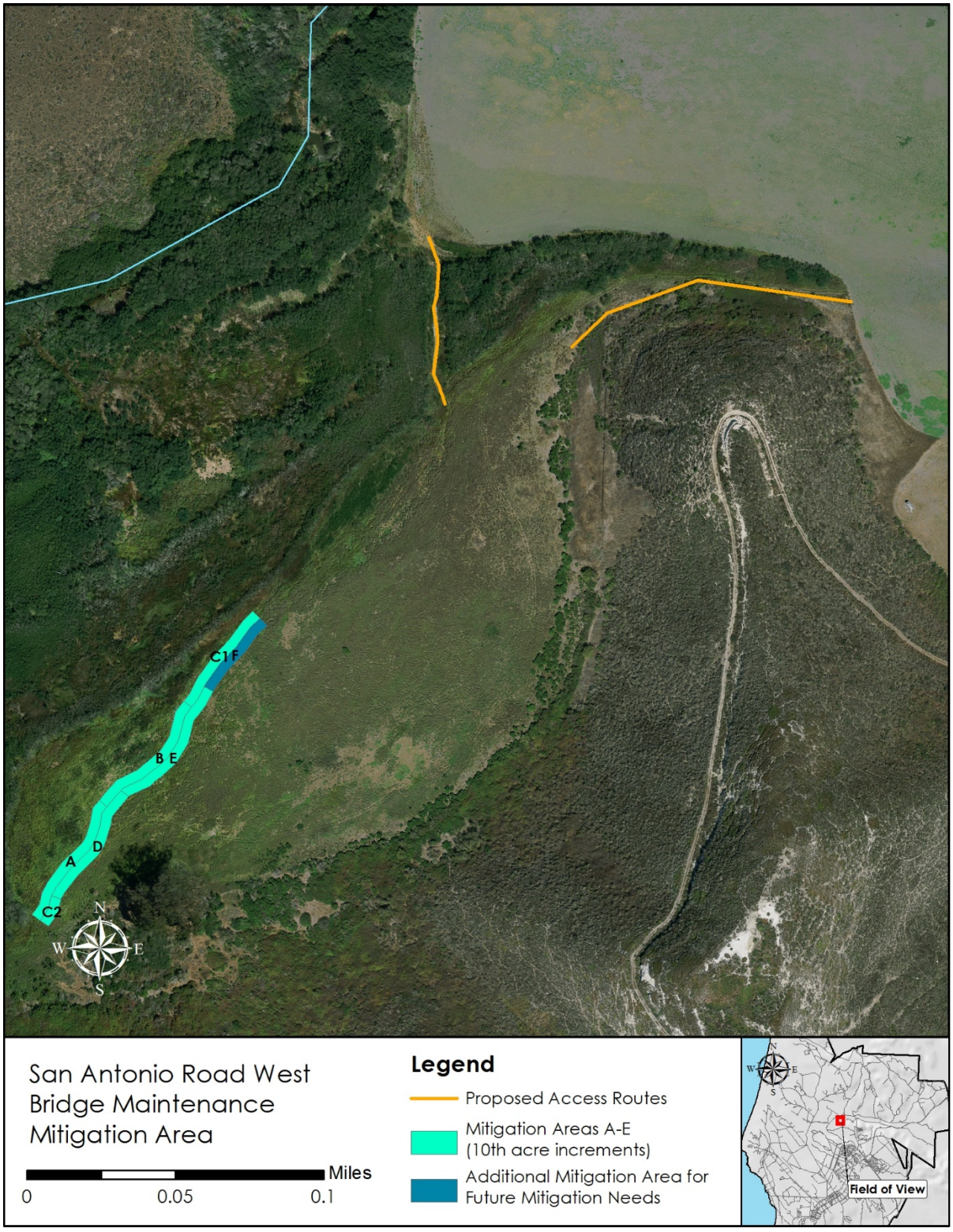

Figure 2. Mitigation area and proposed access routes.

Figure 3. Aerial view of recommended mitigation area, showing active farm field at bottom extent.

1.3 Project Summary – Maintenance of the San Antonio Road West Bridge

Maintenance activities at the San Antonio Road West Bridge include the removal of sediment under the bridge, repair and /or replacement of gabions as needed, and subsequent yearly vegetation removal within the gabions. The project consists of four areas, the main project area (gabions under the bridge and the extent of vegetation removal) where sediment will be removed, two staging areas, and a 400 foot (ft.) (122 meters [m]) downstream area that the Air Force applied to delineate the limit of potential effects from sedimentation or increased turbidity as a result of bridge maintenance (Figure 4).

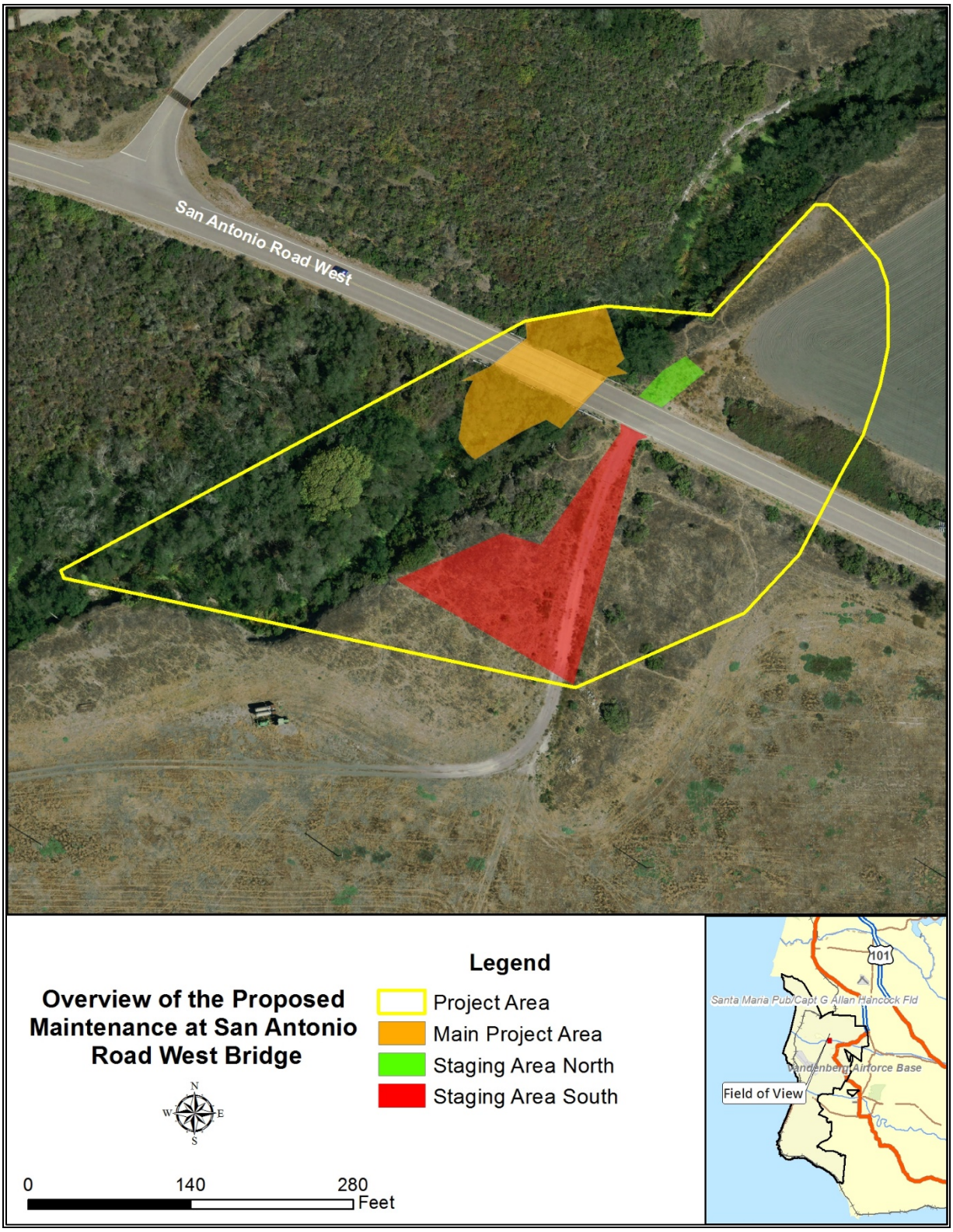

Figure 4. San Antonio Road West Bridge Maintenance Project Area.

1.4 Jurisdictional Areas within the San Antonio Road West Bridge Project Area

Delineation of wetlands within the Proposed Action Area was completed in June 2016 (USAF 2016). In addition to wetlands, the limits of jurisdictional waters of the United States were determined using the ordinary high water mark (OHWM) as indicated by drift lines and shelving present on the bank.

According to section 33 Code of Federal Regulations (CFR) 328.4, the limits of jurisdiction of the United States Army Corps of Engineers (USACE) are bound by the OHWM of San Antonio Creek and the tributary channel and any adjacent wetlands. Waters of the United States encompass Jurisdictional Wetlands as well as areas of open water and areas bound by the OHWM (non-wetland waters). A total of 0.08 ac. (0.03 ha) are classified as Waters of the United States within the main project area, 0.16 ac. (0.06 ha) of willow riparian forest were identified within the main project area.

1.5 Types, Functions and Values of Jurisdictional and Special Aquatic Habitats to Be Impacted within the San Antonio Road West Bridge Project Area

Habitat types, functions and values were assessed within the San Antonio Road West Bridge Project Area by conducting a site visit and literature searches. Results are detailed briefly below.

1.5.1 Hydrology

Review of the VAFB stream data indicated the presence of one potential jurisdictional hydrological feature, the main stem of San Antonio Creek, within the project area. San Antonio Creek is classified as a perennial stream within the Project Area. National Wetlands Inventory (NWI) data indicate that within the Project Area, San Antonio Creek is mapped as R2UBH (riverine, lower perennial, unconsolidated bottom, permanently flooded) and there are areas within the riparian corridor mapped as PSS/FOC (palustrine, scrub-shrub/ forested, seasonally flooded) features (USFWS 2016). There is an additional linear feature on the NWI map that comes in from the north, and then extends laterally along the north side of San Antonio Road West before connecting with San Antonio Creek. This feature is classified as PSSAx (palustrine, scrub-shrub, temporarily flooded, excavated) by NWI.

1.5.2 Soils

The Project Area is comprised of the following soil types: gullied land, Arnold sands, and Agueda silty clay loam (Figure 5). As depicted, San Antonio Creek is located within gullied land, but VAFB Geographic Information System (GIS) data may depict a past creek configuration because the soil boundaries are offset from San Antonio Creek. The soils in the Project Area have the following characteristics ((United States Department of Agriculture [USDA] Natural Resources Conservation Services [NRCS] 1972)):

Agueda silty clay loam: characterized by moderate permeability, slow surface runoff, and a low erosion hazard (none to slight). Absent vegetative cover, soils are susceptible to wind erosion and easily gullied by surface water runoff.

Arnold sands: characterized by rapid permeability, rapid surface runoff, and a high erosion hazard (soil is easily gullied).

Gullied land: characterized by deep gullies, some areas actively eroding, and areas with nearly vertical banks.

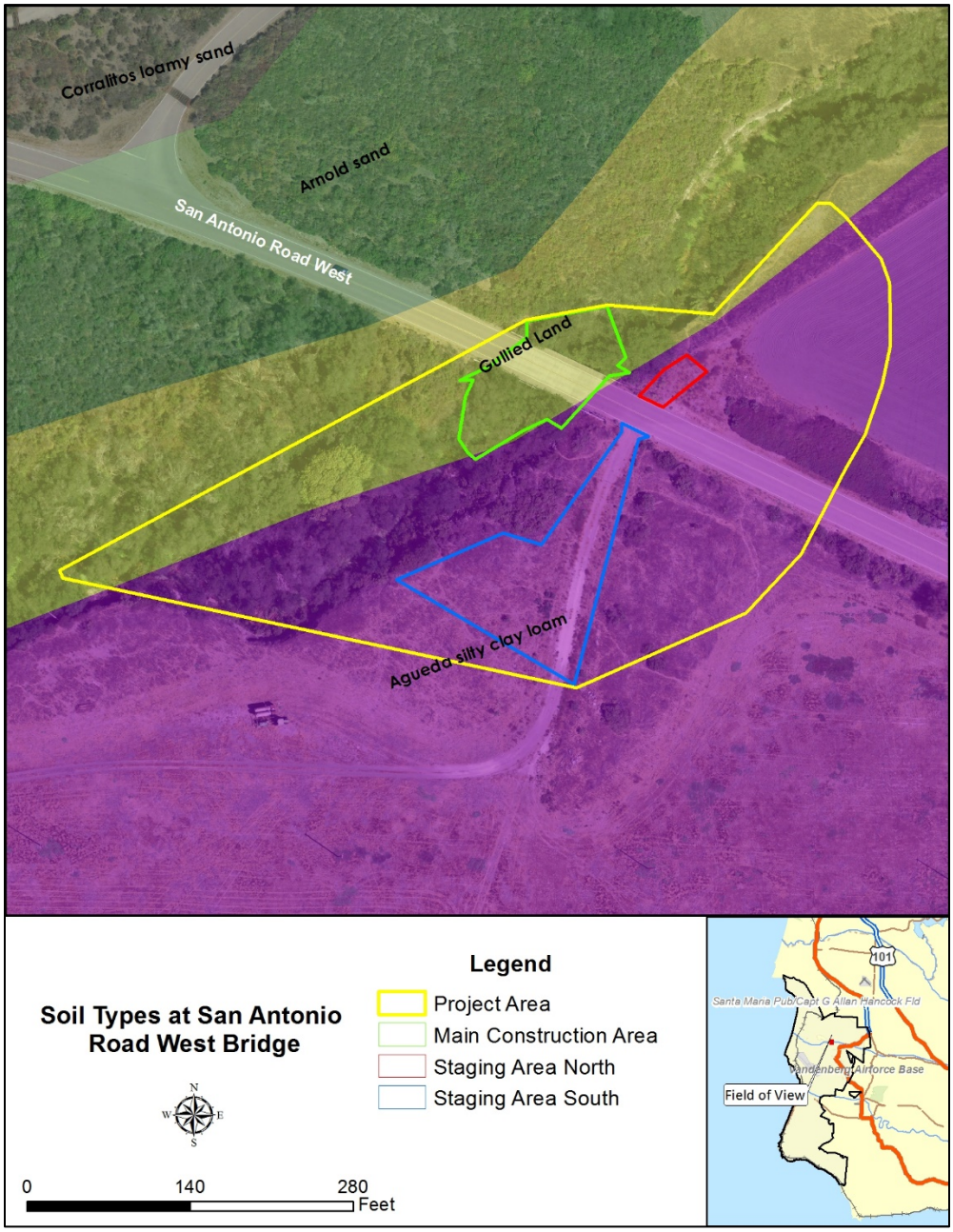

Figure 5. Soil Types within the Proposed Project Area.

1.5.3 Vegetation Types

Vegetation types were classified basewide on VAFB in 2009 using a modified Holland system (VAFB 2009). Types are based on Holland vegetation types, as described in Preliminary Descriptions of the Terrestrial Natural Communities of California, published by Robert F. Holland in 1986, and Documented Flora of Vandenberg Air Force Base, Santa Barbara County, California, published by David J. Keil and V.L. Holland in 1998. Based on the 2009 vegetation classification, the Project Area consists of the following vegetation types: central coast arroyo willow riparian forest and scrub (1.2 ac. [0.4 ha]), central coastal scrub (0.1 ac. [0.04 ha]), non-native grasses and forbs (1.6 ac. [0.6 ha]), and agriculture (0.3 ac. [0.1 ha]). These vegetation types and boundaries were confirmed during jurisdictional determination field surveys (Figure 6). Additionally, dominant species were noted as discussed below.

San Antonio Road West is a developed road within the Project Area and occupies 0.2 ac. (0.08 ha). The area beneath the bridge is open and accumulated sediment is moderately vegetated. Potential jurisdictional waters of the U.S. occur within central coast arroyo willow riparian forest and scrub. The following is a description of each vegetation type within the entire 3.4 ac. (1.4 ha) project area as observed during site visits in June and July 2016.

Central coast arroyo willow riparian forest and scrub

The main canopy consists of arroyo willow (*Salix lasiolepis*). Within the willow riparian understory, water flows within the San Antonio Creek channel with hydrophytic vegetation growing along the slower moving water. This region of the riparian understory is also the area where potential jurisdictional wetlands and waters of the U.S. occur. Section 4 describes potential waters of the U.S. in detail. The area inundated with slower moving water is primarily dominated by bur-reed (*Sparganium eurycarpum* ssp. *eurycarpum*). Common watercress (*Nasturtium officinale*) is dominant within San Antonio Creek south of the bridge where the canopy is slightly more open. Other associated species include tule (*Juncus* spp.), and duckweed (*Lemna* spp.) with a sparse scattering of broad-leaf cattail (*Typha latifolia*). Approximately 0.35 ac. (0.14 ha) of the Project Area is inundated with flowing and slow-moving water.

Plants that tolerate moist soils along the lower banks and shaded by the bridge and arroyo willow include common horsetail (*Equisetum arvense*), celery (*Apium graveolens*), brass buttons (*Cotula coronopifolia;* non-native species), and seep monkeyflower (*Mimulus guttatus*).

The upland portions consist of drier soils that are shaded by the bridge and canopy of arroyo willow. Species typical of the understory in this region include mugwort (*Artemisia douglasiana*), mulefat (*Baccharis salicifolia* ssp. *salicifolia*), California blackberry (*Rubus ursinus*), western poison oak (*Toxicodendron diversilobum*), and stinging nettle (*Urtica dioca* ssp. *holosericea*). There is also a significant presence of non-native plants to include black mustard (*Brassica nigra*), sweet fennel (*Foeniculum vulgare*), and perennial pepperweed (*Lepidium latifolium*). Along the outer riparian edges, central coastal scrub plants encroach such as coyote brush (*Baccharis pilularis*) and California sagebrush (*Artemisia californica*).

The main construction area will affect 0.16 ac. (0.06 ha) of central coast arroyo willow riparian forest and scrub, which is the driver for this mitigation action via the Central Coast Regional Water Quality Control Board.

Central coastal scrub

This vegetation type is dominated by coyote brush and California sagebrush within the project area. Other associated species include blackberry, western poison oak, and blue elderberry (*Sambucus mexicana*). This vegetation type is found in the far eastern portion of the project area with a small west end pocket and is outside of all areas that are anticipated to experience disturbance due to Project activities. Thus, this vegetation type is not expected to be affected by the proposed project.

Non-native grasses and forbs

The disturbances contributing to the non-native character of this vegetation type within the project area are the adjacent agricultural lands and the roadsides of San Antonio Road West. Non-native grasses and forbs also encroach upon central coast scrub, competing for dominance in some areas, as discussed above. Black mustard and poison hemlock (*Conium maculatum*) are the dominant plants. Associated non-native invasive species include wild oats (*Avena fatua*), sweet fennel, milk thistle (*Silybum marianum*), yellow star thistle (*Centaurea solstitalis*), purple star thistle (*Centaurea calcitrapa*), cheat grass (*Bromus tectorum*), and pepperweed. Telegraph weed (*Heterotheca grandiflora*), a native plant that favors disturbance especially along roadsides, is sparsely scattered in the area.

Agriculture

Agricultural vegetation generally represents highly disturbed, consistently tilled lands that is dominated by economically advantageous crops. The agricultural field within the project area is currently active.

Developed

The primary development within the Project Area is San Antonio Road West roadway and supports no vegetative cover. Developed land occupies 0.2 ac. (0.08 ha) within the project area.

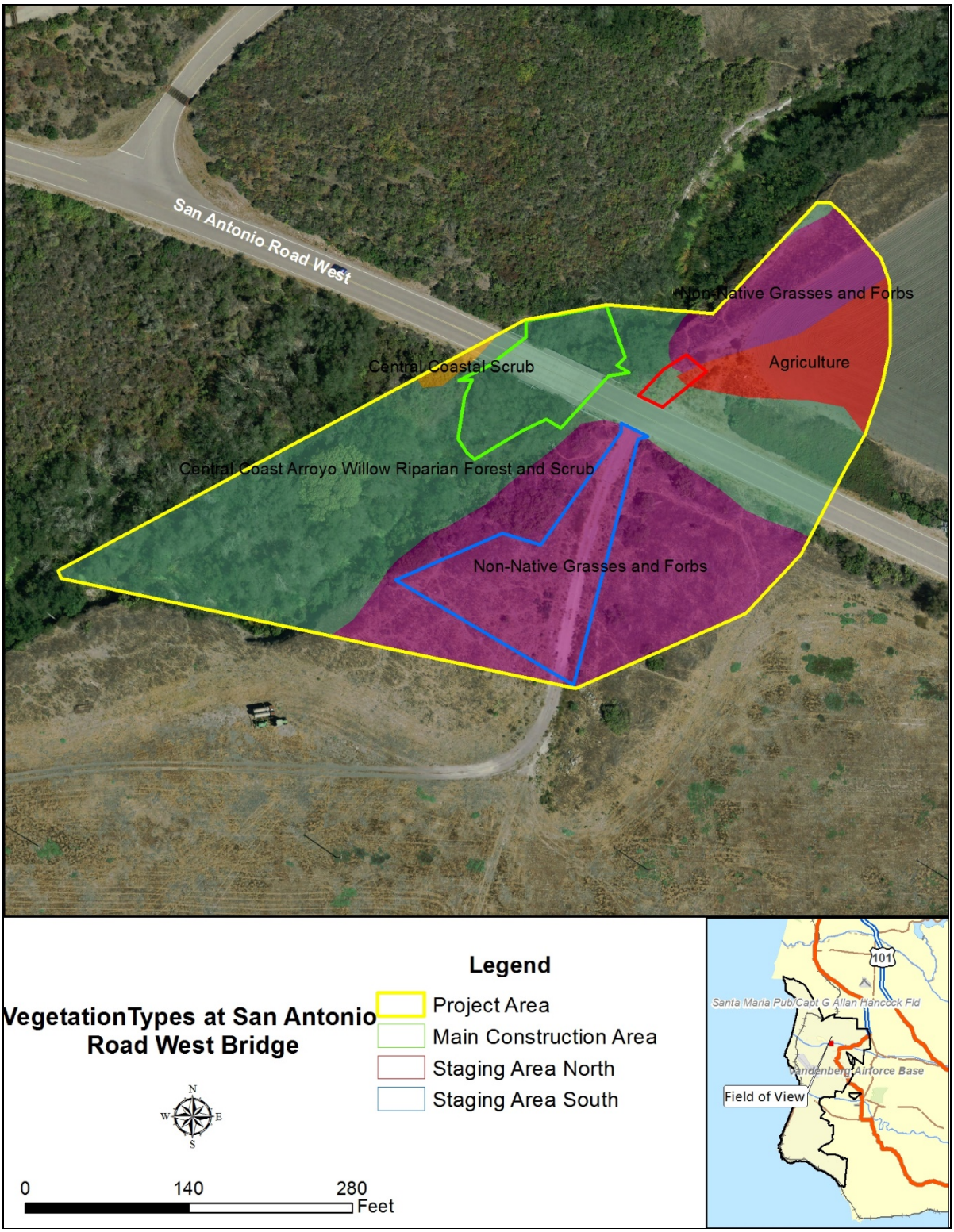

Figure 6. Vegetation types within the proposed action Proposed Action Area.

1.6 Mitigation Design

1.6.1 Willow Riparian Mitigation Area

1.6.1.1 Site Selection

The mitigation area is 0.5 ac. (0.2 ha) and runs parallel to a riparian zone that is adjacent to a farm field. Willow planting in this area would encourage riparian habitat to encroach onto the farm field, and with continued restoration, could potentially return the site to historic riparian conditions.

Mitigation opportunities adjacent to the San Antonio Road West Bridge maintenance area do not occur in the riparian corridor. Adjacent sites would require willow riparian habitat creation on upland benches of the river, approximately 20 ft. (6.1 m) above the water table. This would require excavating enormous volumes of soil to reach the water table, so this alternative was eliminated in favor of the off-site area.

1.6.1.2 Project Summary

Mitigation activities will include two main objectives: site preparation and willow pole planting with an overall timeline of approximately three years (Table 1). An additional five years of monitoring would be required depending on achievement of success criteria, which is discussed in Section 4.1, Final Success Criteria. Site preparation will require broadleaf specific herbicide treatment for two consecutive years through the winter into the early spring, harrowing and seed application during the first years' winter, with a follow-up seed application during the winter of the second year, and spot herbicide treatments of non-native grasses as needed. Willow pole planting and container planting of riparian plants such as California blackberry (*Rubus ursinus*), elderberry (*Sambucus nigra*), and giant rye (*Elymus condensatus*) will occur during the winter of the third year. To reduce competition for newly planted willows and container plantings, spot treatments of whitetop (*Lepidium draba*) and other non-native plants will be applied as needed. A more specific account of site preparation and willow planting can be found in Section 3.

ID	Task Name	Duration	Start	Finish
1	**SAC Bridge Maintenance Mitigation**	**1219 days**	**Tue 10/2/18**	**Fri 6/2/23**
2	Site Preparation	445 days	Tue 10/2/18	Mon 6/15/20
3	Spray broadleaf selective herbicide (Telar)	1 wk	Tue 10/2/18	Mon 10/8/18
4	Harrow and seed with native grass mix	5 days	Tue 12/4/18	Mon 12/10/18
5	Spray Telar	114 days	Tue 1/8/1	Fri 6/14/19
10	Spot spray non-native grasses as needed	110 days	Tue 1/15/19	Mon 6/17/19
11	Spray broadleaf selective herbicide (Telar)	1 wk	Tue 10/1/19	Mon 10/7/19
12	Seed with native grass mix	5 days	Tue 12/3/19	Mon 12/9/19
13	Spray Telar	115 days	Wed 1/1/	Tue 6/9/20
18	**Spot spray non-native grasses as needed**	**110 days**	**Tue 1/14/20**	**Mon 6/15/20**
19	**Willow planting**	**8.8 wks**	**Wed 12/2/20**	**Sat 1/30/21**
20	Spot spray whitetop	5 mons	Wed 2/3/21	Tue 6/22/21
21	Container plantings	40 days	Wed 1/6/21	Tue 3/2/21
22	**Willow planting**	**8.8 wks**	**Wed 12/1/21**	**Mon 1/31/22**
23	Spot spray whitetop	5.4 mons	Tue 2/1/22	Thu 6/30/22
24	Spot spray whitetop	5.4 mons	Wed 2/1/23	Fri 6/30/23

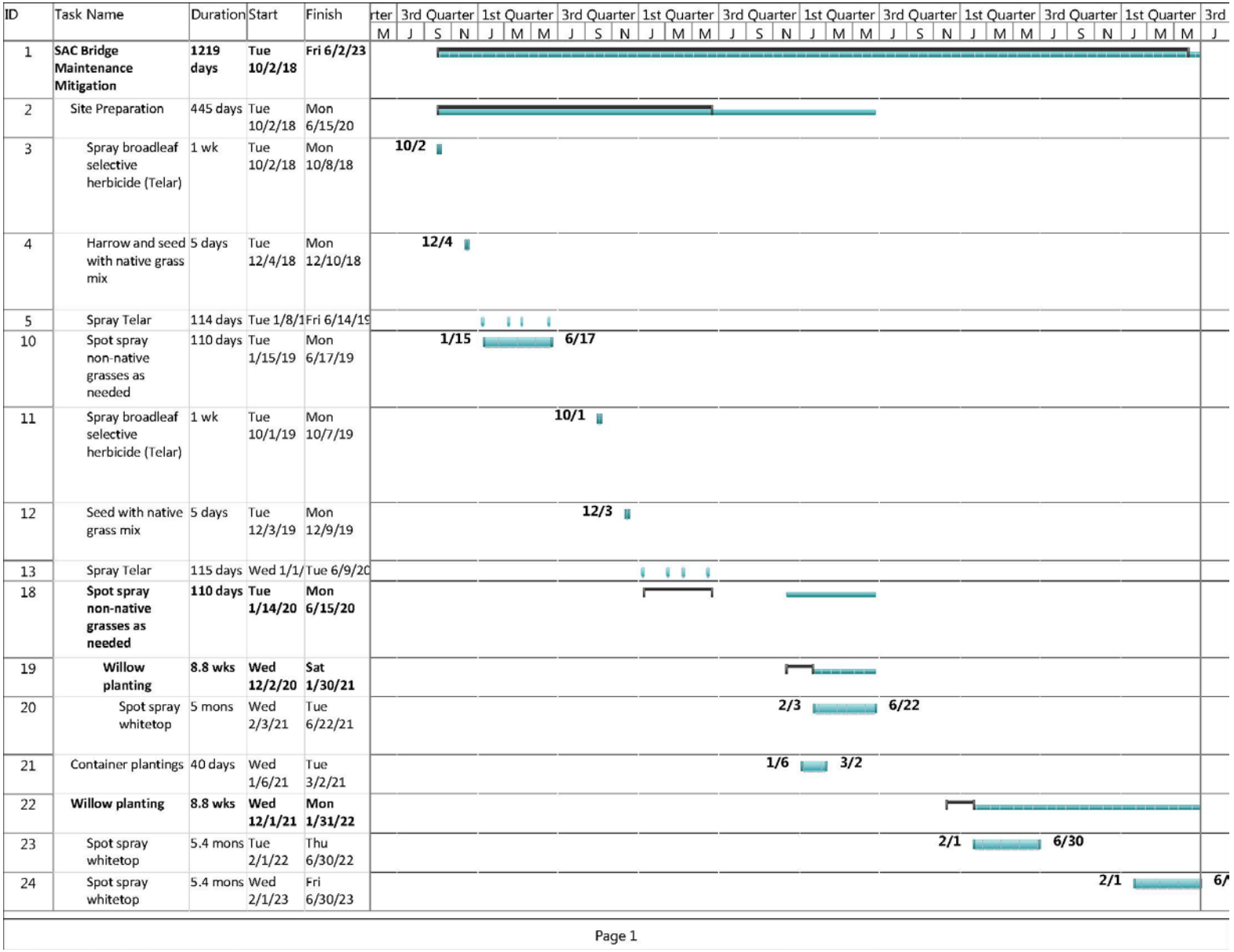

Table 1. San Antonio Road West Bridge Maintenance Mitigation Project Timeline.

1.6.1.3.1 Baseline Conditions

Habitat types, functions and values were assessed within the Main Project Area by conducting surveys, analyses, and literature searches. These included a general biological survey and reviews of literature and databases pertaining to past biological surveys. Results are detailed briefly below.

1.6.1.4.2 Hydrology

Hydrologic characteristics of the mitigation site were not identified in field data collection; however, the site is adjacent to the banks of the San Antonio Creek and was historically covered with willow riparian vegetation. The suggested mitigation actions would be an attempt at bringing that area to historical conditions, prior to agricultural activities.

1.6.1.5.3 Soils

According to the VAFB GIS soils layer, the mitigation area is dominated by Agueda silty clay loam (Figure 7). This soil is characterized by moderate permeability, slow surface runoff, and a low erosion hazard (none to slight). Absent vegetative cover, soils are susceptible to wind erosion and easily gullied by surface water runoff.

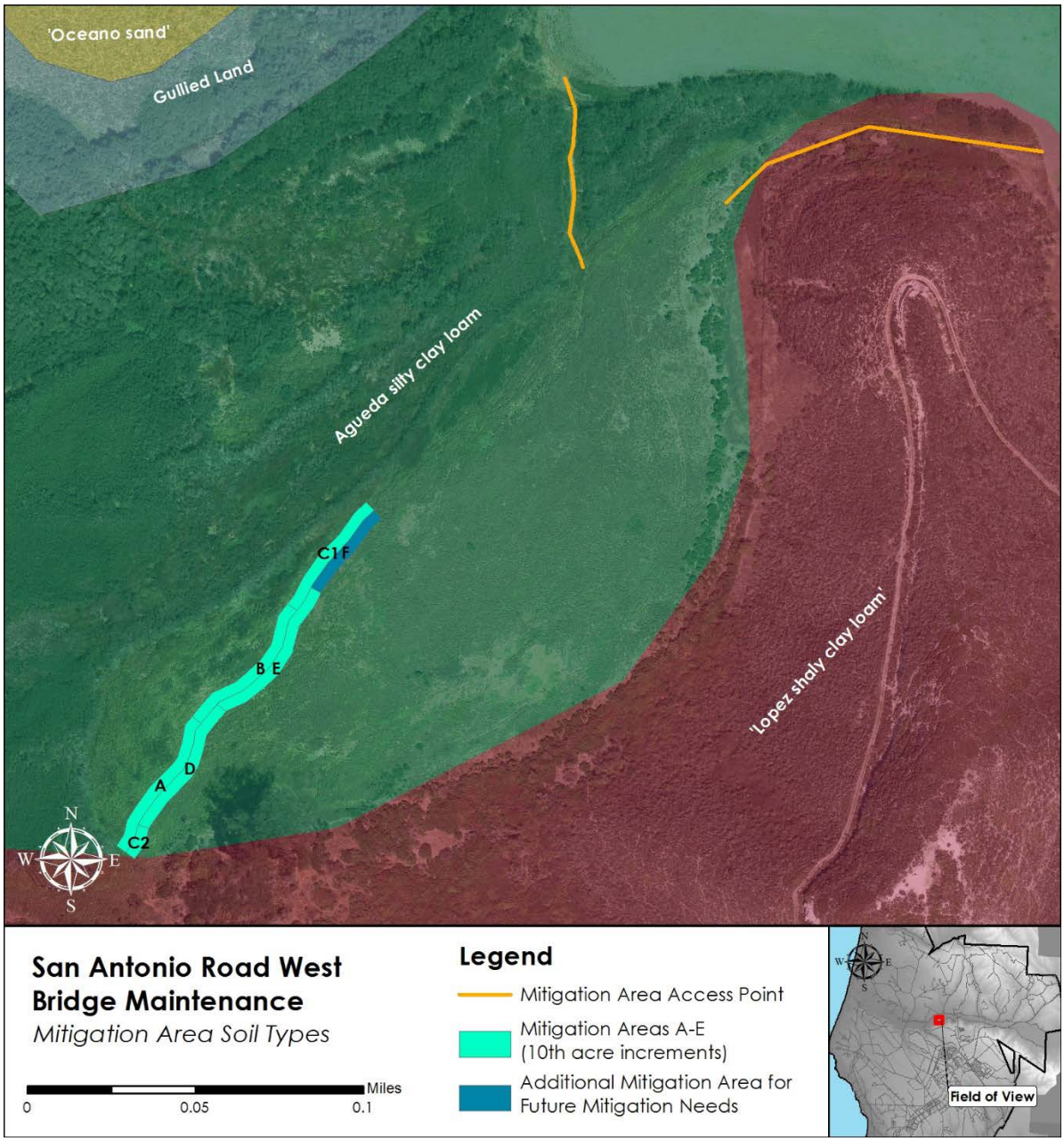

Figure 7. Soil Types within the San Antonio Creek Bridge wetland mitigation area.

1.6.1.6 Vegetation

Based off VAFB GIS vegetation layers, the mitigation area is within an agricultural tract (Figure 8). However, this tract was abandoned, and the area is now inundated with a combination of non-native species including whitetop and mustard, however, willows have begun to develop on the western edge (Figure 9).

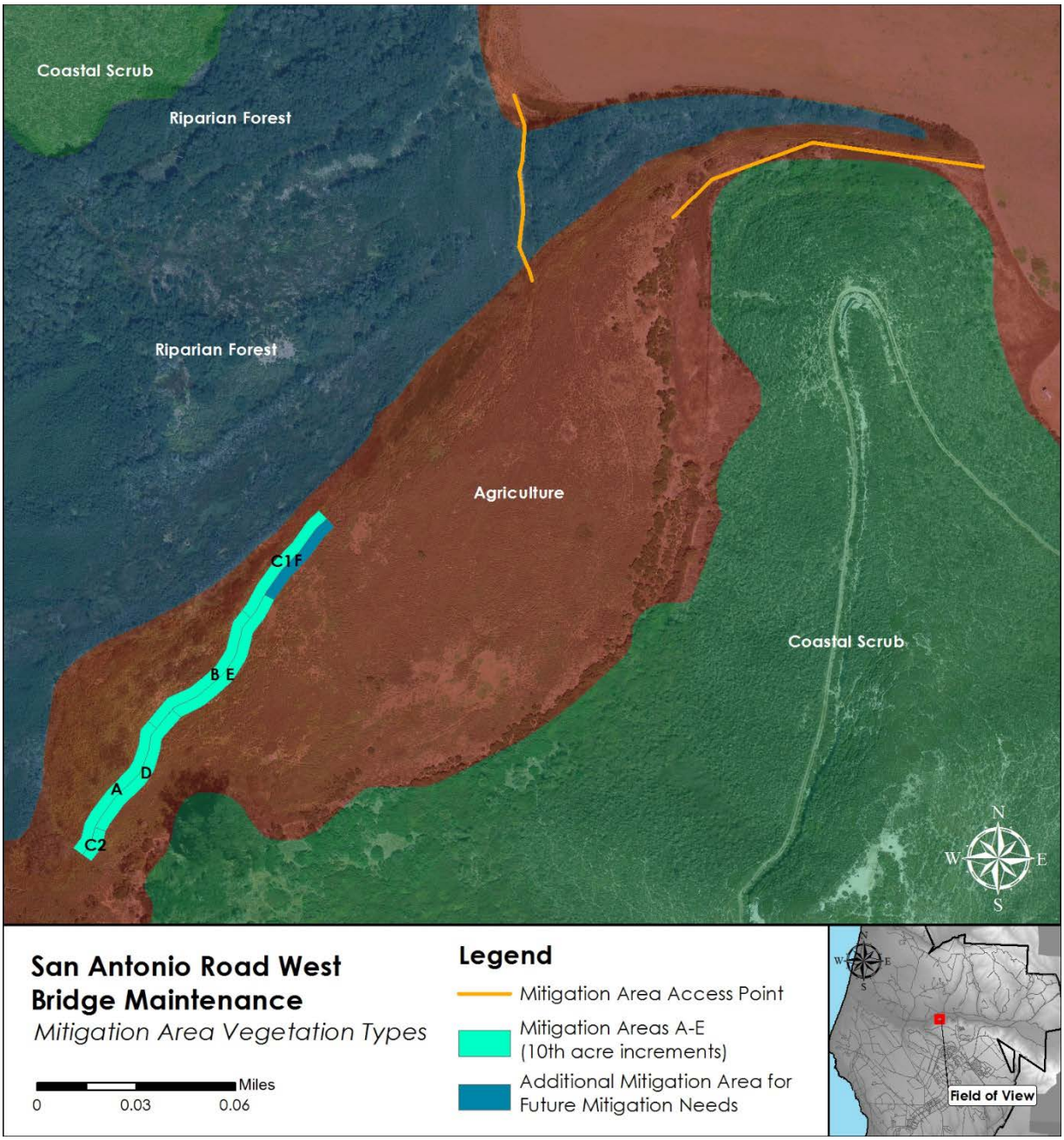

Figure 8. Vegetation types within the San Antonio Road West Bridge wetland mitigation area.

Figure 9. Existing willow riparian vegetation adjacent to proposed mitigation site (left extent of image).

2.0 Goals of Mitigation

The goal of this mitigation is to enhance 0.48 ac. (0.20 ha) of willow riparian vegetation in a downstream location of the proposed action area that will act as a replacement of the permanent loss of 0.16 ac. (0.06 ha) of willow riparian vegetation within the project area as a result of bridge maintenance activities.

The San Antonio Road West Bridge maintenance project mitigation area, when revegetated with willow riparian habitat, will provide refuge for native wildlife species to include the federally threatened California red legged frog (*Rana draytonii*; CRLF). In the long term, the mitigation area must be healthy, self-sustaining, regenerating, and result in the widening of the San Antonio creek riparian corridor, thus providing expanded habitat for wildlife.

3.0 Habitat Mitigation: Implementation and Maintenance

3.1 Site Preparation

Before willows can be installed in the mitigation area, significant preparation must be accomplished. In the fall of the first year, a broadleaf selective herbicide such as chlorsulfuron (tradename Telar®XP) will be applied to whitetop, an invasive plant species that currently dominates the site. Following herbicide application, in the winter of the first year the site will be dragged with a rigid toothed harrow pulled behind a six-wheel drive utility terrain vehicle (such as a Polaris Ranger) and then seeded with a native mixture of foothill needle grass (*Stipa lepida*), purple needle grass (*Stipa pulchra*), California brome (*Bromus carinatus*), meadow barley

(*Hordeum brachyantherum*), and small fescue (*Festuca microstachys*). This mix will help to reduce the re-infestation of whitetop without compromising the establishment of the willow pole plantings that will be installed in year three of the mitigation. An additional four rounds of Telar®XP will be applied after seeding occurs, starting sometime in the winter through mid-summer. During this time, non-native grasses such as veldt grass (*Ehrharta calycina*) will be spot treated with glyphosate (tradename Roundup®) using an ultra-low volume herbicide applicator. This will ensure that only the target species receive herbicide treatment while minimizing damages to native grasses. This treatment cycle will occur again in the second year; however, the site will not be harrowed during the second winter.

3.2 Site Re-vegetation

3.2.1 Willow Pole Planting

Willows will be planted in five 0.10 ac. (0.04 ha) tracts that are approximately 18 ft. (5.4 m) wide by 242 ft. (74 m) long. Target spacing will be approximately 3 ft. (0.9 m), and one to three willow poles will be placed in each hole depending on the method in which the hole is dug. Descriptions of hole creation options are below. Willow planting will occur during the winter of year three and will adhere to the following guidelines:

Installation location selection:

- Willows should be planted to the depth of the capillary fringe where enhanced soil moisture is maintained by a wicking effect from the nearby water table or other ground water;
- Willow cuttings should be prioritized in areas where natural willow recruitment is not already occurring; and
- Willows should be planted in areas with suitable soil.

Cuttings will be harvested in the vicinity of San Antonio Creek from areas within the San Antonio Creek riparian corridor as approved by a 30 CES/CEIEA biologist. Willow cuttings will be collected and planted in January or early February, when the willows are dormant and at a time that will take advantage of winter rains. No more than 25 percent of a single tree's biomass will be harvested.

Willow installation methods have been developed based on the experience of MSRS and published pole planting techniques developed by the U.S. Department of Agriculture - Natural Resources Conservation Service (USDA-NRCS 2005) and J. Chris Hoag, riparian plant ecologist at Hoag Riparian & Wetland Restoration LLC (Hoag 1995; Hoag et al. 2001).

Willows will be installed by one or more of the following methods:

- Water jet installation: If site conditions are dry and allow for equipment, a truck and trailer or water pump hose will be used to liquefy the soil to create a hole that is one inch in diameter, or approximately the diameter of the willow pole. Willow cuttings will be installed to

a depth of the soil's capillary fringe. Using this method, willow cuttings will be installed at a depth of 3-4 ft. (0.9-1.2 m).

- Hand-held power auger: Can be used if water truck and or trailer cannot access site. Auger will be used to drill a hole that is 4-6 in. (10.2-15.2 cm) in diameter and 2.5-4.5 ft. (0.8-1.4 m) deep. One to three willow cuttings will be set in each hole. The exposed hole will then be filled with a slurry of muddy soil to ensure good soil contact with the planting.

- A hole can be manually driven with a five-foot steel rod ((0.75 in. (1.9 cm) diameter)) to approximately 3-4 ft. (0.9-1.2 m) in depth, depending on soil conditions. The willow cuttings will then be installed in the hole, and the soil will be compacted around the willow stem.

- The 30 CES/CEIEA project manager will be informed of the preferred willow planting installation method prior to installation, depending on site conditions.

Water used during the pole planting installation will be supplied from a water tank on a nearby vehicle or pumped from an open section of the creek. All pumping will occur with an onsite USFWS approved biological monitor present to ensure that tidewater goby (*Eucyclogobius newberryi*; TWG), unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*; UTS) and California red legged frog are not impacted. A wire screen (no larger than 0.125 in [0.318 cm] mesh) will be placed around the pump inlet to prevent the entrapment of any living organisms. Subsequent irrigation for maintenance purposes will follow the above procedures and will continue on an as needed basis to promote downward development of the root systems.

3.2.2 Container Planting

Container plant installation will take place during January of year three. Container plant species will include elderberry and giant rye. The giant rye will be planted 3 ft. (0.9 m) on center throughout the 0.5 ac. (0.2 ha) site, with elderberry interspersed every tenth plant. To achieve this density, 2,762 giant rye and 306 elderberry plants will be required. These species will help to enhance a riparian understory for the willows, and thus prevent invasive species to re-establish in the area. Seeds will be collected on base or purchased from a local seed distributer in an effort to maintain local genetics. Plants will be germinated in 2-inch containers and grown to 5 in. (12.7 cm) before planting on site. During container plant installation, plants will be inspected for proper root development and condition before planting. Planting holes will be equal in size to the container size. Holes will be dug manually with a hand trowel. Holes will be approximately 6-12 in. (15.2-30.5 cm) in depth and backfilled with native soil.

Herbivory and browsing of container plant roots and foliage may occur if not properly protected. Therefore, all container plants will be installed with a wire mesh cage placed around the root ball and a fence wire fabricated cage to protect the body of the plant.

3.3 Follow-up Herbicide Treatments

The final activities associated with site mitigation will include monitoring and spot treatment of whitetop, mustard, and other non-native invasives as needed. Treatments will occur the last six months of the year three activities from January through mid-June.

4.0 Monitoring Plan for the San Antonio Road West Bridge Maintenance Project Willow Riparian Mitigation Area

4.1 Monitoring Methods and Final Success Criteria

Successful mitigation will rely on meeting criteria for the control of invasive plants and restoration of native habitat as measured by comparison to an intact reference site. A reference site will be selected in nearby intact native habitat with similar species composition, structural integrity, slope, aspect, moisture regime, and soil composition in comparison to the mitigation site. Within the reference and the mitigation sites, a Rapid Vegetation Assessment, developed by the California Native Plant Society (http://www.cnps.org/cnps/vegetation/protocol.php) will be performed. Within the entire 0.48-acre site that will be used as the representative stand or plot, the percent cover for each native and non-native plant species, overall native cover, and overall non-native cover will be estimated. These will be compared to determine if the mitigation site has reach equivalent or greater values for native and non-native cover. The following success criteria will be applied to determine if the site has achieved restoration goals:

- Native cover within the mitigation site is at or above that of the reference site.
- Non-native cover within the mitigation site is at or below that of the reference site.
- Evidence that the site is sustainable by showing signs of regeneration (progeny and new growth) of healthy plants, a low mortality rate, and resistance to invasion by weeds.

It is the goal of the project to meet all of the above success criteria within five years or less, following the completion of mitigation activities.

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