Stormwater Control Plan

For a Regulated Project

RIVER ROAD BRIDGE REPLACEMENT OVER GILL CREEK

April 1, 2022

County of Sonoma, Department of Transportation and Public Works
Chet Jamgochian, PE

prepared by:

Jeremy Patapoff

Moffatt & Nichol
2185 N. California Blvd, Suite 500

Walnut Creek, CA 94596

P: 925-944-5411

F: 925-944-4732

Email: jpatapoff@moffattnichol.com

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This Stormwater Control Plan was prepared using the BASMAA template dated July 14, 2014.

Project Vicinity Map, Location Map & Site Aerial Map

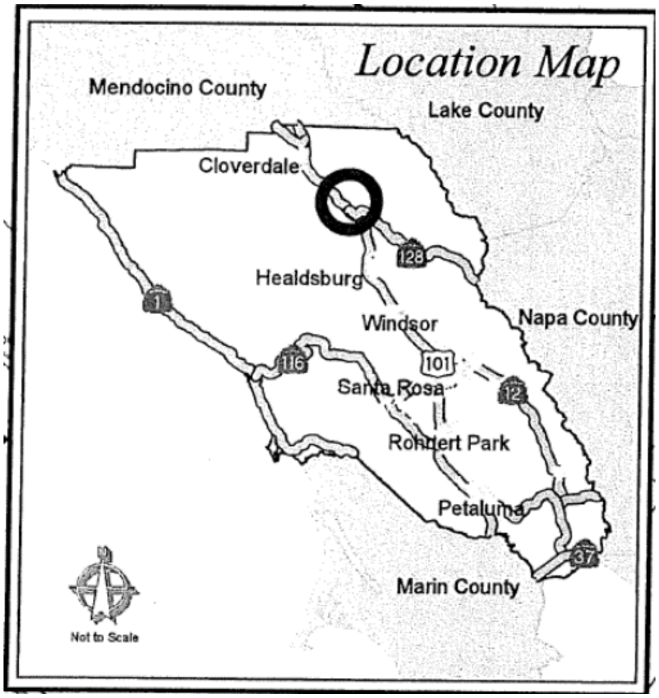


Figure 1. Project Location Map

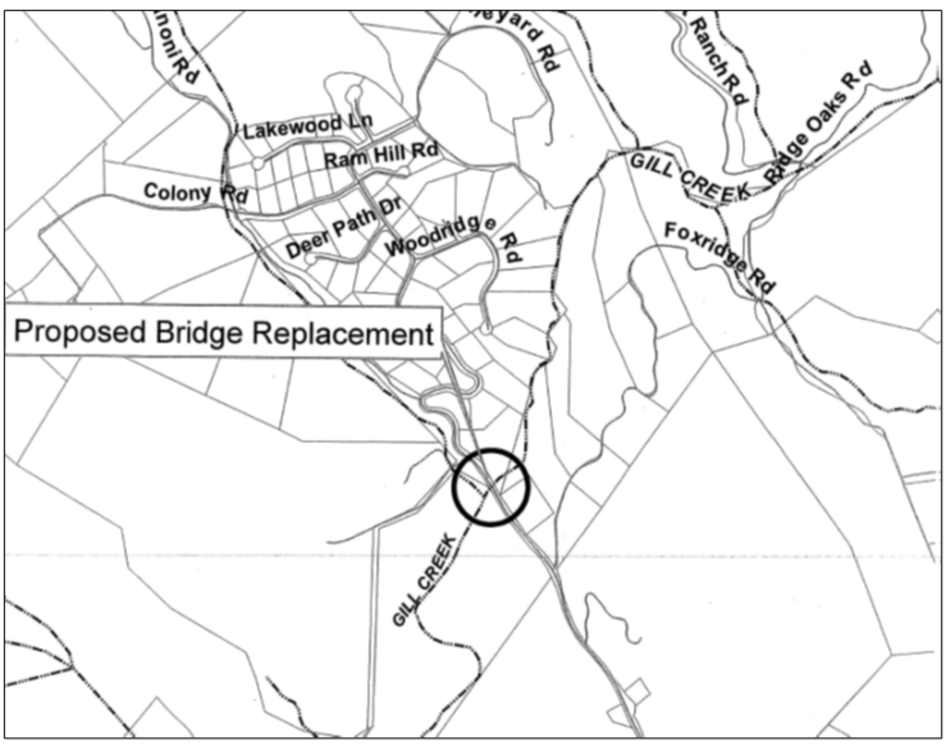


Figure 2. Project Vicinity Map

Figure 3. Project Aerial Map

I. Project Data

Table 1. Project Data Form

Project Name/Number	River Road Bridge Replacement Over Gill Creek Federal Aid Project No. BRLS STPLZ 5920(092)
Application Submittal Date	
Project Location	River Road between Fox Ridge Road and Vineyard Road located 2 miles east of SR 128 north of Geyserville.
Project Phase No.	N/A
Project Type and Description	Replacement of the existing bridge that crosses over Gill Creek and adjustments to the roadway geometry.
Total Project Site Area (acres)	48,950 sf (1.12 acres)
Total New and Replaced Impervious Surface Area	23,220 sf (0.53 acres)
Total Pre-Project Impervious Surface Area	18,570 sf (0.43 acres)
Total Post-Project Impervious Surface Area	23,220 sf (0.53 acres)

II. Setting

II.A. Project Location and Description

The River Road Bridge Replacement project crosses over Gill Creek, is located in Sonoma County between Fox Ridge Road and Vineyard Road, and is 2 miles east of SD 128. The project limits extend from Gill Creek 400' in each direction (north - south).

The basic project scope includes replacement of the existing bridge over Gill Creek, adjusting the horizontal and vertical alignments to improve sight distance, widening the road approaches, adding shoulders and reconstructing the pavement 400' north and south of the bridge.

Since the project requires widening of the roadway cross section, there is an increase of impervious area which would require, to the maximum extent practicable (MEP), treatment of an area greater than or equal to the increased impervious area. However, since the project is also reconstructing the pavement section as a result the profile adjustment and realignment, the project is required to consider treating an area equivalent to the entire project reconstruction area or greater.

II.B. Existing Site Features and Conditions

The existing bridge is a single span reinforced concrete slab haunched rigid frame with reinforced concrete abutments and wingwalls measuring 44 feet long and 24 feet wide. The superstructure consists of a reinforced concrete deck and metal beam guardrails along the full length of the bridge on both sides. The bridge crosses Gill Creek perpendicularly, and the approaches are from both directions consisting of two travel lanes, no shoulders, or sidewalks.

The existing right of way is 60' wide with residential farm properties on both sides of the road west of the creek. There are 4 unpaved driveways within the project limits, 1 to the south of the bridge and 3 to the north of the bridge. The south driveway has an existing culvert crossing under it.

Under the existing conditions, there is a high point at the bridge and runoff flows to the north and south of the bridge. North of the bridge the roadway is crowned and the runoff flows off the roadway, over the unpaved shoulders and into natural swales directed back south to Gill Creek. South of the bridge the existing roadway is superelevated to the east where runoff is collected within a swale, conveyed into a culvert which crosses River Road and discharges to an area that is sloped towards Gill Creek.

Based on the NRCS Soil Survey website, the project area south of the bridge is classified as a hydrologic soil group Type C and the project area north of the bridge is classified as a hydrologic soil group Type B which implies some moderate infiltration characteristics.

II.C. Opportunities and Constraints for Stormwater Control

As it is typical for a project of this type in rolling terrain with superelevated roadway and somewhat narrow right of way, the limited available space for storm water treatment facilities creates a significant challenge for incorporating BMP's. The bridge is outside of the county NPDES boundary, so it isn't subject to LID requirements, however the waterboard will likely require a pre/post analysis and post construction stormwater BMPs as part of the 401 permit process.

The portion of the project south of Gill Creek has a superelevation that collects runoff along the east side of River Road. The roadway is shifted west in this location allowing for the construction of a bioretention area between the roadway and right of way. There is an existing culvert in the vicinity that will be reused to convey the treated runoff and bypass of larger storms.

After the roadway crosses over the bridge it begins to transition back to normal crown as it joins the existing pavement section. This will create a drainage area on each side of the roadway. The roadway pavement is centered within the right of way at this location and space is available for bioretention on each side of the roadway.

As a result of the proposed bioretention areas roughly 100% of the total post-construction impervious area will be treated within the project pavement reconstruction limits. The resulting total treated impervious areas would equal 0.76 acres which would exceed the total (new + reconstructed) project impervious area within the project limits by about 50%.

III. Low Impact Development Design Strategies

The site low-impact design strategy includes optimizing the layout to limit grading and preserving significant trees to maximum extent practicable. Impervious surfaces are limited to only the areas required for vehicles. Bioretention facilities are located to maximize the treated impervious area within the project limits. Not all of the impervious areas within the project limits can feasibly be treated due to various reasons noted elsewhere in this report. As a result, the total post-construction treated impervious area (33,000 sf or 0.76 acres) for the project exceeds the total post-construction impervious area within the project limits requiring treatment (23,220 sf or 0.54 acres).

See the attached SWCP-1 drawing for the location of the various DMA's and bioretention facilities. Also attached are the construction plan drainage sheets to show the drainage components associated with the treatment facilities.

IV. Documentation of Drainage Design

IV.A. Descriptions of Each Drainage Management Area

IV.A.1. Drainage Management Areas

Table 2. Drainage Management Areas

DMA Name	Surface Type	Area (square feet)
DMA 1	Impervious	7,262
DMA 2	Impervious	6,412
DMA 3	Impervious	3,654
DMA 4	Impervious	5,889

IV.A.2. Drainage Management Area Descriptions

DMA 1, totaling 7,262 square feet, drains the portion of River Road, including the asphalt concrete (AC) paved roadbed and shoulder, that encompasses the area between the pavement conform at the southern project join and the superelevation transition point prior to of the new bridge. DMA 1 drains to Bioretention Area No. 1 which is located on the east side of the roadway within the right of way and adjacent to the Lands of Ernst.

DMA 2, totaling 6,412 square feet, drains the portion of River Road, including AC roadbed and paved shoulder from the superelevation transition point of DMA 1 to the high point of the new bridge south of Gill Creek. DMA 2 is located near the bridge approach and therefore cannot be treated due to the proximity of the adjacent slope.

DMA 3, totaling 3,654 square feet, drains the portion of River Road, including eastern half the AC roadbed and paved shoulder from the high point superelevation transition off the bridge to the north and ends at the project limits. DMA 3 drains to Bioretention Area No. 3 which is located on the east side of the roadway, north of the bridge, between the shoulder and right of way.

DMA 4, totaling 5,889 square feet, drains the portion of River Road, including western half the AC roadbed and paved shoulder from the high point of the bridge to the north and ends at the project limits. DMA 4 drains to Bioretention Area No. 2 which is located on the west side of the roadway, north of the bridge, between the shoulder and right of way.

As identified on the SWCP-1 plan sheet and noted above DMA 2 cannot be feasibly routed to a treatment facility within the project limits. This is due to topographic limitations where the existing roadway superelevates and is adjacent to a steep fill slope.

Although some of the noted DMA's above do not reach treatment areas, the overall project is proposing to treat existing areas beyond the limits of the project that equal and exceed the total new + reconstructed impervious area of the project. In addition, per the Soil Survey website, the area of this project includes hydrologic soils of groups Type B and C, which include moderate existing infiltration characteristics. Therefore, there is a reasonable expectation that some or most of the impervious areas not captured by the engineered treatment facilities will still achieve some infiltration and treatment from the surrounding natural ground.

IV.B. Tabulation and Sizing Calculations

IV.B.1. Biofiltration Area Facility Sizing Calculations

Table 3. Biofiltration Area Facility Sizing Calculations

DMA Name	DMA Area (square feet)	Post-project surface type	DMA Runoff factor	DMA Area × runoff factor	Facility Name		
					Bioretention Area No. 1		
1	7,262	Imp	1.0	7,262	Sizing factor	Minimum Facility Size	Proposed Facility Size
5(1)	8,800	Imp	1.0	8,800			
Total>				16,062	0.04	642	689

(1) Offsite area entering the site from the south

DMA Name	DMA Area (square feet)	Post-project surface type	DMA Runoff factor	DMA Area × runoff factor	Facility Name		
					Bioretention Area No. 2		
4	5,889	Imp	1.0	5,889	Sizing factor	Minimum Facility Size	Proposed Facility Size
Total>				5,889	0.04	235	629

V. Source Control Measures

V.A. Site activities and potential sources of pollutants

The site activities include a continuous flow of vehicle traffic passing through and the potential for various pollutants to be dispersed throughout the life of the roadway. The pollutants would travel across the impervious pavement surfaces and into the swales along the shoulders which outlet to Gill Creek.

In addition, construction of the project will permanently disturb existing trees and other ground cover on the site. See table below for a summary of the potential source runoff pollutants, permanent source control BMPs and the operational source control BMPs.

V.B. Source Control Table

Table 4. Source Control Table

Potential source of runoff pollutants	Permanent source control BMPs	Operational source control BMPs
On-site storm drain inlets	Inlets will be marked with the words "No Dumping! Flows to Creek".	Maintain and periodically repaint or replace inlet markings.
Landscape	Preserve existing native trees, shrubs, and ground cover to maximum extent possible. For bioretention areas, plant selection will be appropriate to the site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping/bioretention areas.

V.C. Features, Materials, and Methods of Construction of Source Control BMPs

Bioretention soil mix will be used along with appropriate plantings to provide the necessary treatment for the storm water received from the impervious surfaces.

VI. Stormwater Facility Maintenance

VI.A. Ownership and Responsibility for Maintenance in Perpetuity

The County of Sonoma will maintain the bioretention facilities.

The applicant (County of Sonoma) accepts responsibility for interim operation and maintenance of stormwater treatment and flow-control facilities until such time as this responsibility is formally transferred to a subsequent owner.

VI.B. Summary of Maintenance Requirements for Each Stormwater Facility

The biofiltration facilities soil mix will require monitoring and occasional amendments on an as-needed basis. It is anticipated that this could occur every 3 to 5 years.

VII. Construction Checklist

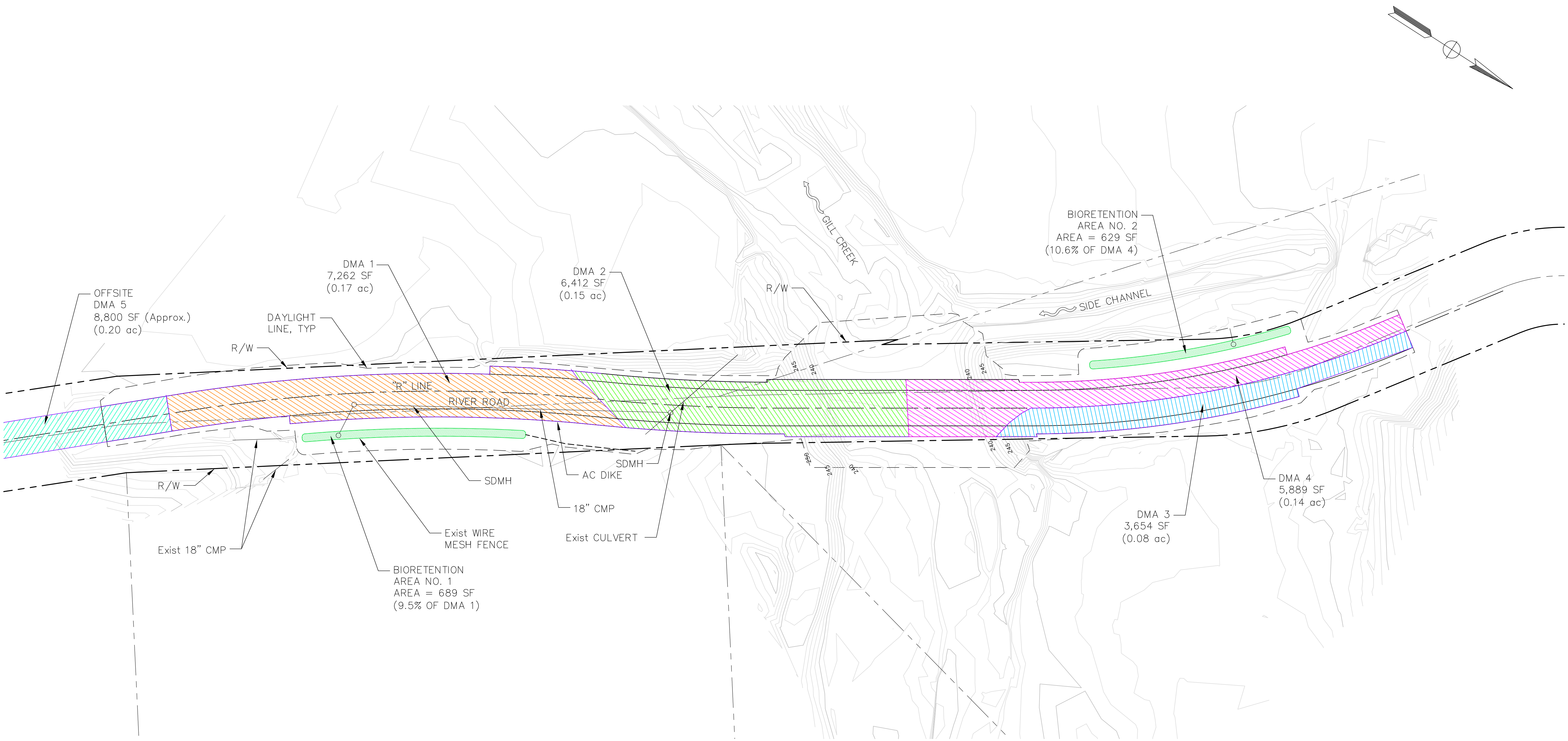
Table 5. Construction Checklist

Stormwater Control Plan Page #	Source Control or Treatment Control Measure	See Plan Sheet #s
SWCP-1	Bioretention Area No. 1	D-1
SWCP-1	Bioretention Area No. 2	D-1

VIII.Certifications

The preliminary design of stormwater treatment facilities and other stormwater pollution control measures in this plan are in accordance with the current edition of the Bay Area Stormwater Management Agencies Association (BASMAA) *Post-Construction Manual*.

ATTACHMENT 1
STORMWATER CONTROL PLAN EXHIBIT



PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

SWCP-1

DESIGN:	–	"AS BUILT" INFORMATION TO BE COMPLETED AFTER CONSTRUCTION	DATE	REVISION	BY	APPROVED
DRAWING:	–					
CHECKED:	–					
DATE:	–	REGISTERED CIVIL ENGINEER:				

MN Logo Stacked 4.2.04.jpg

2185 NORTH CALIFORNIA BLVD, SUITE 500
WALNUT CREEK, CALIFORNIA 94596
(925) 944-5411

Sonoma County.bmp

COUNTY OF SONOMA
2300 COUNTY CENTER DRIVE, SUITE B 100
SANTA ROSA, CALIFORNIA 95403
(707) 565-2231

RIVER ROAD BRIDGE REPLACEMENT OVER GILL CREEK

STORMWATER CONTROL PLAN

ROAD NUMBER	BUDGET NUMBER	FISCAL YEAR	SHEET NUMBER	TOTAL SHEETS
09018	C11002	–	9	–

ATTACHMENT 2
DRAINAGE PLAN D-1

30' 0' 30' 60'
SCALE: 1"=30'

65% UNCHECKED PLANS

D-1

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

DESIGN:	–	"AS BUILT" INFORMATION TO BE COMPLETED AFTER CONSTRUCTION	
DRAWING:	–		
CHECKED:	–		
DATE:	–	REGISTERED CIVIL ENGINEER:	

DATE	REVISION	BY	APPROVED

moffatt & nichol
2185 NORTH CALIFORNIA BLVD, SUITE 500
WALNUT CREEK, CALIFORNIA 94596
(925) 944-5411

COUNTY OF SONOMA
2300 COUNTY CENTER DRIVE, SUITE B 100
SANTA ROSA, CALIFORNIA 95403
(707) 565-2231

GILL CREEK
BRIDGE REPLACEMENT

GRADING AND DRAINAGE PLAN

ROAD NUMBER	BUDGET NUMBER	FISCAL YEAR	SHEET NUMBER	TOTAL SHEETS
09018	C11002	–	10	–

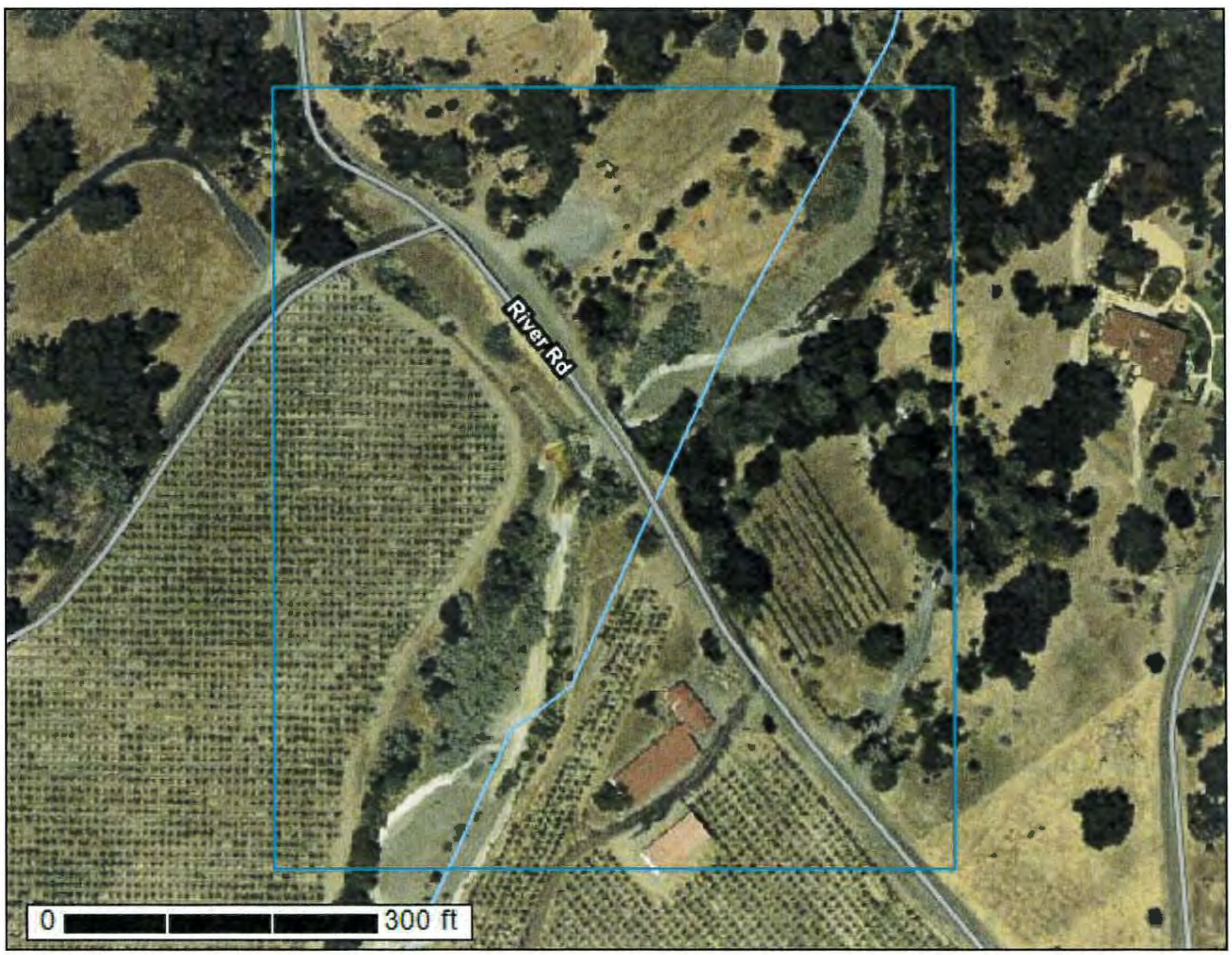
ATTACHMENT 3
NRCS SOIL REPORT

USDA 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
Sonoma County, California



March 21, 2022

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 (https://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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Contents

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.

Soil Map

Map Scale: 1:1,530 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 20, 40, 80, 120

Feet: 0, 50, 100, 200, 300

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 1:20,000.

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:
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: Sonoma County, California
Survey Area Data: Version 15, Sep 10, 2021

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

Date(s) aerial images were photographed: Jul 2, 2019—Jul 5, 2019

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MbC	Manzanita gravelly silt loam, 0 to 9 percent slopes	2.7	24.2%
RnA	Riverwash	4.4	39.7%
StF	Suther loam, 30 to 50 percent slopes	0.6	5.1%
YsA	Yolo silt loam, 0 to 5 percent slopes, MLRA 14	2.4	21.4%
YuF	Yorkville clay loam, 30 to 50 percent slopes	1.1	9.6%
Totals for Area of Interest		**11.1**	**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.

Sonoma County, California

MbC—Manzanita gravelly silt loam, 0 to 9 percent slopes

Map Unit Setting

National map unit symbol: hfh5
Elevation: 1,000 to 1,600 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 230 to 250 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Manzanita

Setting

Landform: Alluvial fans, terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Alluvium derived from basic igneous rock

Typical profile

H1 - 0 to 4 inches: gravelly silt loam
H2 - 4 to 29 inches: clay loam
H3 - 29 to 47 inches: gravelly clay loam
H4 - 47 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 9 percent
Depth to restrictive feature: More than 80 inches
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
Available water supply, 0 to 60 inches: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R014XG918CA - Loamy Fan
Hydric soil rating: No

Minor Components

Haire

Percent of map unit: 4 percent

Hydric soil rating: No

Yolo

Percent of map unit: 4 percent
Hydric soil rating: No

Zamora

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed

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

RnA—Riverwash

Map Unit Setting

National map unit symbol: hfj7
Elevation: 700 to 2,900 feet
Mean annual precipitation: 8 to 15 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Riverwash: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Riverwash

Setting

Landform: Flood plains
Parent material: Sandy and gravelly alluvium

Typical profile

H1 - 0 to 6 inches: very gravelly sand
H2 - 6 to 60 inches: stratified very gravelly coarse sand to very gravelly sand

Properties and qualities

Slope: 0 to 2 percent
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: FrequentNone
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Hydric soil rating: Yes

Minor Components

Unnamed

Percent of map unit: 15 percent
Hydric soil rating: No

StF—Suther loam, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hfk8
Elevation: 300 to 3,000 feet
Mean annual precipitation: 40 inches
Mean annual air temperature: 55 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Suther

Setting

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

Typical profile

H1 - 0 to 3 inches: loam
H2 - 3 to 14 inches: clay loam
H3 - 14 to 36 inches: gravelly clay
H4 - 36 to 59 inches: weathered bedrock

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Moderately 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
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R015XD134CA - STEEP CLAYPAN
Hydric soil rating: No

Minor Components

Laughlin

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

Hugo

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

Josephine

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

YsA—Yolo silt loam, 0 to 5 percent slopes, MLRA 14

Map Unit Setting

National map unit symbol: 2w8b0
Elevation: 30 to 790 feet
Mean annual precipitation: 31 to 54 inches
Mean annual air temperature: 56 to 60 degrees F
Frost-free period: 240 to 260 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Yolo

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from volcanic and sedimentary rock

Typical profile

Ap - 0 to 8 inches: silt loam
C - 8 to 60 inches: loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline (0.3 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R014XG918CA - Loamy Fan
Hydric soil rating: No

Minor Components

Pleasanton

Percent of map unit: 5 percent

Cortina

Percent of map unit: 5 percent

Pajaro

Percent of map unit: 5 percent

YuF—Yorkville clay loam, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hfkz
Elevation: 50 to 2,000 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 57 degrees F
Frost-free period: 175 to 270 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Yorkville

Setting

Landform: Hills

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from igneous and metamorphic rock

Typical profile
H1 - 0 to 14 inches: clay loam
H2 - 14 to 43 inches: clay
H3 - 43 to 59 inches: weathered bedrock

Properties and qualities
Slope: 30 to 50 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R015XD134CA - STEEP CLAYPAN
Hydric soil rating: No

Minor Components

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

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

Suther
Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 1 percent
Landform: Drainageways
Hydric soil rating: Yes

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APPENDICES