Attachment 5

NORTH BAY CIVIL CONSULTING

Technical Memorandum

For

Green Field Farm

Cultivation Operations

Project Name: Green Field Farm

Project Location: 20150 Black Bass Pass Road, Lower Lake, CA 95457

Risk Level: Tier 2 Low

Client: Sergey Yusupov

Prepared By: Matthew Klein, CA P.E. 79674, Senior Project Manager

Date: November 23, 2021

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INTRODUCTION AND PURPOSE

The intent of this hydrology technical memorandum is to analyze the ground water supply for the above-named project in accordance with the Lake County Board of Supervisors Urgency Ordinance 3106 (Ordinance 3106). Requiring land use applicants to provide enhanced water analysis during a declared drought emergency. Ordinance 3106 requires that all projects that require a CEQA analysis of water use include the following items in a Hydrology Report prepared by a licensed professional experienced in water resources:

- Approximate amount of water available for the project's identified water source,
- Approximate recharge rate for the project's identified water source, and
- Cumulative impact of water use to surrounding areas due to the project.

The purpose of this Technical Memorandum (TM) is to provide the information required by Ordinance 3106 for UP 20-30, Green Field Farm. In addition to the Hydrology Report, Ordinance 3106 requires a Drought Management Plan (DMP) depicting how the applicant proposes to reduce water use during a declared drought emergency.

PROJECT LOCATION

The project is located 20150 Black Bass Pass Road, Lower Lake, CA 95457 (APN: 012-052-02). The project site is located approximately 6.3-miles Southeast of the City of Clearlake.

PROJECT OVERVIEW

Existing Conditions

The existing conditions of the project site include three single-level homes, two detached garages, and full perimeter fencing. The site is developed with level terrain, wide roads, and utilities. The remaining area of the property surrounding the residencies consist of native grass, trees, four ponds, and designated livestock areas. Per the Envirostor website, there are no known historic sources of contamination at the site or within 1,000 feet of the project site. The project's proposed cannabis cultivation water source will be a well located on the property just Northeast of the cultivation area.

The project site's sheet flow currently flows in a Western direction towards Hidden Valley Lake. Stormwater is conveyed through surface runoff and flows across natural vegetation creating a vegetative buffer between discharge area and watercourses. Stormwater discharge at all locations on the site are not considered direct discharges into the creek, as defined by the State Water Board. The property varies in slope, ranging from 0% to 10%. The project parcel ranges in elevation from 1,770 feet to 1,810 feet above mean sea level (Information derived from Google Earth). The location where cannabis cultivation will occur slopes roughly at 0% to 6%. Existing site vegetation, topography, drainage patterns, stormwater conveyance systems, and watercourses are shown on the site plan that was submitted to the County of Lake.

The site is underlain by a topsoil of gravelly loam. The subsoil horizons consist of Konocti-Hambright complex. The area that will be utilized for the proposed cannabis operation consists of a gravelly loam. The Soil Analysis reference for the proposed cultivation area can be found in Appendix B.

Proposed Conditions

The project is proposing 2 acres of outdoor cultivation in the project area. This project proposes a number of site improvements to ensure that the cultivation site meets all local and state regulations and guidelines. The proposed improvements consist of a security fence around cultivation site, security system, additional employee parking, trash bins, storage sheds, portable ADA toilets, etc. Plants are to be planted in above ground planter bags. The limits of the canopy and cultivation area are shown on the Overall Site Plan.

PROJECT WATER DEMAND

The CalCannabis Environmental Impact Report (CDFA, 2017) uses a conservative estimate of 6.0 gpd and assumes that there are approximately 500 plants per acre of canopy and the demand is 3,000 gpd (2.1 gallons per minute [gpm]) per acre of canopy; this use rate is consistent with the Water Use Management Plan section (Section 12) of the project's Property Management Plan. The total water demand for 2-acres of canopy is approximately as follows:

Water Demand Calculations:

- Daily – 6,000 gpd (4.2 gpm)
- Annually (Cultivation Season)
  - i. 180-day cultivation season – 3.3 acre-feet (AF)
    - ➢ Typical for 1 acre of Outdoor plant cultivation.

WATER SOURCE AND SUPPLY

There is one (1) existing permitted groundwater well that will be used for cultivation (Lat/Long, 38.842053°, -122.539604°). The well is approximately 190 feet deep and has existed on the property since April 1980. The static water level was at 50-feet below the ground surface prior to pumping and lowered to 160-feet below the ground surface at the end of well test (Appendix A). Using USGS topography, the surface elevation at the well is approximately 1,811-feet; the initial and static water level elevations are approximately 1,761-feet, respectively.

The well was estimated to have a yield of 40 gpm (64.52 acre-feet per year). The potential daily demand of 4.2 gpm represents 10.5% of the well yield and between 3.4%-5.1% of the annual well production in acre-feet.

IRRIGATION AND WATER STORAGE

Irrigation for the cultivation operation will use water supplied by the existing well. The irrigation water would be pumped from the well via PVC piping to (8) 2,500-gallon water storage tanks, totaling 20,000 gallons of water storage and then delivered to a drip irrigation system. The drip lines will be sized to irrigate the cultivation areas at a rate slow enough to maximize absorption and prevent runoff.

GROUNDWATER BASIN INFORMATION AND HYDROGEOLOGY

The well site located nearest to the Coyote Valley Groundwater Basin (Basin #5-018). The well is approximately 2.87 miles North of the basin boundary (Appendix D). Thus, it is likely the well draws from the Coyote Valley Basin. According to the California Department of Water Resources (DWR), the major source of groundwater is from Putah Creek. Other amounts are derived from rain that falls within the 10 square miles of the watershed drainage area (DWR Bulletin 118).

The Coyote Valley Basin is east of Coyote Valley Basin is in the southeastern portion of the County along Putah Creek (Figure 2-14) and is part of the Upper Putah Inventory Unit. Coyote Valley Basin is 5 miles long and 2.5 miles wide. Clear Lake Volcanics border Coyote Valley Basin to the east, Serpentinized ultramafic rocks border the basin to the south and west, and the Franciscan Formation borders the basin to the north. Low hills of basalt are found in the south and southeastern part of the valley. Coyote Valley Basin consists of two water-bearing formations; Holocene Alluvium and Plio-Pleistocene Volcanics and Cache Formation. Holocene Alluvium is the primary water-bearing unit in the basin and overlies the Cache Formation. Holocene Alluvium consists of floodplain and channel deposits of Putah Creek and alluvial fan deposits in the southwestern portion of the valley and at the valley boundaries. The deposits are primarily composed of poorly stratified sand and gravel, with limited fine grained material. The formation is predominantly interbedded coarse sand and gravel, and ranges from about 100 to 300 feet thick (DWR 1976). Groundwater within the upper 100 feet of the formation is largely unconfined (Peterson 1996). Wells drilled in the alluvium produce on average 1,000 gallons per minute (Aust 2006). The Plio-Pleistocene Volcanics and Cache Formation consist of a mixture of volcanic rocks and sediments that may be related to the Cache Formation. The southeastern part of the valley contains volcanic rocks and Cache Formation tuffaceous deposits that may be waterbearing. The poorly consolidated tuffaceous deposits are found fairly deep beneath the hills to the northeast where they are overlain and potentially interbedded with basaltic flows. The northeast edge of the valley contains Cache Formation outcrops that likely underlie much of the alluvium. The Cache Formation is made of gravel, silt, sand and the upper layers contain water-laid tuffs and tuffaceous sands become dominant (DOM 1953). The Cache Formation has low permeability because most of the strata are too high in clay or silt to allow for great water movement.

Putah Creek is the main groundwater recharge source for Coyote Valley Basin. Some recharge occurs from precipitation on the alluvial plain and from side-stream runoff. The USGS Water Supply Paper 1297 estimates the storage capacity of the basin to be 27,000 acre-feet. This estimate is based on the areal extent of alluvium within the basin (approximately 3000 acres) for a saturated depth interval of 10 to 100-feet having a specific yield of 10 percent (Upson 1955). DWR (1960) estimates the storage capacity to be 29,000 acre-feet with a useable storage capacity of 7,000 acre-feet.

The Coyote Valley Basin Groundwater Basin has not been identified by the California Department of Water Resources (DWR) as a critically overdrafted basin. DWR defines critically overdrafted as, “A basin subject to critical overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts." The California Statewide Groundwater Elevation Monitoring (CASGEM) program was developed by DWR to establish a permanent, locally managed system to monitor groundwater elevation in California’s alluvial groundwater basins and subbasins. A statewide ranking system, CASGEM Groundwater Basin Prioritization, was created to prioritize California ground water basins to help assess the need for additional groundwater level monitoring. The rankings for the Groundwater Basin Prioritization are classified into four categories high-priority, medium-priority, low-priority, or very low-priority. The Coyote Valley Groundwater Basin is ranked as very low-priority basins by the CASGEM ranking system. (DWR, 2021).

Recharge Rate

The annual recharge rate can be estimated using a water balance equation, where recharge is equal to precipitation (P) minus runoff (Q) and abstractions that do not contribute to infiltration (e.g., evapotranspiration). The equation that can be used to estimate runoff and abstractions, that uses readily available data, is the Natural Resources Conservation Service (NRCS) Curve Number (CN) Method (NRCS, 1986). Determination of the CN depends on the watershed’s soil and cover conditions, cover type, treatment, and hydrologic condition.

The CN Method runoff equation is:

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$$

Where:

Q = runoff (inches)
P = rainfall (inches)
S = potential maximum retention after runoff begins (inches) and
I_a = initial abstraction (inches)

The initial abstraction (I_a) represents all losses before runoff begins, including initial infiltration, surface depression storage, evapotranspiration, and other factors. The initial abstraction is estimated as $I_a = 0.2 * S$, S is related to soil and cover conditions of the watershed through the CN, determined as $S = \frac{1000}{CN} - 10$. Using these relations, the runoff equation becomes:

$$Q = \frac{(P - 0.2 * S)^2}{(P + 0.8 * S)}$$

The CN is estimated based on hydrologic soil group (HSG), cover type, condition, and land use over the area of recharge, which is estimated as the area of the Coyote Valley Groundwater Basin watershed contributing to the well. The elevation of the initial water level, measured when the well was tested in April 1980, was approximately 1,761-feet. The approximate elevations within the Coyote Valley Groundwater Basin range between a maximum of 1,239-feet and a minimum of 938-feet. Since the well is screened from an elevation of 1,661 to 1,621- feet, it is likely the recharge area is likely most of the Coyote Valley Basin Watershed. However, to be conservative, a localized area of approximately 835.96 acres of recharge was assumed (Appendix D).

The recharge area soils are classified using the NRCS Web Soil Survey. The different classifications of the recharge soils are classified into four Hydrologic Soil Groups (HSGs) A, B, C, and D. The HSGs are used to determine the soil's ability to infiltrate water. HSG A has the highest infiltration potential and HSG D has the lowest infiltration potential. The project's site recharge area is considered to have both HSG C and HSG D. HSG D will be used to provide a more conservative value. The site is undeveloped with a cover type of brush and is in fair condition (50% to 75% ground cover) and has a CN of 84.

The PRISM Climate Group gathers climate observations from a wide range of monitoring networks and provides time series values of precipitation for individual locations (https://prism.oregonstate.edu/explorer/). Using the annual precipitation from 1895 to 2020, as predicted by PRISM, the annual average precipitation over this period is 35.47 inches and the minimum precipitation over this period is 7.09 inches (Appendix C).

Using the above information, and assuming that 50% of the initial abstraction infiltrates and the remainder is evapotranspiration (0.19 inches or 13.27 AF), the estimated annual recharge over the recharge area of 835.96 acres is 139.13 AF during an average year and 116.62 AF during a dry year (Table 1).

Table 1. Estimated annual recharge over the recharge area of the project's well.

	Recharge Area (acres)	P (inches)	CN	S (inches)	I_a (inches)	Q (inches)	Recharge = *P - Q - 0.5*I_a* (inches)	Recharge (AF)
Min	836	7.09	84	1.9	0.38	5.23	1.67	116.62
Avg	836	35.47	84	1.9	0.38	33.28	2.00	139.13

CUMULATIVE IMPACT TO SURROUNDING AREAS

The Coyote Valley Basin groundwater is accumulated from Putah Creek and from rain that falls within the 10 square mile Coyote Valley Basin Watershed drainage area (DWR). Coyote Valley Groundwater Basin has a storage capacity of 105,000 AF and has a usable storage capacity of 60,000 AF (DWR 118). The proposed Green Field Farm project's annual water demand could change depending on the length of the cultivation season. The demand is estimated to be 3.3 to 6.6 AF per year, or approximately 2.8% and 5.6% of the annual recharge during an average and dry year, respectively. Green Field Farm would need approximately 0.25-inches of rainfall to infiltrate into the recharge area shown in Appendix D, to satisfy its demand. Thus, there is sufficient recharge, on an annual basis, to meet the project's demand.

The Lake County Groundwater Management Plan (Table 3-1), states that there are 86 domestic wells, 17 irrigation wells, 5 municipal wells, 6 monitoring wells, and 13 others wells in the Coyote Valley Groundwater Basin. The groundwater demand from agriculture in an average year is 4,073 AF (Table 2-5). The demand from additional proposed cannabis cultivation projects in the Coyote Valley Groundwater Basin is not included in the 2006 Groundwater Management Plan, so the total additional proposed cannabis cultivation is unknown. It will be assumed that new cannabis cultivation could add an additional 15 to 25 acres to the Coyote Valley Groundwater Basin. This additional agricultural demand of the groundwater could increase by 41.3 AF. With the addition of these new cultivations and the proposed Green Field Farm project, the annual groundwater demand could increase up to 44.6 AF of the leftover usable storage capacity of the Coyote Valley Groundwater Basin.

Therefore, the proposed project water use would have little to no cumulative impact on the agricultural groundwater demand.

QUALIFICATIONS OF AUTHOR

I am a registered Professional Engineer with the State of California with 5-years of experience practicing Water Resources Engineering.

REFERENCES

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NRCS Technical Release 55. June 1986. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044171.pdf

APPENDIX A: Well Report & Test

12N/06W-32M

ORIGINAL

File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

Do not fill in

No. 084024

Notice of Intent No.

Local Permit No. or Date

AP 012-052-02

State Well No.

Other Well No.

(1) OWN

Address

City

(2) LOCATION OF WELL (See instructions):

County — Owner's Well Number

Well address if different from above 1472Z SPRUCE GROVE RD

Township — Range — Section

Distance from cities, roads, railroads, fences, etc. 12N/06W-32

WELL LOCATION SKETCH

(3) TYPE OF WORK:

New Well ☒ Deepening ☐

Reconstruction ☐

Reconditioning ☐

Horizontal Well ☐

Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:

Domestic ☒

Irrigation ☐

Industrial ☐

Test Well ☐

Stock ☐

Municipal ☐

Other ☐

(5) EQUIPMENT:

Rotary ☒ Reverse ☐

Cable ☐ Air ☒

Other ☐ Bucket ☐

(6) GRAVEL PACK:

Yes ☒ No ☐ Size 3/8

Diameter of bore

Packed from 20 to 190 ft.

(7) CASING INSTALLED:

Steel ☒ Plastic ☒ Concrete ☐

(8) PERFORATIONS:

Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	2	6 5/8	steel			
0	190	4	c160 pvc	150	190	1/8

(9) WELL SEAL:

Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 20 ft.

Were strata sealed against pollution? Yes ☒ No ☐ Interval ft.

Method of sealing cement

(10) WATER LEVELS:

Depth of first water, if known ft.

Standing level after well completion 50 ft.

(11) WELL TESTS:

Was well test made? Yes ☒ No ☐ If yes, by whom? driller

Type of test Pump ☐ Bailer ☐ Air lift ☒

Depth to water at start of test 50 ft. At end of test 160 ft

Discharge 40 gal/min after 2 hours Water temperature

Chemical analysis made? Yes ☐ No ☒ If yes, by whom?

Was electric log made? Yes ☐ No ☐ If yes, attach copy to this report

(12) WELL LOG:

Total depth ft. Depth of completed well ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	40	red clay and embedded rock
40	80	fract. red rock
80	100	hard blue volcanics
100	150	intermixed fract. volcanics
150	190	fract. red volcanics

JAN 25 2000

Work started 4- 19 80 Completed 4- 19 80

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED LARRY HERMAN by kathy read (Well Driller)

NAME FISCH-HERMAN DRILLING CO. (Person, firm, or corporation) (Typed or printed)

Address 5001 Gravenstein Hwy. N.

City Sebastopol, Calif. Zip 95472

License No. 304138 Date of this report 4-17-80

CONFIDENTIAL — NOT FOR PUBLIC USE — WATER CODE SEC. 13752

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

NORTH BAY CIVIL CONSULTING

APPENDIX B: NRCS Soil Survey Results

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

Lake County, California

May 10, 2021

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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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


122° 32' 36" W
122° 32' 21" W
539620
539680
539740
539800
539860
539920
539980
38° 50' 44" N
38° 50' 28" N
4299730
4299670
4299610
4299550
4299490
4299430
4299370
4299310
152
256
256
Soil Map may not be valid at this scale.
Map Scale: 1:2,350 if printed on A portrait (8.5" x 11") sheet.
Meters
0
30
60
120
180
Feet
0
100
200
400
600
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Lake County, California
Survey Area Data: Version 17, Jun 1, 2020

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
152	Konocti-Hambright complex, 5 to 15 percent slopes	20.8	77.1%
256	Water	6.2	22.9%
Totals for Area of Interest		**27.0**	**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.

Lake County, California

152—Konocti-Hambright complex, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: hf6c
Elevation: 200 to 4,300 feet
Mean annual precipitation: 15 to 35 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Konocti and similar soils: 40 percent
Hambright and similar soils: 20 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Konocti

Setting

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

Typical profile

H1 - 0 to 10 inches: gravelly loam
H2 - 10 to 29 inches: very stony sandy clay loam
H3 - 29 to 39 inches: bedrock

Properties and qualities

Slope: 5 to 15 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 29 to 33 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: R015XD113CA - VERY GRAVELLY LOAMY (LIVE OAK/ MANZANITA)
Hydric soil rating: No

Description of Hambright

Setting

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

Typical profile

H1 - 0 to 4 inches: very gravelly loam
H2 - 4 to 16 inches: very gravelly loam
H3 - 16 to 26 inches: bedrock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 16 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R015XD113CA - VERY GRAVELLY LOAMY (LIVE OAK/ MANZANITA)
Hydric soil rating: No

Minor Components

Aiken

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

Collayomi

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

Konocti, variant

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

Unnamed

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

Guenoc

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

Rock outcrop

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

Sobrante

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

256—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

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APPENDIX C: Prism Climate Precipitation

PRISM Time Series Data
Location: Lat: 38.8421 Lon: -122.5396 Elev: 1788ft
Climate variable: ppt
Spatial resolution: 4km
Period: 1895 - 2020
Dataset: AN81m
PRISM day definition: 24 hours ending at 1200 UTC on the day shown
Grid Cell Interpolation: Off
Time series generated: 2021-Nov-12
Details: http://www.prism.oregonstate.edu/documents/PRISM_datasets.pdf

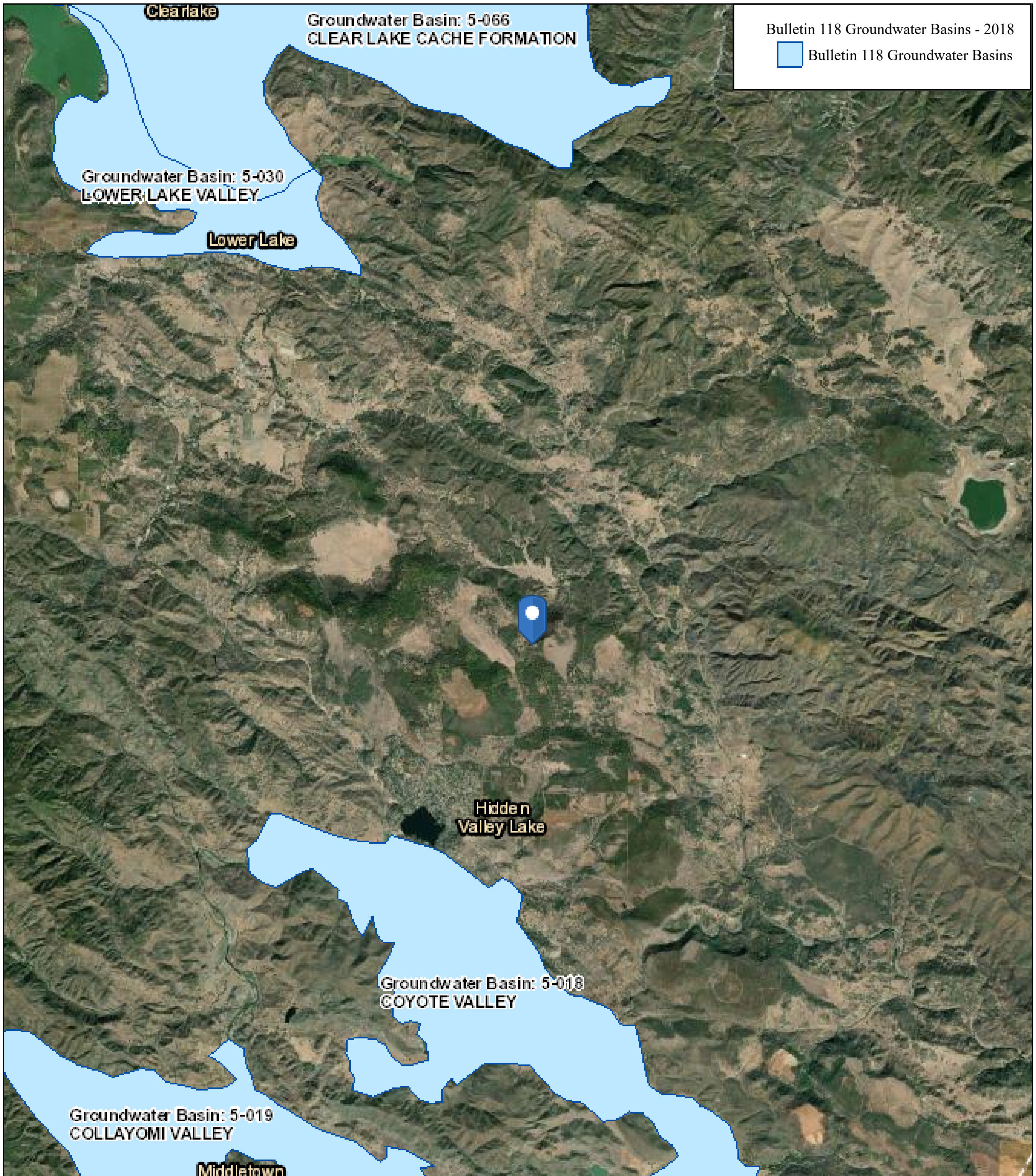
Date	ppt (inches)
1895	43.62
1896	49
1897	30.55
1898	19.5
1899	45.16
1900	30.24
1901	32.53
1902	45.9
1903	33.28
1904	56.39
1905	28.46
1906	52.01
1907	44.98
1908	23.22
1909	58.01
1910	21.97
1911	39.87
1912	27.23
1913	34.27
1914	40.24
1915	48.29
1916	38.35
1917	19.37
1918	27.09
1919	30.19
1920	37.01
1921	30.68
1922	35.81
1923	17.84
1924	25.8
1925	32.9
1926	42.22
1927	37.62
1928	26.81
1929	20.91
1930	20.93

	ppt (inches)
Min:	7.09
Average:	35.47
Max:	76.58

1931	31.96
1932	16.61
1933	28.31
1934	23.63
1935	31.15
1936	32.29
1937	43.16
1938	39.06
1939	17.56
1940	62.22
1941	57.97
1942	43.54
1943	27.9
1944	35.65
1945	39.79
1946	19.13
1947	22.26
1948	30.59
1949	22.8
1950	44.56
1951	38.38
1952	45.08
1953	28.99
1954	39.34
1955	36.87
1956	31.58
1957	41.19
1958	45.32
1959	27.15
1960	38.72
1961	26.91
1962	38.22
1963	39.9
1964	37.14
1965	33.36
1966	32.95
1967	39.78
1968	39.86
1969	49.71
1970	52.83
1971	24.93
1972	27.25
1973	53.69
1974	33.21
1975	34.14
1976	12.11
1977	26.88

1978	38.93
1979	44.81
1980	34.51
1981	43.88
1982	51.37
1983	76.58
1984	25.45
1985	23.19
1986	45.8
1987	33.5
1988	22.6
1989	23.59
1990	19.76
1991	29.69
1992	36.97
1993	42.46
1994	25.56
1995	64.86
1996	51.67
1997	34.23
1998	56.47
1999	29.68
2000	33.55
2001	41.67
2002	35.59
2003	37.75
2004	36.73
2005	47.6
2006	41.07
2007	19.56
2008	26.12
2009	25.82
2010	47.81
2011	30.77
2012	43.7
2013	7.09
2014	36.2
2015	17.99
2016	43.48
2017	53.39
2018	28.78
2019	52.87
2020	12.8

APPENDIX D: Maps



0 1 2mi

N W E S

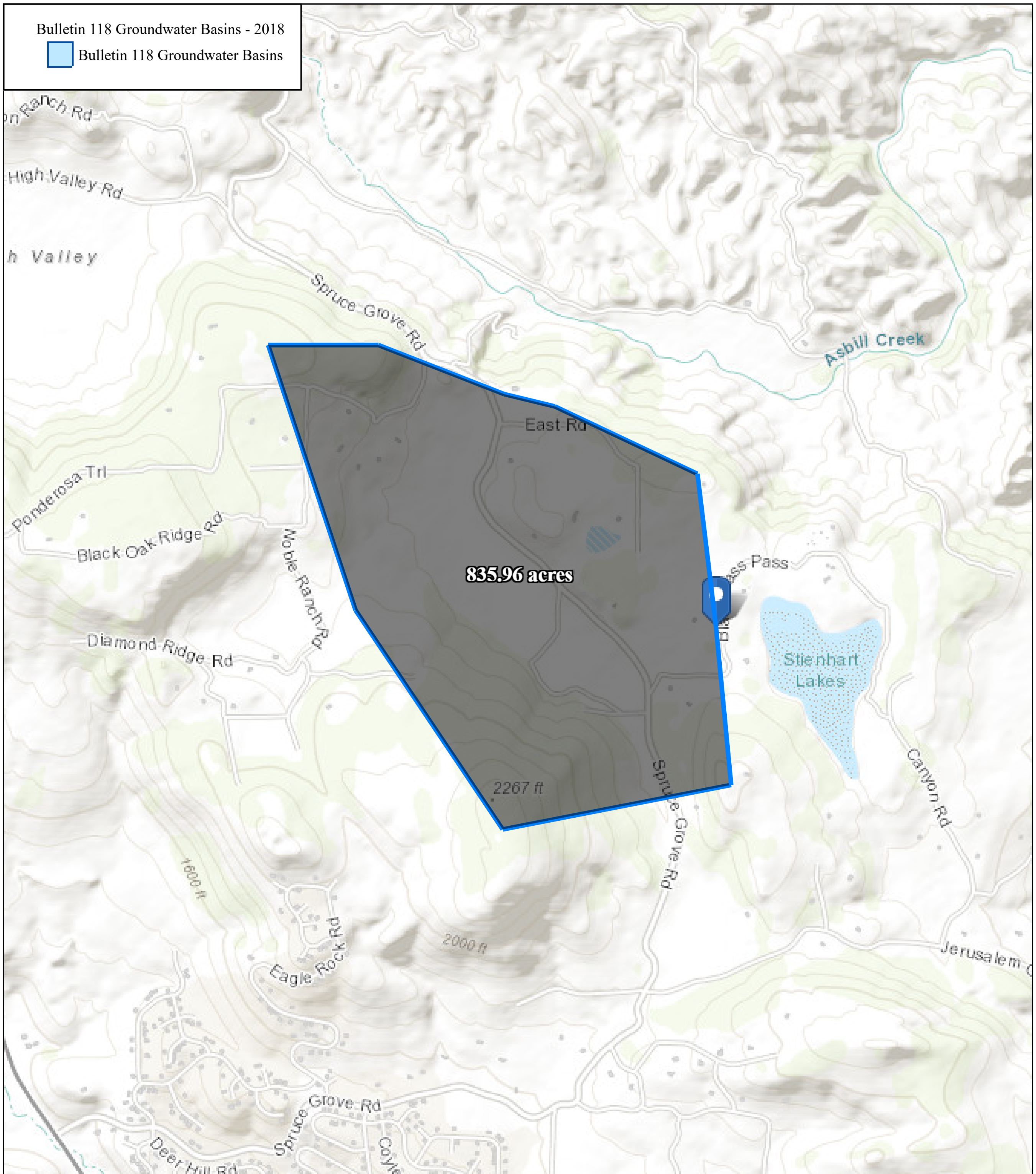
Datum: WGS 1984
Projection: Mercator Auxiliary
Zone:
Units: Mile
Source:

Groundwater Basin Map

Project Location:
20150 Black Bass Pass Rd,
Lower Lake, CA 95457

NORTH BAY | CIVIL CONSULTING

Prepared	ANR	Figure:	001
Job No.:	20-009	Date:	11/23/2021
File:			



0 0.2 0.4mi

N W E S

Datum: WGS 1984
Projection: Mercator Auxiliary
Zone:
Units: Mile
Source:

Watershed Area Map

Project Location:
20150 Black Bass Pass Rd,
Lower Lake, CA 95457

NORTH BAY CIVIL CONSULTING

Prepared ANR	Figure: 002
Job No.: 20-009	Date: 11/19/2021
File:	

Drought Management Plan

For

Green Field Farm

Cultivation Operations

Project Name: Green Field Farm

Project Location: 20150 Black Bass Pass Road, Lower Lake, CA 95457

Risk Level: Tier 2 Low

Client: Sergey Yusupov

Prepared By: Matthew Klein, CA P.E. 79674, Senior Project Manager

Date: November 12, 2021

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Cover Crops: 5
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INTRODUCTION AND PURPOSE

The purpose of this Drought Management Plan is to provide the information required by Ordinance 3106 for UP 20-30, Green Field Farms. Ordinance 3106 requires a Drought Management Plan (DMP) delineating how the applicant proposes to reduce water use during a declared drought emergency.

PROJECT LOCATION

The project is located 20150 Black Bass Pass Road, Lower Lake, CA 95457 (APN: 012-052-02). The project site is located approximately 6.3-miles Southeast of the City of Clearlake.

WATER REDUCTION MEASURES

This project proposes reduction measures that will assist in reducing water loss and minimize the total amount of water use for the proposed project. During drought conditions water availability for the county will be at a critical low. Droughts can reduce the water availability and quality necessary for productive farms, ranches, and grazing lands. It can also contribute to insect outbreaks, increases in wildfire, and altered rates of carbon, and nutrients impacting agricultural production and critical ecosystem services. The proposed water reduction measures are as follows:

Daily Monitoring and Leak Inspection:

Routine inspections of water lines will be made to ensure there are no leaks present. Daily monitoring of the water system shall be conducted and documented to identify any rise or deviation in daily water usage.

Drip Irrigation:

Drip irrigation will be the sole method of watering the cultivation site. Drip irrigation can save up to 80% more water than conventional irrigation methods and can contribute to increased crop yields.

Irrigation Scheduling:

Irrigation scheduling utilizes watering during cooler parts of the day, reducing the amount of water loss due to evaporation. Sensors can be implemented to detect soil moisture levels and soil temperature to further accurately determine when watering is necessary.

Compost and Mulch:

Compost and mulch will be implemented to all cannabis plant soil. Compost or decomposed organic matter used as fertilizer improves soil structure, increasing the soil’s water-holding capacity. Mulch will consist of organic materials such as straw or wood chips that will be spread on top of the soil to conserve moisture. Mulch breaks down into compost, further increasing the soil’s ability to retain water.

Cover Crops:

Cover crops will be implemented to all cannabis plants. Cover crops use perennial grass to protect the bare soil that surrounds a cannabis plant. Cover crops reduce weeds and increase soil fertility and organic matter, improving compaction and prevention of erosion. In addition, cover crops benefit the ability of water to penetrate the soil and retain water, improving the soil's water-holding capacity.

Organic Practices:

The proposed cultivation site will be certified organic. Use of organic materials and amendments prevents toxic pesticides from affecting waterways and the overall environment. Healthy soil that is rich in organic matter and microbial life serves as a sponge that delivers moisture to plants and improves the recharge. Organic cultivation can recharge groundwater supplies up to 20 percent.

Conservation Tillage: (For In-ground Cultivation)

Conservation tillage uses specialized plows or other implements that partially till the soil but leave at least 30 percent of vegetative crop residue on the surface. Similar to cover crops, conservation tillage helps increase water absorption and reduce evaporation, erosion, and compaction.