NORTHPOINT
CONSULTING GROUP, INC.



TECHNICAL MEMORANDUM

To: Lake County Community Development Department

From: Annjanette Dodd, PhD, CA PE #77756 Exp. 6/30/2023

Date: August 19, 2021

Subject: Ordinance 3106 Hydrology Report – UP 19-36 Lake Vista Farms, LLC
2050 and 2122 Ogulin Canyon Road, Clearlake, (APNs 010-053-01 and 010-053-02)

INTRODUCTION AND PURPOSE

On July 27, 2021, the Lake County Board of Supervisors passed an Urgency Ordinance (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 19-36, Lake Vista Farms, LLC. 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. The DMP for this project has been submitted as a separate document.

PROJECT LOCATION

The project is located 2050 and 2122 Ogulin Canyon Road, Clearlake, Lake County, California (APNs 010-053-01 and 010-053-02). The project site is located northeast of the City of Clearlake, about 1- mile east of State Highway 53. The project site is part of a former hops farm, operated as Hops-Meister Farms, cultivating approximately 13.6-acres of hops beginning in about 2009.

PROPOSED PROJECT

The project proposes 15-acres of outdoor cannabis cultivation without the use of light deprivation and/or artificial lighting. The proposed cultivation will be distributed across five (5) sites (Figure 1), labeled A through E.

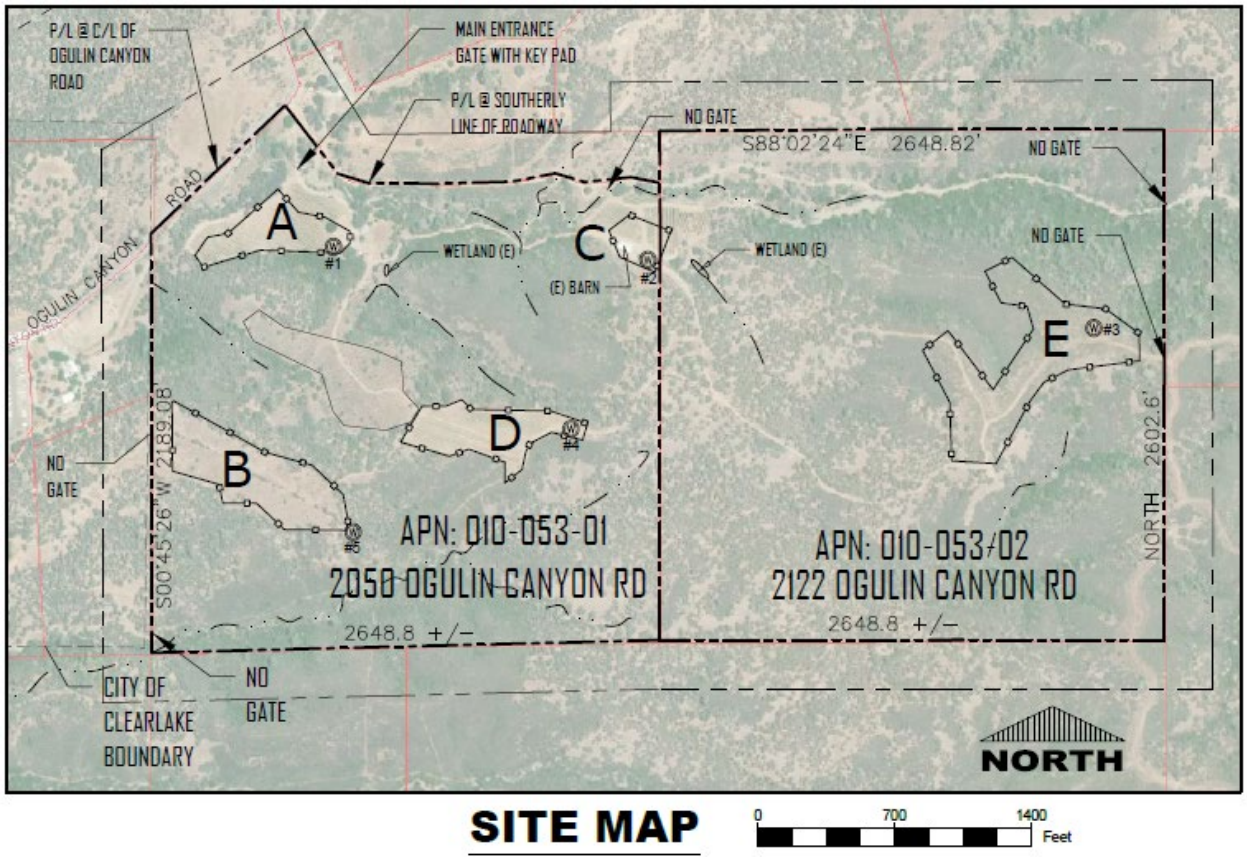


Figure 1. Proposed Site Map

PROJECT WATER DEMAND

The CalCannabis Environmental Impact Report (CDFA, 2017) uses 6.0 gallons per day per plant as an estimated water demand for cannabis cultivation. This is 1.0 gallons (gpd) per plant more than reported by Bauer et. el. (2015), who reported up to 5.0 (gpd) per plant (18.9 Liters/day/plant). Using the more conservative estimate of 6.0 gpd, and assuming there are approximately 500 plants per acre of canopy (CDFA, 2017), 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 15.2) of the project's Property Management Plan. The total water demand for 15-acres of canopy is approximately as follows:

- Daily – 45,000 gpd (31.5 gpm)
- Yearly
    - 120 day cultivation season – 16.6 acre-feet (AF)
    - 180 day cultivation season – 24.9 AF

WATER SOURCE AND SUPPLY

There are five (5) existing, permitted groundwater wells that would be used for cultivation. The yield for each well is summarized in the Table 1 and shown on Figures 1 and 3. The well logs are attached to this TM (Attachment 1). The wells range in depth from 114 ft to 460 ft and have a combined yield of 720 gpm

(1,161 acre-feet per year). The potential daily demand of 31.5 gpm represents 4.4% of the combined well yield and between 1.4-2.1% of the combined annual production in acre-feet.

Table 1. Summary of cannabis cultivation canopy areas for each cultivation site.

Site	Name (Well Latitude/Longitude)	Groundwater Basin[1]	Well #	Depth (ft)	Yield (gpm)
A	Northwestern Hops Field (38.982011, -122.599900)	Burns Valley	1	240	60
B	Southwest Clearing (38.978344, -122.599803)		5	340	300
C	Northeast Hops Field (38.982033, -122.594181)		2	114	60
D	Central Hops Field (38.979569, -122.595764)	Clearlake Cache Formation	4	358	200
E	Chaparral Clearing (38.980981, -122.586219)		3	460	100

[1]California Department of Water Resources, California Groundwater (Bulletin 18)

IRRIGATION AND WATER STORAGE

Irrigation for the cultivation operation will use water supplied by the existing wells. The irrigation water would be pumped from each well, via PVC piping, to a 2,500-gallon water storage tank, adjacent to each well, 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. Drip irrigation systems, when done properly, conserve water compared to other irrigation techniques.

GROUNDWATER BASIN INFORMATION AND HYDROGEOLOGY

The project's water sources are located within the eastern portion of the Burns Valley (Basin #5-17) Groundwater Basin and the western portion of the Clear Lake Cache Formation (Basin #5-66) Groundwater Basin (Table 1, Figure 2 and Figure 3).

The Burns Valley Basin is within the Burns Valley Watershed. The Franciscan Formation borders the Burns Valley Basin on the north, Clear Lake borders the basin on the west, and the Cache Formation borders the basin on the south and east. The valley is drained by Burns Valley Creek, flowing southwest, and eventually into Clearlake. There are three water bearing formations in the Burns Valley Basin, The Quaternary Alluvium, Quaternary Terrace Deposits, and Lower Lake Formation. *Quaternary Alluvium* located in the valley lowlands in the southern end of the valley are composed of silt, sand, and gravel with a thickness up to 50 feet. Groundwater in this formation is unconfined and typically provides water for domestic use. *Quaternary Terrace Deposits* have been deposited on the sides of the alluvial plain in the Burns Valley Basin. The terrace deposits are approximately 15 feet above the valley floor and slope up the valley to a similar elevation as the foothill exposures of the Cache Formation. Groundwater in this formation is not well understood. The *Lower Lake Formation*, consisting of lake deposits, underlies the alluvial and terrace deposits in the basin. The formation consists of fine sands, silts, and thick interbeds of marl and limestone, and has a maximum thickness of 200 feet. The formation has low permeability and provides water to wells at up to a few hundred gallons per minute. The California Department of Water Resources (DWR) estimated a storage capacity of the Burns Valley Basin as 4,000 AF with a usable storage

capacity of 1,400 AF. According to DWR, almost all the groundwater in the Burns Valley Basin is derived from rain that falls within the 12.5 square mile Burns Valley Watershed drainage area. According to the Lake County Groundwater Management Plan, dated 2006, agricultural demand during an average year is 105 AF per year; of this, 14 AF is supplied from groundwater. Wells in the valley range in depth between 25-feet and 525-feet. (CDM 2006 and California DWR 2003, 2021)

The Clear Lake Cache Formation Basin shares a boundary with the Burns Valley Groundwater Basin in the southwest. Lower Cretaceous marine and Mesozoic ultrabasic intrusive rocks bound the south of the basin. Lower Cretaceous marine deposits border the east portion of the basin, and the Franciscan Formation borders the north and west portions of the basin. The basin is drained by the North Fork Cache Creek and Cache Creek to the south and east. The primary water-bearing formation is the Cache Formation. The Cache Formation is largely made up of lake deposits. The formation consists of tuffaceous and diatomaceous sands and silts, limestone, gravel, and intercalated volcanic rocks. In some areas the general lithology includes up to 400 feet of blue clay and shale with alternating strata of shale and limestone below 400-feet. The permeability of the formation is generally low. According to the Lake County Groundwater Management Plan, dated 2006, agricultural demand during an average year is 100 AF; of this, 85 AF is supplied from groundwater. Wells in the valley range in depth between 5-feet and 500-feet. (CDM 2006 and California DWR 2003, 2021)

Neither of these basins have been identified by the California Department of Water Resources (DWR) as critically overdrafted basins. Critically overdrafted is defined by DWR 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." In addition, as part of the California Statewide Groundwater Elevation Monitoring (CASGEM) Program, DWR created the CASGEM Groundwater Basin Prioritization statewide ranking system to prioritize California groundwater basins in order to help identify, evaluate, and determine the need for additional groundwater level monitoring. California’s groundwater basins were classified into one of four categories high-, medium-, low-, or very low-priority. Both the Burns Valley and Clear Lake Cache Formation Basins were ranked as very low-priority basins by the CASGEM ranking system. (DWR, 2021)

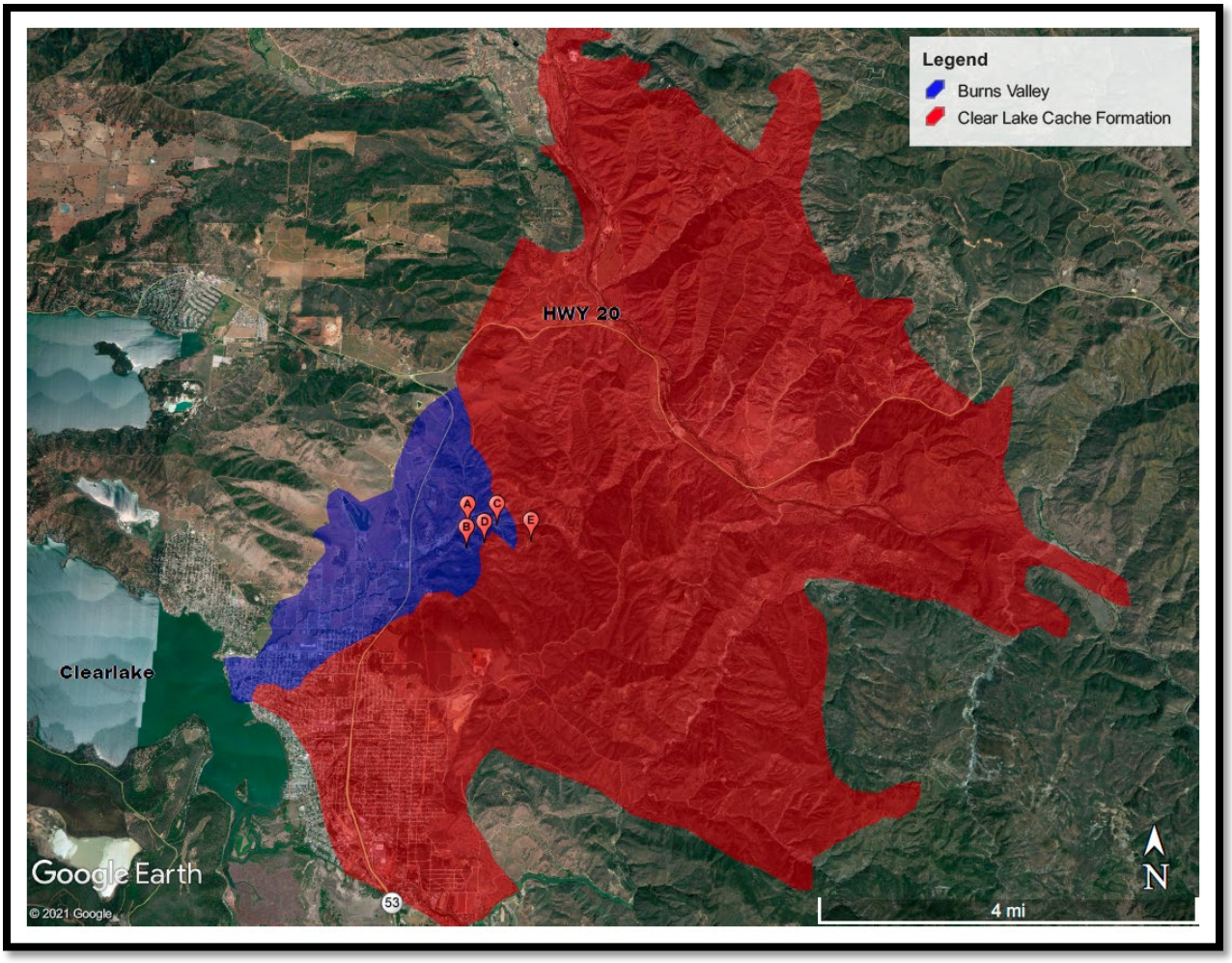


Figure 2. Field Locations (labeled A through E) and Mapped Groundwater Basins

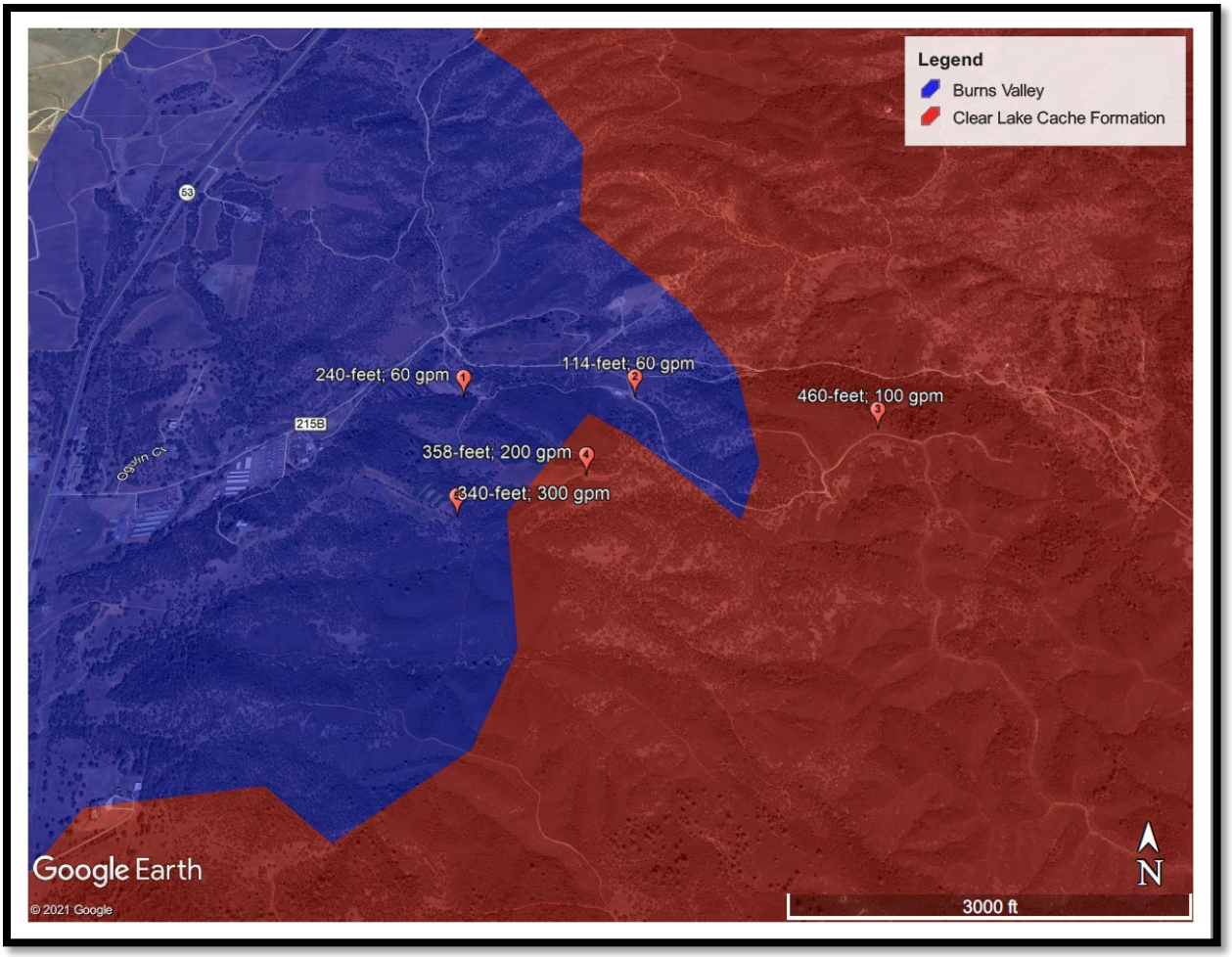


Figure 3. Well Locations (numbered 1 through 5) and Mapped Groundwater Basins

RECHARGE RATE

The annual recharge can be estimated using a water balance equation, where recharge is equal to precipitation (P) less runoff (Q) and abstractions that do not contribute to infiltration (e.g., evapotranspiration). A simple tool 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 $I_a = 0.2S$. S is related to soil and cover conditions of the watershed through the CN, determined as $S = 1000/CN - 10$. Using these relations, the runoff equation becomes:

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

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 watershed contributing to the wells. Although well numbers 3 and 4 are located in the Clear Lake Cache Formation, they are on the western boundary and within the Burns Valley Watershed. The approximate area of recharge, 954 acres, was delineated using USGS StreamStats (https://streamstats.usgs.gov/ss/) and is shown in Figure 4.

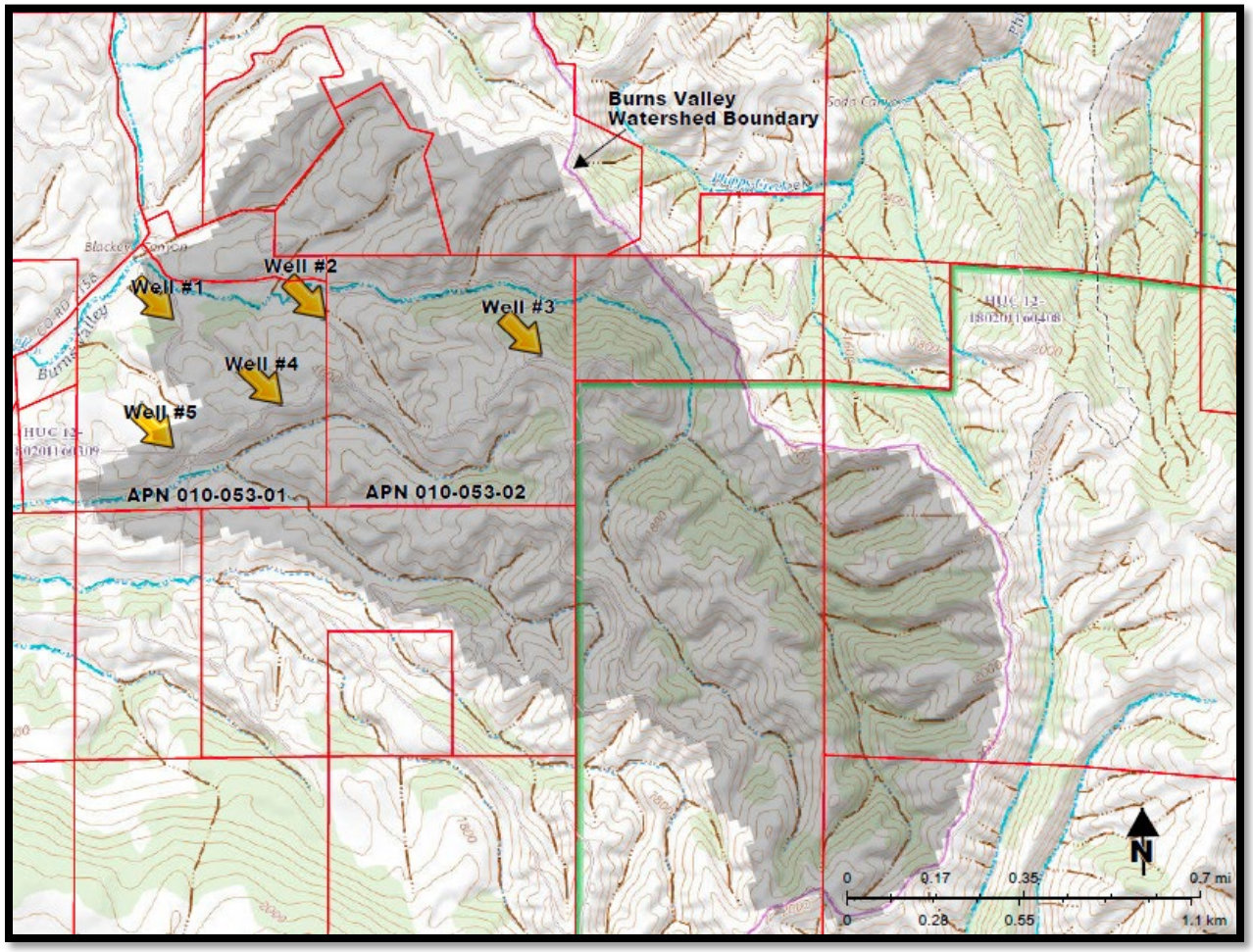


Figure 4. Recharge Area (Shaded Area)

Soils are classified into four HSGs (A, B, C, and D) according to the soils ability to infiltrate water; where HSG A has the highest infiltration potential and HSG D has the lowest infiltration potential. HSGs are based on soil type and are determined from the NRCS Web Soil Survey

(https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm).

The recharge area is comprised of two HSGs: 942 acres (99%) HSG C and 12 acres (1%) HSG D (Attachment 2). The area is dominated by HSG C. The land use is undeveloped with a cover type of brush in fair (50% to 75% ground cover) condition and has CNs of 70 and 77 for HSGs C and D, respectively. The weighted CN for the recharge area is 70.

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 27.5 inches and the minimum precipitation over this period is 6.5 inches (Attachment 3).

Using the above information, and assuming that 50% of the initial abstraction infiltrates and the remainder is evapotranspiration (0.43 inches or 34.2 AF), the estimated annual recharge over the recharge area of 954 acres is 328 AF during an average year and 228 AF during a dry year (Table 1).

Table 2. 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)
954	6.5	70	4.29	0.86	3.2	2.9	228
954	27.5	70	4.29	0.86	23.0	4.1	328

CUMULATIVE IMPACT TO SURROUNDING AREAS

The Burns Valley Groundwater Basin has a storage capacity of 4,000 AF with a usable storage capacity of 1,400 AF (CDM 2006 and California DWR 2003, 2021). The proposed project's demand, 24.9 AF, is 1.8% of the usable storage capacity. In addition, the proposed 15-acres cannabis cultivation is replacing approximately 13.6 acres of hops cultivation. Hops have large leaf area and require a significant amount of water, approximately 1.5-inches of water equivalent per week (Bamka and Dager, 2002). This equates to 40,700 gallons per acre per week or 5,800 gallons per day (gpd) per acre (note: 1 US gallon equates to 231 cubic inches); which is almost double the amount of water used to cultivate cannabis (43.6 AF per year for hops). The proposed cannabis cultivation would use less water compared to farming hops and would have less of an impact on the surrounding area.

Since all five project wells are within the Burns Valley Watershed, it is likely that they would have the most impact on the Burns Valley Groundwater Basin. Annual water demand of the proposed project could be up to 24.9 AF per year, depending on the length of the cultivation season, which is approximately 8% and 11% of the annual recharge during an average and dry year, respectively. The project recharge area of 954 acres would need just under 1-inch of rain per year to meet the project's demand. Thus, there is sufficient rainfall recharge, on an annual basis, to meet the project's demand, even during low precipitation years.

According to the Lake County Groundwater Management Plan, there are 86 domestic wells and 9 irrigation wells in the Burns Valley Basin and agricultural demand during an average year is 105 AF per year; of this, 14 AF is supplied from groundwater. The Groundwater Management Plan is dated 2006, and does not include the demand from the hops farm. With the 13.6-acre hops farm included, the average

annual groundwater demand for irrigation is 57.6 AF. Replacing the 13.6-acres of hops with 15.0-acres of cannabis reduces the average annual demand from 57.6 AF to 38.9 AF or only 2.8% of the usable storage capacity in the Burns Valley Basin.

The Burns Valley Groundwater Basin appears to have sufficient storage and recharge to meet the proposed projects' water demand, during both a dry and average rainfall year. In addition, the proposed cannabis cultivation uses less water than the previous hops farm. Therefore, the proposed project water use would not likely have a cumulative impact on the surrounding area.

QUALIFICATIONS OF AUTHOR

I am a registered Professional Engineer with the State of California with 30-years of experience practicing and teaching Water Resources Engineering.

REFERENCES

Bamka, W and Dager, E (2002). Growing Hops in the Backyard. Rutgers Cooperative Research & Extension. Published January 2002. Accessed August 2021. https://www.canr.msu.edu/uploads/234/71501/fs992%20Growing%20Hops%20Rutgers%20University.pdf

Bauer S, Olson J, Cockrill A, van Hattem M, Miller L, Tauzer M, et al. (2015). Impacts of Surface Water Diversions for Marijuana Cultivation on Aquatic Habitat in Four Northwestern California Watersheds. PLoS ONE 10(9): e0137935. https://doi.org/10.1371/journal.pone.0137935

CDFA (2017) CalCannabis Cultivation Licensing Program Draft Program Environmental Impact Report. State Clearinghouse #2016082077. Prepared by Horizon Water and Environment, LLC, Oakland, California. 484 pp.

California DWR (2003). California's Groundwater Bulletin 118 Update 2003. October 2003. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/Statewide-Reports/Bulletin_118_Update_2003.pdf

California DWR (2003). California's Groundwater Bulletin 18, Update 2003. October 2003.

California DWR (2021). California's Groundwater. https://water.ca.gov/programs/groundwater-management/bulletin-118

CDM (2006). Lake County Water Inventory Analysis. Prepared for the Lake county Watershed Protection District. March 2006. http://www.lakecountyca.gov/Assets/Departments/WaterResources/Groundwater+Management/Lake+County+Water+Inventory+and+Analysis+w+Appendices.pdf

CDM (2006). Lake County Groundwater Management Plan. Prepared for the Lake county Watershed Protection District. March 2006. http://www.lakecountyca.gov/Assets/Departments/WaterResources/IRWMP/Lake+County+Groundwater+Managment+Plan.pdf

Gupta, R.S. (2008). Hydrology and Hydraulic Systems, 3rd Edition. Waveland Press, Long Grove IL.

Natural Resources Conservation Service, NRCS< (1986) Urban Hydrology for Small Watersheds. USDFA NRCS Technical Release 55. June 1986. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044171.pdf

Attachments:

1. Well Logs
2. NRCS Soil Survey Results
3. PRISM Climate Precipitation 1895 to 2020

ATTACHMENT 1

WELL LOGS

LAKE VISTA FARMS, LLC

Well #1, Field A

TRIPLICATE
Owner's Copy

Page ___ of ___
Owner's Well No. ___
Date Work Began 6-30-11 Ended 7-1-11
Local Permit Agency Lake Co. Health Dept
Permit No. WE-2808 Permit Date 6-30-11

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 0950518

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Air Rotary FLUID ___

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0 : 20	Brown Clay
20 : 130	Brown Clay w/Red Chert
130 : 240	Green Clay w/Greenstone

House Field

TOTAL DEPTH OF BORING 240 (Feet)
TOTAL DEPTH OF COMPLETED WELL 240 (Feet)

WELL OWNER

Name Claudia Kay Kudinski
Mailing Address PO Box 13366
City Clearlake CA 95422 STATE ZIP

WELL LOCATION

Address 2050 Ogulin Canyon Rd
City Clearlake Ca 95422
County Lake
APN Book 010 Page 053 Parcel 01
Township 13N Range 7W Section 13
Lat ___ DEG. ___ MIN. ___ SEC. N
Long ___ DEG. ___ MIN. ___ SEC. W

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

✓ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

USES (✓)

WATER SUPPLY
✓ Domestic ___ Public
___ Irrigation ___ Industrial
___ MONITORING
___ TEST WELL
___ CATHODIC PROTECTION
___ HEAT EXCHANGE
___ DIRECT PUSH
___ INJECTION
___ VAPOR EXTRACTION
___ SPARGING
___ REMEDIATION
___ OTHER (SPECIFY)

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 60 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 150 ± (Ft.) & DATE MEASURED 7-1-11
ESTIMATED YIELD * 60 (GPM) & TEST TYPE Air Lift
TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 : 160	7"					PVC	4½"	160	
160 : 200	7"					PVC	4½"		
200 : 240	7"		X			PVC	4½"	200	.030

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE: CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 : 20	✓			
20 : 240				5/16 pea Gravel

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Layne Nevada Drilling (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS PO Box 1152 CITY Lower Lake STATE Ca ZIP 95457
Signed ___ (C-57 LICENSED WATER WELL CONTRACTOR) DATE SIGNED 7-3-2011 C-57 LICENSE NUMBER 465071

DWR 188 REV 05-03

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #2, Field C

IPLICATE
Owner's Copy

Page ___ of ___
Owner's Well No. ___
Date Work Began 11-4-04 Ended 11-4-04
Local Permit Agency Health Dept.
Permit No. WE 23317 Permit Date 10-7-04

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 1075331

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Air Rotary FLUID ___

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0 : 50	Cemented Gravel
50 : 90	Green Stone
90 : 120	BLACK Rock

Born FIELD

TOTAL DEPTH OF BORING 120 (Feet)
TOTAL DEPTH OF COMPLETED WELL 114 (Feet)

WELL OWNER

Name Claudia Kay-Kuykendall
Mailing Address P.O. Box 536
City Cache Creek State CA ZIP 95673

WELL LOCATION

Address 2123 Oaulia Canyon Rd.
City Clearlake CA 95422
County Lake
APN Book 014 Page 053 Parcel 02
Township 13N Range 7W Section 13
Lat ___ DEG. ___ MIN. ___ SEC. N Long ___ DEG. ___ MIN. ___ SEC. W

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materia Under "GEOLOGIC LO

USES (✓)

WATER SUPPLY
X Domestic ___ Public
___ Irrigation ___ Industri
___ MONITORING
___ TEST WELL
___ CATHODIC PROTECTION
___ HEAT EXCHANGE
___ DIRECT PUSH
___ INJECTION
___ VAPOR EXTRACTION
___ SPARGING
___ REMEDIATION
___ OTHER (SPECIFY)

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 90 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 68 (Ft.) & DATE MEASURED 11-3-04
ESTIMATED YIELD * 60 (GPM) & TEST TYPE Air Lift
TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 : 20	9	X				PVC	4½	160	
20 : 74	7	X				PVC	4½	160	
74 : 114	7		X			PVC	4½	200	.030

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 : 20	X			
20 : 74				#1 Pea
74 : 114				

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Larry Herman (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS P.O. Box 1102 CITY Lower Lake STATE CA ZIP 95457
SIGNATURE ___ DATE SIGNED 11-4-04

Well #3, Field E

ATE
s Copy
of
ner's Well No.

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 1093074

Date Work Began 6-6-06, Ended 6-7-06
Local Permit Agency [illegible]
Permit No. UE 2116 Permit Date 10-3-05

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Air Rotary FLUID

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0 60	Cemented Gravel
60 100	Clay w/ some Gravel
100 130	Clay w/ some Gravel
130 220	Cemented Gravel
220 400	Green Stone

RIDGE TOP

TOTAL DEPTH OF BORING 400 (Feet)
TOTAL DEPTH OF COMPLETED WELL 400 (Feet)

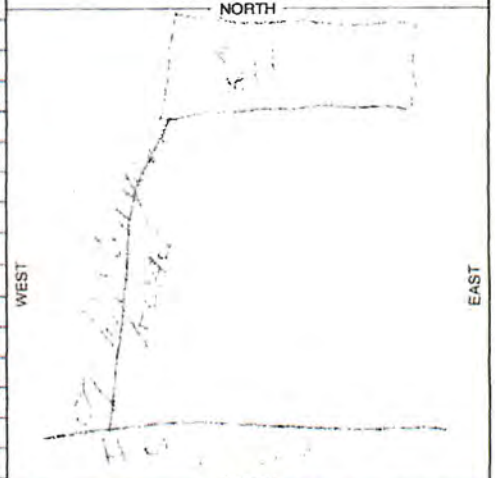
WELL OWNER

Name [illegible]
Mailing Address [illegible]
CITY STATE ZIP

WELL LOCATION

Address [illegible]
City [illegible]
County Lake
APN Book 010 Page 005 Parcel [illegible]
Township 12N Range 7W Section [illegible]
Lat ___ DEG. ___ MIN. ___ SEC. N Long ___ DEG. ___ MIN. ___ SEC.

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

___ NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Mater Under "GEOLOGIC LC*

USES (✓)
WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Indus
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 220 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL [illegible] (Ft.) & DATE MEASURED
ESTIMATED YIELD * 100+ (GPM) & TEST TYPE
TEST LENGTH 2 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 240	7 7/8	X				PVC	4 1/2	160	
240 400	7 7/8		X			PVC	4 1/2	200	.020

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
[illegible]	X			

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME [illegible] (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS [illegible] CITY [illegible] STATE [illegible] ZIP
Signed [illegible] C-57 LICENSED WATER WELL CONTRACTOR DATE SIGNED [illegible] C-57 LICENSE NUMBE

Well #4, Field D

TRIPLICATE
Owner's Copy

Page ___ of ___

Owner's Well No. ___

Date Work Began 6/26/2013 Ended 6/28/2013

Local Permit Agency Lake County Environmental Health

Permit No. WE 2925 Permit Date 6/25/2013

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 0963040

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Rotary FLUID Air

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	5	Brown Soil
5	130	Soft Tan Clay Like Rock
130	195	Brown Clay and Gravel
195	277	Greenish Brown Clay
277	352	Green Gravel
352	370	Soft Tan Clay Like Rock

UPPER FIELD

Old well
0 ← 175' → 0 well

TOTAL DEPTH OF BORING 370 (Feet)
TOTAL DEPTH OF COMPLETED WELL 358 (Feet)

WELL OWNER

Name Claudia Kay Hydinski
Mailing Address PO Box 5816
City Corta Madera State CA ZIP 94926

WELL LOCATION

Address 2050 Oguin Canyon Rd.
City Clearlake County Lake
APN Book 010 Page 053 Parcel 01
Township ___ Range ___ Section ___
Lat ___ DEG. ___ MIN. ___ SEC. N
Long ___ DEG. ___ MIN. ___ SEC. W

LOCATION SKETCH

NORTH / WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

USES (✓)

WATER SUPPLY
___ Domestic ___ Public
X Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 280 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 195 (Ft.) & DATE MEASURED 6/28/2013
ESTIMATED YIELD * 200+ (GPM) & TEST TYPE Air Lift
TEST LENGTH 1 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	120	9	X				PVC F480	4 1/2	SDR26	
120	272	8	X				"	"	"	
272	352	8		X			"	"	"	.032
352	358	8	X				"	"	"	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	1	X			
1	21		X		
21	356				pea gravel

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Dan McMullen Well Drilling (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS P.O. Box 951 CITY Lower Lake STATE CA ZIP 95457
Signed [signature] C-57 LICENSED WATER WELL CONTRACTOR
DATE SIGNED 6/28/2013 C-57 LICENSE NUMBER 572152

DWR 188 REV. 05-03

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well #5, Field B

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

Page 1 of 1

Owner's Well Number 2

Date Work Began 4-8-20 Date Work Ended 4-10-20

Local Permit Agency Lake County Environmental Health

Permit Number WE-5331AG Permit Date 3-17-20

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. XXXXXXX

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude Longitude W

APN/TRS/Other

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify

Drilling Method Air Rotary Drilling Fluid —

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc
0	30	Brown Clay
30	60	Brown Gravely clay
60	100	Brown Shale
100	240	Brown Gravely clay & Shale
24	280	Green stone (Soft)
280	300	Franciscan Gravels cemented
300	340	Green stone / Green Shale

Total Depth of Boring 345 Feet

Total Depth of Completed Well 340 Feet

Well Owner

Name Lake Vista Farms

Mailing Address 405 Clear View Place

City Petaluma State CA Zip 94952

Well Location

Address 2050 Ogulin Canyon Rd.

City Clearlake County LAKE

Latitude Deg. Min. Sec. N Longitude Deg. Min. Sec. W

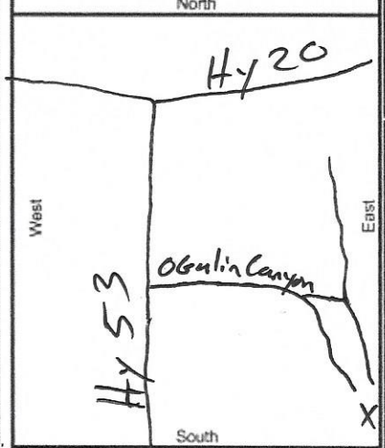
Datum Dec. Lat. Dec. Long.

APN Book 010 Page 053 Parcel 01

Township Range Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)



Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

● New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

● Water Supply
☐ Domestic ☐ Public
■ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water 200' (Feet below surface)

Depth to Static Water Level 173 (Feet) Date Measured 4-9-20

Estimated Yield * 300+ (GPM) Test Type Air lift

Test Length 2 HRS (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	240	10 5/8	F-480	PVC	.340	6"	Blank	—
240	340	10 5/8	F-480	PVC	.340	6"	Perfs.	.032

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	1	Concrete	SEAL
1	21	Bentonite	
21	340	5/16 Pea	Gravel Pack

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Will Peterson Well Drilling (Person, Firm or Corporation)

P.O. Box 695 (Address) Kelseyville CA 95451 (City, State, Zip)

Signed [signature] (C-57 Licensed Water Well Contractor) 4-10-20 (Date Signed) 1009053 (C-57 License Number)

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

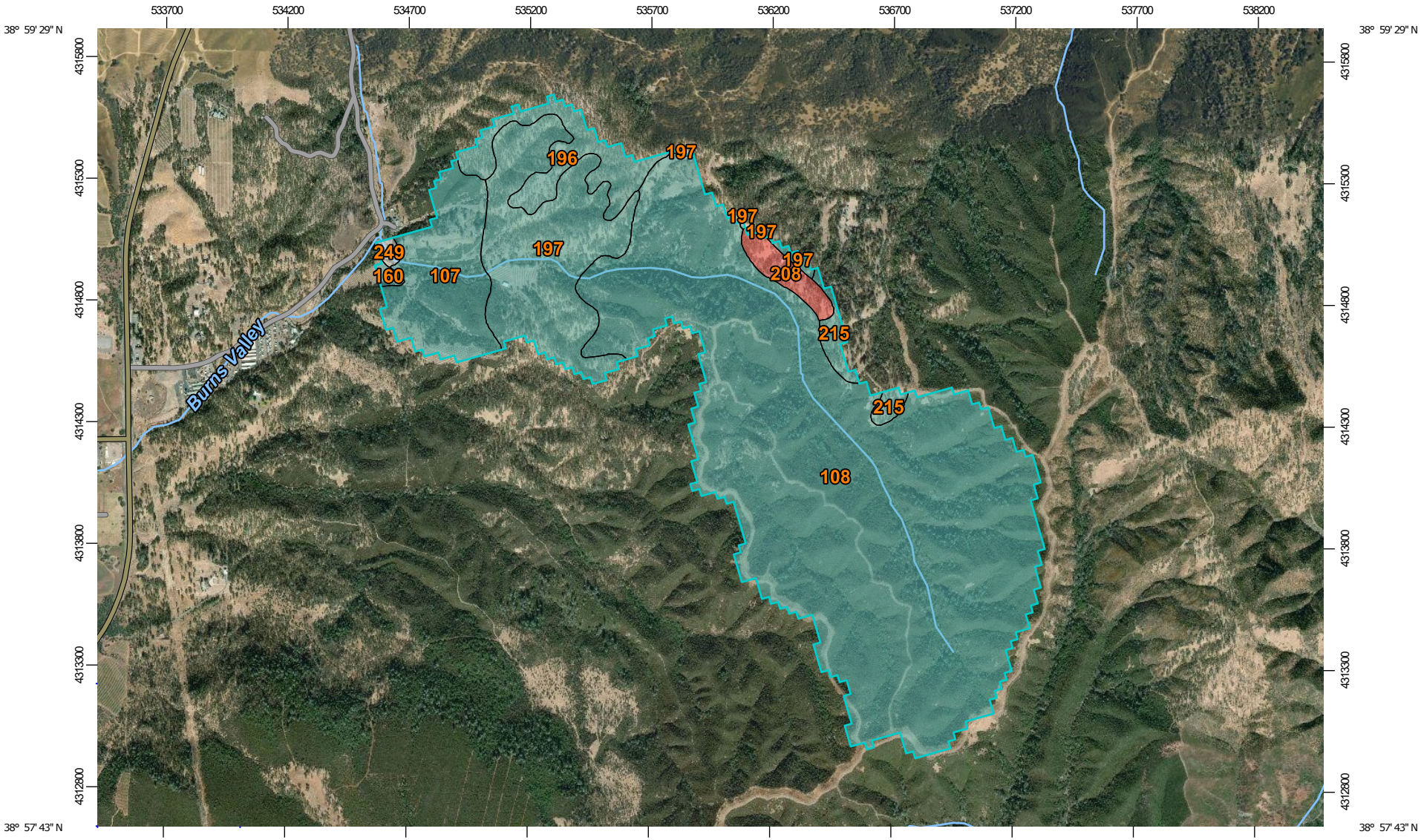
ATTACHMENT 2

NRCS SOIL SURVEY RESULTS

HYDROLOGIC SOIL GROUPS

LAKE VISTA FARMS, LLC

Custom Soil Resource Report
Map—Hydrologic Soil Group (North Basin)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

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.

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: Sep 18, 2016—May 10, 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.

Table—Hydrologic Soil Group (North Basin)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
107	Bally-Phipps complex, 15 to 30 percent slopes	C	61.8	8.5%
108	Bally-Phipps-Haploxeralfs association, 30 to 75 percent slopes	C	507.5	69.4%
160	Manzanita loam, 5 to 15 percent slopes	C	1.9	0.3%
196	Phipps complex, 15 to 30 percent slopes	C	34.0	4.6%
197	Phipps complex, 30 to 50 percent slopes	C	102.3	14.0%
208	Skyhigh-Asbill complex, 15 to 50 percent slopes	D	11.5	1.6%
215	Sleeper variant-Sleeper loams, 30 to 50 percent slopes	C	10.0	1.4%
249	Xerofluvents-Riverwash complex		2.0	0.3%
Totals for Area of Interest			**731.0**	**100.0%**

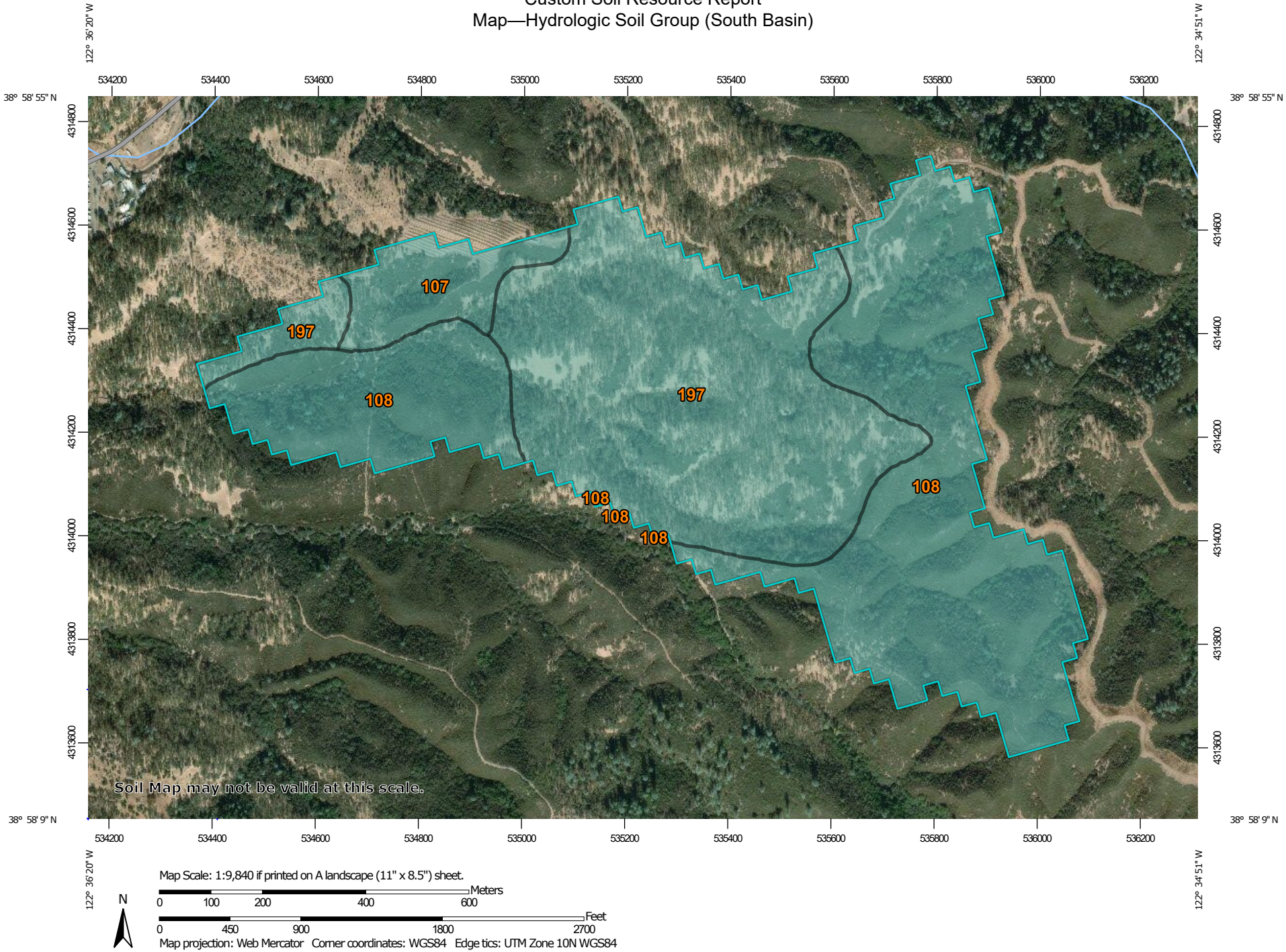
Rating Options—Hydrologic Soil Group (North Basin)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Custom Soil Resource Report
Map—Hydrologic Soil Group (South Basin)



Map Scale: 1:9,840 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 100 200 400 600

Feet
0 450 900 1800 2700

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 Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

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: Sep 18, 2016—Nov 4, 2017

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.

Table—Hydrologic Soil Group (South Basin)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
107	Bally-Phipps complex, 15 to 30 percent slopes	C	13.8	6.2%
108	Bally-Phipps-Haploxeralfs association, 30 to 75 percent slopes	C	112.3	50.6%
197	Phipps complex, 30 to 50 percent slopes	C	95.8	43.2%
Totals for Area of Interest			**222.0**	**100.0%**

Rating Options—Hydrologic Soil Group (South Basin)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT 3

PRISM PRECIPITATION 1895-2020

LAKE VISTA FARMS, LLC

PRISM Time Series Data
Location: Lat: 38.9813 Lon: -122.5945 Elev: 1634ft
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: On
Time series generated: 2021-Aug-16
Details: http://www.prism.oregonstate.edu/documents/PRISM_datasets.pdf

Date	ppt (inches)
1895	33.45
1896	39.39
1897	26.36
1898	14.99
1899	35.97
1900	24.78
1901	26.17
1902	34.35
1903	26.73
1904	42.74
1905	23.09
1906	43.07
1907	35.61
1908	18.71
1909	45.28
1910	17.39
1911	33.86
1912	20.46
1913	26.18
1914	31.14
1915	35.54
1916	29.98
1917	13
1918	20.62
1919	22.96
1920	29.78
1921	24.1
1922	27.53
1923	14.67
1924	21.03
1925	26.1
1926	34.49
1927	28.45
1928	20.62
1929	15.29
1930	17.41

	ppt (inches)
Average	27.5
Minimum	6.5

1931	25.01
1932	12.77
1933	20.87
1934	18.91
1935	25.48
1936	25.52
1937	34.4
1938	31.82
1939	12.63
1940	46.02
1941	45.09
1942	32.28
1943	21.27
1944	26.49
1945	29.24
1946	14.2
1947	16.79
1948	23.39
1949	16.78
1950	34.38
1951	29.78
1952	34.45
1953	21.19
1954	29.38
1955	24.98
1956	21.1
1957	30.79
1958	35.6
1959	20.63
1960	27.07
1961	20.06
1962	27.04
1963	28.52
1964	23
1965	25.92
1966	22.66
1967	27.6
1968	30.44
1969	34.03
1970	35.32
1971	17.7
1972	19.37
1973	41.58
1974	23.99
1975	24.29
1976	8.63
1977	19.17

1978	30.24
1979	34.99
1980	24.62
1981	31.16
1982	33.5
1983	62.26
1984	21.22
1985	16.61
1986	38.61
1987	27.83
1988	17.57
1989	20.95
1990	16.75
1991	24.08
1992	29.87
1993	36.33
1994	21.27
1995	55.42
1996	36.89
1997	30.2
1998	52.5
1999	23.46
2000	27.45
2001	36.14
2002	28.7
2003	32.85
2004	33.62
2005	39.04
2006	34.76
2007	13.57
2008	19.35
2009	17.68
2010	33.89
2011	23.12
2012	30.45
2013	6.46
2014	31.29
2015	18.08
2016	35.65
2017	43.57
2018	23.61
2019	43.17
2020	9.92