Attachment 5a

TECHNICAL MEMORANDUM

To: Lake County Community Development Department

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

Date: Original Date: November 11, 2021
Revised: March 7, 2022

Subject: Ordinance 3106 Hydrology Report – UP 20-40 Higher Ground Farms
3545 Finley East Road, Kelseyville CA 95482 (Cultivation APN: 008-026-07)

REGISTERED PROFESSIONAL ENGINEER
ANNJANETTE DODD
No. 77756
Exp. 6/30/2023
CIVIL
STATE OF CALIFORNIA

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 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 20-40, Higher Ground Farms. In addition to this TM. Ordinance 3106 also 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 at 3545 Finley East Road in Kelseyville, California (Cultivation APN: 008-026-07). The site is accessed by private driveway off Finley East Road approximately 1.5 miles north of Kelseyville.

The site has a history of heavy agricultural activities. Formerly the site was an approximately 17-acre walnut orchard. The existing agricultural well was used to irrigate the walnut orchard (also could include pears) and more recently cultivation of hay and about 3-acres of hemp.

PROPOSED PROJECT

The proposed project is to permit commercial cannabis cultivation in accordance with the Lake County Zoning Ordinance (Article 27). The proposal is for a Type 2b Mixed Light Cultivation License a total canopy area of 22,000 sq. ft. (0.50 acres) within a cultivation area of 47,040 sq. ft. The proposal also includes the development of facilities appurtenant to cultivation, including greenhouses, facilities for drying, trimming, and packaging of harvested cannabis, small storage sheds, and the appropriate irrigation infrastructure (Figure 1). The 22,000 sq. ft. of mixed-light cultivation will occur in (8) 30'x96' greenhouses using light deprivation and/or artificial lighting below a rate of 25 watts per square foot. The proposed project includes two (2) 30'x96 greenhouses for on-site nursery and propagation and a single commercial building for on-site drying, trimming, and packaging. The commercial building will include ADA parking and restroom facilities. Two approximate 2-foot walkways of non-canopy area will occur within each greenhouse, along the length of the greenhouse.

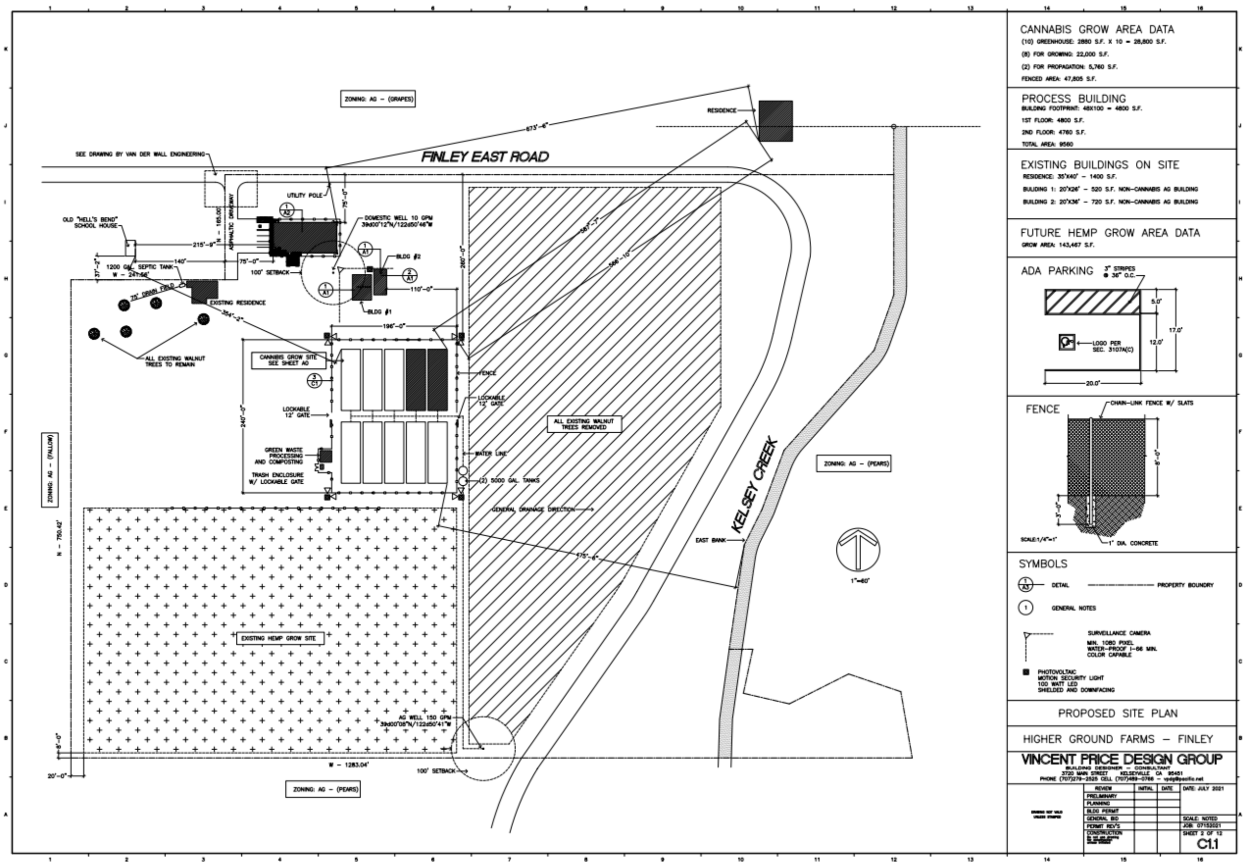

Figure 1: Higher Ground Farms Site Plan.

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 gallon (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 (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 Property Management Plan section (Section 10.0) of the project's Property Management Plan. The total estimated irrigation water demand, for 22,000 sq. ft. of cultivation area and approximately 5,400 sq. ft. of nursery area, is as follows:

- Average Daily
  - 1,887 gpd (1.3 gpm)
- Yearly (cultivation will be mixed light, 365 days/year)
  - 688,774 gallons or 2.1 acre-feet (AF)

The estimated irrigation water demand is reported as an average daily rate of the yearly water demand. However, seasonal water demand likely varies in response to environmental variables (e.g., temperature, relative humidity, wind, plant size, etc.). The monthly estimated irrigation water demand, accounting for seasonal variation, is summarized in Table 1 (totals to 2.1 AF). In addition to irrigation water demand, the project proposes two to four fulltime and eight to sixteen seasonal employees. It is assumed that water demand for fulltime employees is equivalent to sanitary sewer generation for factories without shower facilities. According to the Lake County Rules and Regulations for On-Site Sewage Disposal (Lake County, 2010), the demand would be 15 gallons per day, per person or up to 109,500 gallons per year, assuming operations 7 days per week, all year (0.3 AF per year). All landscaping would be drought-tolerant landscaping, which would require little to no water use. Thus, the total annual water demand is approximately 2.4 AF and the average daily demand is approximately 1.6 gpm.

Table 1: Monthly estimated water usage (units are 1,000 gallons) at Higher Ground Farms.

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
Irrigation	45	45	50	50	55	75	75	80	75	50	45	45	**690**
Employee	9.3	8.4	9.3	9.0	9.3	9.0	9.3	9.3	9.0	9.3	9.0	9.3	**109.5**

WATER SOURCE AND SUPPLY

There is an existing agricultural well on APN 008-026-07 (Latitude/Longitude: 39.001367, -122.845389) that has been in production since prior to the requirement for a well permit. The well was certified by Jim's Pumps on July 27, 2021 (Attachment 1). According to the property owner, the well is approximately 100 feet deep. The ground surface elevation of the well is 1,357 feet according to USGS topography; thus, the elevation of the well bottom is approximately 1,257 feet.

In July of 2021, a Well Test Report was completed by Jim's Pumps and reported the well is capable of approximately 253 gpm (402.5 acre-feet per year). A 7.5-Horsepower (HP) pump has been installed on the well. The static water level when the pump test was conducted was 40 feet below ground surface, at an elevation of approximately 1,317 feet. The pump test was conducted for approximately four hours and concluded with a stable water yield of 253 gpm, resulting in 10 feet of drawdown during maximum well production (Attachment 1). The daily demand of 1.6 gpm represents 0.6% of the potential annual well production.

Historically, the site has been used for heavy agricultural activities. The existing agricultural well was used to irrigate approximately 7 to 10-acres of walnut orchard (also could include pears) and more recently approximately 6 to 8-acres of hay and about 3-acres of hemp. Historical aerial imagery of the project parcel shows the entire parcel planted with walnut trees, approximately 17-acres of coverage (Figure 1). Mature walnut trees can use about 41 to 44 inches of water per acre in an average year, which equates to approximately 58 to 62 acre-feet per year planted over the subject parcel. The historical use is approximately thirty times more than the proposed demand by the project.

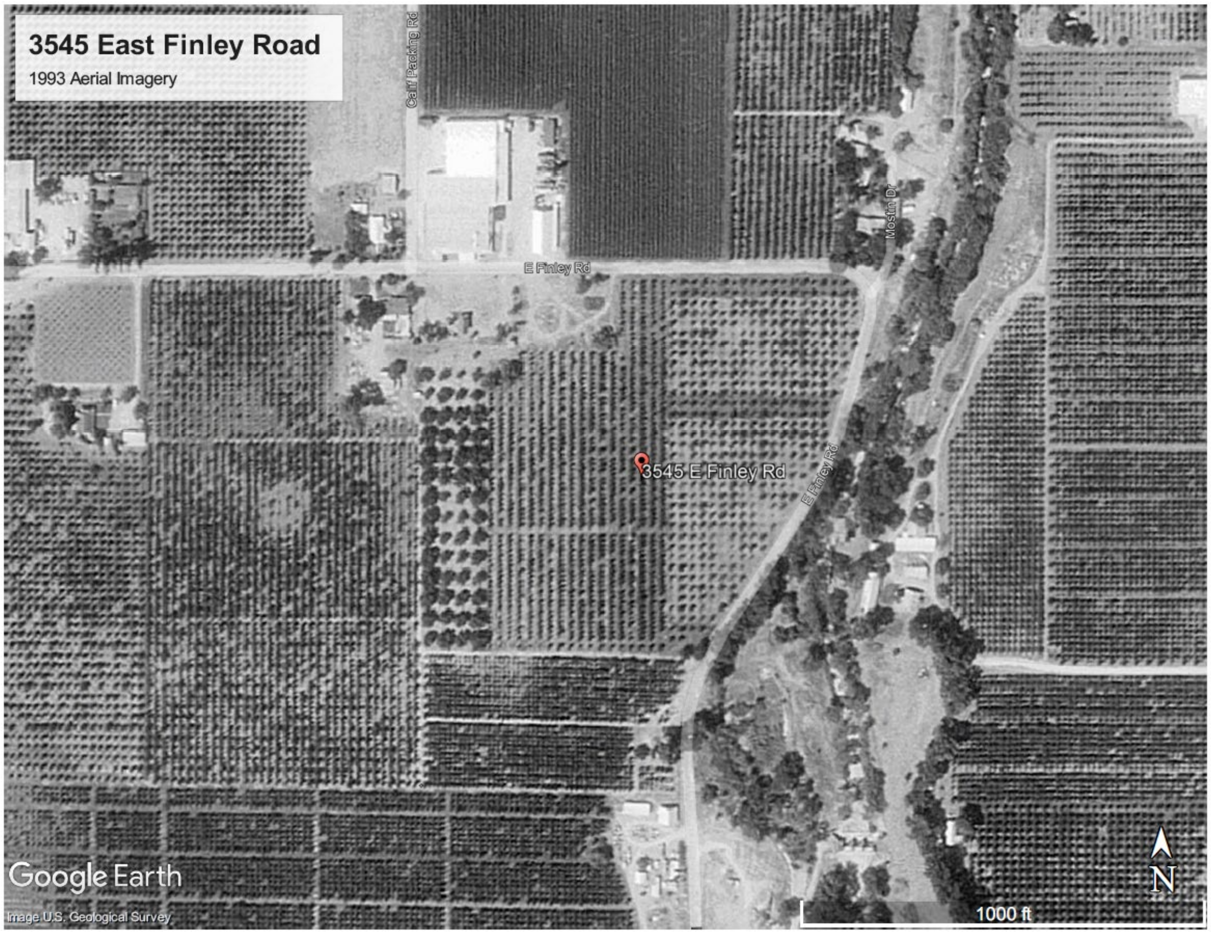

Figure 2. 1993 Aerial Imagery Illustrating Historical Agricultural Activities

IRRIGATION AND WATER STORAGE

Irrigation for the cultivation operation will use water supplied by the existing certified well. Irrigation water will be pumped from the well via PVC plumbing to water storage tanks with a total capacity of 10,000 gallons. The storage provided represents approximately 5-days of the average project demand.

Water from the storage tanks will be plumbed to drip irrigation systems in individual gardens. Drip lines will be sized to irrigate the cultivation areas at a slow rate to maximize absorption and prevent runoff. Drip irrigation systems, when implemented properly, conserve water compared to other irrigation techniques.

GROUNDWATER BASIN INFORMATION AND HYDROGEOLOGY

The water source is in the Big Valley Groundwater Basin (Figure 3). The Big Valley Groundwater Basin includes the watersheds of Manning Creek/Rumsey Slough, Adobe Creek, Hill Creek, Kelsey Creek, Cole Creek, and Highland Creek. The well is located just west of Kelsey Creek in the Kelsey Creek Watershed.

The Big Valley Groundwater Basin primarily corresponds with late-Pleistocene to recent age alluvial and lacustrine basin fill deposits. The basin borders Mesozoic volcanic and metavolcanic rock to the west, Jurassic Cretaceous Franciscan Formation marine sedimentary units to the south and west (which constitutes the basin basement rock), Clear Lake to the north, and Clear Lake Volcanics to the east. The structural boundaries of the Big Valley Groundwater Basin are formed by two major strike-slip faults – the Collayomi fault on the east and the Scotts Valley fault on the west. The Big Valley Fault intersects the Big Valley basin along a NW-SE trajectory, resulting in two distinct hydrogeologic regimes – comprised of younger quaternary alluvial and lacustrine deposits to the north, and raised Central Uplands of the Kelseyville Formation in the south (Figure 4). According to California's Groundwater Bulletin 118, the primary water-bearing formations in the groundwater basin are Quaternary alluvium, lake, and terrace deposits and an interbed deposit of unconsolidated volcanic ash. Recharge in the northern portion of the Big Valley Basin is primarily infiltration from Kelsey Creek and underflow from the Adobe Creek-Manning Creek Subbasin. The estimated storage capacity across the basin is 105,000 acre-feet, with a usable storage capacity of 60,000 acre-feet.

According to the Big Valley Groundwater Sustainability Plan (Big Valley GSP, 2022), Crop changes over the last twenty years (e.g., pear crops replaced by wine grapes) has resulted in a reduction of overall groundwater demand in the Big Valley Groundwater Basin. The three primary water users in the Big Valley Groundwater Basin are agriculture, municipal, and rural domestic; mostly supplied from groundwater sources. Total water use is an estimated 12,944 acre-feet per year (AFY). Most of the water is used for agricultural purposes (11,928 AFY in 2013), with the remainder used by municipal and domestic water uses (622 AFY and 340 AFY, respectively in 2020). Irrigation/Municipal wells range in depth between 48-feet and 524-feet. Irrigation/Municipal well yields range between 30 and 1,470 gpm (CDM, 2006; California DWR, 2003 and 2021).

Seasonal high groundwater levels range between 5 and 20 feet below ground surface (bgs) in the northern portion of the groundwater basin. Seasonal low water levels can be 5 to 25 feet deeper than seasonal high levels, depending on well location, construction, and local water use. In general, water level fluctuations between dry and wet climatic periods range from a few feet to less than 10 feet. Groundwater levels have remained stable during over the last 30 years with no indication of overdraft in the groundwater basin. (Big Valley GSP, 2022)

Due to the age of the well that supplies water for Higher Grounds Farms, there is no existing well log on record; however, the location and depth of the well (approximately 100-feet) places it within the northern hydrogeologic regime of the Big Valley Basin, within the recent-age Quaternary alluvial and lacustrine deposits (Figure 4). Recharge in this area is derived from infiltration of surface flow from Kelsey Creek.

The Big Valley Groundwater Basin has not been identified by the California Department of Water Resources (DWR) as a critically overdrafted basin. 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 to 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. The Big Valley Groundwater Basin was ranked as a medium priority basin by the CASGEM ranking system (DWR, 2021), requiring the preparation of a Groundwater Sustainability Plan that was completed in January 2022 (Big Valley GSP, 2022).

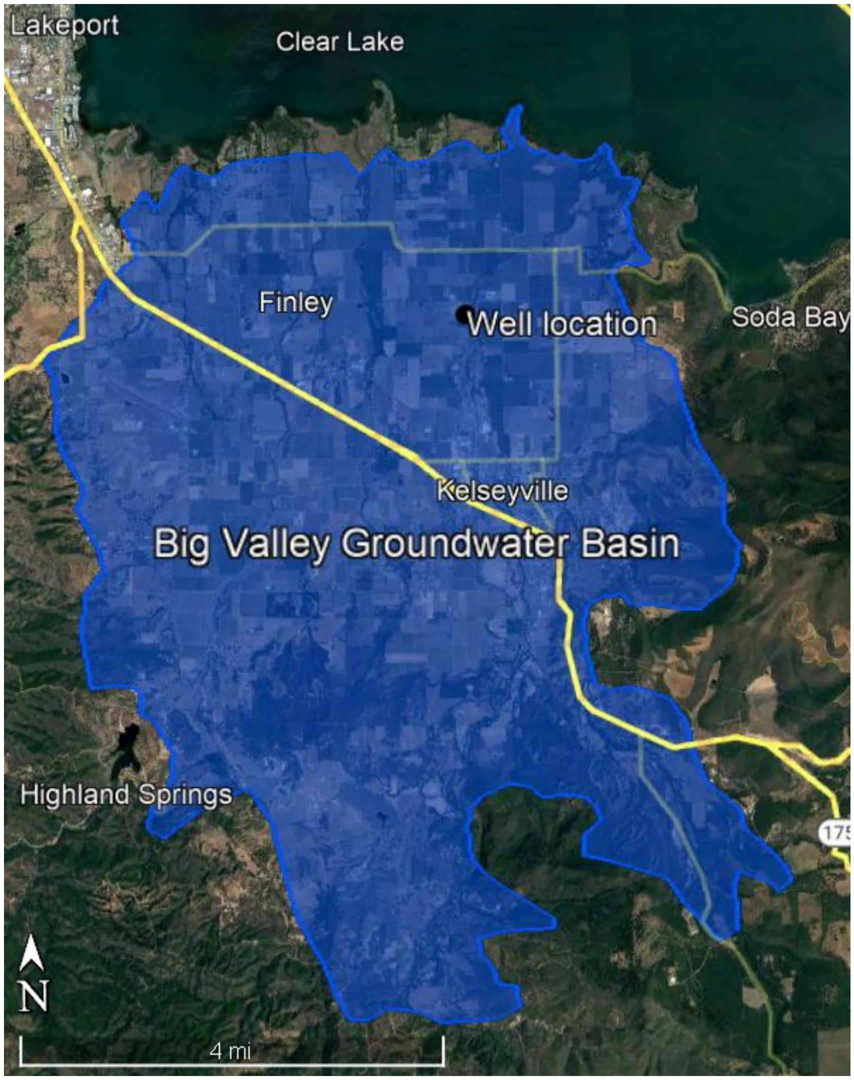

Figure 3. Project well location and mapped Groundwater Basin

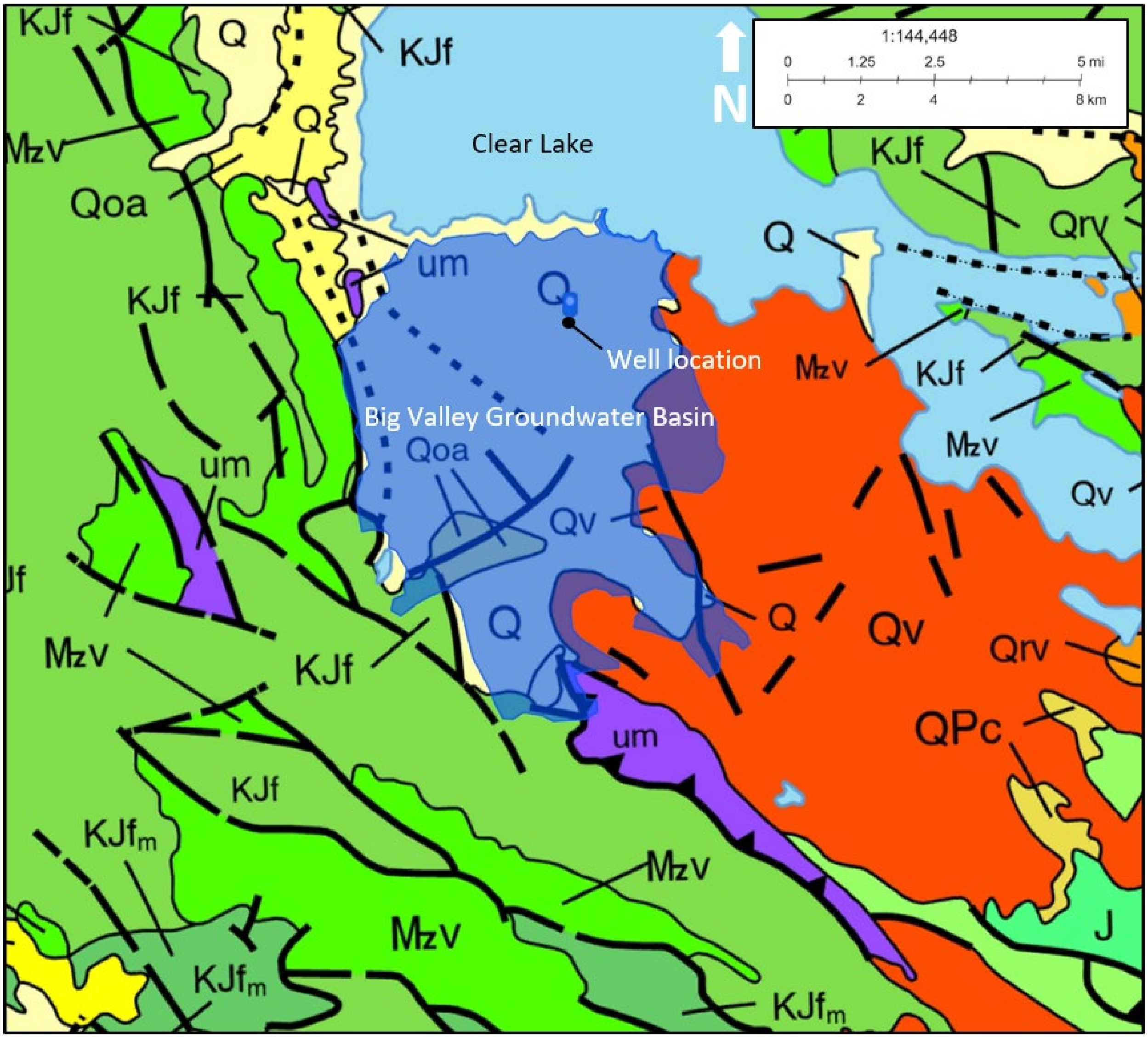

Figure 4. Geologic Map of California with the California Bulletin 118 Big Valley Groundwater Basin, corresponding primarily to recent age Quaternary lacustrine, stream, and terrace deposits (Q=Alluvium, lake, playa, and terrace deposit). Please refer to the [Geologic Map of California](#) online explanations for complete symbol descriptions.

GROUNDWATER SOURCE RECHARGE RATE

Annual groundwater 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 with readily available data is the Natural Resources Conservation Service (NRCS) Curve Number (CN) Method (NRCS, 1986). The CN is an empirical parameter used to predict runoff or infiltration from excess rainfall. Determination of the CN depends on the watershed's soil and cover conditions, cover type, treatment, and hydrologic conditions. 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. The project parcel totals approximately 24.9 acres of land, nearly all of which is considered pervious as observed on aerial imagery (the only exception being the impervious surface area of East Finley Rd). This area was used to estimate the recharge area of the project (Figure 5).

Soils are classified into four HSGs ("A", "B", "C", and "D") according to the expected infiltration rate of each of the mapped soil units; where HSG "A" has the greatest infiltration rate and HSG "D" has the lowest infiltration rate. 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 entire recharge area is comprised of HSG "C" - indicating a moderately high runoff potential (Attachment 2). The land use was classified as row-crop cover with crop residue in good condition. The CN for the recharge area is 82.

Figure 5: The project parcel area (APN: 008-026-07, 24.866 acres) over which groundwater recharge estimates were compared against water use in average and historic low precipitation years.

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 27.6 inches and the minimum precipitation over this period is 6.9 inches.

Using the above information, and assuming that 50% of the initial abstraction infiltrates and the remainder is evapotranspiration (0.2 inches, or 0.45 AF), the estimated annual recharge over the recharge area of 24.9 acres is 4.7 AF during an average year and 3.9 AF during a dry year (Table 2).

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)
24.9	6.9	82	2.2	0.44	4.8	1.9	3.9
24.9	27.6	82	2.2	0.44	25.1	2.3	4.7

Cumulative Impact to Surrounding Areas

The annual water demand of the proposed project is estimated to be 2.4 AF per year. The demand is 62% and 51% of the annual recharge during an average and dry year, respectively. Overall, the project would need ±1.2 inches of rainfall to infiltrate onto the project-parcel to meet the project's demand. Recharge in the Big Valley Groundwater Basin in the area of the project's water source is primarily infiltration and underflow from the Kelsey Creek Watershed. The watershed area upstream of the project is approximately 43.9 square miles (delineated using USGS StreamStats, https://streamstats.usgs.gov/ss/). The area used to estimate recharge for the proposed project is only 0.1% of the entire recharge area. The recharge estimate is likely a very low estimate of total recharge in the area, thus, there is sufficient recharge to meet the project's demand during both average and dry years.

The usable capacity of the Big Valley Groundwater Basin is 60,000 AF. The proposed project demand represents less than 0.01% of the capacity. The greatest demand for groundwater in the basin is agriculture. According to the Lake County Groundwater Management Plan (2006), the agricultural groundwater demand during an average year is 11,363 AF. The proposed project represents less than 0.02% of this demand. The existing irrigation well has a yield of 253 gpm (402.5 acre-feet per year), the project demand of 1.6 gpm (2.4 acre-feet) represents 0.6% of the well's yield.

Potential agricultural activities could occur on the remainder of the parcel, over approximately 13-acres. Potential agricultural activities include hay and/or hemp production or planting of a nitrogen fixing cover crop. Historic demand for approximately 17-acres of orchards was approximately 58 to 62 acre-feet per year or about 3.5 acre-feet per acre per year. According to the Lake County Water Demand Forecast (CDM, 2006), crops in Lake County use approximately 0.6 to 4.4 acre-feet per acre per year, with wine grapes using the least and pasture using the most. To be conservative, at 4.4 acre-feet per acre per year, the potential annual agriculture demand would be about 57 acre-feet. Including the proposed project, the total potential agriculture demand could be 59 acre-feet per year. This represents 0.1% of the usable storage capacity of the groundwater basin, 0.5% of the agricultural demand, and 23% of the well yield. There is sufficient groundwater storage and well capacity to meet the demand of the project and potential futural agricultural activities on the project parcel.

Since there is sufficient recharge and supply to meet the project's demand (2.4 acre-feet per year) during average and dry years; the project's demand is insignificant, only 0.01 % and 0.02%, of the Big Valley Groundwater Basin usable storage capacity and average annual agriculture groundwater demand, respectively; the proposed project would use significantly less water compared to the previous use; and with implementation of water conservation measures (refer to the DMP), the proposed project water use would not have a cumulative impact on the surrounding area.

QUALIFICATIONS OF AUTHOR

I have a PhD in Water Resources Engineering. In addition, I am a registered Professional Engineer with the State of California with 30-years of experience practicing and teaching Water Resources Engineering, including over 15 years of teaching, practicing, and modeling surface and groundwater hydrology.

LIMITATIONS

The study of groundwater hydrology is very complex and often relies on limited data, especially in rural areas. Recommendations and conclusions provided herein are based on professional judgment made using information of the groundwater systems and geology in Lake County, which is limited and allows only for a general assessment of groundwater aquifer conditions and recharge. NorthPoint Consulting Group, Inc. is making analyses, recommendations, and conclusions based on readily available data, including studies and reports conducted by other professionals, Lake County, the State of California, and other consultants hired by the project proponent to prepare technical studies for the proposed project. If additional information or data becomes available for the project area, the recommendations and conclusions presented herein may be subject to change. This report has been prepared solely for the client and any reliance on this report by third parties shall be at such party's sole risk.

Attachments:

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

REFERENCES

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

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Lake County Watershed Protection District. 2022. Groundwater Sustainability Plan for Big Valley Basin (5-015). January 2022.

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

ATTACHMENT 1

WELL TEST RESULTS

JIM'S PUMPS
P.O. Box 474
Upper Lake, CA 95485
Telephone 707-349-2277
Jose Fernandez Jr.
CA# 993066

WELL TEST REPORT

JOB: John Oliver SIZE TURBINE: 7.5 Hp

LOCATION: 3545 Finley East Rd Kelseyville Ca. SETTING: Unknown

WELL DEPTH: Unknown CASING SIZE: 12 in STATIC LEVEL: 40 ft

DATE STARTED: 7-27-2021 DATE COMPLETED: 7-27-2021

DATE	TIME A.M.	TIME P.M.	OPERATOR	G.P.M.	DRAWDOWN	WATER COLOR
7-27-21	9:00		Ben	183	40 ft	Clear
	9:15			183	47 ft	
	9:30			220	47 ft	
	9:45			253	48 ft	
	10:00			253	50 ft	
	10:15			253	50 ft	
	10:30			253	50 ft	
	11:00			253	50 ft	
	11:30			253	50 ft	
		12:00		253	50 ft	
		12:30		253	50 ft	
		1:00		253	50 ft	
			End Test			

COMMENTS: At this time we feel this well is capable of (253 gpm). Note: All results are subject to change depending on time of year and weather conditions.

Jim's Pump
P.O. Box 474
Upper Lake, CA 95485

Contractors Invoice

TO:	WORK PERFORMED AT:
John Oliver	3545 Finley East Rd Kelseyville Ca

DATE	YOUR WORK ORDER NO.	OUR BID NO.
7-27-2021	707-234-9815	

DESCRIPTION OF WORK PERFORMED

Performed Well test and took water samples for Emerald Package and Potability testing @ Alpha Labs. At this time we feel this well is capable of (253 gpm). Note: All results are subject to change depending on time of year and weather conditions.

Well test $750.00
~~Potability test $65.00~~
~~Emerald test $400.00~~
~~Total $1215.00~~
Total- $750.00

Paying w/ Check # 2200

Paid

~~Send Labs to:~~

All Material is guaranteed to be as specified, and the above work was performed in accordance with the drawings and specifications provided for the above work and was completed in a substantial workmanlike manner for the agreed sum of ______________________

______________________ Dollars ($______________).

This is a ☐ Partial ☐ Full invoice due and payable by: ________ Month ________ Day ________ Year

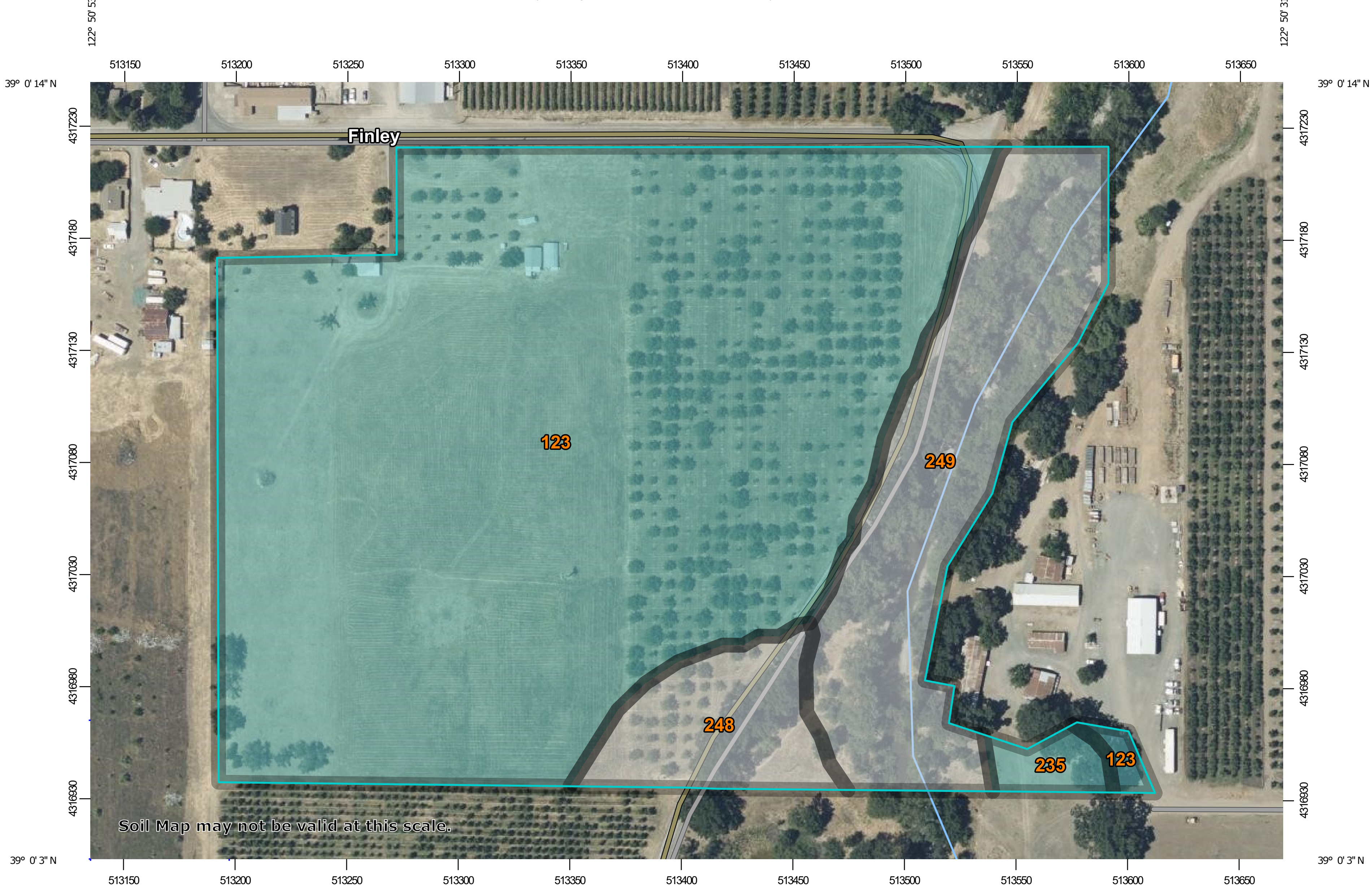
in accordance with our ☐ Agreement ☐ Proposal No. ____________ Dated ________ Month ________ Day ________ Year

ATTACHMENT 2

NRCS SOIL SURVEY RESULTS

HYDROLOGIC SOIL GROUPS

Hydrologic Soil Group—Lake County, California



Map Scale: 1:2,440 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 35, 70, 140, 210

Feet: 0, 100, 200, 400, 600

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil 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 18, Sep 6, 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
123	Cole clay loam, drained	C	18.9	76.0%
235	Still-Talmage complex, 2 to 8 percent slopes	C	0.3	1.3%
248	Xerofluvents, very gravelly		1.4	5.7%
249	Xerofluvents-Riverwash complex		4.2	17.0%
Totals for Area of Interest			**24.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT 3

PRISM PRECIPITATION 1895-2020

ATTACHMENT 1

WELL TEST RESULTS

PRISM Time Series Data
Location: Lat: 39.0022 Lon: -122.8447 Elev: 1358ft
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-Oct-07
Details: http://www.prism.oregonstate.edu/documents/PRISM_datasets.pdf

Date	ppt (inches)
1895	31.76
1896	37.39
1897	25.63
1898	15.35
1899	33.27
1900	23.68
1901	24.45
1902	36.33
1903	24.17
1904	41.29
1905	21.4
1906	38.85
1907	32.24
1908	18.65
1909	45.09
1910	15.96
1911	31.44
1912	19.42
1913	25.63
1914	30.27
1915	36.98
1916	28.31
1917	13.18
1918	20.27
1919	22.83
1920	28.47
1921	22.42
1922	28.64
1923	13.7
1924	22.79
1925	28.39
1926	33.86
1927	29.62
1928	21.1
1929	15.95
1930	17.17

	ppt (inches)
Avg	27.6
min	6.9

PRISM Time Series Data
Location: Lat: 39.0022 Lon: -122.8447 Elev: 1358ft
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-Oct-07
Details: http://www.prism.oregonstate.edu/documents/PRISM_datasets.pdf

Date	ppt (inches)
1895	31.76
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1925	28.39
1926	33.86
1927	29.62
1928	21.1
1929	15.95
1930	17.17

	ppt (inches)
Avg	27.6
min	6.9

1931	24.91
1932	11.66
1933	20.21
1934	18.01
1935	22.93
1936	23.2
1937	34.14
1938	28.64
1939	12.57
1940	42.68
1941	41.53
1942	32.21
1943	20.81
1944	25.79
1945	29.9
1946	14.15
1947	16.41
1948	22.72
1949	15.74
1950	33.53
1951	28.88
1952	34.3
1953	19.95
1954	28.58
1955	27.99
1956	23.57
1957	31.4
1958	35.86
1959	20.63
1960	28.11
1961	20.27
1962	29.85
1963	30.03
1964	28.04
1965	25.49
1966	23.19
1967	29.79
1968	32.78
1969	36.96
1970	38.59
1971	19.56
1972	20.61
1973	41.72
1974	25.37
1975	26.54
1976	10.65
1977	22.59

1978	31.39
1979	38.96
1980	27.76
1981	36.18
1982	35.79
1983	64.32
1984	22.22
1985	16.61
1986	39.03
1987	28.93
1988	17.49
1989	19.39
1990	17.49
1991	22.64
1992	32.12
1993	33.91
1994	22.87
1995	49.84
1996	40.28
1997	30.84
1998	53.43
1999	23.6
2000	27.96
2001	35.22
2002	30.03
2003	34.56
2004	30.99
2005	38.37
2006	33.22
2007	17.6
2008	20.41
2009	20.06
2010	36.55
2011	23.61
2012	30.02
2013	6.92
2014	33.68
2015	20.11
2016	32.87
2017	36.81
2018	22.43
2019	45.32
2020	10.9

Attachment 5b

Drought Management Plan

For

UP 20-40

Higher Ground Farms

APN 008-026-07

3545 Finley East Road, Kelseyville CA 95482

Prepared for:

Lake County Community Development Department
255 N Forbes Street
Lakeport, CA 95453

Prepared by:

NorthPoint Consulting Group. Inc
1117 Samoa Blvd
Arcata, California 95521
(707)798-6438

November 2021

A. Purpose

The purpose of this Drought Management Plan (DMP) is to meet the requirements of Lake County Ordinance 3106, passed by the Board of Supervisors on July 27, 2021. The Ordinance requires all projects that require a CEQA analysis of water use to provide a DMP depicting how the applicant proposes to reduce water use during a declared drought emergency to ensure both the success [of the project] and decreased impacts to surrounding areas. In addition to the DMP, Ordinance 3106 requires a Hydrology Report addressing water usage, water supply, water source recharge rate, and cumulative impacts to surrounding areas. The Hydrology Report, dated November 2021, for this project has been submitted as a separate document.

Note: The project proposes water conservation measures as part of the standard operating procedures. These measures will be followed whether or not the region is in a drought emergency. These measures are included below.

B. Project Description

The proposed project is to permit commercial cannabis cultivation in accordance with the Lake County Zoning Ordinance (Article 27). The proposal is for a Type 2b Mixed Light Cultivation License a total canopy area of 22,000 sq. ft. (0.50 acres) within a cultivation area of 47,040 sq. ft. The proposal also includes the development of facilities appurtenant to cultivation, including greenhouses, facilities for drying, trimming, and packaging of harvested cannabis, small storage sheds, and the appropriate irrigation infrastructure (Figure 1). The 22,000 sq. ft. of mixed-light cultivation will occur in (8) 30’x96’ greenhouses using light deprivation and/or artificial lighting below a rate of 25 watts per square foot. The proposed project includes two (2) 30’x96 greenhouses for on-site nursery and propagation and a single commercial building for on-site drying, trimming, and packaging. Irrigation for the cultivation operation will use water supplied by the existing well. Irrigation water will be pumped from the well via PVC plumbing to water storage tanks with a capacity of 10,000 gallons. Water from the storage tanks will be plumbed to drip irrigation systems in individual gardens. Drip lines will be sized to irrigate the cultivation areas at a slow rate to maximize absorption and prevent runoff. Drip irrigation systems, when implemented properly, conserve water compared to other irrigation techniques.

C. Operational Water Monitoring and Conservation Measures

As part of the project’s standard operational procedures, the project proposes to implement ongoing water monitoring and conservation measures that would reduce the overall use of water. These measures have been provided in the Water Use Management Plan section (Section 9.0) of the project’s Property Management Plan. The Water Use Management Plan includes information on Water Sources and Metering, Estimated Water Use, Water Conservation, and the Irrigation System. On-going water conservation measures include:

- no surface water diversion;
- selection of plant varieties that are suitable for the climate of the region;
- the use of driplines and drip emitters (instead of spray irrigation);
- cover drip lines with straw mulch or similar to reduce evaporation;
- water application rates modified from data from soil moisture meters and weather monitoring;
- shutoff valves on hoses and water pipes;

- daily visual inspections of irrigation systems;
- immediate repair of leaking or malfunctioning equipment; and
- water metering and budgeting.

In addition to water use metering, water level monitoring is also required by the Lake County Zoning Ordinance. Ordinance Article 27 Section 27.11(at) 3.v.e. requires the well to have a meter to measure the amount of water pumped as well as a water level monitor. In addition to the above measures, well water level monitoring and reporting will be performed as follows:

Seasonal Static Water Level Monitoring: The purpose of seasonal monitoring of the water level in a well is to provide information regarding long-term groundwater elevation trends. The water level in each project well will be measured and recorded once in the Spring (March/April), before cultivation activities begin, and once in the fall (October) after cultivation is complete. (note: The California Statewide Groundwater Monitoring Program (CASGEM) monitors semi-annually around April 15 and October 15). Records shall be kept, and elevations reported to the County as part of the project's annual reporting requirements. Reporting shall include a hydrograph plot of all seasonal water level measurements, for all project wells, beginning with the initial measurement(s). Seasonal water level trends will aid in the evaluation of the recharge rate of the well. For example, if the water level in a well measured during the Spring remains relatively constant from year to year, then the water source is likely recharging each year.

Water Level Monitoring During Extraction: The purpose of monitoring the water level in a well during extraction is to evaluate the performance of the well to determine the effect of the pumping rate on the water source during each cultivation season. This information shall be used to determine the capacity and yield of the project's wells to aid the cultivators in determining pump rates and the need for water storage. The frequency of water level monitoring will depend on the source, the source's capacity, and the pumping rate. It is recommended that initially the water level be monitored twice per week or more, and that the frequency be adjusted as needed depending on the impact the pumping rate has on the well water level. Records shall be kept, and elevations reported to the County as part of the project's annual reporting requirements. Reporting shall include a hydrograph plot of the water level measurements, for all project wells, during the cultivation season and compared to prior seasons.

Measuring a water level in a well can be difficult and the level of difficulty will depend on site-specific conditions. As part of the well monitoring program, the well owner/operator shall work with a well expert to determine the appropriate methodology and equipment to measure the water level in their well(s) as well as who will conduct the monitoring and recording of the well level data. The methodology of the well monitoring program shall be described and provided in the project's annual report to the County.

In addition to monitoring and reporting, an analysis of the water level monitoring data shall be provided and included in the project's annual report, demonstrating whether use of the well is causing significant drawdown and/or impacts to the surrounding area and what measures were taken to reduce impacts. If there are impacts, a revised Water Management Plan shall be prepared and submitted to the County, for review and approval, demonstrating how the project will mitigate the impacts in the future, including, for example, additional water sources and possibly a reduction in cultivation, if a reduction in water availability has occurred.

D. Drought Emergency Water Conservation Measures

Drought can reduce both water availability and water quality necessary for productive farming, ranches, and grazing lands, resulting in significant negative direct and indirect economic impacts to the farm. To plan and prepare for drought conditions, the project will follow recommendations for monitoring, planning, and preparedness provided by the National Integrated Drought Information System - https://www.drought.gov/sectors/agriculture.

- Install additional water storage and/or implement a rainwater catchment system;
- Install moisture meters to monitor how much water is in the soil at the root level and reduce watering to only what is needed to avoid excess;
- Cover the soil and drip-lines with removable plastic covers or similar to reduce evaporation;
- Irrigate only in the early morning hours or before sunset;
- Cover plants with shaded meshes during peak summer heat to reduce plant water needs; and/or
- Use a growing medium that retains water in a way to conserve water and aid plant growth. Organic soil ingredients like peat moss, coco coir, compost and other substances like perlite and vermiculite retain water and provide a good environment for cannabis to grow.

In the event that one or all of the wells cannot supply the water needed for the project, the following measures may be taken:

- Reduce the amount of cultivation and/or length of cultivation season;
    - The amount of cultivation would be determined based on available water
- Install additional storage; and/or
- If possible, develop an alternative, legal, water source that meets the requirements of Lake County Codes and Ordinances.

E. Potential Rainwater Catchment

Rainwater catchment is an option if the project needs to offset the groundwater well to supply the project. The greenhouses and processing building provide a total of 33,600 sq. ft. of potential rainwater catchment area. Estimated potential rainwater catchment volume for dry and average precipitation years is summarized below. Storage could be provided using water storage tanks, which would provide additional recharge area. The estimated demand is approximately 2.4 acre-feet. Rain catchment from the proposed cannabis facilities could offset about 18%-74% of the project's demand during a dry and average year, respectively.

Catchment	Area (sq. ft.)	Potential Rainwater Catchment Volume			
		Dry Year (6.9 inches)		Average Year (27.6 inches)	
		Acre-Feet	Gallons	Acre-Feet	Gallons
Greenhouses	28,800	0.38	123,877	1.52	495,509
Processing Building	4,800	0.06	20,646	0.25	82,585
Total	**33,600**	**0.44**	**144,523**	**1.77**	**578,094**