

REALM

Engineering

1767 Market Street, Suite C, Redding, CA 96001



HYDROLOGY REPORT

9141 STATE HIGHWAY 175, KELSEYVILLE, CA

AUGUST 16, 2022





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INTRODUCTION

The purpose of this Hydrology Study/Report is to provide adequate information regarding the water usage for a proposed cannabis cultivation operation and its impacts to surrounding areas. This report was written to meet the requirements of an Urgency Ordinance requiring land use applicants to provide enhanced water analysis during a declared drought emergency, approved by the Lake County Board of Supervisors on July 27th, 2021 (**Attachment A – Urgency Ordinance No. 3106**).

PROJECT DESCRIPTION

Pacific Cann, Inc. (Pacific Cann) is seeking a Major Use Permit from the County of Lake, for a proposed commercial cannabis cultivation operation at 9141 State Highway 175 near Kelseyville, California on Lake County APN 011-060-01 (Project Parcel). The proposed commercial cannabis cultivation operation would be composed of a 31,920 ft² outdoor cultivation area (with 22,800 ft² of cannabis canopy), two 13,200 ft² outdoor cultivation areas (each with 9,600 ft² of cannabis canopy), sixteen 2,304 ft² mixed-light cultivation areas/greenhouses (each with up to 1,875 ft² of cannabis canopy), a 5,000 ft² Processing Building/Facility, and a 2,000 ft² barn that will be used as a Security Center and Pesticides & Agricultural Chemicals Storage Area.

The 103-acre Rural Lands-zoned Project Parcel is located along Highway 175, within the Cole Creek Watershed (HUC 12), in southern Lake County, CA. The Project Parcel is accessed via a private gravel access road that connects Wildcat Road and Highway 175 through the Project Parcel. Current and past land uses of the Project Property are/were extensive agriculture and rural residences. The Project Parcel has been improved with a groundwater well, a barn, and two residences. The proposed cultivation operation will be established in three areas of the Project Parcel that currently support annual grassland and mixed oak woodland habitats.

Cole Creek, a Perennial Class I watercourse, flows through the Project Property from east to west, paralleling Highway 175. A metal framed bridge on concrete abutments spans Cole Creek and provides access to the southern half of the Project Property from Highway 175 via the private access road. There are two springs on the Project Parcel and a small pond that discharges to Cole Creek via an ephemeral Class III watercourse. One of the springs has been developed (spring box) to supply domestic water to the two residences of the Project Property. No cannabis cultivation activities nor agricultural chemicals storage will occur within 150 feet of any surface waterbody. Water for the proposed cultivation operation will come from an existing onsite groundwater well located at Latitude 38.89974° and Longitude -122.74777°. Pacific Cann proposes to drill another groundwater well on the Project Property in the future, to provide an additional/back-up water supply source for the proposed cultivation operation.

6-foot tall wire fences will be erected around the proposed cultivation areas, with privacy mesh where necessary to screen the cultivation operation from public view. The growing medium of the proposed cultivation operation will be an imported organic soil mixture in garden beds and nursery pots, with drip and micro-spray irrigation systems. Pacific Cann's proposed mixed-light cultivation areas will be established within gutter-connected greenhouse structures composed of steel frames with polycarbonate glaze on concrete foundations, equipped with light deprivation curtains and light traps, horticultural lights, and dehumidifiers.

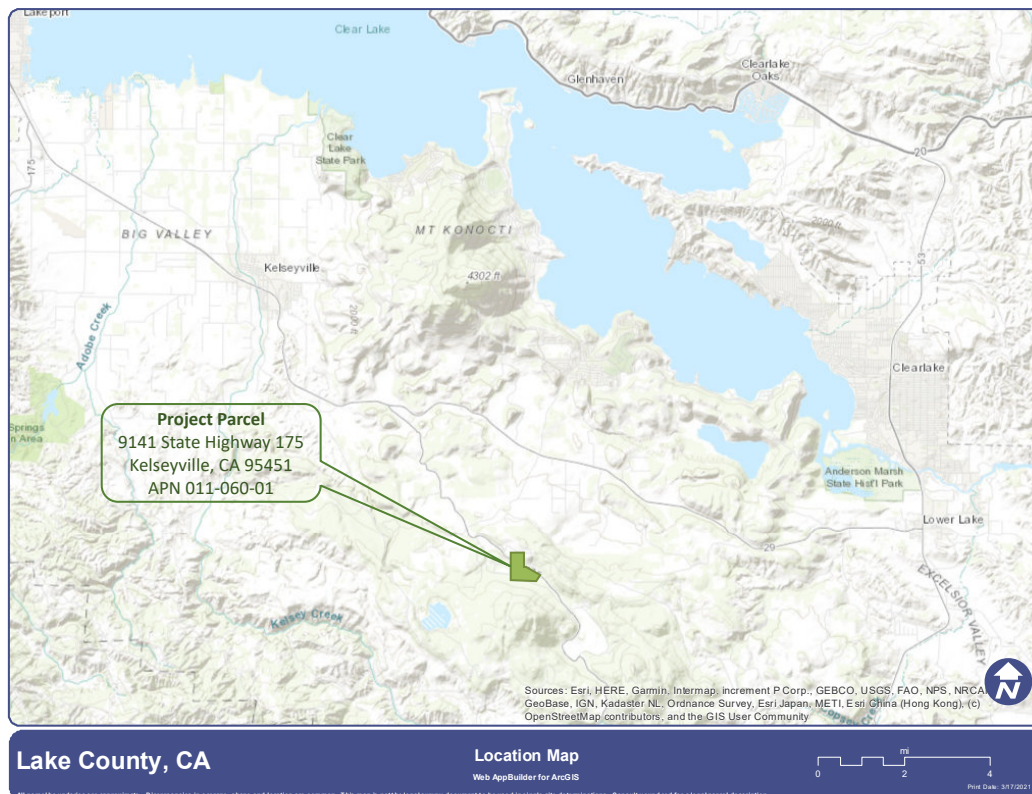


Figure 1 – Site Location Map



Figure 2 – Surrounding Area Aerial Image



WATER USAGE

Cannabis has often been characterized as a high-water-use plant. Bauer et al. (2015)¹ and Carah et al (2015)² estimate that cannabis plants can consume up to approximately 6 gallons per plant per day, whereas grapes consume approximately 3.5 gallons per plant per day in the North Coast region of California. Other authors, however, have reported that water use requirement for cannabis plants are similar to those of other agricultural crops, such as corn and hops, with an estimated water use requirement of 25-35 inches per year (Hammon et al. 2015³). According to a recent study published in the Journal of Environmental Management (Dillis et al. 2020⁴), outdoor and mixed-light cannabis cultivation uses the most water during the month of August, with an estimated water use of approximately 58,704 gallons per acre during the month of August.

According to Pacific Cann's revised Property Management Plan, the total proposed outdoor cannabis cultivation area is 58,320 ft², and the total proposed mixed-light cannabis cultivation area is 36,864 ft². Based on our experience, we estimate that the annual water use requirement for 58,320 ft² of outdoor cannabis cultivation area is approximately 2.68 acre-feet (~2 acre-feet per acre of outdoor cultivation area), and that the annual water use requirement for 36,864 ft² of mixed-light cannabis cultivation area is approximately 2.54 acre-feet (~3 acre-feet per acre of mixed-light cultivation area). The following table presents the expected water use of the proposed cultivation operation (outdoor and mixed-light combined) by month in gallons and acre-feet.

Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
65,200	65,200	97,800	130,400	130,400	195,500	228,100	228,100	228,100	195,500	65,200	65,200
0.2	0.2	0.3	0.4	0.4	0.6	0.7	0.7	0.7	0.6	0.2	0.2

Table 1 – Estimated Monthly Water Use

Based on the water use estimates above, we estimate that the proposed cultivation operation would have a maximum water use requirement of approximately 7,605 gallons per day, with an average water demand of approximately 4,660 gallons per day.

WATER AVAILABILITY

Water for the proposed cultivation operation will come from the existing onsite groundwater well located at Latitude: 38.89974° and Longitude: -122.74777°. This groundwater well was drilled in January of 2021, through “blue-ish clays with some rock”, volcanic ash, and obsidian, to a depth of 134 feet below ground surface (bgs). This well had an estimated yield of 100 gallons per minute at the time it was drilled (**Attachment B: Onsite Well Completion Report**). On February 8th, a 6-hour pump test was performed by JAK Drilling & Pump (licensed well driller), using a 3HP submersible test pump, totalizing flow meter, and Powers Water Meter, to thoroughly evaluate the production capacity of the well. During the pump test, the onsite groundwater well was pumped between 60 and 62 gallons per minute (gpm) for six hours, and the water level in the well dropped from 8.5 to 17.0 feet bgs (**Attachment C – Well Performance Test Report**). A total of 22,200 gallons were pumped from the well during the pump test, nearly three times the estimated daily maximum water use requirement for the proposed cannabis cultivation operation. Within 40 minutes after pumping of the well ceased, the water level in the well rebounded to 10 feet bgs (82% recovery within 40 minutes). From the Well Performance Test data, we can calculate a



Specific Capacity of 7.1 gpm/foot of drawdown (i.e., 60 gpm / 8.5 feet) for the existing onsite groundwater well.

The well yield test data and recovery observations indicate that the onsite groundwater well can produce at least 60 gpm without causing overdraft conditions. However, to satisfy requirements of Chapter 21, Article 27 of the Lake Code pertaining to commercial cannabis cultivation, a 1" totalizing flow meter and Well Watch 670™ continuous water level meter where installed at the well head of the onsite well. Per communication with the JAK Drilling & Pump, the 1" totalizing flow meter restricts flow from the well/pump to less than 40 gpm. At 40 gpm, the onsite groundwater well could meet the peak anticipated daily demand for water of the proposed cultivation operation (~7,605 gallons) in approximately three hours and ten minutes. Additionally, Pacific Cann proposes to establish at least 20,000 gallons of water storage capacity on the Project Parcel for the proposed cultivation operation, which is more than two and a half times its peak anticipated daily water demand. Based on the estimated water usage rates, the measured pumping rates, and the proposed water storage capacity, the site appears to have the water necessary to meet the irrigation water demands of the proposed cultivation operation without creating aquifer overdraft.

AQUIFER CHARACTERISTICS & GROUNDWATER RECHARGE

Groundwater recharge is the replenishment of an aquifer with water from the land surface. It is usually expressed as an average rate of inches of water per year, similar to precipitation. Thus, the volume of recharge is the rate times the land area under consideration multiplied by the time period, and is usually expressed as acre-ft per year. In addition to precipitation, other sources of recharge to an aquifer are stream and lake or pond seepage, irrigation return flow (both from canals and fields), inter-aquifer flows, and urban recharge (from water mains, septic tanks, sewers, and drainage ditches). The Project Parcel is located at the base of Mount Hannah, with soils that are characterized as well-drained gravelly loams derived from residuum weathered from andesite. The United States Geological Survey Map of the Santa Rosa Quadrangle defines the area in the vicinity of the Project Parcel as Clear Lake Volcanics, composed of dacite, andesite, basalt, rhyolite, tuff and other pyroclastic rocks.

The Project Property is located within the Clear Lake Volcanics Groundwater Source Area as identified in the 2006 Lake County Groundwater Management Plan⁵. Groundwater in the Clear Lake Volcanics occurs primarily in fractures, joints, and within weathered zones that formed in between volcanic eruptions. The amount of groundwater available to a well in the formation is highly dependent on the size, openness, frequency, and interconnection of fractures and joints encountered in the well. Based on information provided in the Well Completion Report for the existing onsite groundwater well (**Attachment B: Onsite Well Completion Report**), it appears that the aquifer beneath the Project Parcel is composed of alluvial deposits over decomposed volcanics, underlain by volcanic bedrock with layers of volcanic ash. The majority of recharge to groundwater within the Clear Lake Volcanics Groundwater Source Area is from percolation of rainfall.

To estimate the groundwater recharge at the site, we first must assume that the recharge to the aquifer is primarily through rainfall across the 102.8-acre Project Parcel. Therefore, the annual



precipitation available for recharge onsite can initially be estimated using the following data and equation.

$$102.8 \text{ acres} \times 2.8 \text{ feet (Average Annual Precipitation for Lakeport, CA}^6) = 287.8 \text{ acre-feet}$$

Estimated Average Annual Precipitation Onsite = 287.8 acre-feet/year

However, this estimate does not account for surface run-off, stream underflow, and evapotranspiration that occurs in all watersheds. According to the USGS, the long-term average precipitation that recharges groundwater in the northern California region is approximately 15 percent, but can be as low as 1.67 percent. Since the Project Parcel is mountainous and covered in well drained gravelly loam soils and vegetation, we estimate that the long-term average precipitation that recharges groundwater within the entire site to be approximately 10%. With this data and the precipitation data presented above, we can estimate the groundwater recharge of the Project Parcel by using the following equation.

$$287.8 \text{ acre-feet/year (annual precipitation onsite)} \times 0.1 \text{ (long term average recharge)} =$$

Estimated Average Annual Groundwater Recharge = 28.8 acre-feet/year

The estimates above do not account for severe drought conditions, as we have seen over the last decade. The California Department of Water Resources ranked Water Year 2021 (October 1st, 2020 through September 30th, 2021) as the State's fourth driest on record. During Water Year 2021, less than 10 inches (approximately 9.5 inches) of precipitation fell on the USGS Cache Creek Precipitation Gage near Lower Lake, CA (closest USGS Precipitation Gage to the Project Property). If we rerun the calculations above using this precipitation data, we can obtain the following estimate for groundwater recharge during Water Year 2021.

$$102.8 \text{ acres} \times 0.8 \text{ feet (Water Year 2021 Precipitation for Lower Lake, CA)} = 82 \text{ acre-feet}$$
$$82 \text{ acre-feet (Water Year 2021 Onsite Precip)} \times 0.10 \text{ (long term average recharge)} =$$

Estimated Severe Drought Value for Groundwater Recharge = 8.2 acre-feet

The estimated average annual recharge to the aquifer of the Project Parcel is approximately 28.8 acre-feet/year, and the estimated annual water usage of the proposed cultivation operation is approximately 5.2 acre-feet/year. The estimated amount of water available to recharge the aquifer of the Project Parcel during a severe drought year is approximately 8.2 acre-feet, which is greater than the estimated annual water usage of the proposed cultivation operation. Therefore, it appears that Pacific Cann will have enough water to meet their demands without causing overdraft conditions.

POTENTIAL IMPACTS TO STREAMS & NEIGHBORING WELLS

The onsite groundwater well is located approximately 80 feet south of Cole Creek, and the nearest neighboring wells are located north of Cole Creek and Highway 175, over 500 feet from the onsite groundwater well. On March 3, 2021, JAK Drilling & Pump installed a new 3HP submersible pump in the onsite groundwater well, that is capable of producing flows of 60 gpm at a pumping level of 130 feet bgs. However, to satisfy requirements of Chapter 21, Article 27 of the Lake Code pertaining to commercial cannabis cultivation, JAK Drilling & Pump installed a 1" totalizing flow meter and Well Watch 670™ continuous water level meter at the well head of the onsite well. Per



communication with the JAK Drilling & Pump, the 1" totaling flow meter restricts flow from the well/pump to less than 40 gpm.

To evaluate potential well pumping impacts to surface water bodies or wells on other properties, the potential lateral extent of pumping from the planned project well was estimated. Using general relationships discussed in Driscoll (1986)⁷, we estimate the lateral pumping influence using information from the 2021 well yield test performed by JAK Drilling & Pump. An approximate relationship between specific capacity calculated from the well yield test and aquifer transmissivity was used to obtain aquifer characteristics and estimate a potential radius of pumping influence. Transmissivity was estimated for an unconfined aquifer, using the relationship of specific capacity (yield/drawdown) multiplied by the coefficient of 1,500 (for an unconfined aquifer). To develop the slope of the drawdown curve from the pumping well, the value of Δs (drawdown over on log graph cycle) was calculated for a distance-drawdown relationship, where $T = 528Q/\Delta s$ (Driscoll, 1986, equation 9.11). The analysis is shown on the attached semi-log plot (**Attachment E – Radius of Influence Analysis**).

Using data from the Well Performance Test Report and the general relationships outlined above, we calculated a zone of pumping influence extending approximately 90 feet from the onsite well. Since there are no wells within 500 feet of the onsite groundwater well, we can conclude that pumping the onsite well for the proposed cultivation operation will not have an effect on neighboring wells.

Cole Creek is located approximately 80 feet north of the onsite well, slightly within the estimated radius of pumping influence as calculated. However, the calculations outlined above and in the Radius of Influence Analysis, are based on data from a Well Performance Test where 22,200 gallons of water were pumped from the onsite groundwater well at 60 gpm for six hours. The peak anticipated daily demand for water for the proposed cultivation operation is approximately 7,605 gallons, and the average anticipated daily demand is approximately 4,660 gallons. Additionally, the 1" totaling flow meter restricts flow from the well/pump to less than 40 gpm. To meet the average daily demand, the onsite well would only have to be pumped for less than 2 hours at 40 gpm. To meet the peak anticipated daily demand, the onsite well would only have to be pumped for 3 hours and 11 minutes at 40 gpm. Furthermore, recharge to the aquifer beneath the Project Parcel appears sufficient to meet the proposed cultivation operation's anticipated water demands, even during drought conditions. Therefore, we expect that pumping of the onsite well for the proposed cultivation operation, would have a less than significant impact on stream flow within Cole Creek. Nevertheless, we have proposed mitigation measures in the following Drought Management Plan that should ensure that the proposed project will have a less than significant impact to Cole Creek, even during periods of extreme drought when impacts to all surface water bodies are amplified.

DROUGHT MANAGEMENT PLAN

The Urgency Ordinance approved by the Lake County Board of Supervisors on July 27th, 2021 (Ordinance No. 3106) requires applicants to provide a plan depicting how the applicants plan to reduce water use during a declared drought emergency. Pacific Cann's proposed cannabis cultivation operation will have up to 42,000 ft² of outdoor canopy area and 30,000 ft² of mixed-



light canopy area, with a total combined estimated annual water use requirement of approximately 1,700,000 gallons. Pacific Cann intends to cultivate within the mixed-light canopy areas year-round. Pacific Cann intends to plant the outdoor canopy areas on or around June 1st of each year (depending on climactic conditions). As outlined above, we do not anticipate any direct impacts to streams and/or neighboring wells as a result of pumping of the onsite groundwater well for the proposed cultivation operation.

Per the Water Conservation and Use requirements outlined in the State Water Resources Control Board's Cannabis General Order, Pacific Cann shall implement the following Best Practical Treatment and Control (BPTC) measures to conserve water resources:

- Regularly inspect the entire water delivery system for leaks and immediately repair any leaky faucets, pipes, connectors, or other leaks;
- Apply weed-free mulch in cultivation areas that do not have ground cover to conserve soil moisture and minimize evaporative loss;
- Implement water conserving irrigation methods (drip or trickle and micro-spray irrigation);
- Maintain daily records of all water used for irrigation of cannabis. Daily records will be calculated by using a measuring device (inline water meter) installed on the main irrigation supply line between the water storage area and cultivation area(s);
- Install float valves on all water storage tanks to keep them from overflowing onto the ground.

With the Water Conservation and Use requirements outlined above, the proposed cultivation operation would efficiently use water resources at all times. Additionally, Article 27 Section 27.11 of the Lake County Zoning Ordinance requires commercial cannabis cultivators using water from a groundwater well to install a water level monitor on their water supply well, and to regularly record readings from the continuous water level monitor. Well water level monitoring and reporting shall be performed as follows:

Seasonal Static Water Level Monitoring

Seasonal monitoring of well water levels provides information regarding long-term groundwater elevation trends. The water level in the onsite groundwater well shall be measured and recorded prior to the start of the cultivation season (March/April), and once in the fall (November) after the cultivation season has ended. Data reported to the Lake County Community Development Department as part of the Project's annual reporting requirements shall include a hydrograph plot of all seasonal water level measurements for the onsite groundwater well.

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 can be used to determine the capacity and yield of the onsite groundwater well for 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. Data reported to the Lake County Community Development Department as part of the Project's annual reporting requirements shall include a hydrograph plot of the water level readings during the cultivation season.



In addition to the monitoring and reporting described above, the Project’s annual report shall include an analysis of the water level monitoring data, demonstrating whether or not use of the onsite groundwater 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 Lake County Community Development Department, for review and approval, demonstrating how the project will mitigate the impacts in the future.

DROUGHT EMERGENCY RESPONSE

In response to a drought emergency and to ensure both success and decreased impacts to the surrounding areas, Pacific Cann will reduce water usage by more than 10 percent during the second half of the year, by not replanting a portion of their mixed-light cultivation area during periods of drought. To achieve the 10-plus percent reduction, Pacific Cann will not replant four of the mixed-light greenhouses (7,500 ft² of mixed-light canopy) when a drought emergency has been declared for the region. This reduction would occur during the hottest and driest months, when water usage for the proposed cultivation operation would be at its highest (July, August, and September). The peak anticipated daily demand for water of the proposed cultivation operation is approximately 7,605 gallons per day (when not under a declared drought emergency). By leaving four greenhouses fallow during a drought emergency, Pacific Cann would reduce the peak anticipated daily demand for water of the proposed cultivation operation by more than 750 gallons per day, and its estimated annual water demand by approximately 107,400 gallons. The table below summarizes the anticipated reduction in water usage for the proposed cultivation operation during a drought emergency.

	June	July	August	September	October
Estimated Water Use During Normal Operations (gallons)	195,500	228,100	228,100	228,100	195,500
Estimated Water Use During Drought Emergency (gallons)	176,000	205,300	205,300	205,300	176,000

Table 2 – Estimated Water Use Comparison

As outlined in the Potential Impacts to Streams and Neighboring Wells section of this report, pumping of the onsite well for cultivation, could potentially impact stream flows in Cole Creek during periods of extreme drought. Therefore, we are proposing the following mitigation measure to reduce any potential impacts to surface water bodies (including Cole Creek) to a less than significant level during periods of drought. As depicted on the attached Site Plans (**Attachment D – Proposed and Existing Conditions Site Plans**), Pacific Cann proposes to develop a second onsite groundwater well in the western portion of the Project Parcel, over 1,000 feet from Cole Creek (Item “H” on the Proposed Conditions Site Plans). To mitigate potential impacts to Cole Creek, we propose that Pacific Cann obtain at least 50 percent of the water used onsite for cannabis cultivation during a drought emergency from the proposed groundwater well. Compliance with this mitigation measure should be easy to demonstrate via the data provided in Annual Water Use Reports, as required by Lake County Code for commercial cannabis cultivation operations. We



believe that implementation of this mitigation measure would ensure that potential impacts to stream flows in Cole Creek are reduced to a less than significant level.

CONCLUSIONS

Water for the proposed cultivation operation will come from an existing onsite groundwater well located at Latitude: 38.89974° and Longitude: -122.74777°, and the proposed Project includes at least 20,000 gallons of proposed water storage capacity. The proposed cultivation operation would have an annual water use requirement of approximately 1,700,000 gallons per year. The peak anticipated daily demand for water of the proposed cannabis cultivation operation is approximately 7,605 gallons per day, with an average water demand of approximately 4,660 gallons per day.

Based on the results from a 6-hour Well Performance Test conducted on February 8th, 2021, it appears that the existing onsite groundwater well could produce more than 60 gallons per minute without overdrawing the well. Using data from the 6-hour Well Performance Test we can calculate a Specific Capacity of 7.1 gpm/foot of drawdown. The estimated average annual recharge to the aquifer of the Project Parcel is approximately 28.8 acre-feet/year, and the estimated annual water usage of the proposed cultivation operation is approximately 5.2 acre-feet/year. The estimated amount of water available to recharge the aquifer of the Project Parcel during a severe drought year is approximately 8.2 acre-feet, which is greater than the estimated annual water usage of the proposed cultivation operation. Therefore, it appears that the aquifer storage and recharge area are sufficient to provide for sustainable annual water use at the site and on the Project Parcel.

The calculated zone of pumping influence for the proposed cultivation operation extends approximately 90 feet from the onsite groundwater well. There are no neighboring wells within 500 feet of the onsite groundwater well. Therefore, it does not appear that pumping for the proposed cultivation operation will impact neighboring wells, given the horizontal and vertical separations between the onsite groundwater well and neighboring wells. Cole Creek passes slightly within the calculated zoning of pumping influence. As such, pumping of the onsite groundwater well could potentially impact Cole Creek during periods of drought. Therefore, we have proposed a mitigation measure using a second proposed onsite groundwater well, to reduce the potential impacts to a less than significant level.

Pacific Cann's Drought Management Plan is to reduce water usage by more than 10 percent during the second half of the year, by not replanting four of the mixed-light greenhouses when a drought emergency has been declared. This reduction would occur during the hottest and driest months, when water usage for the proposed cultivation operation would be at its highest (July, August, and September). By leaving four mixed-light greenhouses fallow during a drought emergency, the peak anticipated daily demand for water of the proposed cultivation operation would be reduced by more than 750 gallons per day, and its estimated annual water demand by approximately 107,400 gallons.



LIMITATIONS

Realm Engineering is not responsible for the independent conclusions, opinions or recommendations made by others based on the records review, site inspection, field exploration, and interpretations presented in this report.

Groundwater systems of Lake County are typically complex, and available data rarely allows for more than general assessment of groundwater conditions and delineation of aquifers. Hydrologic interpretations are based on Well Completion Reports made available to us through the California Department of Water Resources, available geologic maps and hydrological studies and professional judgment. This analysis is based on limited available data and relies significantly on interpretation of data from disparate sources of disparate quality.

It should be noted that hydrological assessments are inherently limited in the sense that conclusions are drawn and recommendations developed from information obtained from limited research and site evaluation. Additionally, the passage of time may result in a change in the environmental characteristics at this site and surrounding properties. This report does not warrant against future operations or conditions, nor does this warrant operations or conditions present or a type or at a location not investigated.

This report is for the exclusive use of Pacific Cann, Inc., their affiliates, designates and assignees, and no other party shall have any right to rely on any service provided by Realm Engineering without prior written consent.

Please feel free to contact me with any questions that you may have regarding this Hydrology Study/Report.

Sincerely,
Jason Vine, P.E. 67800



Realm Engineering
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Redding, CA 96001
530-526-7493
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REFERENCES

- ¹Bauer, S., Olson, J., Cockrill, A., et al. 2015. Impacts of surface water diversions for marijuana cultivation on aquatic habitat in four northwestern California watersheds. PLOS ONE, 10(9): e0137935
- ²Carah, J.K., Howard, J.K., Thompson, S.E., *et al.* 2015. High time for conservation: adding the environment to the debate on marijuana liberalization. Bioscience, 65, pp.822-829
- ³Hammon, B., Rizza, J. and Dean, D. 2015. Current impacts of outdoor growth of cannabis in Colorado. Colorado State University Extension, Fact Sheet No. 0.308
- ⁴Dillis, C.R., Grantham, T.E., McIntee, C., McFadin, B., Grady, K.V. 2020. Water storage and irrigation practices for cannabis drive seasonal patterns of water extraction and use in Northern California. Journal of Environmental Management, Volume 272, 15 October 2020, 110955
- ⁵Lake County Watershed Protection District, Lake County Groundwater Management Plan, 2006
- ⁶Scotts Creek Watershed Council, Scotts Creek Watershed Assessment, 2010
- ⁷Driscoll, Fletcher G., 1986, Groundwater and Wells, Second Edition, Johnson Division, St. Paul Minnesota, 1089p.



ATTACHEMENT A

URGENCY ORDINANCE NO. 3106

BOARD OF SUPERVISORS, COUNTY OF LAKE, STATE OF CALIFORNIA

ORDINANCE NO. 3106

AN URGENCY ORDINANCE REQUIRING LAND USE APPLICANTS TO PROVIDE ENHANCED WATER ANALYSIS DURING A DECLARED DROUGHT EMERGENCY

WHEREAS, the Sheriff, acting as the OES Director of Lake County, declared a local emergency due to drought conditions on May 6, 2021; and

WHEREAS, the Lake County Board of Supervisors approved the ratification of the declaration of a local emergency due to drought conditions on May 11, 2021; and

WHEREAS, the Board of Supervisors wish to ensure continued access to drinking water from private wells or from water purveyors throughout the county; and

WHEREAS, the Board of Supervisors wish to ensure that all current agricultural activities and projects find success during this declared drought emergency; and

WHEREAS, the Board of Supervisors of the County of Lake finds that additional information is critical to ensuring that the Planning Commission approves projects based on evidence of water use and water impacts and the analysis of the impacts to the surrounding areas.

NOW THEREFORE, the Board of Supervisors of the County of Lake hereby ordains as follows:

Section One: Due to the exceptional drought that we are experiencing and the declaration of a drought emergency, any land use approvals are required to provide adequate information regarding water usage for the project being considered and its impacts to surrounding areas. All projects that require a CEQA analysis of water use must include these additional items:

- A. Hydrology report prepared by a California licensed civil engineer, hydro-geologist, hydrologist, or geologist experienced in water resources
 - a. Approximate amount of water available for the project's identified water source
 - b. Approximate recharge rate for the project's identified water source
 - c. Cumulative impact of water use to surrounding areas due to project
- B. Drought Management Plan
 - a. Provide a plan depicting how the applicants plan to reduce water use during a declared drought emergency, to ensure both success and decreased impacts to the surrounding areas

Section Two: This urgency ordinance, if approved, shall take effect on all future Planning Commission considerations until the declared drought emergency has expired or if the Board of Supervisors revokes the ordinance.

Section Three: It can be seen with certainty that there is no possibility that this urgency Ordinance may have a significant effect on the environment.

Section Four: All ordinances or parts of ordinances or resolutions or parts of resolutions in conflict herewith are hereby repealed to the extent of such conflict and no further.

Section Five: This ordinance shall go into effect immediately, and before the expiration of fifteen days after its passage, it shall be published at least once in a newspaper of general circulation printed and published in the County of Lake.

Section Six: This Ordinance is adopted as an urgency Ordinance pursuant to the provisions of Government Code sections 25123 and 25131 and shall be effective immediately upon adoption. Based on the declaration of purpose and facts constituting the urgency set forth above in Section One of this Ordinance, the Board of Supervisors finds and determines that the adoption of this Ordinance as an urgency Ordinance is necessary for the immediate preservation of the public peace, health and safety to address critical groundwater conditions in Lake County.

The Foregoing Ordinance was introduced before the Board of Supervisors on the 27th day of July, 2021, and passed by the following vote on the 7th day of July, 2021.

AYES: Supervisors Simon, Crandell, Scott, Pyska, and Sabatier

NOES: None

ABSENT OR NOT VOTING: None

COUNTY OF LAKE


Supervisor, County of Lake, 2021 (04/15/2021)

Chair, Board of Supervisors

ATTEST: CAROL J. HUCHINGSON
Clerk of the Board of Supervisors

By: _____
Deputy

APPROVED AS TO FORM:

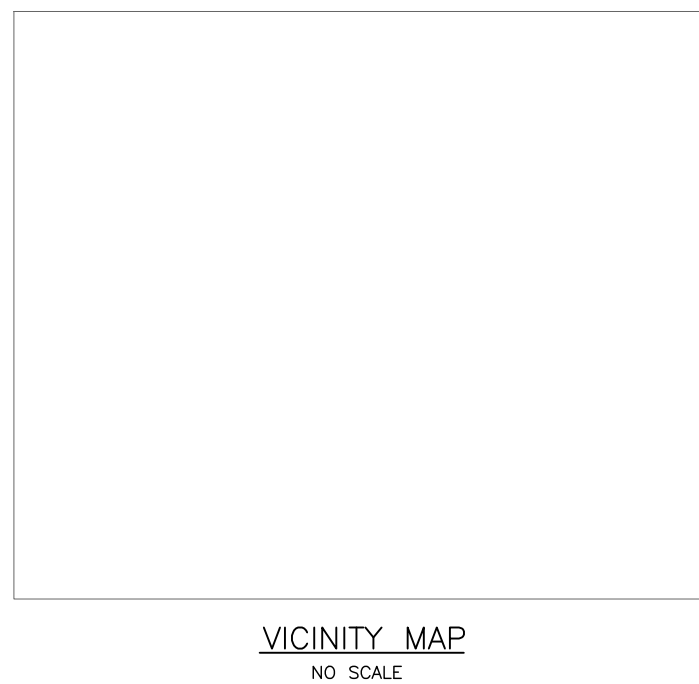
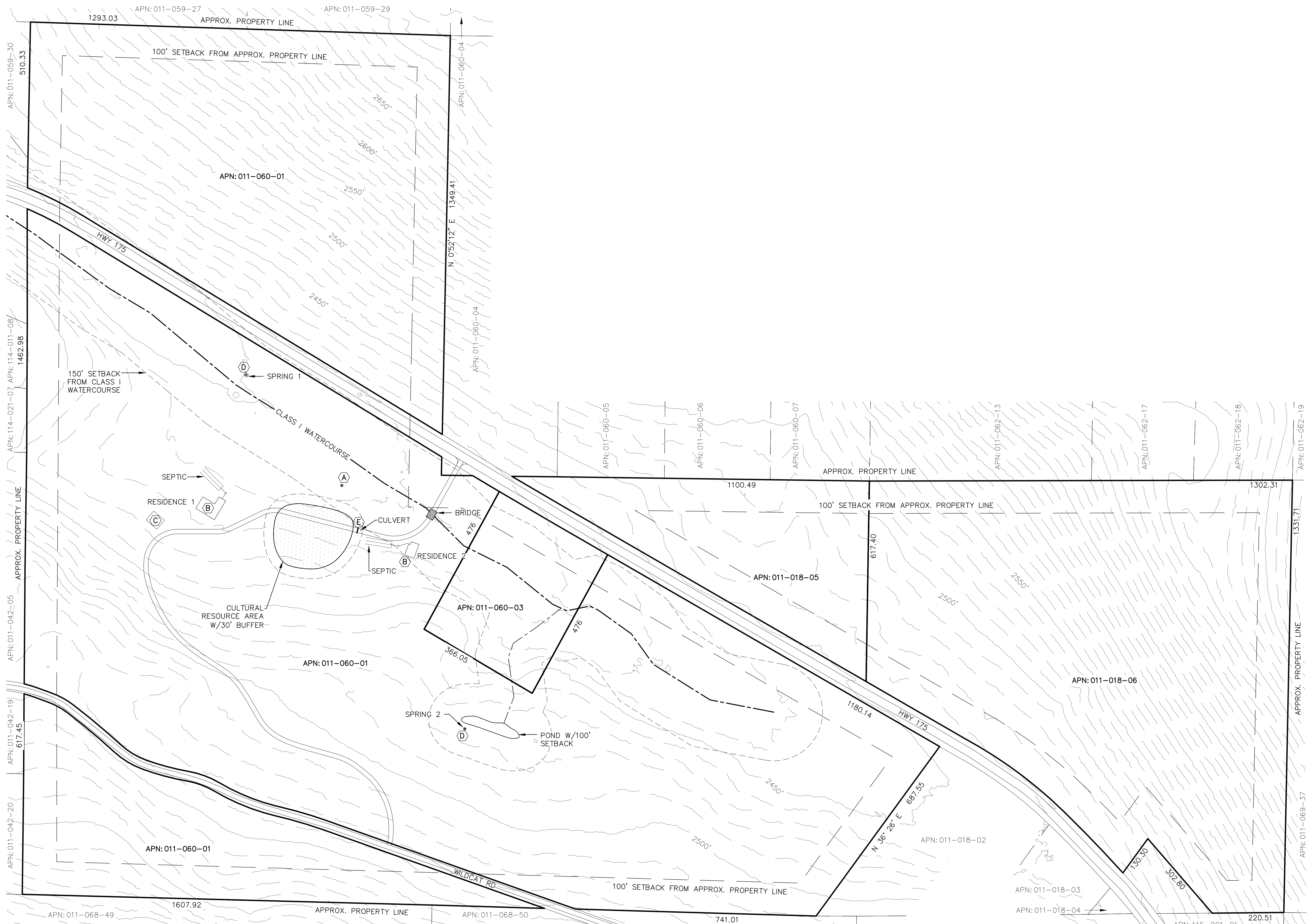
ANITA L. GRANT
County Counsel

By: _____



ATTACHEMENT B

EXISTING AND PROPOSED CONDITIONS SITE PLANS



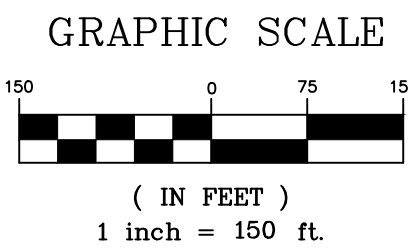
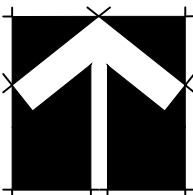
9141 STATE HIGHWAY 175
KELSEYVILLE, CA 95451
LAKE COUNTY
APN'S: 011-018-05 & 06 AND
011-060-01 & 03

- LEGEND:**
- 1530 CONTOUR ELEVATION
 - FENCE
 - ASPHALT
 - GRAVEL
 - CREEK / SWALE
 - APN ASSESSOR'S PARCEL NUMBER
 - APPROX APPROXIMATELY
 - DWY DRIVEWAY
 - (E) EXISTING
 - (P) PROPOSED
 - RD ROAD
 - SF SQUARE FEET

NOTES:
1. CONTOUR INTERVAL IS 10'

- (E) GROUNDWATER WELL
LAT: 38.69974°
LONG: -122.74777°
BENEFICIAL USES:
-IRRIGATION
-FIRE PROTECTION
- (B) (E) RESIDENCE
- (C) (E) BARN
- (D) (E) SPRING
- (E) (E) CULVERT
- (F) (P) 31,920 SF OUTDOOR CULTIVATION AREA W/ 22,800 SF OF CANOPY
- (G) (P) 13,200 SF OUTDOOR CULTIVATION AREA W/ 9,600 SF OF CANOPY
- (H) (P) (18 TOTAL) 6'X90' MIXED-LIGHT CANOPY AREAS (LOW HOOPS)

EXISTING CONDITIONS SITE PLAN



Revisions:

REALM ENGINEERING
CIVIL ENGINEERING, SURVEYING & PLANNING
1767 MARKET STREET SUITE C
REDDING, CA. 96001
530-526-7493

PLANS PREPARED UNDER THE
SUPERVISION OF:



EXISTING CONDITIONS SITE PLAN

9141 STATE HIGHWAY 175
KELSEYVILLE, CA 95451
APN'S: 011-018-05 & 06 and 011-060-01 & 03

PLOTTED BY:

DATE PLOTTED:

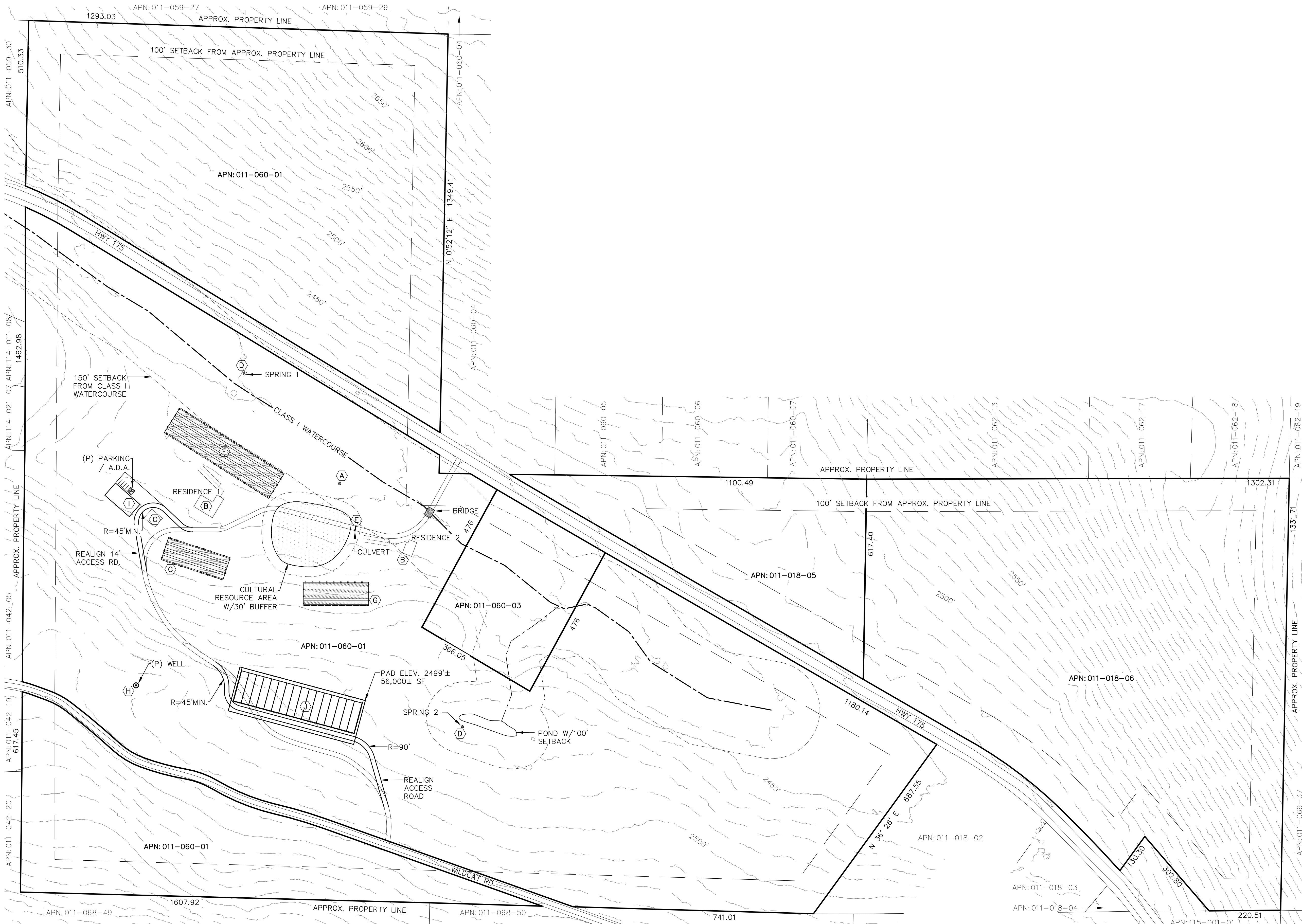
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JOB NUMBER:

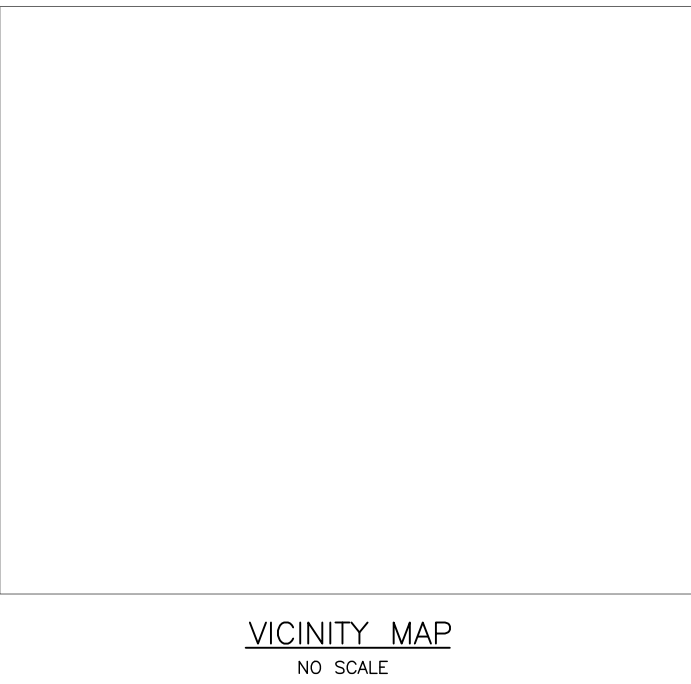
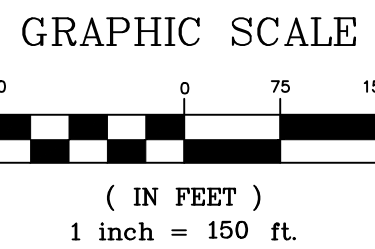
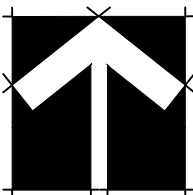
CADD FILE:

SHEET:

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PROPOSED CONDITIONS
SITE PLAN



9141 STATE HIGHWAY 175
KELSEYVILLE, CA 95451
LAKE COUNTY
APN'S: 011-018-05 & 06 AND
011-060-01 & 03

LEGEND:

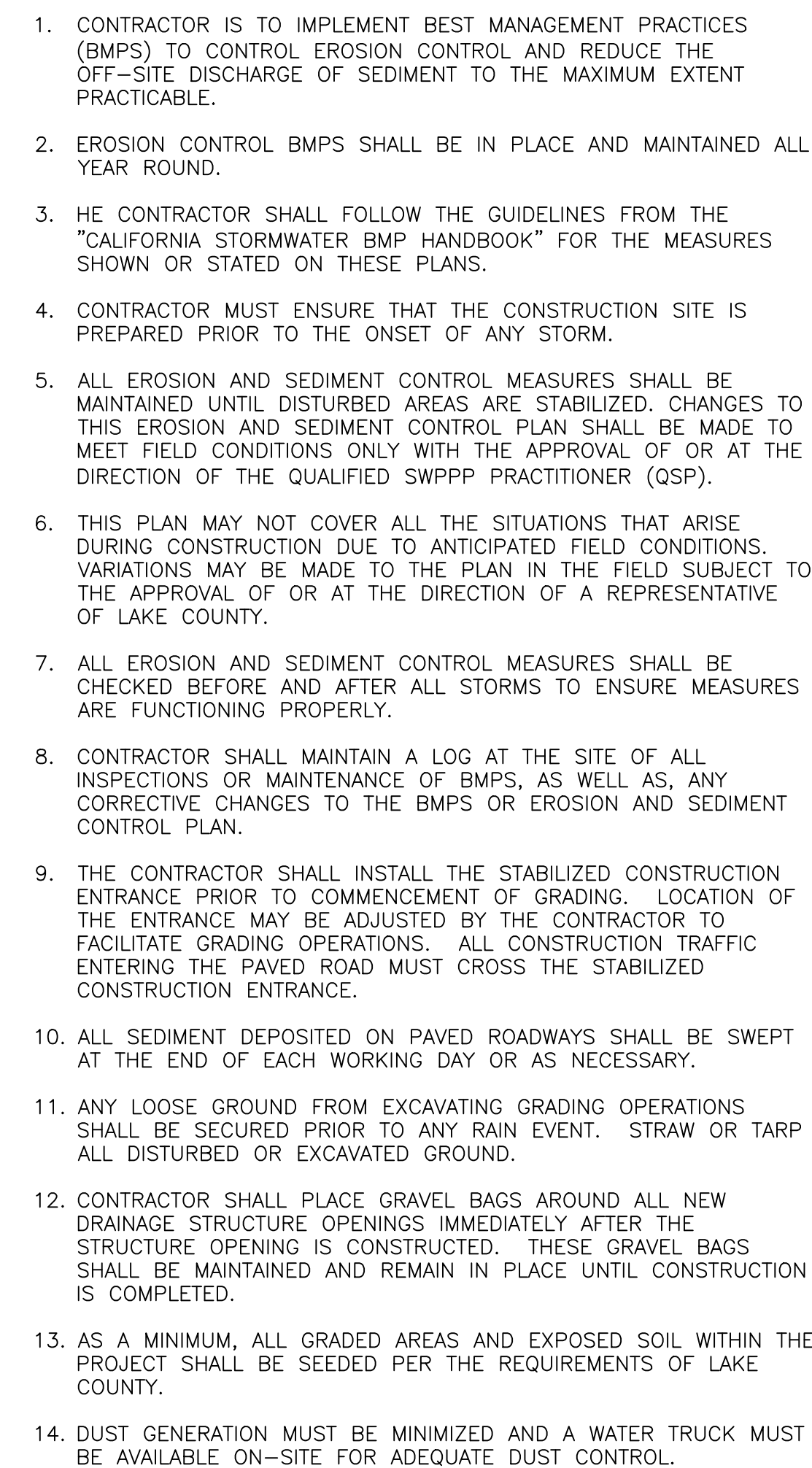
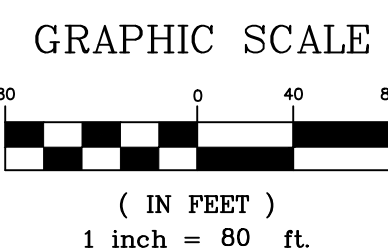
- 1530 CONTOUR ELEVATION
- FENCE
- ASPHALT
- GRAVEL
- CREEK / SWALE
- APN ASSESSOR'S PARCEL NUMBER
- APPROX APPROXIMATELY
- DWY DRIVEWAY
- (E) EXISTING
- (P) PROPOSED
- RD ROAD
- SF SQUARE FEET

NOTES:

1. CONTOUR INTERVAL IS 10'

- (E) GROUNDWATER WELL
LAT: 38.89974°
LONG: -122.74777°
BENEFICIAL USES:
-IRRIGATION
-FIRE PROTECTION
- (B) (E) RESIDENCE
- (C) (E) BARN
- (D) (E) SPRING
- (E) (E) CULVERT
- (F) (E) 31,920 SF OUTDOOR CULTIVATION
AREA W/ 22,800 SF OF CANOPY
- (G) (E) 13,200 SF OUTDOOR CULTIVATION
AREA W/ 9,600 SF OF CANOPY
- (P) GROUNDWATER WELL
LAT: 38.89974°
LONG: -122.75085°
BENEFICIAL USES: IRRIGATION & FIRE PROTECTION
- (P) 50'x100' (5,000 SF) PROCESSING
FACILITY
- (P) SIXTEEN 24'x96' GUTTER CONNECTED
GREENHOUSES

Revisions:



- (A) (E) GROUNDWATER WELL
LAT: 38.89974"
LONG: -122.74777"
BENEFICIAL USES:
—IRRIGATION
—FIRE PROTECTION
- (B) (E) RESIDENCE
- (C) (E) BARN
- (D) (E) SPRING
- (E) (E) CULVERT
- (F) (E) 31,920 SF OUTDOOR CULTIVATION
AREA W/ 22,800 SF OF CANOPY
- (G) (E) 13,200 SF OUTDOOR CULTIVATION
AREA W/ 9,600 SF OF CANOPY
- (E) GROUNDWATER WELL
LAT: 38.89824"
LONG: -122.75085"
BENEFICIAL USES: IRRIGATION & FIRE PROTECTION
- (I) (E) 50'x100' (5,000 SF) PROCESSING
FACILITY
- (J) (E) SIXTEEN 24'x96' GUTTER CONNECTED
GREENHOUSES

[illegible]



ATTACHEMENT C

ONSITE WELL COMPLETION REPORT

State of California
Well Completion Report
 Form DWR 188 Submitted 2/15/2021
 WCR2021-002030

Owner's Well Number _____ Date Work Began 01/15/2021 Date Work Ended 02/04/2021
 Local Permit Agency Lake County Health Services Department - Environmental Health Division
 Secondary Permit Agency _____ Permit Number WP0003682 Permit Date 01/13/2021

Well Owner (must remain confidential pursuant to Water Code 13752)			Planned Use and Activity	
Name	<u>Robin Betts</u>		Activity	<u>New Well</u>
Mailing Address	<u>9141 State Hwy 175</u>		Planned Use	<u>Water Supply Irrigation - Agriculture</u>
City	<u>Kelseyville</u>	State <u>CA</u> Zip <u>95451</u>		

Well Location									
Address <u>9141 State Highway 175 HWY</u>						APN <u>011-060-01</u>			
City <u>Kelseyville</u>		Zip <u>95451</u>		County <u>Lake</u>		Township _____			
Latitude <u>38</u> <u>53</u> <u>59.1719</u> <u>N</u>		Longitude <u>-122</u> <u>44</u> <u>52.044</u> <u>W</u>				Range _____			
Deg. Min. Sec.		Deg. Min. Sec.				Section _____			
Dec. Lat. <u>38.89977</u>		Dec. Long. <u>-122.74779</u>				Baseline Meridian _____			
Vertical Datum _____		Horizontal Datum <u>WGS84</u>				Ground Surface Elevation _____			
Location Accuracy _____		Location Determination Method _____				Elevation Accuracy _____			
						Elevation Determination Method _____			

Borehole Information				Water Level and Yield of Completed Well			
Orientation <u>Vertical</u>		Specify _____		Depth to first water <u>10</u> (Feet below surface)			
Drilling Method <u>Cable Tool</u>		Drilling Fluid <u>Water</u>		Depth to Static _____			
Total Depth of Boring <u>134</u> Feet				Water Level <u>8</u> (Feet)		Date Measured <u>02/03/2021</u>	
Total Depth of Completed Well <u>134</u> Feet				Estimated Yield* <u>100</u> (GPM)		Test Type <u>Bailing</u>	
				Test Length <u>2</u> (Hours)		Total Drawdown _____ (feet)	
				*May not be representative of a well's long term yield.			

Geologic Log - Free Form		
Depth from Surface Feet to Feet		Description
0	5	soft dirt, overburden
5	20	small cobble, round and alluvial in nature, with sand
20	80	Blue-ish clays with some rock
80	105	volcanic ash
105	120	hard rock
120	127	volcanic ash
127	134	obsidian

Casings										
Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	20	Blank	PVC	N/A	0.265	5.563			
1	20	134	Screen	PVC	N/A	0.265	5.563	Milled Slots	0.032	

Annular Material					
Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	20	Bentonite	Other Bentonite		sanitary seal
20	134	Filter Pack	Other Gravel Pack	pea gravel	double washed pea gravel

Other Observations:

Borehole Specifications		
Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	20	10.875
20	134	7.875

Certification Statement

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

Name

JAK DRILLING AND PUMP, Kharom Hellwege

Person, Firm or Corporation

PO Box 250

Middletown

CA

95461

Address

City

State

Zip

Signed

electronic signature received

02/15/2021

1013957

C-57 Licensed Water Well Contractor

Date Signed

C-57 License Number

DWR Use Only

CSG #

State Well Number

Site Code

Local Well Number

N

W

Latitude Deg/Min/Sec

Longitude Deg/Min/Sec

TRS:

APN:



ATTACHEMENT D

WELL PERFORMANCE TEST REPORT



WELL PERFORMANCE TEST REPORT

Client Name: Tyler Betts
Property Location: 9141 State Highway 175, Kelseyville, CA
Parcel Number: 011-060-01
Number of Wells Evaluated: One
Well Performance Test Completion Date: February 8, 2021
Water Samples Collected: No
Pump Technician: Ken Feola

Location Description: 38.89977, -122.74779
Total Depth: 134-feet below top of casing
Depth to Static Water Level: 10.0-feet below the top of casing
Diameter of well: 5-inches
Casing type: PVC
Test Duration: 6-hours
Test Type: Pump
Pumping Rate: >61.67-Gallons Per Minute (GPM)

Observations:

The well is located south of State Highway 175 in a clearing to the northwest of the private residence (see attached Parcel Boundary and Well Location Maps). Per the attached Well Completion Report, the well was completed on February 4, 2021 by JAK Drilling and Pump Company via the cable tool method of drilling. Upon completing the well, the driller developed the well using a suction bailer until the water ran clear which took approximately two hours. Developing the well removes the fines from drilling and prepares the well for the installation of a submersible pump. The driller estimated at the time that the well was capable of producing upwards of 100-GPM. While it was noted by the driller that the well is capable of producing upwards of 100-GPM, for the purpose of this test the performance of the well was measured according to the projected need of the client as opposed to determining the maximum discharge capabilities of the well.

Well Performance Pump Test:

The six-hour pump test was conducted on February 8, 2021 using a temporarily installed 3-horse 40-GPM submersible test pump set in accordance with industry standards. Per the pump curve, the submersible test pump is capable of producing flows of up to 60-GPM at a pumping level of 130-feet below the top of casing. The static water level within the well was measured prior to the start of the test. Once the performance test began, the depth-to-water or pumping level was measured manually with a Powers Water Meter in the well every five minutes during the first half hour of the test and then every 10-minutes for the next hour of the test. The measurement interval was then increased to every 30-minutes for the remainder of the six-hour test. The



pumping rate was measured by timing the flow through a temporarily installed totalizing flow meter connected to the discharge pipe directed away from the well location. The pumping rate was measured at the same intervals as the pumping level. Both the depth-to-water/pumping level and pumping rate measurements are summarized in the attached table.

The static water level was measured at 8.5-feet below the top of casing at the start of the performance test. The pumping level slowly decreased to 17-feet below the top of casing during the first three hours of the test. It remained at 17-feet below the top of casing for the duration of the test. The pumping rate, measured by timing the flow through the totalizing flow meter, measured at 62-GPM at the beginning of the test and the decreased to 60-GPM after two hours. The pumping rate remained at 60-GPM for the duration of the test.

After six hours of pumping, the well produced 22,200-gallons of water which averages out to a pumping rate of 61.67-GPM which is consistent with the capabilities of the temporary installed test pump. At the end of the test the well pump was shut off and the well was then allowed to rest and recharge. The depth-to-water was measured in the well after 10-minutes at 12.00-feet and then again in the well after 30-minutes at 10-feet below the top of casing; resulting in a recharge rate of 82.35% after resting 40-minutes. At the observed rate of recharge the well would be fully recharged within an hour of turning off the pump. Assuming all other variables are constant, at 61.67-GPM the well is capable of producing 32,413,752-gallons annually.

Water Quality:

During the course of the performance test, JAK collected a water sample for the purpose of a field quality test with the following results:

Parameter	Concentration	Discussion
Hardness	4-Grains per gallon	VERY HARD, a softener is recommended when the hardness is greater than 7-gpg
Iron (ferrous)	0.4-part per million	EPA suggests a concentration of less than 0.3ppm for public drinking water system, higher concentrations can cause rust staining over time
pH	6.53	A pH of 7.0 is considered neutral
Total Dissolved Solids	87-part per million	Less than 500-ppm is acceptable, the higher the concentration the harder the water typically

Pump Install:

On March 3, 2021, JAK installed a new 3-horse 40-GPM submersible pump set in the well. Per the pump curves the submersible pump is capable of flows of 60-GPM at a pumping level of 130-feet. Per the County of Lake Ordinance No. 3073, pertaining to cannabis cultivation, Section 5.xii (e); *the production well shall have a meter to measure the amount of water pumped. The production wells shall have continuous water level monitors.*

To satisfy this requirement, JAK installed a totalizing flow meter and Well Watch™670 at the well head. The totalizing flow meter measures the amount of water produced from the well. The Well Watch™670 measures the water level within the well utilizing low frequency sound waves. When powered, the depth to water is measured continuously while the internal datalogger logs/records the measurement every minute.



Disclaimer: Observations made of the well(s) are strictly limited to the date and time that the test(s) was conducted and are in no way a guarantee of future conditions, including but not limited to the quantity and/or quality of the water produced by this well. Please feel free to contact our office if there are any questions regarding the well test and/or well test report.

Sincerely,



Jessica Moreno
JAK Drilling & Pump

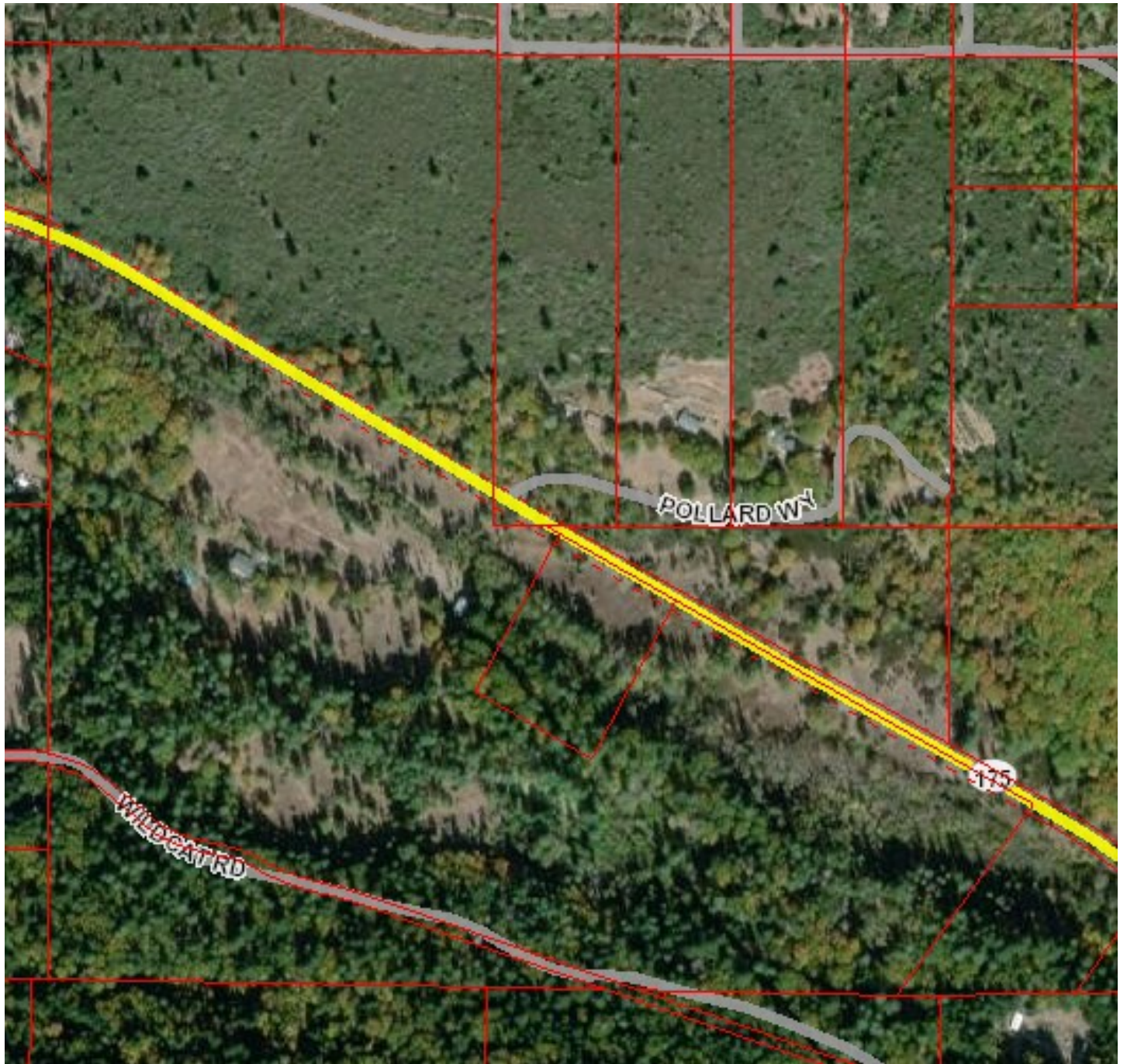
Attachments:

Parcel Boundary Map

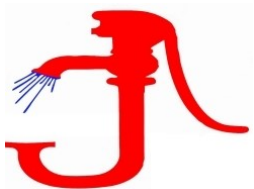
Well Location Map

Well Completion Report

Table 1: Well Performance Test Data



PARCEL BOUNDARY MAP
9141 State Hwy 175
Kelseyville, CA





Well Location
9141 State Hwy 175
Kelseyville, CA



State of California
Well Completion Report
 Form DWR 188 Submitted 2/15/2021
 WCR2021-002030

Owner's Well Number _____ Date Work Began 01/15/2021 Date Work Ended 02/04/2021
 Local Permit Agency Lake County Health Services Department - Environmental Health Division
 Secondary Permit Agency _____ Permit Number WP0003682 Permit Date 01/13/2021

Well Owner (must remain confidential pursuant to Water Code 13752)			Planned Use and Activity	
Name	<u>Robin Betts</u>		Activity	<u>New Well</u>
Mailing Address	<u>9141 State Hwy 175</u>		Planned Use	<u>Water Supply Irrigation - Agriculture</u>
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Address <u>9141 State Highway 175 HWY</u>						APN <u>011-060-01</u>			
City <u>Kelseyville</u>		Zip <u>95451</u>		County <u>Lake</u>		Township _____			
Latitude <u>38</u> <u>53</u> <u>59.1719</u> <u>N</u>		Longitude <u>-122</u> <u>44</u> <u>52.044</u> <u>W</u>				Range _____			
Deg. Min. Sec.		Deg. Min. Sec.				Section _____			
Dec. Lat. <u>38.89977</u>		Dec. Long. <u>-122.74779</u>				Baseline Meridian _____			
Vertical Datum _____		Horizontal Datum <u>WGS84</u>				Ground Surface Elevation _____			
Location Accuracy _____		Location Determination Method _____				Elevation Accuracy _____			
						Elevation Determination Method _____			

Borehole Information				Water Level and Yield of Completed Well			
Orientation <u>Vertical</u>		Specify _____		Depth to first water <u>10</u> (Feet below surface)			
Drilling Method <u>Cable Tool</u>		Drilling Fluid <u>Water</u>		Depth to Static _____			
Total Depth of Boring <u>134</u> Feet				Water Level <u>8</u> (Feet)		Date Measured <u>02/03/2021</u>	
Total Depth of Completed Well <u>134</u> Feet				Estimated Yield* <u>100</u> (GPM)		Test Type <u>Bailing</u>	
				Test Length <u>2</u> (Hours)		Total Drawdown _____ (feet)	
				*May not be representative of a well's long term yield.			

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Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	20	Blank	PVC	N/A	0.265	5.563			
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Other Observations:

Borehole Specifications		
Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	20	10.875
20	134	7.875

Certification Statement

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

Name

JAK DRILLING AND PUMP, Kharom Hellwege

Person, Firm or Corporation

PO Box 250

Middletown

CA

95461

Address

City

State

Zip

Signed

electronic signature received

02/15/2021

1013957

C-57 Licensed Water Well Contractor

Date Signed

C-57 License Number

DWR Use Only

CSG #

State Well Number

Site Code

Local Well Number

N

W

Latitude Deg/Min/Sec

Longitude Deg/Min/Sec

TRS:

APN:

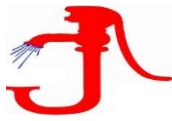


TABLE 1
WELL PERFORMANCE TEST DATA
9141 State Highway 175, Kelseyville, CA
February 8, 2021

Time	Gallons Per Minute	Depth to Water In Feet Below Top of Casing
9:40	Static	8.50
9:45	62.00	13.50
9:50	62.00	14.00
9:55	62.00	14.00
10:00	62.00	14.50
10:05	62.00	14.50
10:10	62.00	15.00
10:20	62.00	15.00
10:30	62.00	15.00
10:40	62.00	15.50
10:50	62.00	15.50
11:00	62.00	15.50
11:10	61.00	16.00
11:40	60.00	16.00
12:10	60.00	16.50
12:40	60.00	16.50
13:10	60.00	17.00
13:40	60.00	17.00
14:10	60.00	17.00
14:40	60.00	17.00
15:10	60.00	17.00
15:40	60.00	17.00
15:50	RECHARGE	12.00
16:20	RECHARGE	10.00

NOTES:

Flow rate measured by timing flow through totalizing flow meter.

<u>Meter Start</u>	<u>Meter End</u>	<u>Total Volume Produced</u>
48200	70400	22,200-Gallons

Average Pumping Rate = 22,200 gallons/360 Minutes = 61.67-GPM

Recharge Rate = $((17-10) \div (17-8.5)) \times 100 = 82.35\%$



ATTACHEMENT E

RADIUS OF INFLUENCE ANALYSIS

Radius of Influence Analysis

Well Radius (from Well Completion Report) = $5.5''/2 \times 1'/12'' = 0.2$ feet

Specific Capacity (using data from Well Performance Test Report)
 $60 \text{ gpm (yield)} / 8.5 \text{ feet (drawdown)} = 7.1 \text{ gpm/foot of drawdown}$
Specific Capacity (SC) = 7.1

Modified Jacob's equation from Driscoll Appendix 16-D (Driscoll 1986⁷)
Transmissivity Unconfined Aquifer $T = SC \times 1500 = 10,650 \text{ gpft/day}$

Distance Drawdown Equation Driscoll 9.11 (Driscoll 1986⁷) $T = 528Q / \Delta s$
 $\Delta s = 528Q / T$
 $\Delta s = 528 \times 60 \text{ gpm} / 10,650 = 3.0$ over one log cycle

From Distance Drawdown Graph (below)
Approximate Radius of Pumping Influence = 90 feet

