Attachment 5

Luhdorff & Scalmanini
Consulting Engineers

TECHNICAL MEMORANDUM

DATE: September 27, 2021 Project No.: 21-1-101

TO: Meili Liu;
Mike Alcantar

FROM: Eddy Teasdale, PG, CHG.
Angelica Rodriguez-Arriaga

SUBJECT: Ground Water (Hydrologic) Technical Memorandum Report to Support Lake County Ordinance 3106 (Specific to Section One, Part A), 8531 High Valley Road, Lake County, CA APN: 006-003-340

1 INTRODUCTION

This Technical Memorandum (TM) supports the requirements of Ordinance 3106 specific to Section One, Part A which pertain to the amount of water available for 8531 High Valley Road, Lake County, CA (Project), recharge rate for the Project's identified water source; and the impact of water use by the Project, to surrounding areas. The process used to determine the requirements of Ordinance 3106 are described in this TM. Provided herein are the key findings, conclusions, and preliminary recommendations regarding water availability for the Project.

The Project will utilize water from a recently installed on-site production well. For irrigation, the Project proposes to utilize, during peak use, an estimated 22,500 gallons per day (gpd); during non-peak use, an estimated 1,500 gpd according to the county approved Project's Water Use Management Plan (WUMP). To meet operational requirements related to irrigation, the production well could produce a maximum of 25 Acre-feet per year (AF/year), assuming the well would pump 40 gallons per minute (gpm) operating 9 hours on and 15 hours off (operating at peak use year-round, which provides a very conservative volume as this duration is not likely); a minimum of 9.4 AF/year, assumed to be 40 gpm operating 9 hours on and 15 hours off for three months (peak use) or 2.9 gpm operating 9 hours on and 15 hours off for nine months (non-peak use). In reality the annual projected use will range from 9.41 – 14.58 AF/year depending on water demands.

2 GEOLOGY AND HYDROGEOLOGY

The Project location is in the High Valley Ridge area, which in turn is located within a large structural depression referred to as the Clear Lake Basin. The High Valley Ridge is a northwest – east-west trending ridge that is bound by the Clear Lake fault and Clear Lake on the west and by Long Valley to the east.

The Clear Lake Basin is located in the northern section of the San Andreas Fault system which is dominated by right lateral strike slip faults oriented north north-west – south south-east, parallel to the coastline to the west. Principal faults in the Clear Lake Basin area include the Collayomi fault, which spans across the southwest portion of the basin and dies out northward between Big Valley and Mount Konocti; the Clover Valley and Clear Lake faults span the east portion of the basin and extend to the northeast. The orientation and position of faults describes a right stepover of lateral movement which, for a right lateral fault system, results in local extension expressed as a topographic basin such as the Clear Lake Basin.

The Clear Lake Basin is located in the Coast Range province; the basement unit of the Coast Range consists of the 150-165 Ma Franciscan Formation (metamorphic rock) which underlies most groundwater basins in the Clear Lake Basin. Quaternary alluvium (sedimentary rock) forms groundwater basins in the valleys of the Clear Lake Basin, and Clear Lake Volcanics (volcanic rock) 2.5 Ma and younger, form hills, geysers, and hot springs in the area (see map on **Figure 1**).

There are 12 groundwater basins and one groundwater source area (Clear Lake Volcanics groundwater source area) recognized in Lake County (CDM, 2006). Information on each groundwater basin varies widely, some basins have little or no data available to characterize groundwater conditions. While sedimentary deposits data is available for major groundwater basins, little information is available for the smaller alluvial basins within Lake County.

Natural recharge to the Clear Lake Basin is presumably from three sources, percolation of runoff, subsurface inflow in unconsolidated sediments and direct infiltration from rain (USGS, 2008).

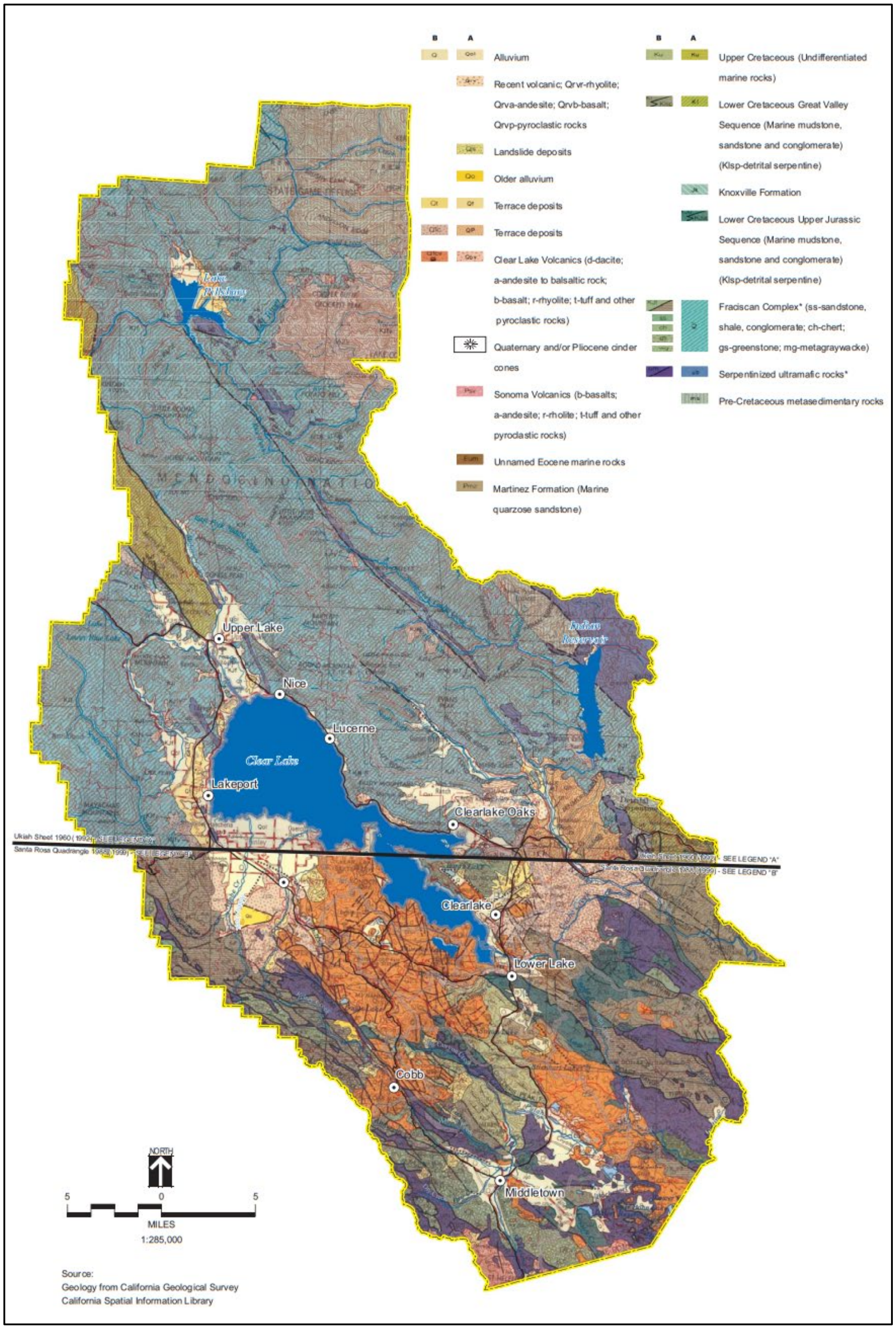

Figure 1. General Geologic Map of the Project Location (CDM, 2006)

3 GROUNDWATER CONDITIONS

3.1 Well Inventory

An inventory of existing domestic wells within 8 miles of the Project are documented by LSCE to support Ordinance 3106 items related to the impact of water use on neighboring domestic wells. Existing domestic wells were reported as listed in the California Department of Water Resources (DWR) Well Completion Report Map Application (DWR-Well Completion Report Map Application, 2021). The number of existing wells (n) and average depth of wells (d) in ft below land surface, within 8 miles, are presented on **Figure 2**.

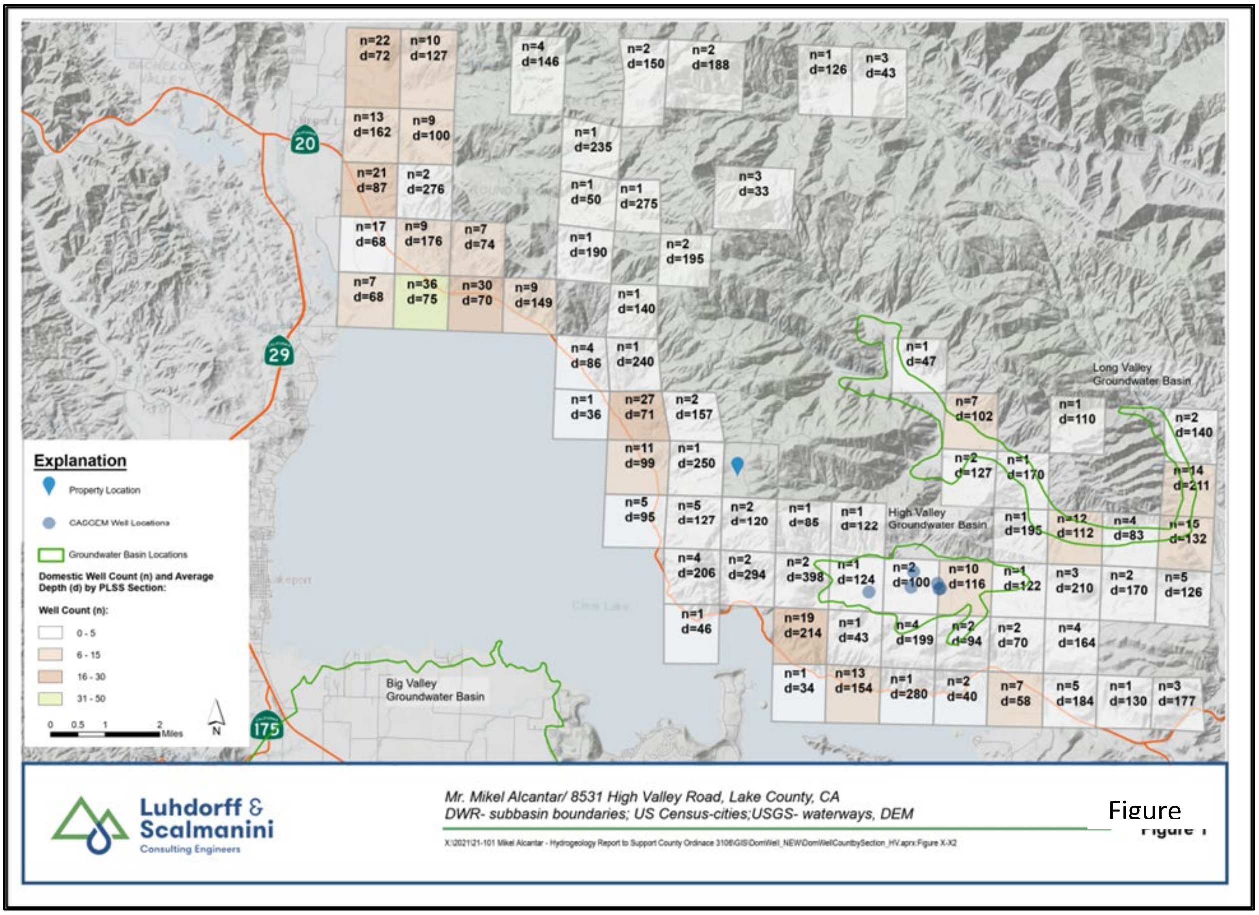

Figure 2. Number of Nearby Domestic Wells (n) and Average Depth (d) in ft Near Project Location.

3.2 Historical Water Level Changes

Limited historical depth to groundwater level data are available for the area. A representative hydrograph from a CASGEM well (state well ID 14N08W24H001M; SGMA dataviewer, 2021), a component of the CASGEM well array in the High Valley groundwater basin, is presented on **Figure 3**. Well locations are shown on **Figure 2** and on **Figure 4**. The hydrograph indicates an increase in groundwater levels (groundwater was rising) starting in 1963 through approximately 2006, when depth to groundwater ranged from 1,652 feet above mean sea level (a MSL) to 1735 feet a MSL. From 2006 until 2009 depth to groundwater decreased (groundwater was falling) from approximately 1735 feet a MSL to 1667 feet a MSL. Since about 2013, groundwater levels have been increasing in this area (groundwater is rising).

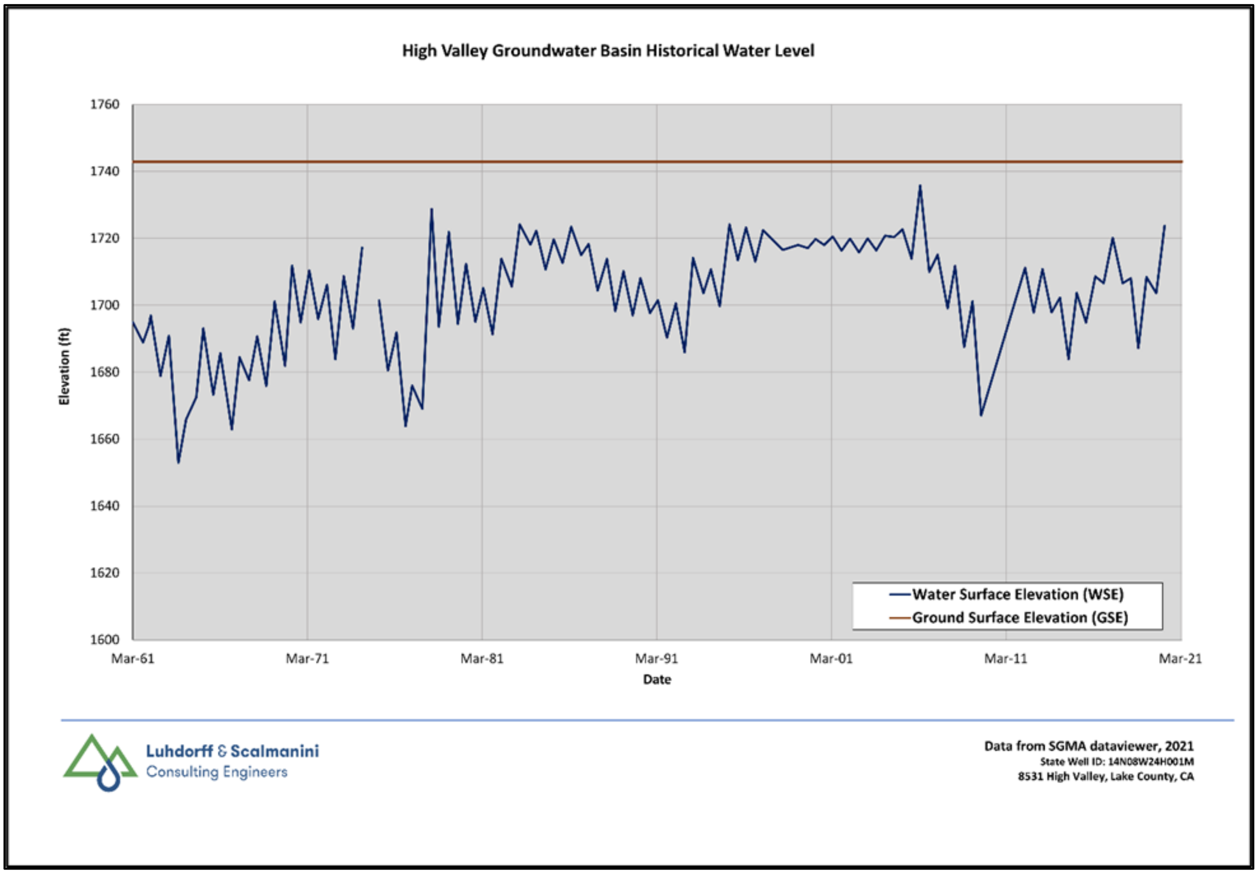

Figure 3. A Hydrograph Showing Historical Water Levels for the High Valley Groundwater Basin (State Well ID: 14N08W24H001M).

4 GROUNDWATER AVAILABILITY

To support Ordinance 3106 items related to estimating amount of water available for the Project's identified water source, LSCE utilized two well-established and accepted methodologies to evaluate groundwater availability for the Project. The first methodology evaluated the availability of water based on calculating the amount of groundwater flowing beneath the Project site. This groundwater would be available for extraction by one or more wells for use on the overlying lands. This evaluation was completed by using Darcy's Law, which described flow through porous media. The second methodology estimated the groundwater recharge from precipitation records collected at two databases including 1. The California Irrigation Management Information System (CIMIS) Sanel Valley Station (location on Figure 6; data CIMIS, 2021) and 2. The Parameter-elevation Regression on Independent Slopes Model (PRISM; data PRISM, 2021) which interpolates data for the Project's location based on surrounding PRISM grid cell centers.

4.1 Availability based on Flowing Groundwater beneath the Project

Approximate groundwater discharge flowing through the area proposed for development at 8531 High Valley Road, Lake County, CA was estimated by utilizing Darcy's Law:

$$Q = KiA$$

Where *Q* is discharge (ft^3/day or AF/year), *K* is hydraulic conductivity feet per day (ft/day), *i* is the hydraulic horizontal gradient (ft/ft), and *A* (ft^2) is the cross-sectional area.

Hydraulic Conductivity, K: Values for transmissivity, T, were reviewed from well testing conducted on the Project well (WCR, 2020). Aquifer transmissivity is ideally determined from long duration (i.e. greater than 12 hrs in duration) aquifer tests, but these have not been done in the vicinity. In the absence of aquifer tests, a specific capacity value can be used to estimate transmissivity. During well testing (WDDT, 2021), a specific capacity (Sc) of 1.06 gpm per foot of drawdown was calculated. Applying a commonly used conversion factor for semi-confined aquifers of 1,500, per Driscoll (1986), the estimated transmissivity was calculated to be 212 ft^2/day. To calculate hydraulic conductivity (K), LSCE used the following equation:

$$T = Kb$$

Where b is the aquifer thickness. The assumptions for aquifer thickness are described in detail below. For this analysis, an aquifer thickness of 125 feet was used to calculate K. This results in a K of 1.7 ft/day.

Hydraulic Gradient, i: A range of hydraulic gradient (i) values was calculated from 0.018 to 0.064 (ft/ft), from October 2019 and April 2020 groundwater elevation data from adjacent area wells (14N08W24H001M, and 14N07W19M002M; location on **Figure 4**) in the High Valley Groundwater Basin (SGMA dataviewer, 2021).

Cross-Section Area, A: The cross-sectional area of the aquifer (A) was determined based on utilizing the saturated thickness across the width of the aquifer that would be available to the well.

Aquifer Width: The aquifer width utilized for this calculation is 3,938 ft, determined based on the N-S length of the property, perpendicular to the inferred flow of groundwater, as demonstrated on **Figure 5**.

Aquifer Thickness: The well was drilled to a depth of 305 ft below ground surface (BGS) based on the WCR and the well screen begins at 180 ft. This results in an estimated aquifer thickness of 125 ft.

Quantity of Groundwater Flow, Q: The calculated values of Q ranged from 0.35 AF/day to 1.2 AF/day (range due to October 2019 and April 2020 variable values in hydraulic gradient, respectively) or (126 - 449 AF/year or 288 AF/year on average). The anticipated groundwater demand for site development and future operations is 0.07 AF/day, (WUMP); 0.09 AF/day, (LSCE) at peak use, where peak use is described as 120 days (WUMP) or 155 days (LSCE). Non-peak use is estimated at 0.005 AF/day (WUMP). Estimated yearly use, accounting for peak use and non-peak use, is 9.41 AF/year, (WUMP); 14.58 AF/year, (LSCE). Given that annual projected use is 9.41 – 14.58 AF/year which is between 3 and 5 percent of the estimated average annual flux, there is sufficient groundwater available to supply the Project.

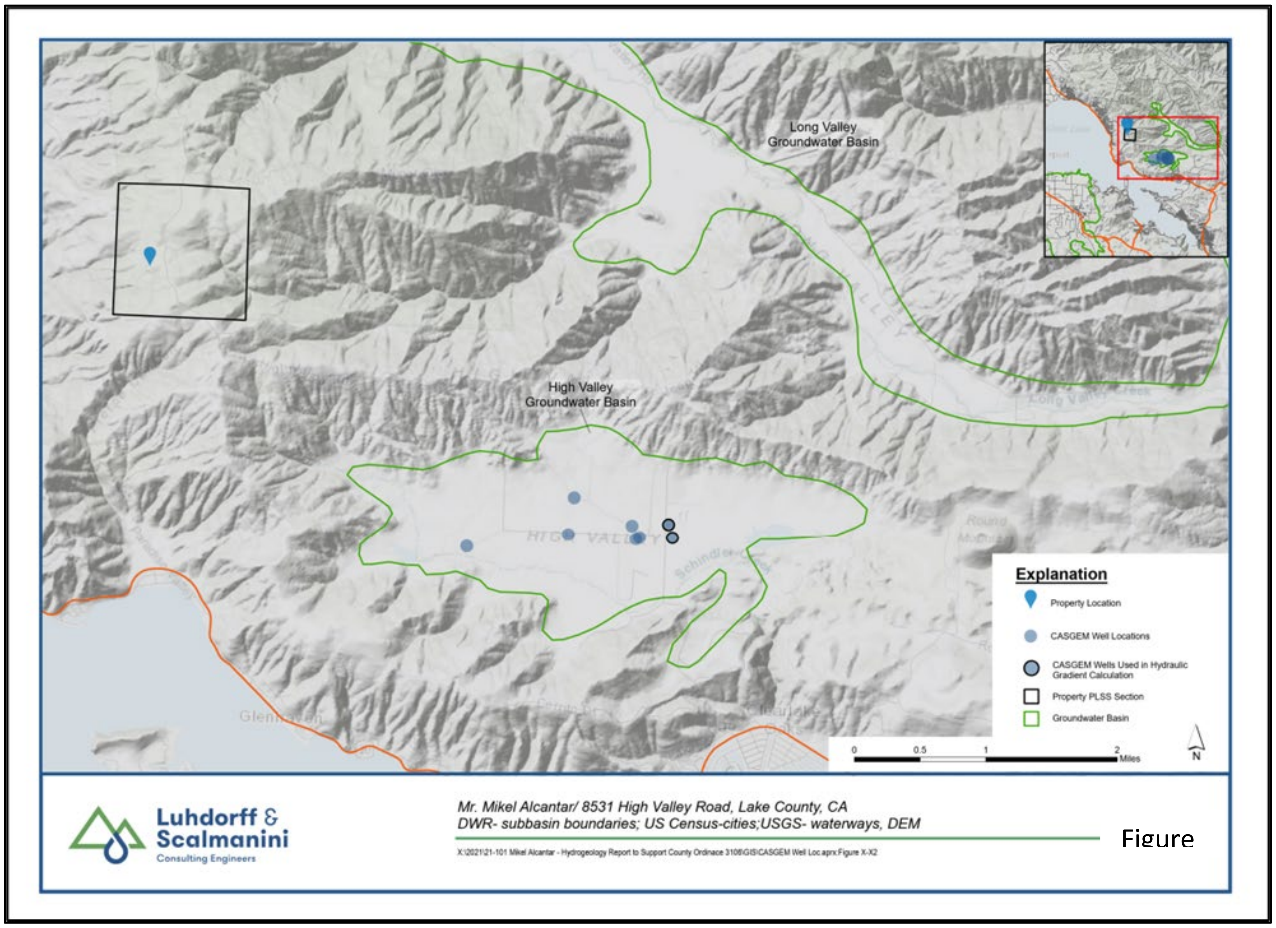

Figure 4. Location of CASGEM Well Array (blue) Near Property; and Wells Used for Hydraulic Gradient Calculation (Green- State Well ID: 14N08W24H001M and 14N07W19M002M; WSE Data (SGMA dataviewer, 2021)).

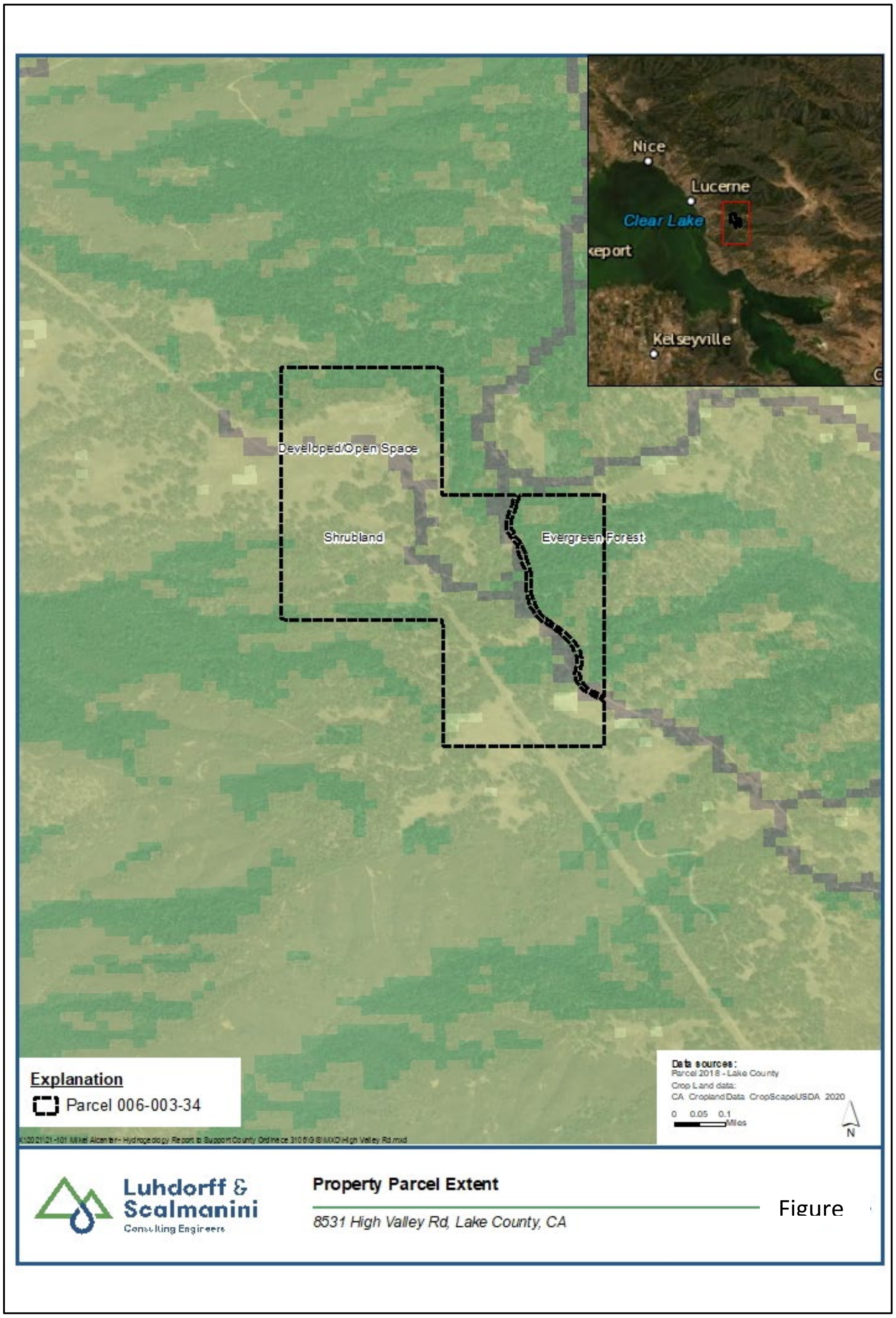

Figure 5. Parcel Extent where N-S length (3,938 ft) is used as the Aquifer Width.

4.2 Availability based on Precipitation

Records of precipitation spanning 10 water years (October 1st, 2010 to September 30th 2020) from two databases were collected. 1. The Sanel Valley CIMIS station (location on **Figure 6**), demonstrates an average long-term precipitation of 26.4 in/year recorded at the station; 2. The PRISM database demonstrates an average long-term precipitation of 38.9 in/year at the Project location. The long-term average precipitation value (26.4 in/year) from the Sanel Valley CIMIS station is within the precipitation ranges given for the Big Valley Groundwater Basin (22-35 in/year; DWR, 2004-BVGB), and falls short of the ranges in the Long Valley Groundwater Basin (27-33 in/year; DWR, 2004-LVGB), and the High Valley Groundwater Basin (27-35 in/year; DWR, 2004-HVGB) (see location of groundwater basins on **Figure 2**). The long-term average precipitation value (38.9 in/year) from the PRISM database exceeds the precipitation ranges given for the Big Valley, Long Valley, and High Valley Groundwater Basins. The precipitation value from the PRISM database is justified due to differences in factors that impact precipitation such as location and elevation. The property is located at a high elevation (2717 ft) on the windward side of the High Valley Mountain Range, and experiences increased precipitation values. The precipitation value from the Sanel Valley CIMIS station is justified for similar reasons, the station is at a lower elevation (538 ft) than the Long Valley and High Valley Groundwater Basins and receives less precipitation throughout the year Given these differences in location and elevation, the values given by the Sanel Valley CIMIS station, and the PRISM database are reasonable for the Property. Further, it is noted that precipitation increases to the west of the Long Valley Groundwater Basin (located east of the Project) (DWR, 2004-LVGB).

Direct infiltration of precipitation is one of three inferred natural recharge methods to the Clear Lake Basin (Section 2). Long term average recharge ranges from 10 to 66 percent of precipitation, as described by USGS (2007). Given the precipitation record from two databases we present a range of values that represent a minimum and maximum estimate for annual recharge from precipitation. From the Sanel Valley CIMIS station data (26.4 in/year long term average precipitation), annual recharge values range from 35 AF/year to 209 AF/year for the Project (10 and 60 percent of average precipitation, respectively). From the PRISM database (38.9 in/year long term average precipitation), annual recharge values range from 51 AF/year to 307 AF/year for the Project (10 and 60 percent of average precipitation, respectively). Where the average annual recharge from precipitation is between 104 AF/year to 153 AF/year (Sanel Valley and PRISM database, respectively).

The annual projected use of the Project is 9.41 – 14.58 AF/year (WUMP, LSCE; see Section 4.1) which is between 9 and 14 percent of the minimum estimate for average annual recharge from precipitation (104 AF/year), and between 6 and 10 percent of the maximum estimate for average annual recharge from precipitation (153 AF/year) demonstrating that there is sufficient groundwater available to supply the Project.

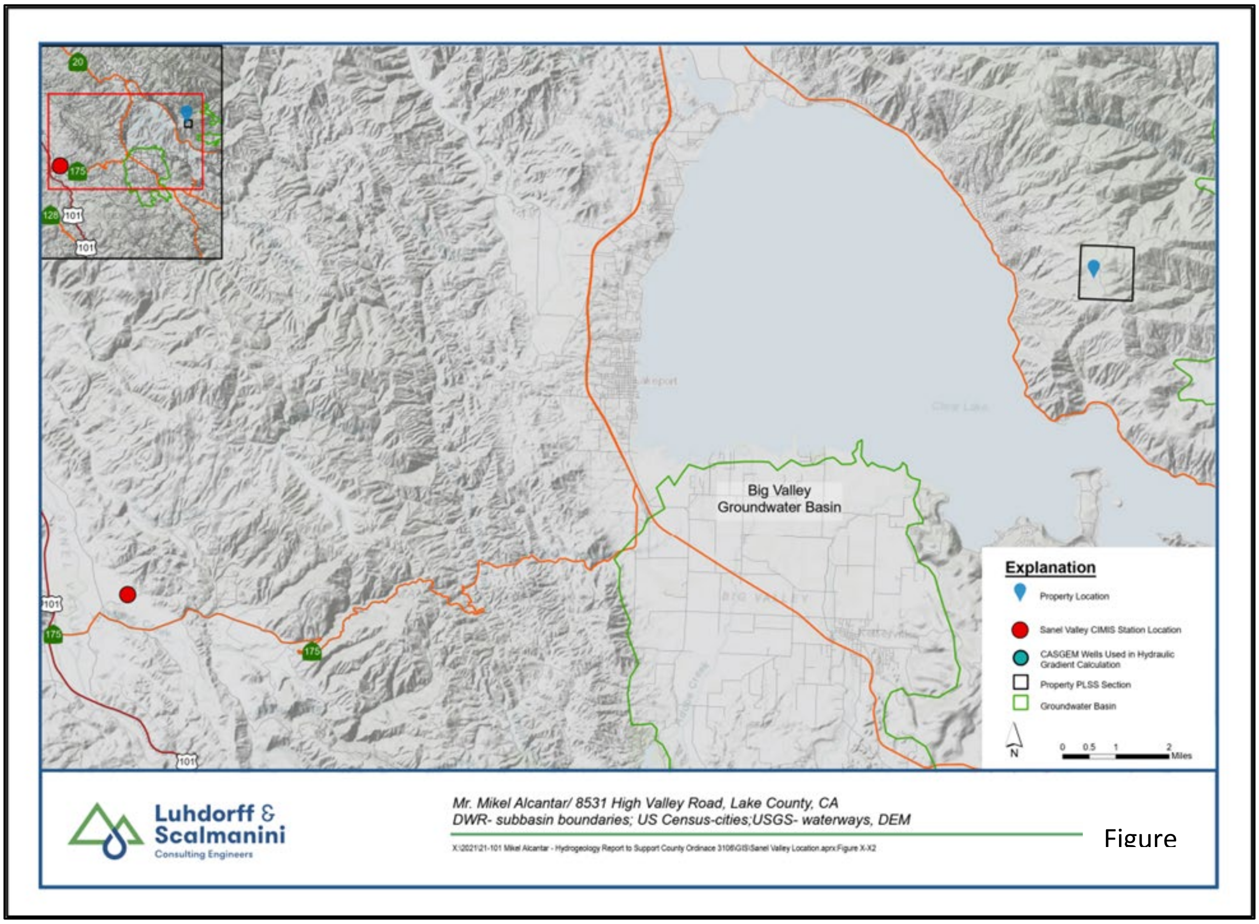

Figure 6. Location of Sanel Valley CIMIS Station (Red) Near Property Used for Precipitation Values (Station #106; Precipitation Data (CIMIS, 2021)).

5 IMPACTS OF PROPOSED PUMPING

To assess the potential impact of groundwater drawdown in response to extraction from the Project well at 40 gpm (WUMP), a desktop drawdown analysis was conducted. Two scenarios were considered, the first analysis is based on a scenario where the well is operated at peak use year-round, 40 gpm pumping for 9 hours on and 15 hours off for 25 years, in the analysis LSCE uses an equivalent pumping rate of 15.5 gpm on a 24-hour per day schedule for a 25-year period. The second analysis is based on a scenario where the well is operated at peak use and non-peak use throughout the year, as described in the WUMP, 40 gpm pumping rate for 9 hours on and 15 hours off for three months during peak use and 2.9 gpm operating 9 hours on and 15 hours off for nine months during non-peak use for 25 years, in the analysis LSCE uses an equivalent pumping rate of 5.88 gpm on a 24-hour per day schedule for a 25-year period. A caveat of this approach is that the sequence of drawdown is not represented exactly, in that the well drawdown sequence will be different operating intermittently (40 gpm pumping rate 9 hours on and 15 hours off, as described in WUMP) in comparison to operating continuously (15.5 gpm or

5.88 gpm pumping rate continuous, this analysis). However, both well operating methods (intermittent vs continuous) result in an equivalent amount of water utilized per year as listed in **Table 1** and effectively show drawdown over time.

Table 1. Intermittent vs. Continuous Pumping

	Intermittent Pumping	Continuous Pumping
Variables	Well Sequence (hrs): 9 on 15off Pumping rate (gpm): 40	Well Sequence (hrs): 24 on Pumping rate (gpm): 15.5
Conversion	Water Use = (pumping rate x well sequence x conversion factor)	
Calculation	(40 gpm x 0.391 hrs x 1.6130) Where: 9/24 hrs = 0.391 hrs 1 gpm = 1.6130 AF/yr	(15.5 gpm x 1.0 hrs x 1.6130) Where: 9/24 hrs = 0.391 hrs 1 gpm = 1.6130 AF/yr
Peak Use Year-Round Water Use Estimate (AF/Year) (rounded)	25	25
Variables	Well Sequence (hrs): 9 on 15 off Pumping rate (gpm): 40 Peak Use, 0.75 Non-Peak Use Use (days): 120 Peak Use; 245 Non-Peak Use	Well Sequence (hrs): 24 on Pumping rate (gpm): 5.88 Use (days): 365
Conversion	Water Use = (pumping rate x well sequence x use x conversion factor)	
Calculation	Peak Use: (40 gpm x 0.391 hrs x 0.329 days x 1.6) Where: 9/24 hrs = 0.391 120/365 days = 0.329 1 gpm = 1.6130 AF/yr Non-Peak Use: (40 gpm x 0.0288 hrs x 0.671 days x 1.6) Where: 0.69/24 hrs = 0.0288 hrs 245/365 days = 0.671 days 1 gpm = 1.6130 AF/yr Peak Use + Non-Peak Use (AF/yr): = 8.23+1.24	(15.5 gpm x 1.0 hrs x 1.0 days x 1.6) Where: 24/24 hrs = 1.0 365/365 days = 1.0 1 gpm = 1.6130 AF/yr
Peak Use + Non-Peak Use (Sum) Year-Round Water Use Estimate (AF/Year) (rounded)	9	9

5.1 Analytical Approach

The following analytical modeling approach is provided to determine the potential impact for the well on neighboring properties. The assessment of potential impact is based on the Theis (1953) analytical solution for transient groundwater flow. The Theis solution permits estimates of head loss due to pumping as a function of pumping rate, time, and distance from the well. As a transient model, the solution permits estimates of head change before conditions in the formation stabilize or reach equilibrium. The Theis solution is used for many applications in petroleum engineering and groundwater hydrogeology. Where the derivation assumptions are generally met, the Theis method provides estimates of pumping influences that serve in test planning and design, estimates of interference for well spacing, and estimates of short-and long-term effects of operating wells.

Assumptions for Theis Model (Theis, 1953):

The following are basic assumptions for the Theis analytical solution and applicability to the pumping well.

- **Assumption 1** – The formation is homogeneous and isotropic.
  All systems have inherent variations in properties due to depositional factors. Departures from the assumption of homogeneous and isotropic conditions are resolved by 1) conservative selection of formation properties and 2) sensitivity analyses for key parameters.

- **Assumption 2** – The formation is infinite in extent.
  This assumption is met for the proposed well due to the lack of apparent local boundaries such as faults.

- **Assumption 3** – The pumping well fully penetrates the formation.
  The pumping well is within a portion of a stratigraphic formation. The effect of the well failing to penetrate the entire aquifer is negligible in many cases per Theis (1935).

- **Assumption 4** – Diameter of the pumping well is an infinitesimal diameter
  Diameter of the pumping well is small (4.25in) which yields 0.09AF of storage, this volume is neglected.

- **Assumption 5** – The flow regime is radial around the well.
  This assumption is satisfied for the well.

- **Assumption 6** – The pumping rate is constant.
  The pumping is expected to be continuous.

- **Assumption 7** –Darcy's Law applies (no turbulent flow at the well).
  The area of potential impact is concerned with conditions up to and greater than hundreds of feet from the well where Darcy flow is met due to low fluid velocities.

- **Assumption 8** – Flow to pumping well is horizontal

Flow to control well is assumed to be horizontal.

- **Assumption 9** – Water is released instantaneously from storage with the decline of hydraulic head This assumption is satisfied for the well due to the well drawdown test.

Theis Method Limitations

An analytical approach may be invalid in the absence of reasonable parameter estimates required in the solution equations. For the Project well, some parameters are estimated based on local experience to characterize the targeted pumping zone. To overcome the lack of quantitative sources, sensitivity analyses are performed to produce potential head loss range induced by pumping.

Benefit of Using the Theis Analytical Solution

The Theis method is widely used in petroleum engineering and groundwater hydrology as a tool for evaluating the influences of production and injection wells. Despite potentially limiting assumptions, the Theis equation has broad applicability to many problems and is an accepted method for evaluating conditions for wells.

Applicable Equations

The applicable equations for the Theis method are as follows:

$$\Delta h = \frac{Q}{4\pi T} W(u)$$

Δh = change in head at a given distance from the well

Q = pumping or injection rate

T = transmissivity of the aquifer/formation

In the above equation, $W(u)$ is known as the well function, where u is:

$$u = \frac{r^2 S}{4Tt}$$

r = distance from the producing well

S = storativity of the aquifer/ formation

T = transmissivity of the aquifer/ formation

t = time

The well function W(u) is an integral that can be approximated by a series of terms. The series can be truncated to only a few terms without affecting the resultant estimates to a significant degree. For this analysis, a spreadsheet was used with W(u) estimated by the following sequence:

$$W(u) = -0.5772 - \ln(u) + u - \frac{u^2}{2*2!} + \frac{u^3}{3*3!} - \cdots + \frac{u^{17}}{17*17!} - \frac{u^{18}}{18*18!}$$

Various sets of consistent units can be used with the above equations. For the purposes of this analysis, the units are as follows:

Δh:	feet
T:	ft^2/day
Q:	ft^3/day
r:	feet
S:	dimensionless
t:	days

Parameter Selection

Parameter estimates for the analysis using the Theis solution are as follows:

Transmissivity (T) – The calculated transmissivity is 212 ft^2/d, as described in section 4.1, for both scenario 1 and scenario 2.

Storativity (S) – A storativity value of 0.07 is used for both scenario 1 and scenario 2. The California DWR gave the value of 0.07 corresponding to the Big Valley groundwater basin, as reported in Christensen Associates Inc. (2003). The value was assessed in the report (Christensen Associates Inc. (2003)) using both a lithologic (classification based on materials including soil, clay, sand, etc.) and a stratigraphic approach (involving interpretation of different layers based on lithology and structural features of the basin; different layers include soil, aquifers, aquitards, etc.). Both the Big Valley groundwater basin and the Project location are within comparable or related aquifer stratigraphy in that the composition of the stratigraphy is similar (quaternary alluvium), from a similar origin. The Big Valley groundwater basin and the Project share similar lithologic qualities including that they are composed of alternating layers of alluvium and clay (Big Valley) or black shale (Project; WCR, 2020). Based on the shared lithologic and stratigraphic qualities of the Project area and Big Valley, and the lack of availability of data for the Project area, we use the storativity value given by DWR.

Extraction Rate (Q) – The value of 15.5 gpm (25 AF/year) was used for scenario 1 and the value of 5.88 gpm (9.42 AF/year) was used for scenario 2, see **Table 1** for conversion.

Extraction Time (t) – The period of 25 years (9,125 days) of pumping is used for the calculations.

5.2 Results

Results for the Theis method of estimating the area of potential impact for the Project well are discussed below. All parameters were the same for scenarios 1 and 2, except Q which potentially has a moderate to significant impact on the spatial distribution of the loss of head at the specified period of time. Using the parameter estimates summarized above, the head loss due to pumping is calculated from the Theis analytical solution and presented on **Figure 7**.

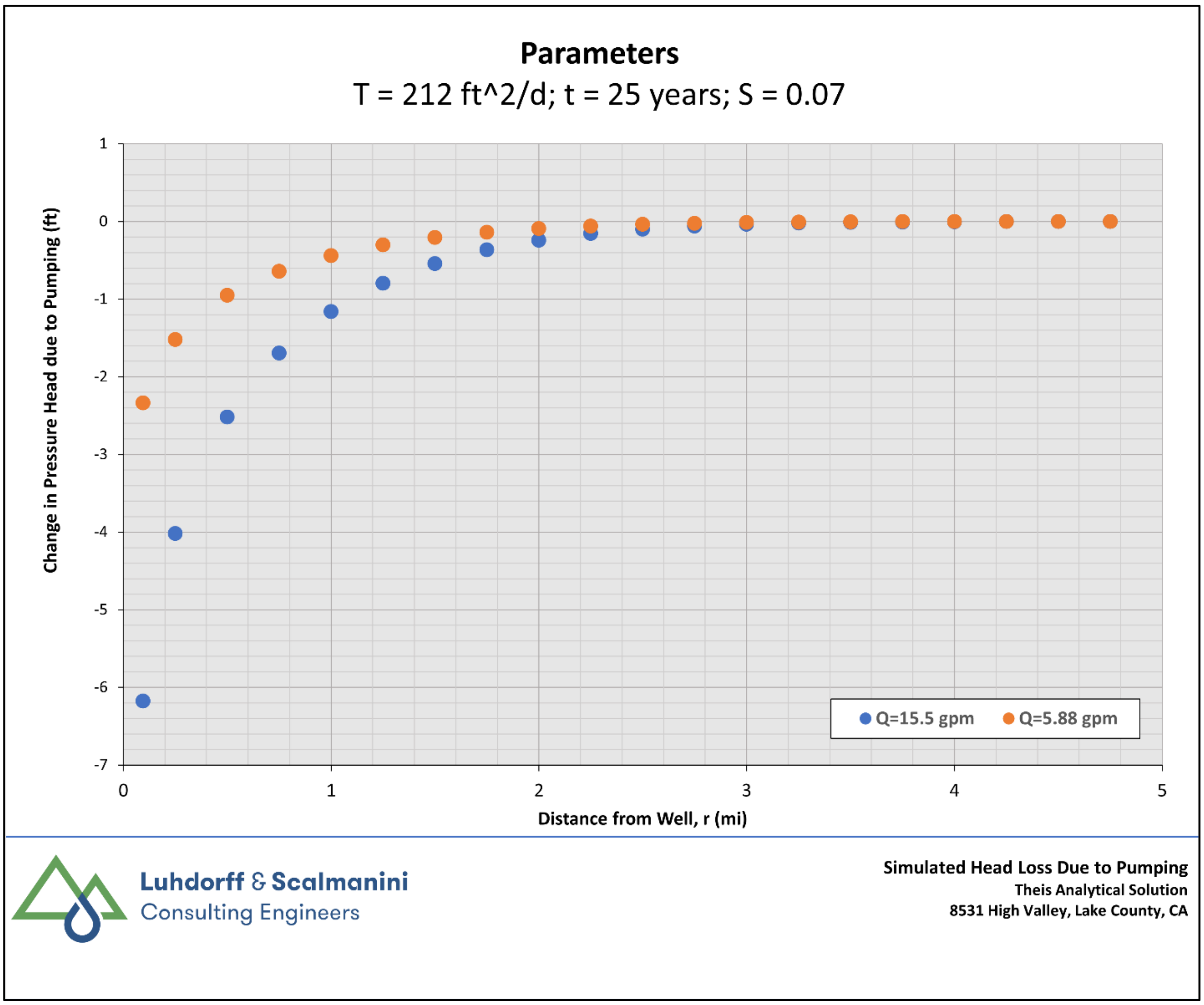

Figure 7. Change in Drawdown Due to the Operation of the Project Well, at Increasing Distances from the Project Location Results for Two Scenarios (Scenario 1: 15.5 gpm-blue; Scenario 2: 5.88 gpm-orange).

After 25 years of operating the well, the simulated head loss due to pumping within a 1-mile radius from the well's location is almost 1.16 feet and 0.44 feet when the pumping rate is changed from 15.5 to 5.88 gpm, respectively. The figure illustrates that a decrease in the head is larger at any radius from the well when we consider the larger pumping rate value in the calculations rather than using 5.88 gpm for the same purpose. The results of using 5.88 gpm reflects a smaller area of potential impact on the scale of a couple of miles away from the well, than results from 15.5 gpm.

Besides the impact of the pumping rate on the result, it is important to know that the nature of the Theis solution is to compute impacts that uniformly propagate in all directions for the entire injection period. In practice, system heterogeneities and boundary conditions typically cause a Theis calculation to over predict impacts in the long term. However, the Theis solution can serve as a sound method to predict response for shorter injection durations before equilibrium is reached in the actual setting.

5.3 Area of Potential Impact

The area of potential impact is delineated as a radius surrounding the well where the impacts of head loss could impact neighboring wells (wells documented on **Figure 2**). The results of this analysis indicate that, for the first scenario, the drawdown of water table at the radius of approximately one mile from the well, after 25 years of continuous pumping at 15.5 gpm continuous is 1.16 feet. While the second scenario indicates the drawdown of the water table at the radius of approximately one mile from the well, after 25 years of continuous pumping at 5.88 gpm continuous is almost 0.44 feet. This is shown graphically on **Figure 7**.

6 CONCLUSIONS

Groundwater availability was calculated based on Darcy's Law and Theis analytical solution using available parameters from existing wells. The result of the groundwater analysis is that sufficient groundwater supplies exist and are quantified based on three major lines of evidence:

1. Water flowing beneath the property, calculated by Darcy's Law, would range from 126 to 449 AF/year (October 2019, April 2020, where horizontal gradient (i) variable values range respectively) flowing beneath the Project site. The proposed project will only utilize approximately 9.41 to 14.58 AF/year (WUMP estimate, LSCE estimate, respectively) or 3 to 5% (WUMP, LSCE) of the average annual groundwater flowing beneath the Project site.
2. Minimal impacts on nearby domestic wells, as shown by the Theis analytical solution. The predicted drawdown after 25 years of continuous pumping at peak use year-round, is approximately 1.16 feet at a radius of one mile. In contrast, the predicted drawdown after 25 years of continuous pumping at combined peak use and non-peak use year-round, as described in WUMP, is 0.44 feet at a radius of one mile. Further, the Theis analytical solution does not account for recharge into the system, making this a maximum prediction of drawdown.
3. Water available from precipitation, or recharge due to direct infiltration of precipitation was calculated as a percentage of the average precipitation from the Sanel Valley CIMIS Station. LSCE reports 35 to 209 AF/year available for the Project from this source. The Project will utilize

9 to-15% (WUMP, LSCE) of the minimum average annual recharge from precipitation for the Project site and 6 to – 10% (WUMP, LSCE) of the maximum average annual recharge from precipitation for the Project site.

These three lines of evidence confirm that the Project pumping between 9.41 to 14.58 AF/year from the local aquifer could be supplied by groundwater in the area and the recharge rates (groundwater inflow and precipitation) In addition, the cumulative impacts of operating this well will probably not impact neighboring area wells.

Our evaluation of other professional engineering and hydrogeological analyses, coupled with LSCE's analysis of this Project site using accepted methodologies, results in calculations and conclusions that represent a conservative quantification of groundwater supplies available to the proposed Project, and more generally, the local vicinity.

7 LIMITATIONS

The conclusions presented in this report are professional opinions based solely upon the presented data. They are intended exclusively for the purpose outlined herein and the site location and Project indicated. This report is for the sole use and benefit of the Client. The scope of services performed in execution of this investigation may not be appropriate to satisfy the needs of other users, and any use or reuse of this document or the findings, conclusions, or recommendations presented herein is at the sole risk of said user.

Given that the scope of services for this investigation was limited, it is possible that currently unrecognized subsurface conditions may be present at the site. Should site use or conditions change, the information and conclusions in this report may no longer apply. Opinions relating to environmental, geologic, and geotechnical conditions are based on limited data and actual conditions may vary from those encountered at the times and locations where data were obtained. No express or implied representation or warranty is included or intended in this report except that the work was performed within the limits prescribed by the Client with the customary thoroughness and competence of professionals working in the same area on similar projects.

8 REFERENCES

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

File Original with DWR

State of California
Well Completion Report
Refer to Instruction Pamphlet
No. xxxxxxx

DWR Use Only – Do Not Fill In
State Well Number/Site Number
Latitude N | Longitude W
APN/TRS/Other

Page 1 of 1
Owner's Well Number
Date Work Began 4-22-20 Date Work Ended 4-29-20
Local Permit Agency LAKE County Environmental Health
Permit Number WE-5326 Permit Date 3-16-20

Geologic Log

Orientation ● Vertical ○ Horizontal ○ Angle Specify
Drilling Method Air/Mud Rotary Drilling Fluid Bentonite

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
0	20	Brown clay
20	80	Brown clay w/gravels
80	120	Black shale and sandstone
120	200	Brown shale, sandstone & black shale
200	270	Brown shale, black shale & sandstone
270	305	sandstone and calcite

Total Depth of Boring 310 Feet
Total Depth of Completed Well 305 Feet

Well Owner

Name Meili Lin
Mailing Address 2014 Central Ave
City Alameda State CA Zip 94501

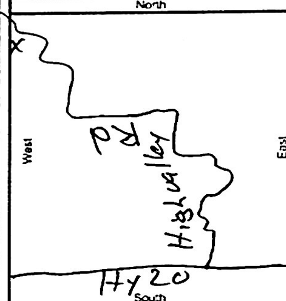
Well Location

Address 8531 Highvalley Rd.
City Clearlake Oaks County LAKE
Latitude ___ Deg. ___ Min. ___ Sec. N Longitude ___ Deg. ___ Min. ___ Sec. W
Datum ___ Dec. Lat. ___ Dec. Long. ___
APN Book 006 Page 003 Parcel 34
Township ___ Range ___ Section ___

Location Sketch

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

North



West / East / South

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

Activity

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

Planned Uses

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

Water Level and Yield of Completed Well

Depth to first water 90' (Feet below surface)
Depth to Static Water Level 90' (Feet) Date Measured 4-29-20
Estimated Yield* 80 (GPM) Test Type Air lift
Test Length 1HR (Hours) Total Drawdown ___ (Feet)
*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	180	9"	F480	PVC	1/4"	4 1/2	Blank	—
180	305	9"	F480	PVC	1/4"	4 1/2	Perf	.032

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	1	Concrete	SEAL
1	22	Bentonite	
22	305	3/16 Pea	Gravel Pack

Attachments

□ Geologic Log
□ Well Construction Diagram
□ Geophysical Log(s)
□ Soil/Water Chemical Analyses
□ Other ___
Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief
Name Will Peterson Well Drilling
Person, Firm or Corporation
P.O. Box 695 Kelseyville CA 95451
Address City State Zip
Signed [signature] 4-30-20 1009053
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well Completion Report for Project Well (WCR, 2020)

LSCE

Cramer Enterprises

LIC#984176

Well Test

Job Name:	Meili Liu	Well Diameter:	4 1/2 pvc
Location:	8531 High Valley Rd	Static Water Level:	120'
Operator:	RH	Well Depth:	305
Original Meter Reading:		Pump Setting:	N/A
Final Meter Reading:		Pump:	5 HP sub
Total gallons pumped:	13,554	Pump running upon arrival?	Yes X No

Date	Time	GPM	Pumping Level	Color	Comments
5/26/21	12:47	51	127	Clear	Clear/Cold, no smell
	12:48	51	127.9		
	12:49	51	130.1		
	12:50	51	131		
	13:00	51	131.8		
	13:10	51	135.5		
	13:20	51	141.2		
	13:30	51	147.1		
	13:45	51	155.1		
	14:00	50	158.2		
	14:15	50	160		
	14:30	48	162.7		
	14:45	48	165.1		
	15:00	48	165.2		
	15:15	48	165.2		
	15:30	48	165.2		
	15:45	48	165.2		
	16:00	48	165.2		
	16:15	48	165.2		
	16:30	48	165.2		
	Start Recovery				
	16:32		155.4		
	16:33		137.9		
	16:34		130.1		
	16:35		128.7		
	16:36		128.1		

Well Draw Down Test (WDDT, 2021)

Section 12 Water Use

Liu Farm is applying for one Commercial Cannabis Cultivation Major Use Permit for seven A-Type 3's and one Type 3B in Lake County, California. Accordingly, Liu Farm proposes to implement the following Water Use Management Plan.

12.1 PURPOSE

The Water Use Management Plan (WUMP) has been designed to conserve the County's water resources and establish best management practices to ensure the plan is always followed, as well as in full compliance with applicable local, county, and state regulations.

Liu Farm's Water Use Management Plan includes measures to monitor and evaluate the performance of the plan, as well as ensure that all data and information is reported to the County of Lake and appropriate local agencies.

12.2 Scope

The Liu Farm Water Use Management Plan focuses on the following:

- Develop and maintaining a safe, clean, and reliable water supply;
- Meeting all legal requirements for the use of water resources located on the property and providing documentation of legal compliance;
- Monitoring the quantity of water used for the cultivation of cannabis;
- Design a water efficient delivery system and irrigation system for cannabis cultivation. All employees are required to follow the procedures outlined in this plan;

12.3 Overview

Liu Farm's well was drilled on April 22nd, 2020. A well draw down test was conducted on May 26th, 2021 and indicated the well to be capable of producing 40 GPM continuously.

The well is sealed to the outside environment and is contained within a well house. Liu Farm's well is located towards the southwesterly corner of the parcel, east of a natural spring. The Storage tanks are located adjacent to the cultivation site.

From the well, water will be pumped to 15 separate tanks, stored directly adjacent to each cultivation site. When all 15 tanks are full, a mechanical float switch shuts off the system.

Water is delivered to an irrigation system via a 1hp jet pump pressure tank system. Liu Farms shall use a drip irrigation system to water plants. The projected monthly usage during peak use (July, August, and September) is 675,000 gallons per month. This represents a usage of 3,000 gallons per day per acer.

Liu Farm will not engage in any unlawful drawing of surface water. Liu Farm will not use water provided by a public water supply, unlawful water diversions, bottled water, a water vending machine, or a retail water facility. The property is outside any County Water District "Exclusion Areas." Liu Farm will use water transportation trucks if needed or in an extreme emergency.

Water Usage Management Plan (WUMP)

12.4 Water Storage (BMPS)

Liu Farm will install vertical storage tanks according to manufacturer's specifications and place the tanks on properly compacted soil that is free of rocks and sharp objects capable of bearing the weight of the tank and its maximum contents with minimal settlement. Water will be stored in polyethylene water tanks with a total of 37,500 gallons of water stored close to the cultivation site.

New storage tanks will be in areas with great slope stability at the cultivation site. To prevent rupture of overflow and runoff, Liu Farm will only use water storage tanks and bladders equipped with a float valve, or equivalent device, to shut off diversion when storage systems are full. All vents and other openings on water storage tanks will be designed to prevent the entry and/or entrapment of wildlife. Liu Farm will also monitor the well meter on a regular basis to ensure excess water is not being used.

12.5 IRRIGATION SYSTEM

Daily Watering of cannabis will be achieved via a drip irrigation system feed from water storage tanks. The watering will be administered by a timed irrigation controller, set to irrigate during the nighttime when the evaporation rates will be the lowest. Drip lines will be sized to irrigate large areas slowly, to maximize absorption, and will be placed under a layer of straw mulch. Hose bibs will be positioned throughout the cultivation area for spot watering.

IRRIGATION & SPRINKLERS (BMP'S)

The following are irrigation best management practices implemented by Liu Farm:

- The site will utilize a drip irrigation system with a schedule that requires the use of as little water as possible;
- Regularly inspect the entire water delivery system for leaks and immediately repair any leaky faucets, pipes, connectors, or other leaks;
- Replace worn, outdated, or inefficient irrigation system components and equipment to ensure a properly functioning, leak-free irrigation system at all times;
- Install according to the irrigation design specifications, locally applied codes and standards, and manufacturers' product requirements;
- Actively manage the system and adherence to all applicable watering limitations;
- Ensure sprinkler heads and nozzles will apply water uniformly to the target areas;
- Match the precipitation/application rate of the sprinklers for each zone (+/- 5 percent)
- Design to reduce overspray of impervious surfaces or adjust planting areas, and prevent runoff of water;
- Avoid of low head drainage;
- Drip irrigation will be utilized instead of spray sprinklers in narrow or complex shape areas;

12.6 MONITORING PERFORMANCE OF WATER

Liu Farm will maintain records of diversion with separate records that document the amount of water used for cannabis cultivation separated out from the amount of water used for other irrigation purposes and other beneficial uses of water (e.g., domestic, fire protection, etc.). These records will be available upon request from the Water Boards or any other authorized representatives of the state.

Liu Farm will share date relating to the cost of implementing the water management plan with the County as requested.

12.7 EVALUATING PERFORMANCE OF THE WATER USE MANAGEMENT PLAN

Annually, Liu Farm will review the Water Use Management Plan and record logs in conjunction with the reviews of all management plans. Upon review, Liu Farm will address any outstanding issues immediately. Additionally, a professional evaluation of the water plan will occur annually with the goal of improving water management practices.

12.8 CALIFORNIA DROUGHT DECLARATIONS

Liu Farm recognizes that on occasions, the Governor of California and the Lake County Board of Supervisors has and likely will continue to periodically issue a proclamation of a local or state emergency based on drought conditions in any give year. In the event of such a Declaration, Liu Farm will abide by all emergency regulations adopted in response to drought conditions.

12.9 EMERGENCY USE PLAN

In the case of an emergency that retail water is needed, Liu Farm will work with a licensed retail water supplier as defined by Section 13575 of the Water Code and provide the following information to the Department in 7 days:

- A description of the emergency;
- Identification of the retail water supplier including license number;
- Volume of water supplied;
- Actions taken to prevent the emergency in the future.

12.10 WATER AVAILABILITY ANALYSIS

This Water Use Plan has been developed in compliance with the appropriate local, and state laws that pertain to water use. These include:

- Cannabis Cultivation Policy & California State Water Resources Board;
- California Code of Regulations, Title 3 Food and Agriculture, Division 8 Medical Cannabis Cultivation, Section 8107;
- County of Lake Ordinance 3703;
- Division of Water Rights, Principals and Guidelines for Cannabis Cultivation.

Water Usage Calculation

Description	Use	Amount of Water Needed
Well Production	40 GPM Continuous	9.375 hours of pumping per day
Existing Usage (AG/Live Stock)	Vacant	No current use
Proposed (Cannabis Cultivation)	7 acres of outdoor & 22,000 sq/ft Mixed Light	3,000 gallons per day per acre 22,500 gallons per day total 675,000 gallons per month (30 days) @ peak use (July, August, September)

12.11 REVIEW

Director of Cultivation, Mikel Alcantar, will review the Water Use Plan on an annual basis and will share data related to the cost of implementing this plan with the County as requested. The well will be monitored through well draw down tests as requested by the County of Lake. Liu Farm will monitor and log the well meter at a minimum twice per week and will provide said logs upon request by the County.