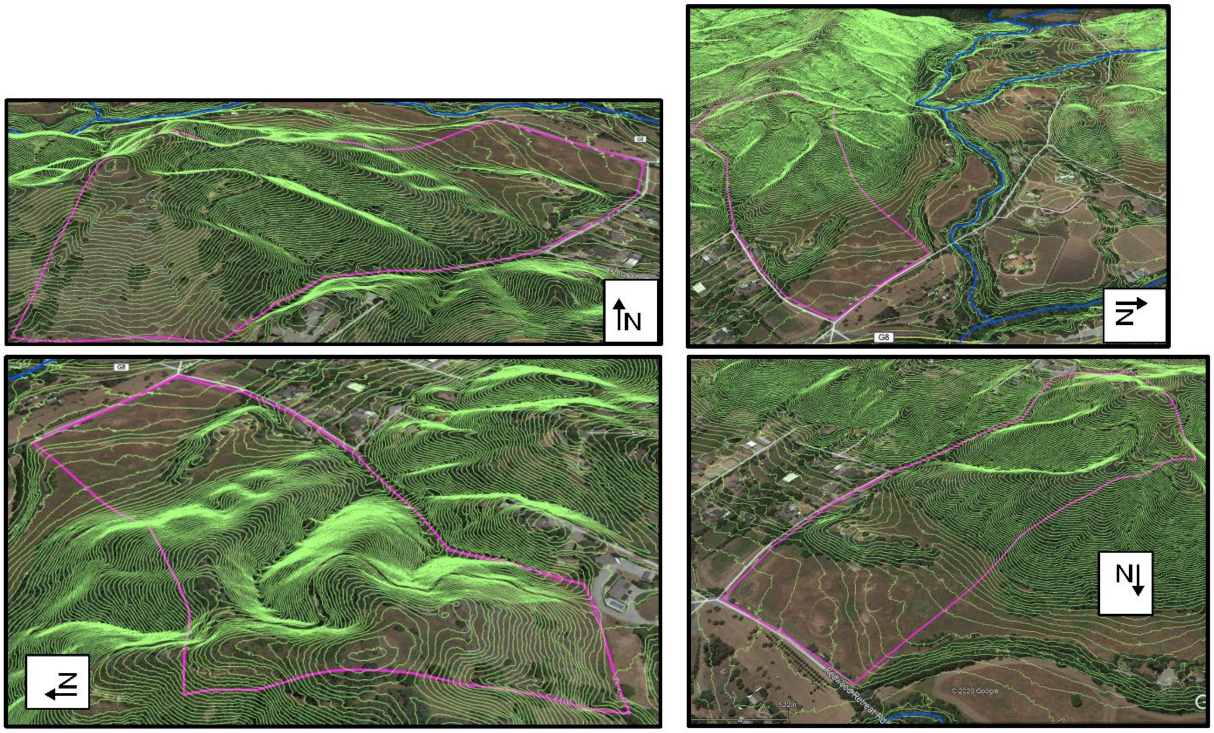
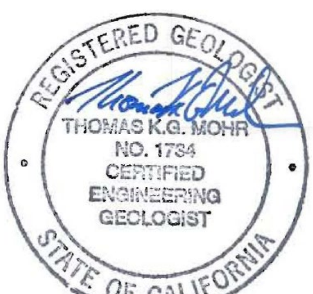
WATER SUPPLY ASSESSMENT
BAY AREA VIPASSANA CENTER
9201 El Matador Drive, Gilroy



Prepared for:

Bay Area Vipassana Center
9201 El Matador Drive
Gilroy, CA 95020



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Section 1 – Introduction

This Water Supply Assessment was prepared by Mohr HydroGeoScience, LLC, for the Bay Area Vipassana Center (Center). Mohr HydroGeoScience LLC was retained to provide water supply analysis, well interference analysis, and a water quality impact assessment.

The planned Center location is at the mouth of the Little Arthur Creek valley, southwest of the confluence of Little Arthur Creek with Uvas Creek. This area experiences substantial seasonal creek flows in Little Arthur Creek and Uvas Creek, which provide groundwater recharge to both the alluvial and bedrock aquifers. The typical creek flow pattern in Little Arthur Creek is intermittent high volume flows in response to larger rainfall events, with sustained low volume flow between January and May. Flow ceases in Little Arthur Creek most commonly in the first half of May, with flow extending in to June and July, and rarely August in wetter years. Flow in Uvas Creek is controlled by releases from Uvas Reservoir, which are scheduled by the Santa Clara Valley Water District in response to rainfall and sustaining anadromous fish species (steelhead) during spawning season.

1.1 Project Overview

BAVC plans to create a meditation center at 9201 El Matador Drive, located near the intersection of Watsonville Road and Redwood Retreat Road, west of Gilroy. The parcel is 54.6-acres, the majority of which is wooded uplands of relatively steep topography, which will not be developed. The northeast portion of the parcel is gently sloped and amenable to developing the Center.

The Center will host students of Vipassana silent mediation for 10-day guided retreats. The Center will be staffed by instructors and volunteer servers, and will accommodate a maximum of 150 people during up to 26 retreats per year. There will be three to five days between retreats when the on-site staff is limited to about 5 people.

1.2 Water Supply Assessment Objective

This Water Supply Assessment (WSA) evaluates whether projected water supplies identified for the Center during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand for the Center. A WSA is a required submittal when applying for a Conditional Use Permit. The objective of this WSA is to provide an analysis of water supply sufficiency in a manner that can assist the Santa Clara County Planning Department with analysis of the acceptability of the proposed project.

1.3 Hydrologic Setting and Climate

The Little Arthur Creek watershed receives mean annual precipitation between 24 and 46 inches, depending on elevation, with the Center property receiving the lowest end of the range. The single rainfall value used to represent the whole Little Arthur Creek watershed in studies of the larger Uvas watershed is 38.1 inches (SCVWD, 1978). The steep topography of the watershed headlands facilitates rapid runoff.

The first few rainfall events of the season are usually absorbed by dry soils, until rainfall infiltration exceeds soils' water holding capacity. As the winter rainy season progresses, the ratio of runoff to infiltration increases, and stream channels carry more water. Occasionally, during prolonged high intensity rain storms, runoff exceeds stream channel capacities, and flooding occurs on adjacent low lands (Williams, et al., 1973). Annual rainfall cycles vary considerably from year to year, and longer term trends caused by the Pacific Decadal Oscillation can generate years with multiple "atmospheric river" events producing intensive rainfall, as well as multi-year droughts producing minimal rainfall.

The primary source of groundwater recharge supplying wells in the vicinity of the Dhamma Santosa Center parcel is Little Arthur Creek, which drains the 9.2 square mile Little Arthur Creek Watershed. Flow in Little Arthur Creek infiltrates underlying alluvium, creating an unconfined or "water-table" aquifer. The saturated alluvium in turn transmits water to fractures in underlying fractured shales, sandstones, serpentenite, and pillow basalts. The secondary source of groundwater recharge is deep infiltration of rainfall in the Little Arthur Creek watershed. A third and minor source of recharge is return flow from vineyard, crop, and landscape irrigation, and percolation of water from septic leach fields.

Flow in Little Arthur Creek is seasonal, with "dry-back" occurring in the summer. Little Arthur Creek is relatively narrow, with average bank-full width of 15.3 feet. The stream channel is underlain primarily by cobbles, boulders, and bedrock, with some gravels and a minor amount of finer sediments (Herbst et al., 2016). Baseflow in the sand and gravel bed of Little Arthur Creek may continue to recharge groundwater for weeks and months after flow in the creek stops. Further details on the hydrologic setting and flow in Little Arthur Creek is provided in **Appendix A.**

The following charts summarize the climate features at the Center location as pertains to water supply. The location is 5 miles west of Gilroy. The charts below are from Gilroy, which is in the Llagas Valley, where the climate may vary somewhat from the micro-climate in the Little Arthur Creek Valley. Climate at the Center location is likely to be slightly cooler, and to receive significantly higher rainfall, as described in this section and **Appendix A**.

One must bear in mind that the impact of climate change has diminished the reliability of weather expectations based on long term averages. For example, the past decade has had several "hottest year" designations, and the current year is in the running to be among the driest on record. It is also important to recognize that California has been settled by non-indigenous people for only 252 years, and meteorological records are limited. Longer term climate records, recorded indirectly in tree rings and stable isotope variation in glacial ice core measurements that date back hundreds and thousands of years, suggest that extended droughts and extreme floods beyond our memories and records have occurred and will recur

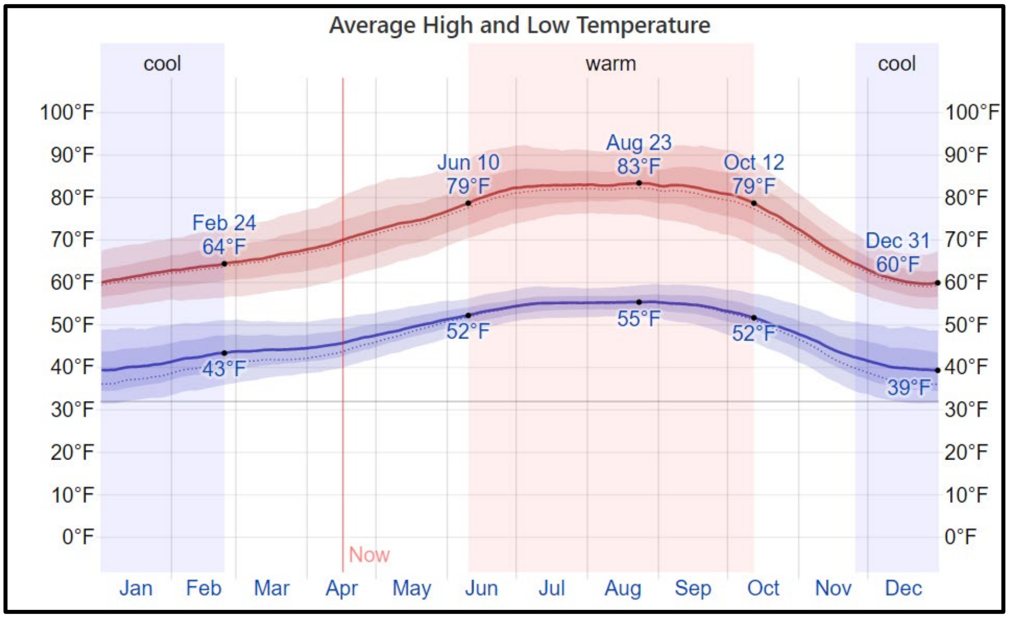

Figure 1 – Gilroy Annual Temperature Range (weatherspark.com)

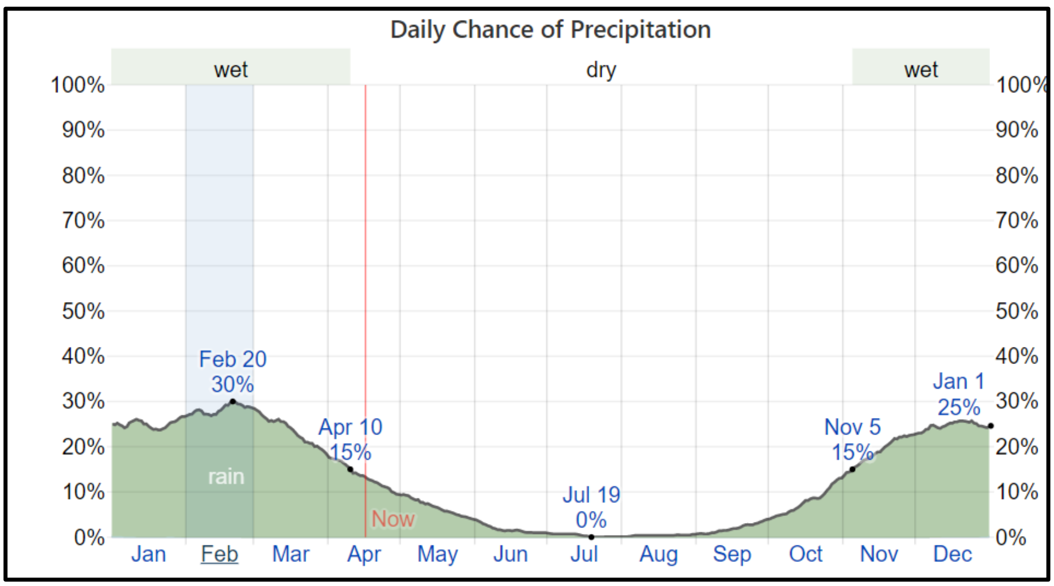

Figure 2 – Gilroy Average Daily Chance of Precipitation

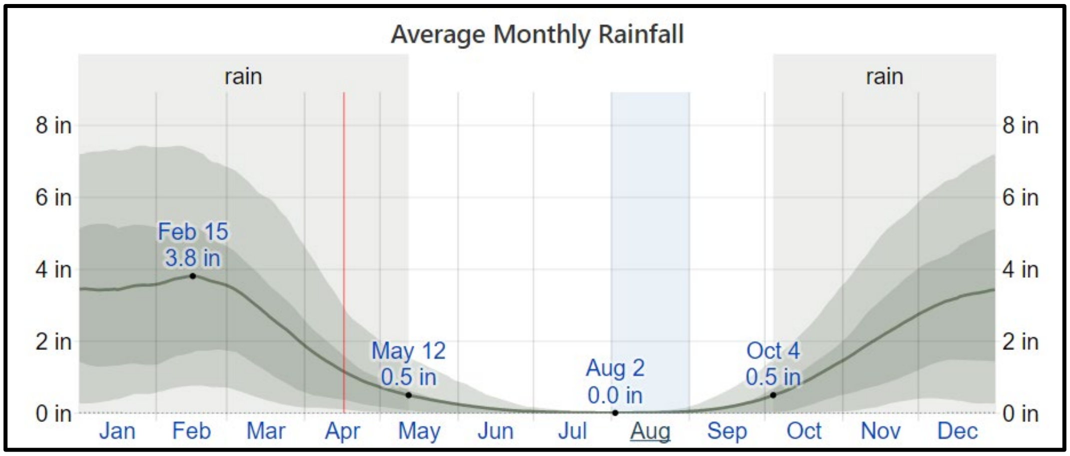

Figure 3 – Gilroy Average Monthly Rainfall Pattern

Section 2 - Project Description and Water Demands

2.1 Project Description

The Center will include a large meditation hall and two smaller meditation cells, 8 participant accommodations, showers and restrooms, a dining hall and kitchen, four teacher accommodations, and 2 volunteer accommodations with 16 bedrooms and bathrooms each, a caretaker's accommodation, and a maintenance building. The use of these buildings by students, volunteers, and teachers, and irrigation of landscaping, will require a moderate water supply as described herein.

2.2 Potable Water Demands

Water supply for the Center's participants will be about 40% less than typical residential water demands. Residents of the nearby City of Gilroy used an average of 166 gallons per capita per day (gpcd) between 1984 and 2008 (AKEL Engineering Group, 2011). In response to the drought, the City conducted a major water conservation campaign, which achieved a reduction to 113 gpcd by 2015 (AKEL Engineering Group, 2016). Water use by participants at the Center is projected to average less than 45 gallons per person per day, or not more than 135,000 gallons (0.41 acre-feet) per month. This projection is based on BAVC's plans to operate two 10-day retreats per month, and based on water use at other BAVC mediation centers that conduct nearly identical activities and follow the same schedule planned for the Center. BAVC operates similar meditation centers in the Central Valley and in northwestern California. At the northwest center, three years of water meter records showed that average daily water use was 32 gpcd, and maximum daily water use was 44 gpcd. At the Central Valley Center, during one retreat when temperatures ranged from 90° to 100° F, water use averaged 45 gpcd. The water use data from BAVC's other meditation centers, upon which this water demand projection is based, is presented in **Appendix B**.

Water use at this facility is lower than is typical for several reasons, including:

- Meal preparation consists of two meals a day breakfast and lunch ending at 12 noon; no meals are served after 12 noon.
- There is a dining facility where the meals are prepared and served. The facility will not be used for other purposes such as outside rentals, day use programs or large special events.
- Guests bring their own bedding, and are not provided access to laundry during the typical 10 day stay.
- A typical day consists of approximately 10 hours of meditation with a work period, rest period and two meal times.

The Center's operations favor substantially lower rates of water use than residential water use patterns. Centralization of food preparation results in significant water savings over the same number of people divided among multiple homes. The nature of Center activities does not require significant water use, e.g. there are no water-based recreational activities, nor are there high-energy physical activities that would entail showering more than once daily. To ensure water supply reliability for the Center, BAVC plans to construct a 97,000 gallon water storage tank on a pad at an elevated location, to support fire suppression requirements and to support a flexible pumping schedule.

2.3 Landscape Irrigation

The Center landscaping has been designed with drought-tolerant native species in order to minimize water demand. A list of species selected for the Center landscaping is included in **Appendix D**. The landscape design emphasizes low water demand planting. A single ornamental lawn will occupy 2,000 ft^2 at the center of a traffic circle. The balance of the landscaping is limited to drought-tolerant shrubs, trees, and grasses. The landscape architect's total Estimated Total Water Use per year for landscaping is 1,373,696 gallons, or 4.22 acre-feet. With the exception of the lawn, all landscape irrigation will use drip irrigation and bubblers.

2.4 Projected Total Water Demands

Based on data from BAVC's Central Valley and Northwest Center operations, as well as projected irrigation demand for the Dhamma Santosa Center, the annual total pumping is projected to be:

Students and Servers:	4.92 AF/yr, based on 0.41 AF/month
Irrigation:	4.22 AF/yr, based on ~0.6 AF/month May through October
Maximum Annual Pumping:	9.14 AF/year: 0.41 AF/month November through April; 1 AF/month May through Oct

Irrigation demand will decrease after landscaping has been established, beginning in the 3rd to 4th year after planting. The maximum expected landscape irrigation demand is 4.22 AF/yr. In order to minimize total water demand, the Center has begun irrigating the first phase of landscape plantings using an existing irrigation well. The irrigation well will be destroyed after the water system has been developed and permitted, as it is located to close to the neighboring mutual water company well to sustain long-term production of the magnitude needed for Center operations. By establishing landscaping before

Center operations begin, the overall water demand will be substantially decreased. A moderate landscape irrigation demand, approximately 1.5 to 2.5 AF/year (depending on rainfall, humidity, heat waves, or sustained drought), will continue on an ongoing basis. Accordingly, the anticipated long-term average demand for the Center is 6.4 to 7.4 AF/year. For the purposes of this WSA, the overall water demand is taken as 6.9 AF/yr.

Section 3 - Existing Water Demands

3.1 Historic and Current Water Demands

Center operations have not yet begun as this location; accordingly, historic water demand is unavailable. Water demand from the operation of other BAVC mediation centers was used to inform the projected demand for the Center. As described in Section 2.4 and Appendix B, the projected water demand after landscape planting has been established is 6.9 AF/yr.

3.2 Dry Year Demands

Center operations water demand for consumptive use is not expected to vary between normal and dry years. Indoor water demand is limited to food preparation and dishwashing, toilet flushing, bathroom sinks and showers, and limited laundering between sessions. These uses are expected to remain unchanged during periods of drought, with the exception of efforts by Center staff to achieve additional water conservation.

Irrigation water demand may increase by 5% during a single dry year, or in the first of multiple dry years, due to increased plant irrigation demands. In multiple dry years, the Center would seek to reduce potable demands by 10 to 15% in the second year, and 15 to 20% in the third year, by instituting a shower duration policy or intermittent showering schedule ("Navy shower"), and other conservation measures.

Section 4 - Water Supply

4.1 Current Water Supply

The water supply for the Center has not yet been developed. A water system application has been filed with the State Water Resources Control Board Division of Drinking Water for a Transient Non-Community Water System. The system will include two new wells drilled on-site to supply both potable and fire water for the Center. The new wells will be constructed and tested to ensure that a sufficient supply is available to sustain Center Operations during a range of hydrologic conditions. BAVC understands that permit approval is entirely dependent upon proving a viable supply with 72-hour (and preferably 10-day) pumping and recovery tests. Further, as persuasively stated in the General Plan section on Water Supply, bedrock wells "*tend to deliver less quantity of water over the long term than initially, and drilling additional wells can often deplete the limited reserves of existing wells.*"

The primary supply well will be drilled into bedrock to a depth of approximately 500 feet. We anticipate completing the well with a 6-inch diameter casing, and set screen entirely within bedrock aquifers. The well is expected to produce approximately 15 to 30 gallons per minute (gpm), which will be confirmed by conducting a minimum 72-hour pumping test, if not a 10-day test.

A secondary supply well may be drilled into the shallow alluvium at the east end of the property, in proximity to Little Arthur Creek, provided that location can accommodate a well without excessive well interference to neighboring residential wells, and the primary well for the Happy Acres Mutual Water Company, which serves 79 homes. Should it prove to be infeasible to locate the secondary supply well in the alluvium, an alternate location for the secondary well is in the bedrock uplands, possibly at the west end of the property, with conveyance to the Center at the east end. The west end of the property includes a serpentenite outcrop whose associated soils host protected flora. If it is necessary to drill in this area, an exemption will be sought for minimal disturbance and restoration to support drilling a well. Existing roads would be utilized for access, minimizing impact to sensitive flora.

The anticipated yield of a bedrock well drilled at this location is ~19 gpm, based on well performance tests completed for neighboring wells. Data for pumping tests conducted on neighboring wells is presented in **Appendix C**. A description of the geology of the water bearing features of the fractured bedrock found on the Center property is included as **Appendix F**.

4.2 Future Water Supply

BAVC has contacted the City of Gilroy, as well as nearby mutual water companies or small water systems, to inquire whether the Center may connect to an existing water system. None of the known water suppliers can sustain the Center's water demand. The City of Gilroy has no formal plans to expand its sphere of influence westward, and has issued a letter to BAVC advising that BAVC may not rely upon the City of Gilroy for current or future water supply. BAVC must therefore depend on constructing two viable supply wells on the 9201 El Matador Drive property.

4.2.1 Conservation

BAVC plans to pursue water conservation at every opportunity. Center design water conservation planning includes the following elements:

- Bioretention swales to promote water collection for natural irrigation from rainfall runoff, and to promote groundwater recharge to the alluvial aquifer
- Rainfall harvesting from roofs to limit irrigation water demand or for groundwater recharge
- Gray water reuse
- Septic emitters to maximize nitrogen uptake while concurrently irrigating landscaping
- Low flow showers
- Low flush toilets

Section 5 - Supply Sufficiency Analysis

5.1 Comparison of Project Demands to Projected Supply

The project water supply demand has been enumerated in reliable detail. The projected supply is entirely dependent upon the specific subsurface conditions encountered when drilling the wells, e.g. the degree of fracturing in a shale or sandstone unit, or whether the borehole intersects a saturated fracture network.

To make a comparison of projected demand vs. projected supply, Table 1 provides calculated pumping cycles needed to sustain maximum anticipated long term average demand. Peak demand for firefighting will leverage the 97,000 gallon storage facility that BAVC plans to construct to satisfy the State and County permitting agencies.

The corresponding estimated Average Day Demand (ADD) for the proposed project is 6,160 gallons per day.[1] This is the full build out demand, and will not increase over the next 20 years. The BAVC meditation center will neither expand its facilities nor increase the number of student participants attending its courses, thereby limiting water demand.

The estimated Maximum Day Demand (MDD) is 8,440 gallons per day. The MDD is calculated using indoor water demand for only the days that students are present, i.e. 240 days per year (24 ten-day sessions).[2] The basis for estimated ADD and MDD is water use records from a similar BAVC meditation center already operating in the Central Valley. Based on similarity of the design of the student accommodation halls, and on the daily schedule for 10-day meditation retreats, the operating water demand of the Central Valley Center provides a reliable basis for estimating MDD and ADD. The water use records that form the basis for the ADD and MDD are presented in Appendix B.

The primary supply will be the deep fractured rock well. A review of the specific capacities and initial well yields reported on logs for nearby wells completed in fractured rock indicates that the primary bedrock well will yield 10 to 20 gpm, or more. The bedrock well alone is likely to meet the MDD, 10,150 gallons per day, without storage. The range of pumping discharge-duration to achieve MDD is:

Table 1 – Pumping Rates and Cycles to Achieve Maximum Daily Demand

Discharge	Duration	MDD Achieved
6 gpm	24 hours	8,440 gallons
10 gpm	14 hours	8,440 gallons
15 gpm	9½ hours	8,440 gallons
20 gpm	7 hours	8,440 gallons

The ability of a bedrock well at the Center to reliably pump at these rates is also informed by competing demand from neighboring wells. **Figure 4**, below, provides a water use estimate survey of known wells

[1] 6.9 acre-feet × 43,560 ft³/AF × 7.48 gals/ft³ ÷ 365 days = 6,160 gals/day

[2] Indoor Water Uses: 4.9 AF × 43,560 ft³/AF × 7.48 gals/ft³ ÷ 240 days (for 24 sessions/yr) = 6,160 gals/day
Outdoor Water Uses: 2 AF × 43,560 ft³/AF x 7.48 gals/ft³ ÷ 365 days = 1,785 gals/day; Indoor + Outdoor = 6,160 + 1,785 = 8,440 gals/day

in the vicinity of the Center. Water Use Factors were developed for common land uses, e.g. vineyards, orchards, extensive ornamental landscaping, pools, and stables. The Water Use Factors used to develop annual pumping estimates are presented in **Appendix F**. The estimated pumping figures developed must be considered an interpreted estimate, which may be high or low, but is nonetheless useful for understanding *relative* quantities of groundwater pumped annually, and how pumping to supply the Center will fit into regional pumping rates in the Little Arthur Creek watershed.

Screening level well interference calculations for the nearest known bedrock wells indicate minimal interference, e.g. at most 5 inches drawdown. However, the subject wells are between a quarter and a third of a mile distant from the proposed location of BAVC's primary bedrock well, and located on the opposite side of Little Arthur Creek. The probability that pumping in BAVC's well would cause measurable drawdown and interferences in these wells is low. BAVC has invited the owners of these wells to participate in initial, baseline water level measurements in June, to gage effects of existing pumping patterns on water levels in these wells. The data collected is expected to further inform BAVC's analysis of whether and to what degree BAVC's pumping would be in competition with existing pumping.

5.2 Comparison of Project Demands to Projected Supply in Dry Years

This section provides a calculation of anticipated supply during drought years.

Assumptions Used to Anticipate Center Supply in Normal, Single-Dry, and Multiple Dry Year Conditions:

1. The BAVC system demand is fairly constant, as the pattern of 10-day meditation retreats, with 3 days between retreats, is scheduled far in advance. The only variations in this pattern would result from seasonal irrigation demand of native landscaping, and possible decrease in demand if a retreat is cancelled for unanticipated reasons. At no time will the water demand exceed the 4.92 acre-feet per year indoor water use. The 2 acre-feet per year outdoor water use projection for irrigating landscaping (once established) is probably on the high side. The amount of irrigation demand that can be met primarily with gray water reuse may be 25% or more (gray water system design is in progress; projections are not yet available).

2. The bedrock well yield is 15 gpm or higher. The average initial well pumping rate for nearby bedrock wells was 18.9 gpm, and the median 15 gpm, and the 10^{th} percentile 10 gpm.

3. Water level data for neighboring wells has not been measured, with the possible exception of HAMWC, whose data may become available later in the permitting process. Therefore, water level response to pumping is based on calculations using assumed aquifer properties, based on specific capacities measured at the times the wells were drilled, without the benefit of measured water levels.

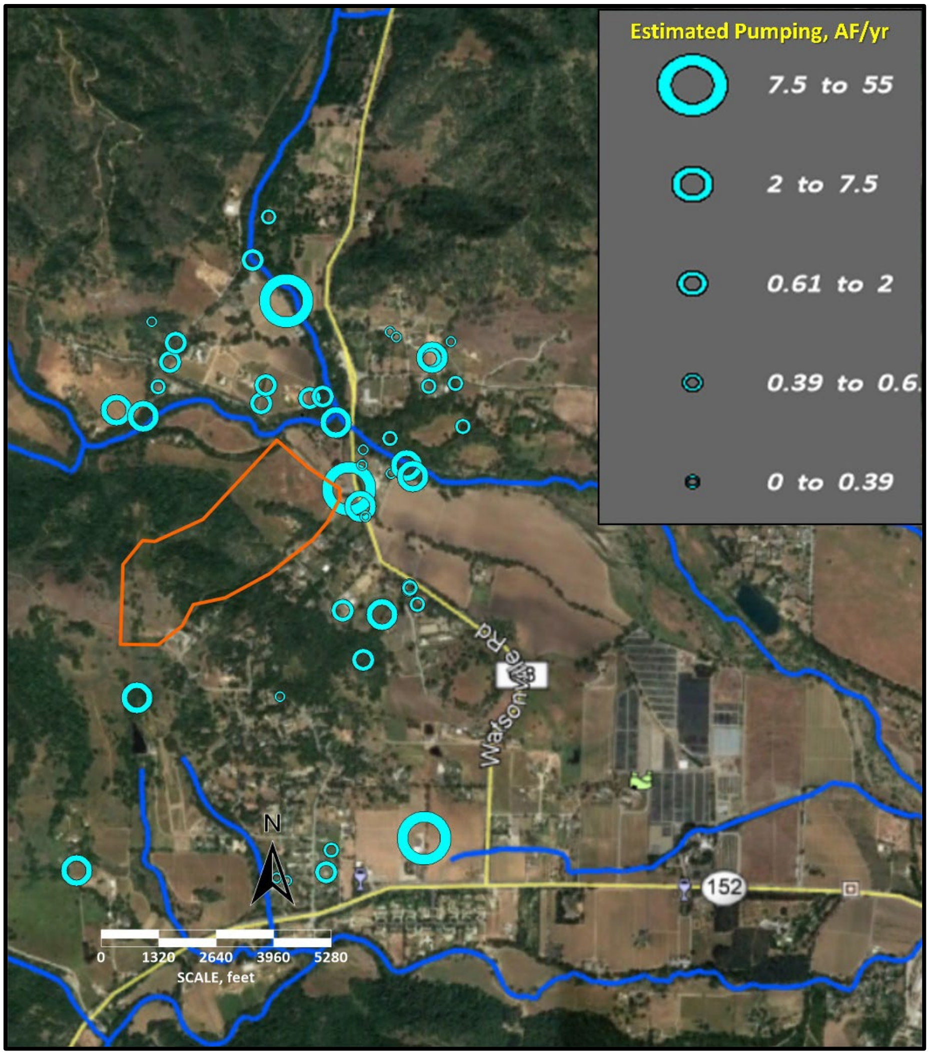

Figure 4 – Estimated Water Demand in the Vicinity of the BAVC Center

4. For the alluvial well, as water levels decline, the distance from the well to the edge of the alluvium at the water table elevation decreases. Therefore, the volume of aquifer supplying the well decreases significantly with water level decline. The effect of the cone of depression in an alluvial well intersecting low-yielding bedrock is effectively to double the drawdown in that direction.

5. For the bedrock well, the formation yield may decrease with depth where fewer fractures may occur, and will vary significantly with rock type. The water-bearing units of the Franciscan formation include siltstones and shales, as well as sandstone and basalt. On the BAVC property, the expected bedrock lithology at depth is sandstone and shale on the east end of the property, and sandstone, shale and serpentinite on the west end of the property. The degree of fracturing in the bedrock is variable but relatively high, due to several active faults in the area, including the Berrocal Fault and San Andreas Fault. It is not possible to foretell whether a saturated, interconnected fractured rock formation will be encountered during drilling. Nevertheless, many wells in the same Township Range Section have yielded enough water to support

vineyards, stables, homes, and crops. In the 9-section area comprising the east slope of the Santa Cruz mountains, several bedrock wells have yielded 30 gpm or more.

6. To estimate the effect of drought on well yield, the simplifying assumption is made that the fractured bedrock aquifer yield is constant over the entire 500 foot length of the well, and that the well is perforated over its entire length below the sanitary seal.

Tables 2 and 3 provide the estimated drawdowns and yield in the fractured bedrock well and alluvial well, applying the simplifying assumptions described above.

Table 2: Estimated Impact of Single and Multiple Dry Years on Bedrock Well Yield

Condition	**Depth to Water, ft** Total Depth = 500 ft	**Pumping Rate, gpm**	**Pumping Hrs/day to produce MDD**	**Notes**
Normal	75	20	7	
Single Dry Year	150	16.5	8½	
Multiple Dry Years 3	225	13	12	
Multiple Dry Years 4	300	9.5	15	
Multiple Dry Years 5	375	**6**	23	Requires well #2
Multiple Dry Years 6	450	**<3 gpm = dry well**	-	Requires well #2

Table 3: Estimated Impact of Single and Multiple Dry Years on Alluvium Well Yield

Condition	**Depth to Water, ft** Total Depth = 120 ft	**Pumping Rate, gpm**	**Pumping Hrs/day to produce MDD**	**Notes**
Normal	40	50	3	
Single Dry Year	60	37½	4	
Multiple Dry Years 3	75	28	5	
Multiple Dry Years 4	90	19	7	
Multiple Dry Years 5	105	9	16	
Multiple Dry Years 6	120	**Dry well**	Requires 2nd bedrock well at west end, or temporary Center shutdown	

In view of the challenging hydrologic conditions that the BAVC water system may encounter, and the likelihood that severe droughts will recur in the future, BAVC is planning its water system with long term water supply sustainability in mind. BAVC plans to evaluate the feasibility of implementing water resources management measures to improve water supply reliability. Water supply sustainability measures under consideration include:

- Designing dormitory plumbing to accommodate graywater harvesting and filtering to limit the use of pumped groundwater for landscape irrigation.

- Rainwater harvesting from roofs BAVC's 16 buildings for groundwater infiltration, to enhance recharge to BAVC's and HAWMC's alluvial wells.

- Construction of infiltration galleries to promote stormwater capture for groundwater recharge to both the alluvium and bedrock aquifers.

5.3 Plans for Acquiring Additional Water Supplies

BAVC has no plans for acquiring additional water supplies. The Center water use is small in comparison to nearby heavy agricultural irrigation pumping along Uvas Creek, and other nearby users. A protracted drought that might motivate BAVC to secure an additional water supply would also motivate surrounding land owners to secure an additional supply. At that point, the shared need for additional water could precipitate a coordinated effort to arrange for a temporary water importation scheme for the Little Arthur Creek Valley, to the benefit of multiple groundwater pumpers, including BAVC. However, a permanent water importation from the Llagas groundwater subbasin, even if technically feasible, would be contrary to the County General Plan policy in opposition to developing urban water supply infrastructure in areas outside the Urban Service Areas, and is unlikely to obtain approval. Accordingly, BAVC plans to design its operations around water supply sustainability and self-sufficiency.

BAVC may seek a future permit to expand its water storage facilities, to assist the Center with flexibility in groundwater pumping schedules. Added storage could enable tank filling during periods of higher groundwater levels in the winter and spring, to enable extended periods of no pumping in the fall. This arrangement, if pursued, is likely to be sustainable because the site topography promotes gravity drainage of groundwater out of the aquifer, beyond the wells' zones of capture. In other words, the water that would be captured with added storage would otherwise drain away and be unavailable later in the year.

Section 6 - Conclusion

6.1 Sufficiency of Water Supply for the Project

Mohr HydroGeoScience LLC has reviewed groundwater conditions on the subject property and surrounding areas, examined the known features of the Little Arthur Creek hydrology, and considered how these conditions may be affected by extended periods of drought. The ability of two bedrock wells to be drilled for the Bay Area Vipassana Center to sustain project water demand based on the forecasted average and peak daily demands described herein cannot be assured before the wells are drilled and tested. Based on my analysis of nearby well specific capacities, site geology, and features of groundwater recharge and runoff, it is my opinion that there is a reasonably high likelihood that BAVC will succeed with drilling two viable wells that can sustain operations during multiple consecutive dry years. Therefore, proceeding with permit application, drilling, and well performance testing is recommended. It is my further opinion that baseline water quality is sufficiently low in nitrate that the Center will not encounter groundwater quality degradation from nitrate. I have reviewed Questa Engineering's separate OWTS study, and I have conducted my own analysis of baseline nitrate loading and nitrate loading from BAVC operations. My conclusion is that BAVC operations will not deteriorate groundwater quality relative to State standards for nitrate in either the Center's wells or neighboring wells. It remains possible that the bedrock wells may encounter elevated levels of iron and manganese, which would have to be managed with greensand filtration or other common means of conventional wellhead treatment.

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APPENDIX A - HYDROLOGIC SETTING – FLOW IN LITTLE ARTHUR CREEK

Approximately 93 percent of the annual precipitation in the Little Arthur Creek watershed occurs during the six month period between November and April (SCCFCWD, 1972). The peak discharge recorded in Little Arthur Creek was 2,116 cubic feet per second (cfs), on January 16, 1970. Mean Annual runoff for Little Arthur Creek has been estimated at 2,420 AF/yr. The 100-year return flood estimate was 2,800 AF, and the 500-year return peak flood was estimated at 4,600 cfs (SCCFCWD, 1972).

A major storm event occurred in 1986, which updated the 100-year return flood estimate. In the 9 days between February 12 and February 20, 1986, 18.2 inches of rainfall was recorded at Uvas reservoir, whereas the seasonal average at this rain gage was 32.2 inches (up to 1987). Rainfall intensity during this storm was measured as high as 0.4 inches per hour. Peak measured flow on Little Arthur Creek at Redwood Retreat Road during the 1986 flood event was 2,500 cfs, measured at 9:15 pm on February 17, 1986. This flood event was determined to have a 25-year frequency, and from this data, the 100-year return flood was estimated to be 3,400 cfs (SCVWD, 1988), which is also the "Green Book" 1% design event used for bridge design and floodplain planning, based on 11 years of gaging Little Arthur Creek (from 1964 to 1975) (SCVWD, 1978).

Limited stream gaging data is available for Little Arthur Creek. The charts below summarize Little Arthur Creek gaging data recorded by Santa Clara Valley Water District personnel at a gaging weir located where Little Arthur Creek is crossed by Redwood Retreat Road. Creek gaging data was available for Water Years[3] 1964 through 1969, 1973 and 1974, 1977, 1981, 1998, and 1999, with isolated readings in a few intermittent years. Records within these years are sporadic, and were primarily made for the purpose of recording stream response to rainfall events in December through March, with a few late spring and summer measurements.

The hydrographs presented below show only the readings, and do not interpolate between readings. Examination of the stream gaging data shows that while Little Arthur Creek may exhibit significant flow in response to a heavy rainfall event, flow usually decreases tenfold within a day or two. Where readings are made two or more weeks apart, it is not possible to interpolate between measurements. Two examples from the data are listed below, to demonstrate that even frequent measurements will exhibit order-of-magnitude variability. Between storms, winter baseflows are reported to frequently be in the range of 3 to 10 cubic feet per second (cfs) during normal years (Hecht and White, 1993).

Table A-1 – Examples of Flow Variability in Little Arthur Creek

Date	Flow, cfs
12/15/1977	14
12/16/1977	175
12/18/1977	13
1/6/1978	97
1/7/1978	211
1/9/1978	170

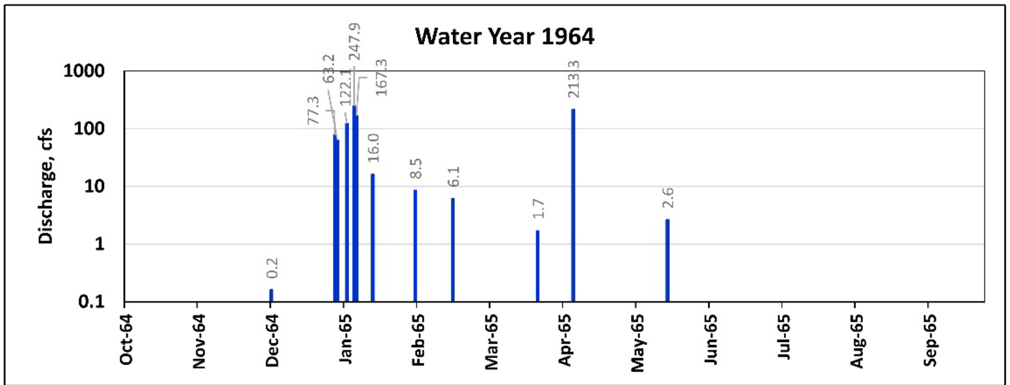
Date	Flow, cfs
1/13/1969	98
1/19/1969	431
1/20/1969	118
1/22/1969	85
1/26/1969	374

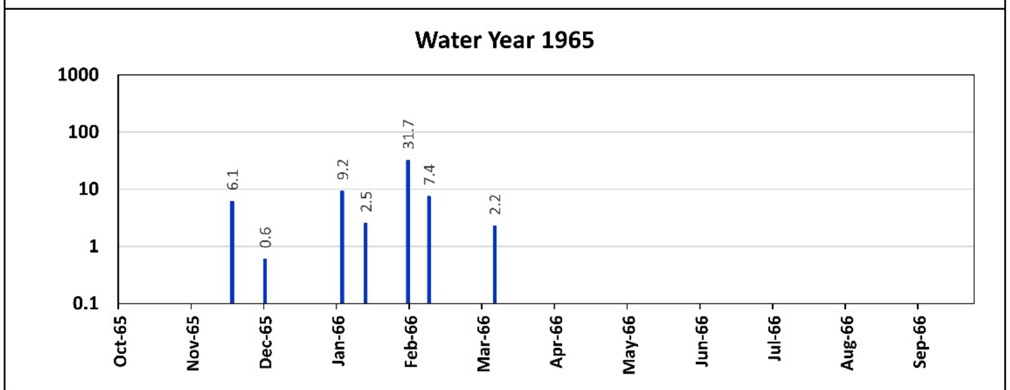
[3] The Water Year is defined as October 1 through September 30.

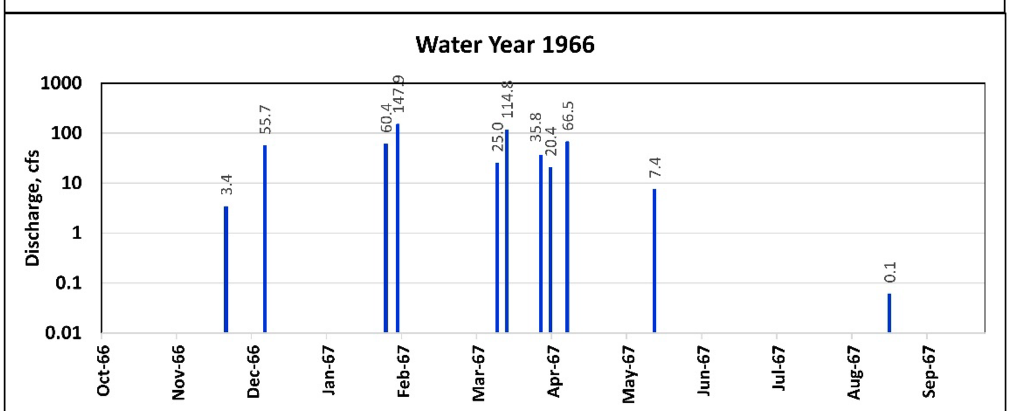
1/14/1978	165
1/15/1978	146
1/16/1978	374
1/18/1978	92
2/6/1978	17
2/9/1978	258

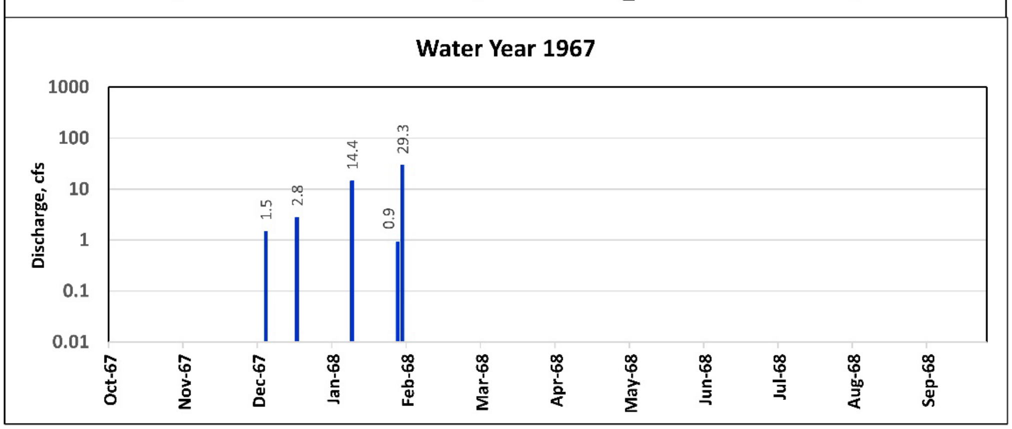
cfs = cubic feet per second

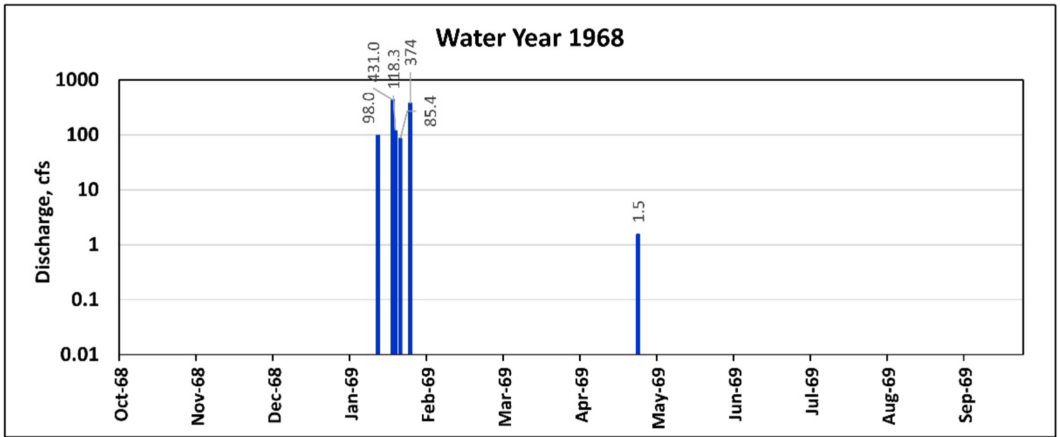
Figure A-1 Stream Flow Hydrographs from SCVWD Stream Gaging Data, Little Arthur Creek at Redwood Retreat Road

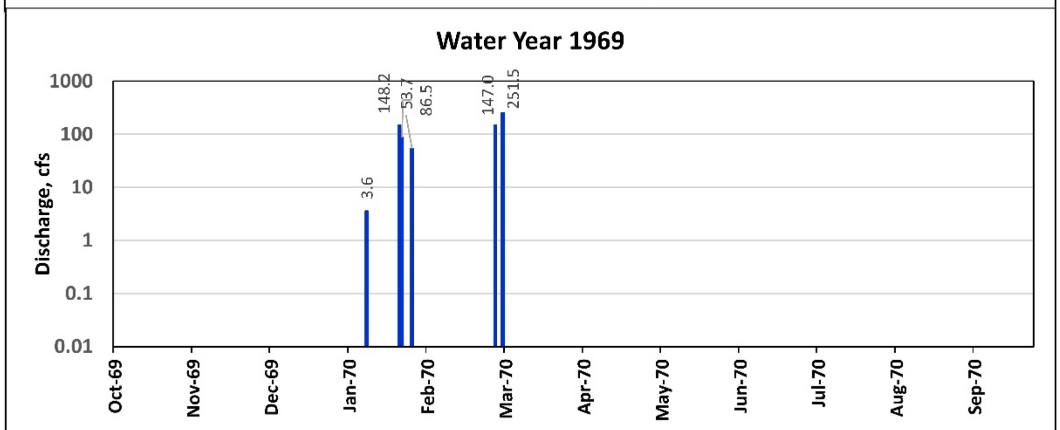

Water Year 1964
Discharge, cfs
1000
100
10
1
0.1
0.2
77.3
63.2
122.1
247.9
167.3
16.0
8.5
6.1
1.7
213.3
2.6
Oct-64
Nov-64
Dec-64
Jan-65
Feb-65
Mar-65
Apr-65
May-65
Jun-65
Jul-65
Aug-65
Sep-65

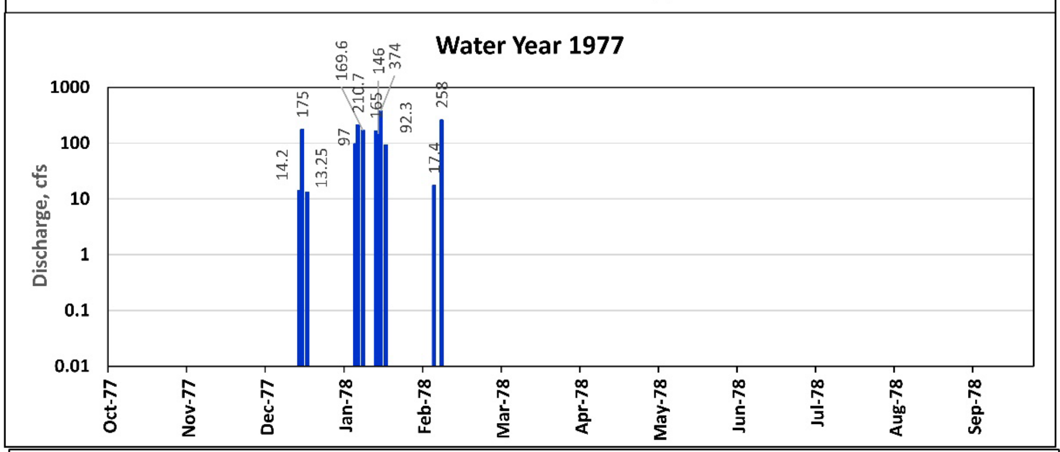

Water Year 1965
1000
100
10
1
0.1
6.1
0.6
9.2
2.5
31.7
7.4
2.2
Oct-65
Nov-65
Dec-65
Jan-66
Feb-66
Mar-66
Apr-66
May-66
Jun-66
Jul-66
Aug-66
Sep-66

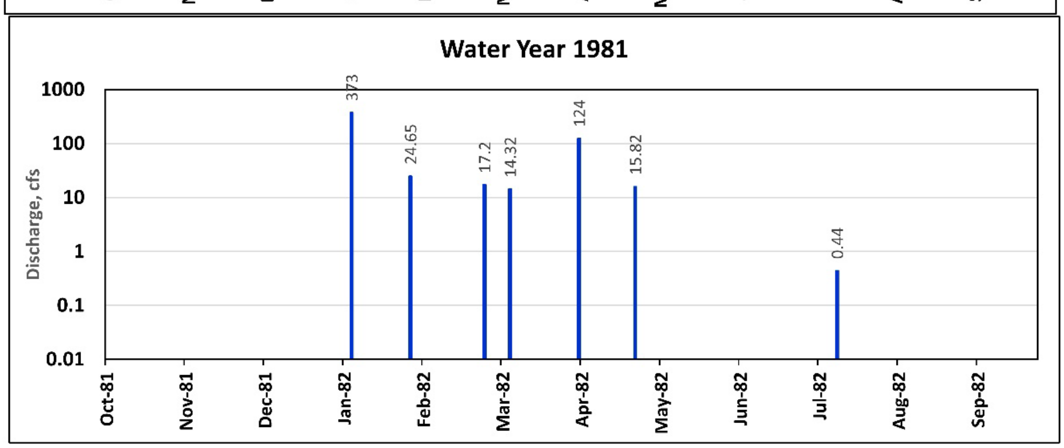

Water Year 1966
Discharge, cfs
1000
100
10
1
0.1
0.01
3.4
55.7
60.4
147.9
25.0
114.8
35.8
20.4
66.5
7.4
0.1
Oct-66
Nov-66
Dec-66
Jan-67
Feb-67
Mar-67
Apr-67
May-67
Jun-67
Jul-67
Aug-67
Sep-67

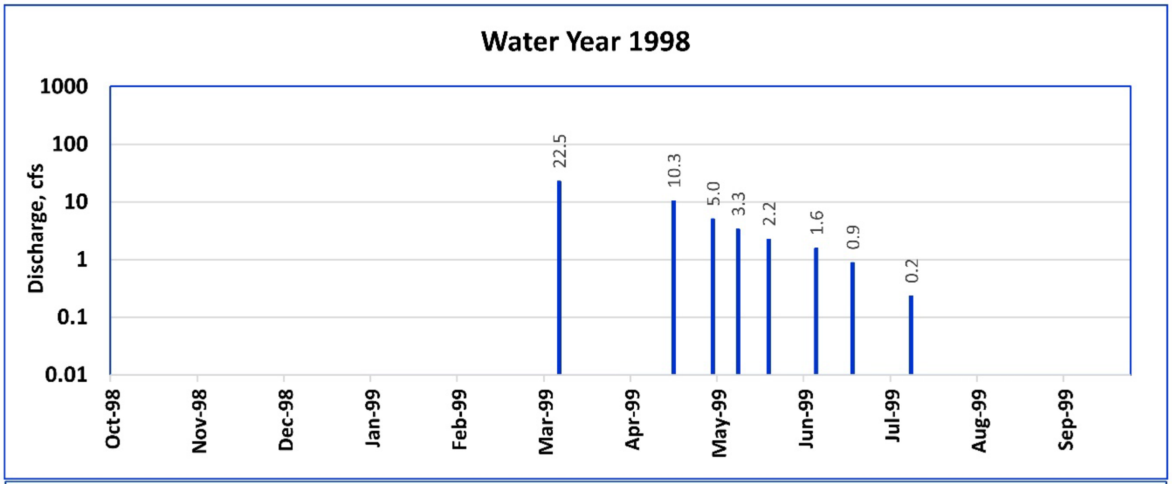

Water Year 1967
Discharge, cfs
1000
100
10
1
0.1
0.01
1.5
2.8
14.4
0.9
29.3
Oct-67
Nov-67
Dec-67
Jan-68
Feb-68
Mar-68
Apr-68
May-68
Jun-68
Jul-68
Aug-68
Sep-68

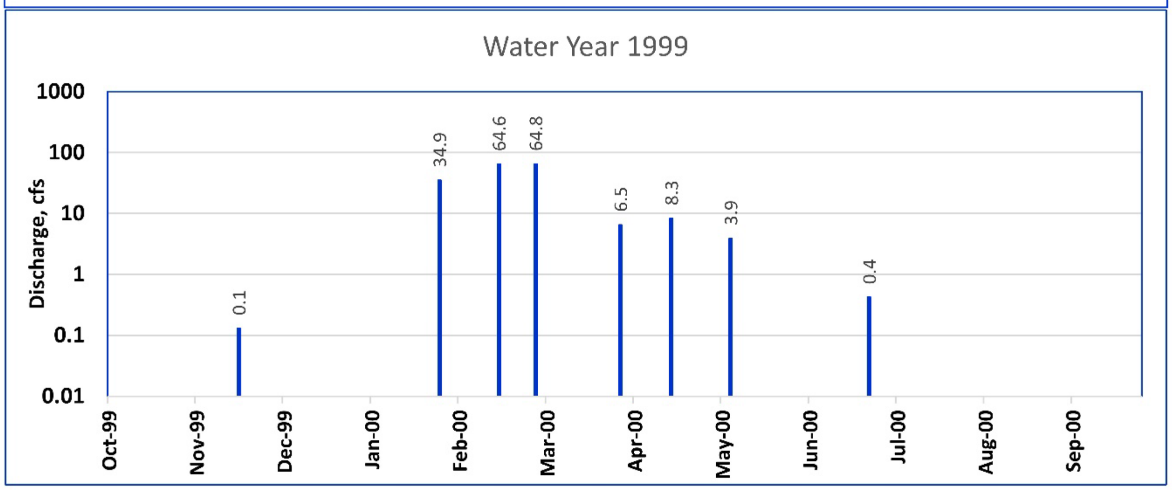

Water Year 1968
Discharge, cfs
1000
100
10
1
0.1
0.01
98.0
431.0
118.3
374
85.4
1.5
Oct-68
Nov-68
Dec-68
Jan-69
Feb-69
Mar-69
Apr-69
May-69
Jun-69
Jul-69
Aug-69
Sep-69


Water Year 1969
Discharge, cfs
1000
100
10
1
0.1
0.01
3.6
148.2
53.7
86.5
147.0
251.5
Oct-69
Nov-69
Dec-69
Jan-70
Feb-70
Mar-70
Apr-70
May-70
Jun-70
Jul-70
Aug-70
Sep-70


Water Year 1977
Discharge, cfs
1000
100
10
1
0.1
0.01
14.2
175
13.25
97
169.6
210.7
165
146
374
92.3
17.4
258
Oct-77
Nov-77
Dec-77
Jan-78
Feb-78
Mar-78
Apr-78
May-78
Jun-78
Jul-78
Aug-78
Sep-78


Water Year 1981
Discharge, cfs
1000
100
10
1
0.1
0.01
373
24.65
17.2
14.32
124
15.82
0.44
Oct-81
Nov-81
Dec-81
Jan-82
Feb-82
Mar-82
Apr-82
May-82
Jun-82
Jul-82
Aug-82
Sep-82


Water Year 1998
1000
100
10
1
0.1
0.01
Discharge, cfs
22.5
10.3
5.0
3.3
2.2
1.6
0.9
0.2
Oct-98
Nov-98
Dec-98
Jan-99
Feb-99
Mar-99
Apr-99
May-99
Jun-99
Jul-99
Aug-99
Sep-99


Water Year 1999
1000
100
10
1
0.1
0.01
Discharge, cfs
0.1
34.9
64.6
64.8
6.5
8.3
3.9
0.4
Oct-99
Nov-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00
Jul-00
Aug-00
Sep-00

Appendix B

Basis for Estimated Average Day Demand and Maximum Day Demand

The estimates for ADD and MDD are based upon water use records from another Vipassana Meditation Center, operating in similar climate in California's Central Valley, as tabulated below:

Central Valley Center Monthly Water Use (gallons)

		August 21 – September 1		Use, gallons
January	148,500	Day 0	90°	6,600
February	89,100	Day 1	92°	1,900
March	93,600	Day 2	96°	10,400
April	105,900	Day 3	95°	2,100
May	103,700	Day 4	96°	12,000
June	93,700	Day 5	100°	1,700
July	172,500	Day 6	96°	8,200
August	163,400	Day 7	93°	5,500
September	102,000	Day 8	92°	5,100
October	109,000	Day 9	90°	8,300
November	101,600	Day 10	93°	2,200
December	114,100	Day 11	95°	6,600
TOTAL	**1,397,100**			**70,600**

Average annual daily use, over 365 days:	3,827 gallons/day
Average annual daily session use, over 240 days:	5,821 gallons/day
Average annual daily use per capita, ~130 people:	~45 gallons/person/day
Average daily use, 2019 Aug/Sept:	5,883 gallons/day
Average daily use per capita, 2019 Aug/Sept:	44.6 gallons/person/day

Appendix C

Basis for Estimating Water System Supply Capacity

The BAVC Water System capacity will be determined by well yields, which are as yet unknown. The best indication of the likely yield available on the BAVC property is a compilation of specific capacities and initial well yields recorded on nearby well logs. As described in Section 6, the primary water supply well will be a bedrock well drilled to a depth of approximately 500 feet. A second well may be drilled in the alluvium at the northeast corner of the property, where the alluvium is believed to be greater than 100 feet deep. The basis for this estimate of depth to bedrock is the log of the nearby Happy Acres Mutual Water Company Well #1, which is located 900 feet to the south. Borings drilled at a prospective dam site, one mile upstream of the BAVC property, also inform the depth of alluvium in the Little Arthur Creek Valley. Because the BAVC property is located within 700 feet of the confluence of Little Arthur Creek and Uvas Creek, the depth to bedrock is likely to be deeper than at either the HAMWC well location or the upstream dam site borings, due to channel meanders of Uvas Creek, which carries more than four times the flow of Little Arthur Creek.[4] Only drilling can confirm the depth, yield, and feasibility of an alluvial well to serve as a backup supply for the BAVC Water System.

Initial Yield and Specific Capacity of Bedrock Wells in the Little Arthur Creek Valley, within 1 mile of the BAVC Center

Wells Near Center	Dist. from Center, ft	Depth, ft	Depth to Water	Screen Length, ft	Casing Storage, gal	Time to formation draw-down,	Pumping Duration, hrs	Gallons per min, gpm	Drawdown, ft	Formation Drawdown	Adjusted S.C. Q/s, gpm/ft
30H	5,603	290	90	60	266	22	2	12	0.1	0.065	185
30L	2,321	198	30	150	223	112	8	2	0.1	0.065	31
29M	2,321	210	93	100	188	12	6	16	1	0.65	25
32H	1,862	277	55	60	357	18	5	20	8	5.2	3.8
29R-B	798	260	56	100	1,644	33	1	50	186	120.9	0.41
29R-B	694	375	65	100	545	20	72	27	103	66.95	0.40
32P	5,228	85	17	33	244	20	6	12	51	33.15	0.36
29J	1,840	260	10	205	1,964	79	1.5	25	120	78	0.32
29Q	1,944	245	35	84	696	46	15	15	125	81.25	0.18
29K	1,815	225	65	100	301	30	1	10	110	71.5	0.14
							Average	**18.9 gpm**			

Data from DWR Well Logs; some well locations inferred from well log map sketches lacking detail. Initial well performance does not predict long-term performance; well yields often decrease by 40% within the first year of operations. In general, the higher initial well yields correspond to the deeper wells. Performance of nearby wells indicates *possible* well performance; actual well performance can only be confirmed by conducting a 72-hour or longer pumping and recovery test.

[4] Technical Support Data Notebook for Upper Uvas Carnadero Creek, August 2000. Nolte and Associates. Prepared for Santa Clara Valley Water District.

APPENDIX D

Drought Tolerant Landscaping Species Selected for the BAVC Meditation Center

Shrubs & Grasses Species w/ Low Water Use to be selected from the following list:

Botanical Name	**Common Name**
Arctostaphylos	'Howard Mcminn' Manzanita
Arctostaphylos	'Pacific Mist' Manzanita
Artemisia californica	California Sagebrush
Calamagrostis	'Karl Foerster' Feather Reed Grass
Calycanthus occidentalis	Spice Bush
Carex praegracilis	California Field Sedge
Ceanothus 'Concha'	Concha Ceanothus
Ceanothus griseus horiz.	Carmel Creeper
Chondropetalum tectorum	Small Cape Rush
Dendromecon rigida	Bush Poppy
Eriogonum fasciculatum	California Buckwheat
Eriogonum giganteum	St. Catherine's Lace
Frangula californica	Coffee Berry
Fremontodendron californicum	Flannel Bush
Lupinus albifrons	Silver Bush Lupine
Muhlenbergia 'Pink Flamingo'	Pink Flamingo Muhly
Muhlenbergia rigens	Deer Grass
Myrica californica	Pacific Wax Myrtle
Penstemon eatonii	Firecracker Beardtongue
Ribes viburnifolium	Catalina Currant
Savia clevelandii	Cleveland Sage
Salvia greggii	Autumn Sage

Source: Meditation Center Landscape Plan, Karen Aitken & Associates, Landscape Architects

APPENDIX E

GEOLOGIC AND HYDROGEOLOGIC FEATURES OF FRACTURED ROCK AT THE CENTER PROPERTY

The rock formations in the area of the Center are moderately to highly fractured in response to shearing, faulting, compaction, compression, and uplift. The sandstones on the Center parcel are mapped with bedding planes that dip to the southwest (McLaughlin, 1971). Many of the well logs in the area have recorded fractured shales. In general, shales commonly display bedding plane fractures, which permit the storage and transmission of groundwater in an otherwise low permeability formation. Bedding fractures at shale/sandstone contact zones are also likely to be open and transmit groundwater. Fractured sandstones, most likely the Franciscan Cretaceous sandstone, are also commonly logged and targeted with well screens for groundwater extraction in area wells. Brief descriptions of the water bearing capacity of rock formations mapped on the Center Parcel are provided in in Table E-1, below.

Table E-1 – Descriptions of Center Parcel Rock Formation Water Bearing Capacity

Formation	Description	Fractures	Permeability
Temblor Sandstone	Thick-bedded medium to coarse-grained sandstone with mudstone interbeds	Moderate to 5-foot spacing; closer spacing in weathered outcrops	Low to moderate intergranular permeability
Franciscan Sandstone and shale	Sandstone (greywacke) and shale, including siltstone, both thinly bedded and very thickly bedded occurrences; beds interrupted by ubiquitous shear zones	In sandstone, mostly close to moderate spacing. Where thickly bedded, wide to very wide spacing. Shale fractures closely spaced.	Low to very low intergranular permeability in sandstone, fracture permeability low to moderate.
Franciscan Greenstone	Altered basaltic volcanic rock consisting of pillow lava, tuff breccia, tuff	Largely close to moderate spacing; Pillows create effective 1 – 3 ft wide fracture spacing in pillow lava.	Very low inter-granular permeability, low to locally moderate fracture permeability, largely in shallow rock
Serpentinized Ultramafic Rocks	Sheared serpentinite	Very close fractures (½ inch) to close fractures ½ to 2-inch	Very low intergranular permeability. Fracture permeability in shallow rock is mostly low, some moderate, some very low

Source: Ellen and Wentworth, 1995.

None of the formations described in Table F-1 are characterized as high-yielding aquifers, which is consistent with the predominantly low well yields reported on area well logs reviewed for this report. A few of the logs, however, reported relatively high yields, in the range of 25 to 50 gallons per minute. **Figure E-1** displays pumping rates reported in initial well acceptance tests.

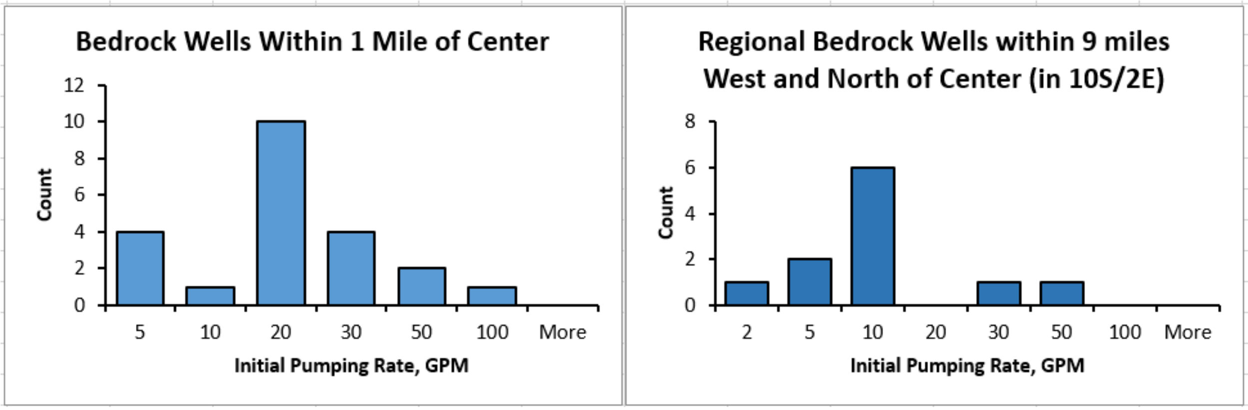


Figure E1 – Pumping Rates Reported on Well Logs for Initial Well Acceptance Tests
(long-term pumping rates likely to be up to 40% lower after the first year of pumping).

The BAVC property has two geologic features that favor extensive fracturing and improve the likelihood of finding sufficient yield upon drilling a bedrock well. The first is the effects of seismic activity on the condition of the bedrock in the hills above the planned meditation center. The property has been subjected to significant seismic shaking from the San Andreas and Sargent Faults over recent geologic time. The Berrocal Fault, which is today relatively inactive, may cross the Center property. **Figure E-2** below indicates the possible locations of the concealed extensions of the Berrocal fault mapped by USGS under the alluvium on the north end of the parcel (dashed line with question marks), and the uncertain location of a splinter of the Berrocal Fault zone through the Cretaceous sandstone in the middle of the parcel. These are not definite fault locations, but rather the best guess of the geologists who compiled the most recent geologic map for the area. A fault can provide deep fractures that may help water production. Faults can also act as barriers to groundwater flow, retaining higher water pressures and levels on the upgradient ('upstream') side of the fault, which often produces springs. Springs have been observed on the BAVC parcel in the late summer and fall, suggesting that faulting or other geologic conditions are contributing to the surface discharge of groundwater. The same effect can be produced where a low permeability serpentinite block causes groundwater in fractured sandstone to build up pressure.

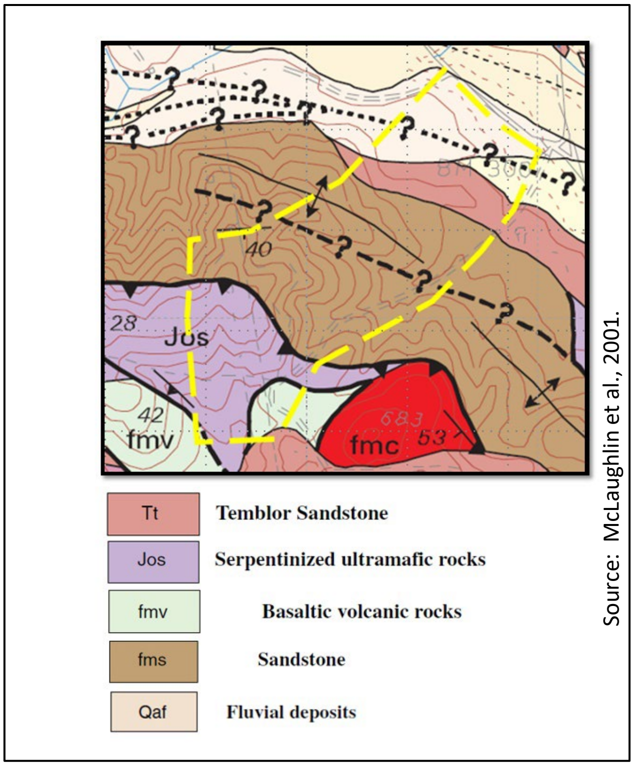


Figure E-2 – Geologic Map of the Center Property

The second feature that I believe favors a well providing sufficient yield in up to 500 feet of bedrock is the topography. The steep-sided hills lack the lateral compression of bedrock that is laterally confined at depth. In other words, the rocks on and below the property have room to expand sideways, whereas bedrock buried deeper does not.

APPENDIX F

Water Use Estimation Factors

	AF/yr	Gal/yr	Gal/day	Notes	Reference
Homes	0.127	41,245	113	# persons from Census + house size	AKEL, 2016
Horse	0.011	3,650	10	gallons/horse/day; # horses = size of stables	Miller et al, 2019
Goats	0.003	1,095	3		https://www.engineeringtoolbox.com/farm-use-animals-water-consumption-d_1588.html
Sheep	0.003	1,095	3		
Vineyard	0.8	260,681	714	Includes frost protection	McGourty et al, 2014
Pool	0.044	14,446	40	assumes pools are 450 ft^2	DWR, 2020 (inches ETo/Yr)
Landscape	0.4	130,340	357	Per avg. residential yard	AKEL, 2016
Orchard	2.5	814,628	2232	using walnuts	UCCE
Pasture	2	651,702	1785	Irrigated	UCCE