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SPRING FLOW MONITORING, RAIN WATER HARVESTING & WATER QUANTITY/QUALITY REPORT

April 16, 2018

Prepared For:
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(Long Ridge)
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EXECUTIVE SUMMARY

This report provides Spring Flow Monitoring, Rain Water Harvesting Analysis and Water Quantity/Quality Results for Assessor Parcel Number (APN): 418-151-005-000 (38059 Palo Colorado Road, Carmel, Ca.) as shown on Figure 1. The purpose of this report is to; 1)Address the code-violation (PLN160856, Code Enforcement Case: CE080464) with respect to the projects water quantity and quality plus, 2)Document and provide spring quantity and quality information for determining whether the spring(s) source(s) meet Monterey County Environmental Health Bureau (MCEHB) minimum standards for single-connection domestic use[1] and, 3)Document and analyze historical and recent precipitation data and the existing Rain Water Harvesting (RWH) system serving the structures for determining whether the existing RWH system is adequate for intended use.

In preparing this Spring Flow Monitoring & Rain Water Harvesting Quantity/Quality Report, the following was completed;

- Regional & local structural geology, lineament analysis, spring locating and, site map compilation[2] - Figures 1, 2, 3, 4.
- Review of Grant Deed; Easement for Spring Box and 1-inch water pipe installation and maintenance - Appendix A.
- Inspection of the spring(s) outcrop, outcrop characteristics and associated flow rate(s) along with, inspection of the existing RWH system in relation to Industry Standards[3].
- Spring & rain water sampling/laboratory analysis in relation to State Drinking Water Standards[4] - Appendix B.
- Data acquiring & analysis of historical and current precipitation[5] - Table 1.
- Analysis of historical & current precipitation and its relation to spring flow - Table 2.
- Analysis of the projects water demand - Tables, 3, 4, 5.
- RWH supply/demand analysis in regards to "average", "drought" and, "reoccurring" year historical precipitation - Table 6.
- Analysis of a 4-year cumulative RWH supply & demand for domestic use - Table 7.

In summary, in order to mitigate MCEHB code-violation[6], it is believed that this report has the appropriate documentation of the projects spring locations and associated flow rates to demonstrate that the spring can generally support the project if needed. However, the structures existing are currently being served by an RWH system, such that, the existing RWH system is a very productive functioning system and adequately serves the existing Single Family Dwelling (SFD), Accessory Structure[7] (GH), other sheds, exterior water use and livestock for the last 12+ years (including the 2011-2015 drought years). More so, an extrapolated 4-year cumulative RWH supply & demand also suggest adequate long term water supply with the addition of increased RWH storage to allow for maximum capture during 'average' and 'above average' precipitation years and, to allow for additional supply during drought precipitation years.

In conclusion, it is recommended that this RWH system with added storage and water treatment be allowed to continue serving the existing residence and accessory structure and, that the spring be used as a supplement source as needed especially in prolonged drought conditions. BHgl is encouraged that this report may be used as a template for setting regulations, analysis and, requirements for using RWH systems as a sustainable long-term water supply for the purposes of obtaining residential building permits.

It should also be noted that this properties RWH system not only saved this residence and it's structures during the Soberanes Fire of 2016, this RWH system was pivotal in saving several other neighboring structures. This RWH system in association with Cal-Fire (which used this property as a staging area to fight the fire) saved several structures with the use of this sites RWH storage capacity. Without this sites RWH system/storage, more neighboring structures and/or onsite structures would have been lost.

[1] Monterey County Environmental Health Bureau (MCEHB) is the lead regulatory agency governing the water quantity and quality for domestic use. Although the spring is located on an adjacent parcel the associated water rights documentation is in Appendix A.
[2] Site Map from HPE Architects completed, April, 2018.
[3] Rainwater Catchment System Design and Installation Standards, by American Rainwater Catchment Systems Association (ARCSA), American Society of Professional Engineers (ASPE), dated January 20, 2009.
[4] California Administrative Code, Title 22, Chapter 15, Article 4. Primary Standards – Inorganic Chemicals, Section 64431, Maximum Contaminant Levels – Inorganic Chemicals, 7th Edition, January, 2018.
[5] California Data Exchange Center (CDEC) Big Sur Station (Online at www.cdec; tab online data, Big Sur Station).
[6] PLN160856, Code Enforcement Case: CE080464).
[7] Also known as Art Studio. There is no kitchen in the art studio.

SITE DESCRIPTION

The property is located within the Santa Lucia Mountain Range, township 18 south, range 1 east, portion of section 11, with address 38059 Palo Colorado Road, Assessor Parcel Number (APN): 418-151-005. Based on Location Map (Figure 1) the subject property is noted as being 43.65-acres[8]. Although, after a proposed lot-line adjustment, the parcel will be 40.75 acres.

The property is situated such that it resides at the top of the ridge (Long-Ridge) and drops to the north toward Rocky Creek. The southern property line generally runs east-west along the ridge line, whereas the northern property line terminates just south of the incised valley of Rocky Creek. The property ranges in elevation of 2,640-ft mean sea level (msl) at the ridge line to 2,080-ft msl near the bottom of the incised valley. Since the property is very steep (much greater than 30%) the structures on the property are spatially distributed and situated along the ridge line as shown on Figure 2. The seven existing structures on the property include; Single Family Dwelling, Accessory Structure (Art Studio), Pole Barn, two Storage Sheds, Workshop and Tool-Shed all of which capture precipitation for the existing RWH system. A detailed description of the sites storage tanks are presented in the Rain Water Harvesting System Inspection section below.

Figure 4 shows the approximate location of the spring (which is on APN: 418-151-031-000) for which the subject property (APN 418-151-005-000) has a water-rights to (Water Rights in Appendix A) although, the spring has not been developed as the existing RWH system has, and, continues to function properly for the last 12+ years (including the 2011-2015 drought years).

REGIONAL HYDROGEOLOGIC SETTING

Regional Hydrogeology:

The site is located in the northern Santa Lucia Range what is termed "geologically" as the Salinian Block of the Central Coast Ranges which contains a crystalline basement of granitic and regionally metamorphosed rocks, overlain by multiple sets of Quaternary deposits which consists of several hundred million years of alluvial sediment deposition. These alluvial sediments were buried over time and eventually became sandstone, siltstones, and limestones for which some were later compressed becoming metasedimentary rock (schist, gneiss and marble). With time, the rocks have continuously been compressed and folded in response to plate-tectonics. With continual rotation and pressure, faults emerged gradually releasing the pressure and creating secondary porosities that can provide water via springs, seeps and/or fractures for nearby water wells.

The Salinian Block is bounded by two major faults: the San Gregorio and San Andreas Fault. The San Gregorio Fault, which marks the southwestern boundary, is offshore with the main splay striking land at Cypress Point. However, several other smaller splays within the San Gregorio fault zone[9] (Palo Colorado Fault, Sur Fault, Church Creek Fault) strike land at Soberanes, Kaslar, Hurricane Point, and localized areas around Parrington Ridge.

Geologic Map, Figure 3, shows the regional related faults in the area which trend northwest-southeast offsetting sedimentary, meta-sedimentary and granitic rocks, resulting in steep, narrow canyons with friable regolith and thus prone to landslides. Stream canyons frequently follow fault splays, hence, most canyons, near-parallel the coast rather than descend directly in to it. The highest peaks are generally granitic rock because they are more resistant to erosion, although, they may also be marble (metamorphosed limestone). In areas where stream erosion is minor, there are still exposures of sandstone and siltstone sediments that have been tilted and/or folded and lay atop more rigid bedrock.

Localized Hydrogeology:

The localized hydrogeology for the property generally consists of a relative thin sequence of decomposed granitic sands with a conglomerate basal section overlaying granitic bedrock. The northern 2/3 of the property has a greater thickness of the decomposed granitic sands due to landslide and colluvium deposits on shallower slopes as compared to the southern side of the property. The southern 1/3 of the property has a little to no decomposed granitic sands due to bedrock outcropping on the ridge tops and along exposed sections on the southern slope of Long-Ridge with slopes exceeding 50%. The difference in decomposed thickness across the property is due to steeper southern slopes, inferred as uplift of the granitic bedrock south of the property creating a normal dip of bedrock (from south to north) resulting in a thicker depositional colluvium sequence to the north[10].

[8] Monterey County Assessors map shows 40-acres whereas the Surveyed Map from Rasmussen Land Surveying, Inc , dated 6/23/16 shows the parcel to be 43.65-acres.
[9] Soberanes Point and Mt. Carmel Quadranagles, Dibblee Jr., 2007.
[10] Site inspection – July, 2017.

18-Year Historical Precipitation Record (Water Years: October 1999 to December, 2017):

The Santa Lucia Range has a Mediterranean climate characterized by year-round moderate temperatures with short, cool winters, and warm dry summers. Table 1 shows the 18-Year Historical Precipitation Record for Pfeiffer Big Sur Gauging Station (Big Sur Station). The mean annual precipitation in the area averages 39.27-inches[11] (varying by exact location) with higher precipitation occurring in the western Santa Lucia Range, most prominent in the coastal highlands areas and ridge-lines. Over the 18-year data-set, the highest precipitation was 77.82" (2016-2017 WY) and the lowest precipitation was 18.22" (2013-2014 WY).

SPRING INSPECTION & ANALYSIS

On July 17th, 2017 a spring source inspection was completed. Figure 2 shows the property structures, and rainwater harvest tanks and Figure 4, shows the spring siting map. Based on the inspection, the following was observed;

It is BHgl understanding, the site spring has never been used for domestic use and, no spring-box has ever been installed. The springs main source (approximate location shown on Figure 4) was observed to be emerging from within decomposed granitic sands, just south of a large granitic-boulders outcrop. It is BHgl's opinion, that the spring outcrop is likely the result of a un-mapped splay of a portion of the northern Church Creek Fault lineament[12] (Figure 3 & 4) uplifting the granitic boulders outcrop. There were other smaller spring outcrops within the vicinity creating a healthy fern-grotto.

Spring-Water Sampling:

Prior to leaving the spring, a spring-water sample was obtained by placing sterilized bottles directly beneath the 1-inch PVC pipe making sure that the sample would be free of unnecessary turbidity and organics. The spring-water sample was transported to Monterey Bay Analytical Services (MBAS) for analysis of State Drinking Water Standards (DWS)[13]. A detailed analysis of the spring water quality is presented below.

Initial Spring Flow Measurements:

After initial observations of the spring outcrop and obtaining a water sample, an initial spring flow measurements was obtained by placing a 1-quart bottle beneath the pipe and measuring the time taken to fill the bottle. The initial spring flow measurement was calculated to be 1.05 gpm with only approximately 50% capture due to lack of an adequate spring box, spring-underflow, fern grotto and tree root uptake (evapotranspiration). This flow measurement is representative of spring base-flow, dry-season conditions. During wetter months, spring flow will likely increase. It is BHgl opinion, that approximately 2+ gpm could be captured if an appropriate spring box was constructed and ferns removed, which would eliminate a portion of underflow and plant-uptake.

Weekly, Bi-Monthly and Monthly Spring Flow Measurements:

Table 2, shows the initial spring flow measurement (July, 2017). Daily measurements (per requests of MCEHB) in July were inadvertently not obtained due to distance and difficulty of getting to spring.

On September 27, 2017, a battery operated, digital totalizing and instantaneous spring-flow meter was installed to more accurately obtain spring flow rates. However, after the 10/2/17 spring flow reading, the meter was observed to be clogged and not recording, so the meter was removed and instantaneous spots checks were completed.

Table 2 shows weekly, bi-monthly and monthly spring flow measurements (9/27/17; 10/2/17; 10/12/17; 10/21/17; 11/4/17; 11/17/17; 12/25/17 and; 1/28/17 and 3/4/18) as requested by MCEHB. Ongoing monthly spring flow measurements are being obtained with the next measurement due at the end of March. Recall, the spring flow measurements being reported (1 to 2.56 gpm) are only capturing approximately 50% of the flow due to lack of a spring box, underflow and plant uptake (evapotranspiration). It is recommended that a spring-box be installed along with a flow meter, so that totalizing and spot measurements can be obtained.

Historical Precipitation -vs- Spring Flow Analysis:

As shown on Table 1, there was 0.26 inches of precipitation in September 2017 to end the 2016-2017 water year. The 2017-2018 water year started with a relatively dry-month for October 2017 in comparison to the 18-year average, whereas, November 2017 was slightly above the average, December 2017 was extremely dry (way below the average) and, January and February, 2018 were at, or, just above averages as shown on Table 1.

[11] California Data Exchange Center (CDEC) Big Sur Station October 1999 to September, 2017) - Online at www.cdec; tab online data, Big Sur Station.
[12] Bierman Hydrogeologic Site Inspection, 7/17/2017.
[13] California Administrative Code, Title 22, Chapter 15, Article 4. Primary Standards – Inorganic Chemicals, Section 64431, Maximum Contaminant Levels – Inorganic Chemicals, 7th Edition, January, 2018.

In a comparison of the precipitation versus the spring flow data obtained to date (Table 2) it is noted that the spring-flow does not appear to be directly related to precipitation. Specifically, as shown on the Graph of Figure 2, the amount of precipitation in November-2017 shows an significant increase and in December-2017 an significant decrease. Whereas, the spring flow tends to only increase and decrease slightly relative to precipitation values/amplitudes. Generally, if springs are directly connected to precipitation and precipitation percolated as recharge, spring flow curves and amplitude would be very similar to that of the precipitation curve/amplitude which is not necessarily observed, suggesting a lag-time of percolated precipitation to emerge as spring flow. The lag-time for percolated recharge as precipitation has not been thoroughly determined.

WATER DEMAND

In order to determine whether the existing Rain Water Harvesting (RWH) system can adequately support the projects water demand as a long-term water supply, a analysis of each structures fixture count (interior water use) and exterior total water use was completed.

Interior Water Demand:
The fixture unit count coefficients used to determine water demands is based on generally accepted industry standards for approximating interior water use[14]. The interior water use for the Main Residence was calculated to be 0.073 acre-ft per year (afy) equivalent to 23,787.12 gallons/yr. Whereas, the Accessory Structure interior water use was calculated to be 0.083 afy, equivalent to 27,045.63 gallons/yr. Interior water use calculations are shown on Tables 3, 4.

Exterior Water Demand:
Exterior water use factors is based on generally accepted industry standards for approximating exterior water use[15]. Table 5 shows the projects exterior total water use calculated to be 0.07 afy which includes the State's Outdoor Water Use Factor (OWUF) of 0.01 acre-ft per year (afy). The total exterior water use was calculated to be 22,809.57 gallons/yr. Breaking down the exterior water demand further, it should be noted that the exterior water use is zero during the winter-months (Dec, Jan, Feb, March) except for use by farm animals (3-horses) calculated for this project to be 814-gallons/month. It is also assumed that summer-months (June through October) uses 2/3 of the remaining exterior use (2,553 gal/month) whereas Spring/Fall-months use is 1/3 of the remaining exterior use (2,263 gal/month). These seasonal use values will be used in the Rain Water Supply and Demand Analysis section below and as depicted on Table 7.

The total combined water demand for the project was calculated to be 73,642.32 gallons.

RAIN WATER HARVEST SYSTEM INSPECTION & ANALYSIS

On July 17th, 2017 a inspection of the RWH system was completed. Figure 2 shows all of the onsite structures and RWH system storage tanks whereas, Table 6 shows, in tabular form the catchment areas[16]; Main Residence (1224 sq.ft); Pole Barn (936 sq.ft); Accessory Structure (300sq.ft); Storage (375sq.ft); Work Shop (1128sq.ft) and; Tool Shed (143sq.ft) giving a approximate total catchment area of 4,106 sq.ft. Generally, 1-inch of precipitation over 1000-sqft of catchment can yield 650 gallons of water, depending on type of roof and gutter material and tree canopy. Although there is a fairly thick Oak-tree canopy, each of the catchment structures have steel roofs and cooper gutters which allows for greater runoff coefficient and rain-water capture.

As per Industry Standards[17] this site's RWH system is constructed such that each of the individual structures contains appropriate sized 'first-flush' diversion, settling tanks, subsequent down-line storage (ranging in size from 2,500 to 12,000 gallons) with clean-outs, appropriate sized pipe diameters, conveyance, distribution and storage tanks with cross-connection and check values as needed.

There are a series of several tanks that capture and convey and/or store water. The SFD and Accessory Structure capture and drain rain water to one 2,500-gallon poly tank, two 4,990-gallon poly tanks and one 12,000-gallon steel tank. The Pole Barn captures and drains water to one 3,000-gallon poly tank. One large Storage Shed captures and drains to one, 500-gallon poly tank. The combined Workshop + Small Storage Shed captures and drains rain water to one 500-gallon poly tank, one 4,990-gallon poly tank and one 3,000-gallon poly tank. The tool-shed captures and drains to one, horse-trough which is used to feed livestock. There are two other 500-gallon tanks down-slope below the Pole Barn that capture storage overflow. When

[14] Based on Monterey Peninsula Water Management Agency Fixture Unit Count coefficients.
[15] Based on Monterey Peninsula Water Management Agency exterior use coefficients.
[16] The square-footages shown are roof-top catchment square-footage, which are not to be confused with under-carriage or habitable, workable storage space square footages. Roof-top catchment square footages provided by Applicant.
[17] Rainwater Catchment System Design and Installation Standards, by American Rainwater Catchment Systems Association (ARCSA), American Society of Professional Engineers (ASPE), dated January 20, 2009.

the storage for each catchment area is full, a booster pump ignites (for any give storage tank that is full) and pumps water to the highest point of the property consisting of three, 4,990-gallon poly and, two 2,500-gallon poly tanks. These tanks then gravity drain back to the Main Residence, Accessory Structure, Storage Shed (which contains a sink for the Accessory Structure) and exterior water taps (garden crops and horse corral). The total RWH storage capacity was calculated to be 56,940-gallons. It should be noted that as water is used during the fall and winter months, more water is replenished and the system conveys (as detailed above) roughly 73,642 gallons annually.

Above, Below, Average & Most Probable Reoccurrence Interval Precipitation Years -vs- RWH Capture Volume:

As part of our analysis for determining whether the RWH has an adequate, long-term, sustainable water supply the 18-year historical precipitation record (Table 1) was evaluated to determine how many water-years were below average, above average and, what percentage of water-years had the most probable reoccurrence percentage of precipitation. Based on the 18-years of precipitation analyzed, 13 out of 18-years (72.22% of the time) had a precipitation that was 87% of average, equivalent to 34.16-inches annually. Over the same 18-years time-span, 7-years (38.88% of the time) were above average and, 11-years were below average (61.11% of the time). The most significant drought year on record (2013-2014) occurring 5.5% of the time was 46% of average precipitation, or 18.22-inches annually.

Based on technical calculations shown on Table 6 and, using total catchment area of 4,106 sq. ft, along with runoff coefficient (0.98 unitless) and, safety factor (0.90 unitless) values, the 'average', 'low' and, 'most probable' (87% of average) precipitation values was used to determine the volume this RWH system has the potential to capture. Specifically;

- 88,600.56 gallons in an average precipitation year (39.27-inces/yr)
- 41,107.77 gallons in a drought precipitation year (18.22-inches/yr) and,
- 77,082.49 gallons in a most probable[18] precipitation year (34.16-inches/yr).

As shown on Table 6, technical calculations using the most probable reoccurrence precipitation value (87% of average precipitation) a volume of 77,082.49 gallons could be captured in a year. This capture volume is greater than the calculated water demand of 74,359.19 gallons/year indicating that the RWH system in an 'most-probable' precipitation year can support the existing domestic use long-term. However, it is recommended that the capture/storage volume be increased by roughly 15,000 gallons to meet annual demand volumes, maximize storage in a 'average' water-year and retain extra volume in 'most-probable' water-year especially for fire protection storage in drought years.

Projected, 4-Year Cumulative RWH Supply & Demand Analysis:

In addition to the evaluation of historical precipitation to springs flows and RWH capture percentages between drought, average, most probable, and wet water-years precipitation (as presented above), a Projected 4-Year Cumulative RWH Supply & Demand Analysis was completed and is presented below and graphically on Table 7.

In completing the 4-year cumulative RWH supply & demand analysis, the projected years within the analysis alternates between the most probable reoccurrence precipitation (87% of average precipitation, or 34.16-inches/yr) and, drought precipitation (46% of average or 18.22-inches/yr). Using these values provides a conservative, more stringent and realistic analysis of whether the RWH system should be considered a sustainable long-term water supply, especially with the effects of climate change and assessing drought conditions[19]. It should also be noted that the analysis also accounts for maintaining 20,000 gallons of storage for fire protection for any given year.

Based on the existing storage volume (~45,000 gallons[20] as of 2/28/18) and the conservative analysis of projected future precipitation (alternating between 87% and 46% of average precipitation over the projected 4-years of analysis) along with accepted interior and exterior water demand coefficients, and maintaining 20,000 gal at all times, the RWH system shows that even with conservation practices, the long-term demand has the potential to eventually catch up with RWH supply unless; 1)average and above average water-years occur and, 2)an additional 14,970-gallons of storage (three, 4,990-gallon tanks) is added to maximize storage for the most-probable, average, and above average water-years so as to retain extra volume in drought years, especially for fire protection.

It should be noted that the owner successfully managed and conserved rainwater through the last four-year drought (2011-2015) without importing water. This suggests that the interior/exterior coefficient values are either over-estimated values and inflates demand to more than what is actually used or, the owner was very successful in conservation. As shown on Table 7 graph and, using the accepted interior/exterior coefficients, the projected 4-year cumulative demand analysis shows that there

[18] As discussed above, out of the 18-year historical record reviewed, 77% of the time there is 87% of average precipitation.
[19] Industry Standard for RWH for Long-Term Sustainable Use, uses a flat 60% of average precipitation versus this analysis percentages which uses historical precipitation data for determining the % average precipitation with the most probable reoccurrence interval and most significant drought value and alternate those values of a projected 4-year period for determining long-term sustainability analysis.
[20] Based on RWH storage from 2/28/18 data (personal communication with applicant).

is less water in the long-term (especially year 4 after two 46% and two 87% of average water-years) than what potential rain water can supply (especially if 46% of average precipitation occurs over a 4-year period).

Whether the demand is due to applicant conservation or, unit coefficients values used in the calculations is undetermined at this time. If rain gauges were installed at the site, along with totalizing meter's installed on the structures, actual demand volumes could be determined accurately and, further RWH sustainability analysis could be conducted.

In summary, assuming drought and most-probable reoccurrence interval water years occur over the next 4-years, and, if the water demand is accurate (which it appears to be slightly elevated to actual use especially since the system survived the worst drought in recent history and was able to survive the fire) the RWH supply may be less than demand in year #4 and therefore, as a back-up, the spring water may be needed to offset water supply. It is therefore recommended that either the spring be incorporated into the water supply for the existing structures or, additional storage is added to the RWH system to maximize storage in a average and above average precipitation years and retain extra volume in drought years especially for fire protection.

SPRING & RAIN WATER QUALITY

On July 17, 2017 a spring water sample was obtained from the spring and was transported under proper chain of custody for analysis by a certified laboratory, Monterey Bay Analytical Services (MBAS) for the Ca. Title 22 State Drinking Water Standards[21] (DWS) to include; general mineral, general physical and inorganic constituents, along with a presence/absence bacteriological scan.

On February 6th, after several rain events of the winter year, a rain water harvest sample was obtained from the Main Residence kitchen tap and was transported under proper chain of custody for analysis by MBAS for the same suite of analyis as above; Ca. Title 22 DWS, to include; general mineral, general physical and inorganic constituents, along with Perchlorate and presence/absence bacteriological scan.

A waiver for asbestos, thiobencarb, and MTBE (and Perchlorate for Spring water) is requested from MCEHB, as these constituents are not considered vulnerable to this sites sources.

Laboratory analytical results for the spring and RWH system are included in Appendix B.

Bacteriological Water Quality Analysis:

- The spring water was detected with the presence of Total Coliform and E-Coli bacteria.
- The RWH water was detected with the presence of Total Coliform yet, absent for E-Coli bacteria.

Total-Coliform is bacteria which are naturally present in the environment and are used as an indicator that other, potentially harmful, pathogenic bacteria may be present[22] (like e-coli). Usually, the presence of coliform bacteria is a sign that there was turbidity or, minor particulate in the water sample. Detection of Total Coliform bacteria is not uncommon in springs or rain water harvest systems. E-coli bacteria is an indicator that there is animal feces present in the spring water and should not be consumed. Boiling the water is mandatory for E-coli bacteria.

As a condition of approval by MCEHB, the spring and rain-water will need to be treated. A discussion and recommendations on treatment methodology are discussed below.

[21] California Administrative Code, Title 22, Chapter 15, Article 4. Primary Standards – Inorganic Chemicals, Section 64431, Maximum Contaminant Levels – Inorganic Chemicals, January, 2018.
[22] Driscoll, Groundwater and Wells, Second Edition, 1986.

Title 22 Drinking Water Quality Analysis:

- Spring-Water - The spring water is considered very good quality water. No primary[23] and only two secondary[24] constituents (iron and turbidity) were detected exceeding State DWS[25]. Iron was detected at 579 parts per billion (ppb) above the recommended standard of 300 ppb. Iron is naturally occurring in decomposed granitic sand formations. Turbidity was detected at 6.9 National Turbidity Units (NTUs) above the recommended level of 5 NTUs. This is likely to obtaining the sample without having a spring box, such that, turbidity would likely decrease if a spring box was constructed. On the quality Total Dissolved Solids (TDS) was detected at only 140 parts per million (ppm) significantly below the recommended level of 500 ppm suggesting very good quality water with short residence time in the subsurface, yet long enough to increase the pH to typical groundwater concentrations (7.5 expressed as potential Hydrogen).

- Rain-Water - The rain water is considered very good quality water. No primary[17] and only two secondary[18] constituents (Color and Odor) were detected exceeding State DWS[19]. As with the spring water, the total dissolved solids were detected at only 66 parts per million (ppm) extremely below the recommended level of 500 ppm which is typical of rain water with limited contact on the ground or subsurface. A low pH (6.0) was also observed and is typical of rain-water chemistry.

Other constituents of significance that were detected, although remain below their respective drinking water standard in both RWH and spring water included Fluoride and, in the RWH system- Lead. No matter what the constituent, spring and RWH water should be monitored with subsequent sampling events as constituent concentrations change from initial sampling, and/or seasonally or immediately after precipitation events.

Impact on Spring Water Quality from Septic Leachate:

Although the spring water was detected with a trace of Nitrate+ Nitrite as N (a indicator constituent that septic leachate may be influencing or partially influencing the spring) the nitrate and nitrate level were both non-detected and therefore impacts from septic leachate is not expected.

It should also be noted that if there were a direct connection between the spring and any septic fields associated with the property, other indicator constituents such as ortho-phosphates, surfactants, elevated chlorides and sulfates would be detected, which is not the case. All of these aforementioned constituents were non-detected.

Spring and RWH Quality Treatment:

Although the spring and RWH water is very good quality water, MCEHB will require treatment to ensure bacteria free water. Secondary constituents should be treated for taste and aesthetics. Recommended treatment methodologies should consist of; 1) ozone injection[26] within the primary storage tanks at the top of the hill prior to gravity drainage and either; 2) slow or, fast sand flirtation followed by a 0.01 micron ultra-filtration unit[27] or, chlorine injection within the primary storage tanks followed by a carbon filtration unit to remove the chlorine odors while maintain a free chlorine residual.

MCEHB doesn't necessarily recognize sole treatment by Ozone and ultra-filtration even though they are effective duplicate treatment methodologies. Rather, MCEHB does generally accept slow or fast sand filtration followed by chlorine injection and carbon filtration.

Water Quality Summary:

In summary, the spring and RWH water is very good to excellent quality water with low hardness, nitrate, TDS, turbidity and, near-neutral pH and will only require treatment of bacteria and some secondary constituents (iron on the spring water and, color and odor for the rain-water) for taste and aesthetics to meet State DWS.

Conclusions and recommendations for the project are discussed below.

[23] Primary constituents are contaminants that may cause adverse effects to human health and safety, and are enforceable by regulatory agencies. MCEHB does not regulate single-connection systems unless detected above the MCL.

[24] Secondary constituents are contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. Secondary constituents are non-enforceable; however, Environmental Protection Agency (EPA) recommends secondary standards to water systems but does not require systems to comply. Individual States and/or local counties may choose to adopt them as enforceable standards. Although MCEHB does not enforce these standards for single-connection system, we recommend treating the secondary constituents to the recommended standards.

[25] California Administrative Code, Title 22, Chapter 15, Article 4. Primary Standards – Inorganic Chemicals, Section 64431, Maximum Contaminant Levels – Inorganic Chemicals, 7th Edition, January, 2011.8

[26] Ozone injection will not only provide primary disinfection, it will oxidize and precipitate iron (if spring water is incorporated) and, reduce color and odor of the rain-water.

[27] 0.01micron ultra-filtration will effectively remove E-coli and total Coliform bacteria.

CONCLUSIONS

Based on the all of the data collected, the following conclusions can be drawn;

1) 18-year historical average precipitation was determined to be 39.27 inches/yr (Big Sur Tipping Bucket Rain Gauge).
2) 13 of the 18-years of historical precipitation (77% of the time) had 87% of average precipitation (34.16 inches/yr).
3) The most significant drought year (2013-2014) of the 18-year historical record had only 46% of average precipitation (18.22 inches/yr).
4) The spring has not been developed but emerges within granitic sands likely from un-mapped fault lineaments.
5) Spring base-flow conditions were measured to be 1.05 gpm (July, 2017).
6) The spring flow was generally stable between July 2017 and December 2017 due to below average precipitation at flow rates ranging from 1.05 (July, 2017) to 1.43 gpm (January, 2018) with only 50% capture noted due to lack of spring box, underflow, and evapotranspiration of surrounding fern grotto and tree canopy.
7) Spring flow rates increased in January and February 2018 to rates of 1.58 gpm and 2.56 gpm respectively, due to emergence of average water-year precipitation values.
8) The spring does not appear to be in direct hydrogeologic connection with precipitation events, rather, there is a lag-time between precipitation, precipitation percolation and emergence as spring flow.
9) The property is currently served by an existing RHW system which has a storage capacity of 56,840 gallons.
10) In an average precipitation year (39.27-inches) capture could be as much as 88,600.56 gallons.
11) In a most probable reoccurring water-year (77% of the time precipitation is 34.16-inches/yr) the RWH system is capable of capturing 77,082.49 gallons. It should be noted that as water is used in any given year, more water is replenished and so the overall storage volume is generally more than the actual storage capacity.
12) The water demand was calculated to be 73,642.32 gallons/yr which is less than the what the system could capture in a most-probable reoccurring water-year of 77,082.49 gpm which suggests the RWH system is capable as a long-term sustainable water supply.
13) The projected, 4-year cumulative supply & demand analysis (alternating between 87% and 46% of average precipitation) suggests that the RWH supply could diminish unless; one or more of the 4-years in the projected anaysis has average or above average water-year or, the water system is substituted with additional storage and/or supplemented with the sites spring water source.
14) Although the spring and RWH water is very good quality water MCEHB will only treatment to ensure bacteria free water. Secondary constituents should be treated for taste and aesthetics.

RECOMMENDATIONS

BHgl recommends that MCEHB approve the existing RWH for the property based on the above conclusions and the following recommendations:

1) It is recommended that rain gauges be installed on the site to accurately determine daily and monthly total precipitation to accurate assess RWH potential.
2) It is recommended that the RWH system increase storage by roughly 14,970 gallons (three, 4,990-gallon tanks) to maximize storage in average and above average water-years and, to offset fire protection and retain water during drought conditions in less than average water-years.
3) It is recommended that a spring box be constructed and implemented as a supplement source for the water system, if RWH supply is diminished due to long-period of drought conditions.
4) It is recommended (but perhaps difficult) that a pre-filter and totalizing meter be installed post spring-box in order to record total and instantaneous flows on a monthly basis.
5) It is recommended that demand meters be installed in the on the main residence, accessory structure and other exterior taps to assess actual demand and accurately determine water demands in relation to RWH capture volumes.
6) It is recommended that treatment methodologies consist of; 1) ozone injection within the primary storage tanks at the top of the hill prior to gravity drainage and either; 2) slow or, fast sand flirtation followed by a 0.01 micron ultra-filtration unit or, chlorine injection within the primary storage tanks followed by a carbon filtration unit to remove the chlorine odors while maintain a free chlorine residual.
7) It is recommend that spring and RWH water be monitored with subsequent sampling events (especially for lead in the RWH sample) as constituent concentrations change from initial sampling, and/or seasonally due to poor or inadequate recharge, reduction in baseflow or, following first flush precipitation events.

LIMITATIONS

Our service consists of professional opinions and recommendations based on the data compiled. *Bierman Hydrogeologic P.C.* bases the conclusions provided upon the tests and measurements, using accepted hydrogeologic principles and practices of the groundwater industry.

Additionally, conditions in springs are subject to dramatic changes, even in short periods of time. The techniques employed in conducting pump testing or spring monitoring may be subject to considerable error due to factors within the well, aquifer and/or spring, which are beyond our immediate control or observation.

Therefore, the data included within this report are valid only as of the date and within the observational limitations of the test or monitoring conducted. The test conclusions are intended for general comparison of the well, aquifer and/or spring in its present condition against known water well standards and/or spring guidelines. The analysis and conclusions in this report are based on information reviewed, and field-testing which are necessarily limited. Additional data from future work may lead to modification of the opinions expressed herein.

In accepting this report, the client releases and holds *Bierman Hydrogeologic, P.C.* harmless from liability for consequential or incidental damages arising from any different future flow rate, calculated well yield or water quality that was expressed herein. Our report is not a guarantee of any water production rate, yield or water quality.

Respectfully submitted,

Aaron Bierman
Certified Hydrogeologist #819

Table 1

18-Year Historical Precipitation Record (Water Year: October 1999 to September 2017)[1]

Water Year[2]	Month												Annual Totals[3]
	October	November	December	January	February	March	April	May	June	July	August	September	
1999-2000	0.18	4.26	0.38	17.59	20.18	3.01	2.66	1.96	0.01	0.00	0.00	1.25	51.48
2000-2001	7.12	0.77	0.55	9.03	8.83	4.24	3.79	0.00	0.00	0.00	0.00	0.15	34.48
2001-2002	1.24	8.28	10.06	4.61	3.99	4.62	0.74	0.57	0.00	0.00	0.03	0.13	34.27
2002-2003	0.05	6.73	13.96	3.63	3.65	0.40	4.70	1.28	0.00	0.07	0.00	0.00	34.47
2003-2004	0.21	2.44	18.07	3.57	11.38	0.00	0.12	0.28	0.41	0.00	0.00	0.00	36.48
2004-2005	7.30	2.87	13.71	10.45	11.28	8.52	3.32	1.19	0.33	0.02	0.00	0.00	58.99
2005-2006	0.04	2.37	15.41	3.92	3.84	11.84	13.65	2.67	0.00	0.00	0.00	0.00	53.74
2006-2007	0.14	2.81	6.58	1.07	9.28	0.89	1.55	0.32	0.00	0.00	0.00	0.56	23.2
2007-2008	2.11	0.63	4.12	16.62	5.65	0.41	0.80	0.00	0.00	0.00	0.00	0.00	30.34
2008-2009	0.57	3.66	4.24	4.76	13.23	5.92	1.94	0.90	0.10	0.00	0.05	0.24	35.61
2009-2010	9.88	0.26	4.20	12.17	9.40	3.81	7.49	1.71	0.00	0.00	0.00	0.06	48.98
2010-2011	2.17	3.81	7.38	3.64	7.27	12.21	0.70	2.57	4.01	0.00	0.00	0.00	43.76
2011-2012	4.13	2.84	0.94	5.14	2.21	7.51	0.00	0.00	0.00	0.00	0.00	0.00	22.77
2012-2013	0.76	10.82	10.13	2.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.53
2013-2014	0.28	0.54	0.63	0.00	9.81	4.17	2.46	0.00	0.00	0.00	0.00	0.33	18.22
2014-2015	1.24	4.48	18.91	0.00	5.74	0.55	3.03	0.36	0.00	0.07	0.05	0.00	34.43
2015-2016	0.56	4.11	7.66	16.46	1.21	11.68	1.33	0.19	0.00	0.00	0.00	0.00	43.20
2016-2017	6.23	4.29	7.40	25.49	22.87	5.65	5.33	0.00	0.30	0.00	0.00	0.26	77.82
2017-2018[4]	0.15	3.73	0.06	7.78	9.17	2018 Data Pending							
Monthly Averages[4] & 18yr Annual Average	2.45	3.67	8.02	7.83	8.32	4.75	2.98	0.78	0.29	0.01	0.01	0.17	39.27

[1:] Data Source: California Data Exchange Center, Big Sur State Park (BGS); www.cdec.com

[2:] "Water Year" is defined as; October 1 through September 31st of any given year.

Table 2

Spring Flow Monitoring Data & Precipitation -vs- Spring Flow Analysis

Spring #1 Monitoring Data[1]

Date	Spring Flow (gpm)	Notes
7/17/2017	1.05	Initial Reading[2]
9/27/2017	1.15	Weekly readings for a month
10/2/2017	1.08	
10/12/2017	1.09	
10/21/2017	1.13	
11/4/2017	1.15	Bi-monthly readings
11/17/2017	1.4	
12/25/2017	1.43	Monthly reading
1/28/2018	1.58	Monthly reading
2/28/2018	2.56	Monthly reading
3/31/2018	Pending[#3]	Monthly reading pending

Footnotes:

[#1:] Only 50% capture obtained due to lack of spring box, underflow and plant uptake

[#2:] Daily reading for a week (per MCEHB) inadvertently not obtained

[#3:] Monthly readings are in-progress

Precipitation -vs- Spring Flow Data

Date	Precipitation (in)	Spring flow (gpm)
Jul-17	0	1.05
Sep-17	0.26	1.15
Oct-17	0.15	1.13
Nov-17	3.73	1.4
Dec-17	0.06	1.43
Jan-18	7.78	1.58
Feb-18	9.17	2.56

Precipitation -vs- Spring Flow Graph

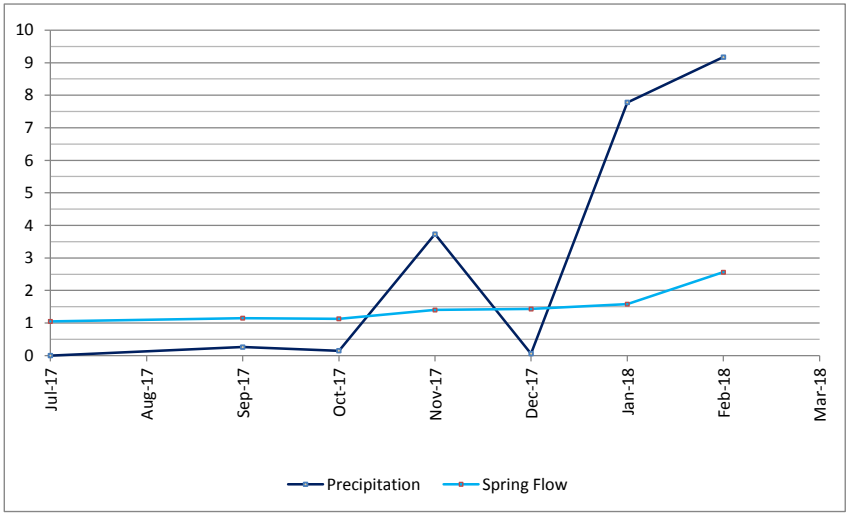


Table 3

Main Residence Interior Water Use[1]

TYPE OF FIXTURE	No. of FIXTURES		Fixture Unit coefficient	Fixture Unit Count
Washbasin (lavatory sink), each	1	x	1	1
Two Washbasins in Master Bathroom		x	1	0
Toilet, Low-Consumption (1.6 gal/flush)		x	1.7	0
Toilet, High Efficiency (1.28 gal/flush)* - Requires Deed Restriction	1	x	1.3	1.3
Toilet, Ultra Low-Consumption (0.5 gal/flush)* - Requires Deed Restriction		x	1	0
Urinal (1.0 gal/flush)		x	1	0
Urinal (0.5 gal/flush)		x	0.5	0
Urinal (0 Water Consumption)		x	0	0
Master Bathroom - Bathtub and Separate Shower		x	3	0
Large Bathtub (over 55 gal) w/ showerhead above	1	x	3	3
Standard Bathtub w/showerhead above		x	2	0
Shower, Separate Stall		x	2	0
Shower, each additional fixture		x	2	0
Shower System, Rain Bars, Custom Shower (Per Specs)		x	0	0
Kitchen Sink w/optional Dishwasher	1	x	2	2
Kitchen Sink w/Ultra Low-Consumption Dishwasher* - Requires Deed Restriction		x	1.5	0
Dishwasher (above initial SFD Dishwasher)		x	2	0
Dishwasher, Ultra Low-Consumption (above initial SFD Dishwasher)		x	1.5	0
Laundry Sink/Utility Sink/Bar Sink		x	2	0
Washing Machine		x	2	0
Washing Machine, Low Consumption (28gal/cycle)* - Requires Deed Restriction		x	1.5	0
Washing Machine, Ultra Low Consumption (18 gal/cycle)* - Requires Deed Restriction		x	1	0
Bidet		x	2	0
Swimming Pool (Surface Area of Pool - sq.ft.)		x	0.00026	0
Total Fixture Unit Count:				7.3

Interior Annual Water Demand (afy) - using coversion factor of 0.01 af per fixture unit:	0.073	afy
Interior Annual Water Demand (gallons) - using coversion factor of 325,851 gal/af:	23,787.12	gal

Footnote:

[1:] Type of fixture unit and fixture unit coefficients based on MPWMD values.
No. of fixture units based on personal communication with Applicant.

Table 4

Accessory Structure Interior Water Use[1]

TYPE OF FIXTURE	No. of FIXTURES		Fixture Unit coefficient	Fixture Unit Count
Washbasin (lavatory sink), each	1	x	1	1
Two Washbasins in Master Bathroom		x	1	0
Toilet, Low-Consumption (1.6 gal/flush)		x	1.7	0
Toilet, High Efficiency (1.28 gal/flush)* - Requires Deed Restriction	1	x	1.3	1.3
Toilet, Ultra Low-Consumption (0.5 gal/flush)* - Requires Deed Restriction		x	1	0
Urinal (1.0 gal/flush)		x	1	0
Urinal (0.5 gal/flush)		x	0.5	0
Urinal (0 Water Consumption)		x	0	0
Master Bathroom - Bathtub and Separate Shower		x	3	0
Large Bathtub (over 55 gal) w/ showerhead above	0	x	3	0
Standard Bathtub w/showerhead above		x	2	0
Shower, Separate Stall	1	x	2	2
Shower, each additional fixture		x	2	0
Shower System, Rain Bars, Custom Shower (Per Specs)		x	0	0
Kitchen Sink w/optional Dishwasher (Sink located in Adjacent Storage Shed - No Diswasher)	1	x	2	2
Kitchen Sink w/Ultra Low-Consumption Dishwasher* - Requires Deed Restriction		x	1.5	0
Dishwasher (above initial SFD Dishwasher)		x	2	0
Dishwasher, Ultra Low-Consumption (above initial SFD Dishwasher)		x	1.5	0
Laundry Sink/Utility Sink/Bar Sink		x	2	0
Washing Machine	1	x	2	2
Washing Machine, Low Consumption (28gal/cycle)* - Requires Deed Restriction		x	1.5	0
Washing Machine, Ultra Low Consumption (18 gal/cycle)* - Requires Deed Restriction		x	1	0
Bidet		x	2	0
Swimming Pool (Surface Area of Pool - sq.ft.)		x	0.00026	0
Total Fixture Unit Count:				8.3

Interior Annual Water Demand (afy) - using coversion factor of 0.01 af per fixture unit:	0.083	afy
Interior Annual Water Demand (gallons) - using coversion factor of 325,851 gal/af:	27,045.63	gal

Footnote:

[1:] Type of fixture unit and fixture unit coefficients based on MPWMD values.
No. of fixture units based on personal communication with Applicant.

Table 5

Exterior Total Water Use

Type of Use		Landscape Area (acres)	Annual Usage (per area or animal)	Annual Use af/yr
Irrigation	Turf (lawn)	0	2.1	0
	Non-Turf on Sprinker	0	1.8	0
	Non-Turf on Drip	0.00	0.9	0
	Pasture / Alfalfa	0	4.3	0
	Pasture / Grazing	0	2.1	0
	Vineyard	0	0.8	0
	Orchard	0	4.4	0
	Garden Crops (20' x 30')	0.014	2.3	0.03
	Plant Nursery	0	3.92	0
Hot Tub	Surface Area (sq. ft):	0	0.00026	0
Farm Animals	Cattle/Horses (# of animals)	3	0.01	0.03
	Goats, Hogs, Sheep (# of animals)	0	0.01	0
Other Use		0	0	0

Estimated Applied Water Use (EAWU):	0.06 af/yr
Outdoor Water Use Factor (OWUF):	0.01 af/yr
Exterior Total Water Use (ETWU):	0.07 af/yr
Exterior Total Water Use (ETWU):	22,809.57 gallons/yr

Notes:

1) Form is based on MPWMD Water Use Factors for Land Use Reporting Method form worksheet.
The difference between this form and MPWMD is the footnote numbering sequence and the conversion value for Horses, which was reduced to 0.01 from 0.05 (based on Applicants personal experience and analysis)

2) 1-acre-foot = 325,851 gallons

3) 1 acre = 43,560 ft^2

4) Revisions in 1992 included the addition of a new category, "Pasture / Grazing" to account for irrigated pasture that is not harvested

5) Revisions in 1992 also included a reduction in the factor for "Vineyard" from 2.8 af/yr to 0.8 af/yr, based on site inspections and on measured crop applied water data from Bulletin 113-4 of the California Department of Water Resources, "Crop Water Use in California" (1986).

6) Revisions in 1993 include changes to Turf and Non-Turf, and the addition of Plant Nursery in order to be consistent with the Calculated Average Consumptions: Commerciual Uses Report prepared by the Demand Management Office of the MPWMD, updated June, 1992.

7) Revisions in 2010 follow State Model Water Efficient Landscape Oridance and is adopted by MPWMD in Rule 24-A-5a & 5b, Dec, 2010. Revisions include the addition of Outdoor Water Use Factor of 0.01 af/yr and revised Evapotranspiration values for Special*, New and Existing landscape Areas (0.3; 0.7; and 0.8 respectively). *Special Landscape Areas are Gardens, Ponds.

8) This form was modified from MPWMD Water Use Factors for Land Use Reporting Method form worksheet.

Table 6
Rain Water Harvesting Supply & Demand Analysis[1]

Precipitation Data[2,3]:

18-Year Average Precipitation	=	39.27	in/yr	or	3.27	ft/yr
18-Year Lowest Precipitation	=	18.22	in/yr	or	1.52	ft/yr
87% of Avg Precipitation[3]	=	34.16	in/yr	or	2.85	ft/yr

Catchment Areas[4]:

Main Residence	=	1224	sq. ft
Accessory Structure (Art Studio)	=	300	sq. ft
Pole Barn	=	936	sq. ft
Storage Shed	=	375	sq. ft
Combined Work Shop + Storage Shed	=	1128	sq. ft
Tool Shed	=	143	sq. ft
Total Catchment Area	=	**4,106**	sq. ft

Rain Water Harvest Calculations[5]:

Average Precipitation:	=	RWH Area (ft^2)	x	**Avg_{precip} (in)**	x	0.623	x	Runoff Coef.***	x	Safety Factor****
RWH	=	4,106	x	39.27	x	0.623	x	0.98	x	0.9
RWH	=	88,600.56	gallons							
RWH	=	0.27	af/yr							
Lowest Precipitation:	=	RWH Area (ft^2)	x	**$Lowest_{precip}$ (in)**	x	0.623	x	Runoff Coef.***	x	Safety Factor****
RWH	=	4,106	x	18.22	x	0.623	x	0.98	x	0.9
RWH	=	41,107.77	gallons							
RWH	=	0.13	af/yr							
87% of Average Precipitation:	=	RWH Area (ft^2)	x	**87%ofAvg_{precip} (in)**	x	0.623	x	Runoff Coef.***	x	Safety Factor****
RWH	=	4,106	x	34.16	x	0.623	x	0.98	x	0.9
RWH	=	77,082.49	gallons							
RWH	=	0.24	af/yr							

Summary:

Using 87% of Average Precipitation, RWH capture volume =	77,082.49	gallons
Calculated Water Demand (Interior + Exterior Use, Tables 3, 4, 5) =	73,642.32	gallons
Actual Stoage Volume =	56,940	gallons
Estimated Overflow =	20,142	gallons

Footnotes:

1: Yellow Highlights are Input Values; Green Highlights are the result of Techincal Calculations and convential conversion factors.

2: 18-yr precipitation record from Big Sur Station, Big Sur, California (California Data Exchange Center, 2018).

3: Based on the 18-year historical precipitation data-set, 77% of the time (13 out of 18-years) precipitation was 87% of averge, and thus is used in the above calculations.

4: Catchment Area shown on Site Plan, Figure 2, provided by Applicant, 2018.

5: Rain Water Harvest Calculations followed the industry standards in regards to runoff coefficients, and safety factors (Canopy Cover

** 0.623 is a Conversion Factor for converting inches to gallons.

*** Runoff Coefficient are based on Surface Area and Character of Surface

Asphalt Road = 0.85 to 0.70

Metal Roof w/Copper Gutters = 0.95 to 0.98

Ceramic Tile/ Slate Roof = 0.85

Asphalt Shingle Roof = 0.75

Wood Shingle Roof = 0.75

**** Safety Factor is based on Surrounding Canopy & Vegetation, and/or other structures that may impeed RWH.

Safety Factors range from 0.8 to 1 (high to low impceedance respectively)

Table 7

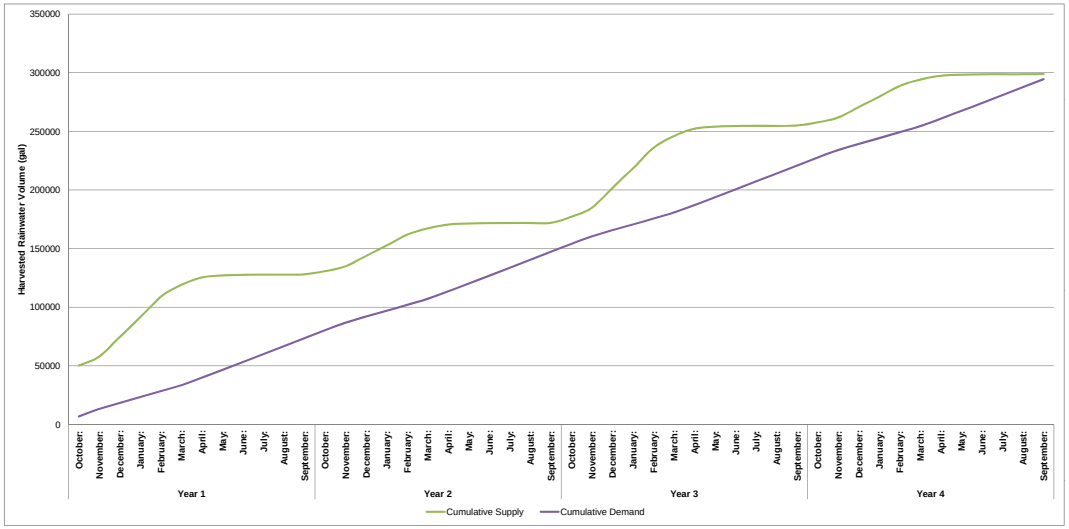
4-Year Cumulative Rain Water Harvesting Supply & Demand Analysis

Input Values	
Roof Catchment Area (ft^2):	4,106
Collection efficiency (%):	95
Indoor demand (gal/mth^1):	4,236
Total Exterior demand (gal/yr^2):	22,810
Exterior Demand - Winter: Dec, Jan., Feb, March (gal/mth^3):	814
Exterior Demand - Spring/Fall: Nov, April, May (gal/mth^4):	2,263
Exterior Demand - Summer: June thru October demand (gal/mth^5):	2,553
Existing Storage Volume (gal^6):	45,000
Desired minimum volume for fire protection (gal):	20,000

Avg. monthly rainfall (in): Source = Big Sur Station	
October:	2.45
November:	3.67
December:	8.02
January:	7.83
February:	8.32
March:	4.75
April:	2.98
May:	0.78
June:	0.29
July:	0.01
August:	0.01
September:	0.17
Total Output:	39.28

Percent Average Rainfall (%) Using Most Probable Percentage of 18year Data-Set	
Year 1:	87%
Year 2:	46%
Year 3:	87%
Year 4:	46%

Calculated Output Values	
Existing Storage Capacity(gal):	56,940
Recommended Tank Capacity based on Year 1-4 Precipitation Analysis(gal):	85,594
Recommended Increase in Storage Volume (gal):	14,327
Minimum volume observed (gal):	4,344
Months below desired minimum volume for Fire Protectione:	3



Annual Water-Year Calculations (in gallons)

	Month	Supply	Demand	Cumulative Supply	Cumulative Demand	Difference	Months Below Minimum Desire for Fire Protection
Year 1	October:	5180	6789	50180	6789	43391	0
	November:	7759	6499	57939	13288	44651	0
	December:	16956	5050	74895	18338	56557	0
	January:	16554	5050	91449	23388	68061	0
	February:	17590	5050	109040	28438	80602	0
	March:	10043	5050	119082	33488	85594	0
	April:	6300	6499	125383	39987	85396	0
	May:	1649	6499	127032	46486	80546	0
	June:	613	6789	127645	53275	74370	0
	July:	21	6789	127666	60064	67602	0
	August:	21	6789	127687	66853	60834	0
	September:	359	6789	128046	73642	54404	0
Year 2	October:	2739	6789	130785	80431	50354	0
	November:	4103	6499	134888	86930	47958	0
	December:	8965	5050	143853	91980	51873	0
	January:	8753	5050	152606	97030	55576	0
	February:	9301	5050	161907	102080	59827	0
	March:	5310	5050	167216	107130	60086	0
	April:	3331	6499	170548	113629	56919	0
	May:	872	6499	171420	120128	51292	0
	June:	324	6789	171744	126917	44827	0
	July:	11	6789	171755	133706	38049	0
	August:	11	6789	171766	140495	31271	0
	September:	190	6789	171956	147284	24672	0
Year 3	October:	5180	6789	177136	154073	23063	0
	November:	7759	6499	184895	160572	24323	0
	December:	16956	5050	201851	165622	36229	0
	January:	16554	5050	218406	170672	47734	0
	February:	17590	5050	235996	175722	60274	0
	March:	10043	5050	246038	180772	65266	0
	April:	6300	6499	252339	187271	65068	0
	May:	1649	6499	253988	193770	60218	0
	June:	613	6789	254601	200559	54042	0
	July:	21	6789	254622	207348	47274	0
	August:	21	6789	254643	214137	40506	0
	September:	359	6789	255003	220926	34077	0
Year 4	October:	2739	6789	257741	227715	30026	0
	November:	4103	6499	261844	234214	27630	0
	December:	8965	5050	270809	239264	31545	0
	January:	8753	5050	279562	244314	35248	0
	February:	9301	5050	288863	249364	39499	0
	March:	5310	5050	294173	254414	39759	0
	April:	3331	6499	297504	260913	36591	0
	May:	872	6499	298376	267412	30964	0
	June:	324	6789	298700	274201	24499	0
	July:	11	6789	298711	280990	17721	1
	August:	11	6789	298722	287779	10943	1
	September:	190	6789	298912	294568	4344	1

Footnotes:

[1] Indoor Water Demand (afy and galsyr) derived from MPWMD interior use facotrs and is sum of Main Residence (Table 3) & Accessory Structure (Table 4) demands divided by 12 months.

[2] Exterior Demand derived from MPWMD Water Use Factors (Table 5) and divised by 8 months.

[3] Winter exterior demand is zero except on for use with farm animals.

[3] Remaining 1/3 of exterior demand (after farm animal use) is used in Spring.

[4] Remaining 2/3 of exterior demand (after farm animal use) is used in Summer.

[5] As of 2/28/18 there was approximately 45,000 gallons of stroage - Personal Communication with Applicant.

Basemap From: Delorme Topo North America 9.0

BIERMAN Hydrogeologic
A Professional Company
Hydrogeologic Consulting & Water Resource Management

LOCATION MAP

APN: 418-151-005-000
Monterey County, California

FIGURE 1

AB; 7/27/17
Maehr/Figures/Location Map

THIS MAP PORTRAYS THE SITE AT THE TIME OF THE SURVEY AND DOES NOT SHOW SOILS OR GEOLOGY INFORMATION, UNDERGROUND CONDITIONS, EASEMENTS, ZONING OR REGULATORY INFORMATION OR ANY OTHER ITEMS NOT SPECIFICALLY REQUESTED BY THE PROPERTY OWNER.

THERE MAY BE EASEMENTS OR OTHER RIGHTS, RECORDED OR UNRECORDED, AFFECTING THE SUBJECT PROPERTY WHICH ARE NOT SHOWN HEREON.

UNDERGROUND UTILITIES, IF ANY, WERE NOT LOCATED. INFOR- MATION REGARDING UNDERGROUND UTILITY LOCATIONS SHOULD BE OBTAINED FROM THE APPROPRIATE UTILITY COMPANIES OR PUBLIC AGENCIES.

ELEVATIONS ARE BASED ON AN ARBITRARILY ASSUMED DATUM AS NOTED. GROUND MAY BE MORE IRREGULAR THAN CONTOURS INDICATE.

DISTANCES ARE EXPRESSED IN FEET AND DECIMALS THEREOF. PARENTHESES DENOTE RECORD DATA. THE CROSS SYMBOL (+) MARKS THE HORIZONTAL POSITION OF THE SPOT ELEVATION SHOWN. TREE SYMBOLS ARE DRAWN TO SCALE ONLY APPROXIMATELY.

O WOOD SUPPORT POLES, VARYING IN DIAMETER

Site Plan

Scale: 1 to 1,000

1

HPEARCHITECTS
663 LIGHTHOUSE AVE, SUITE F | PACIFIC GROVE, CALIFORNIA 93950
T: (831) 373-4341 | F: (831) 373-4345
E: hunter@hpe-arch.com | www.hpe-arch.com

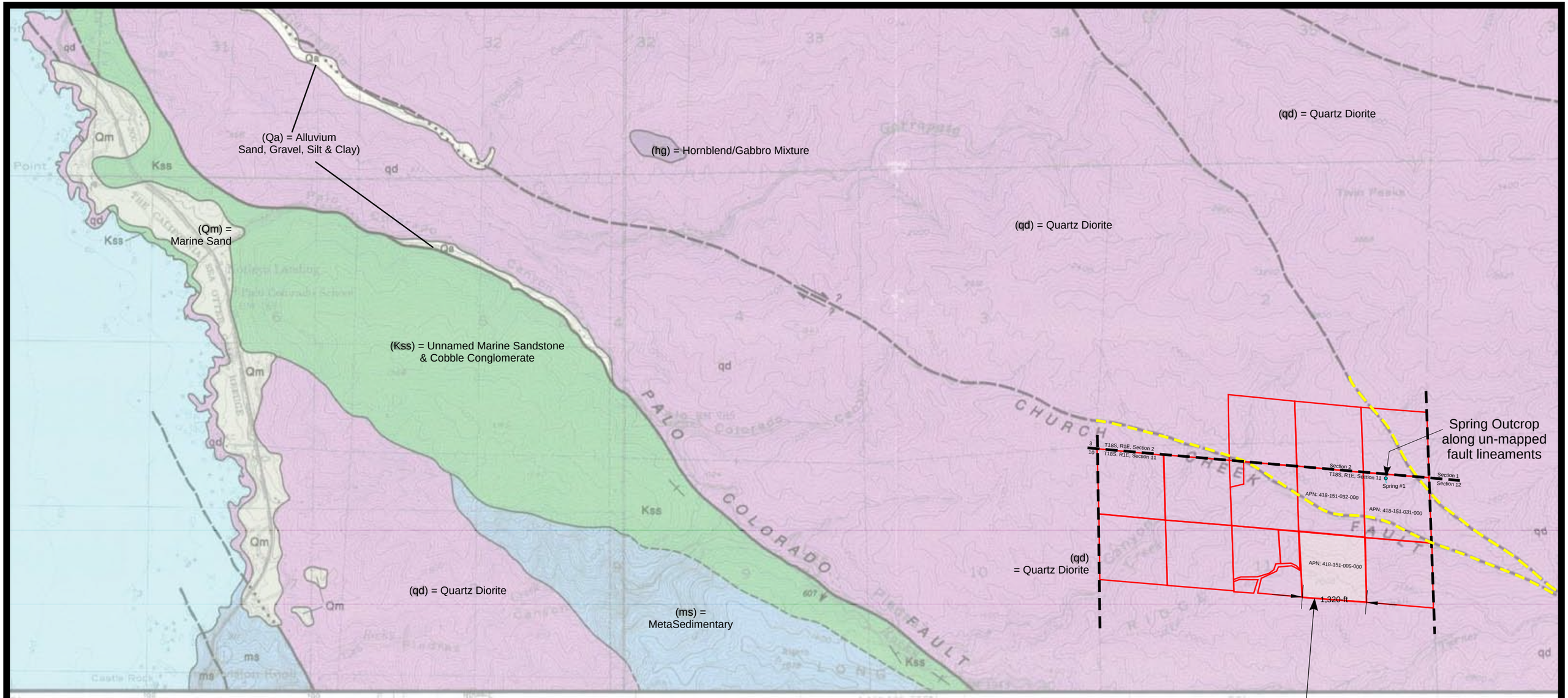
LICENSED ARCHITECT
HUNTER PORTER ELDRIDGE
C-32809
Renewal Date: 12/31/2019
STATE OF CALIFORNIA

CONSULTANT

Maehr Residence
418-151-005
38059 Palo Colorado Rd
Carmel CA, 93921

ISSUE DATES
April 15, 2018
Hyrdology Report Submittal

A1.1
Existing Overall Site Plan



Basemap from USGS Soberanes Point and Mt. Cramel Quadrangles, Dibblee Jr., 2007

BIERMAN Hydrogeologic
A Professional Company
Hydrogeologic Consulting & Water Resource Management

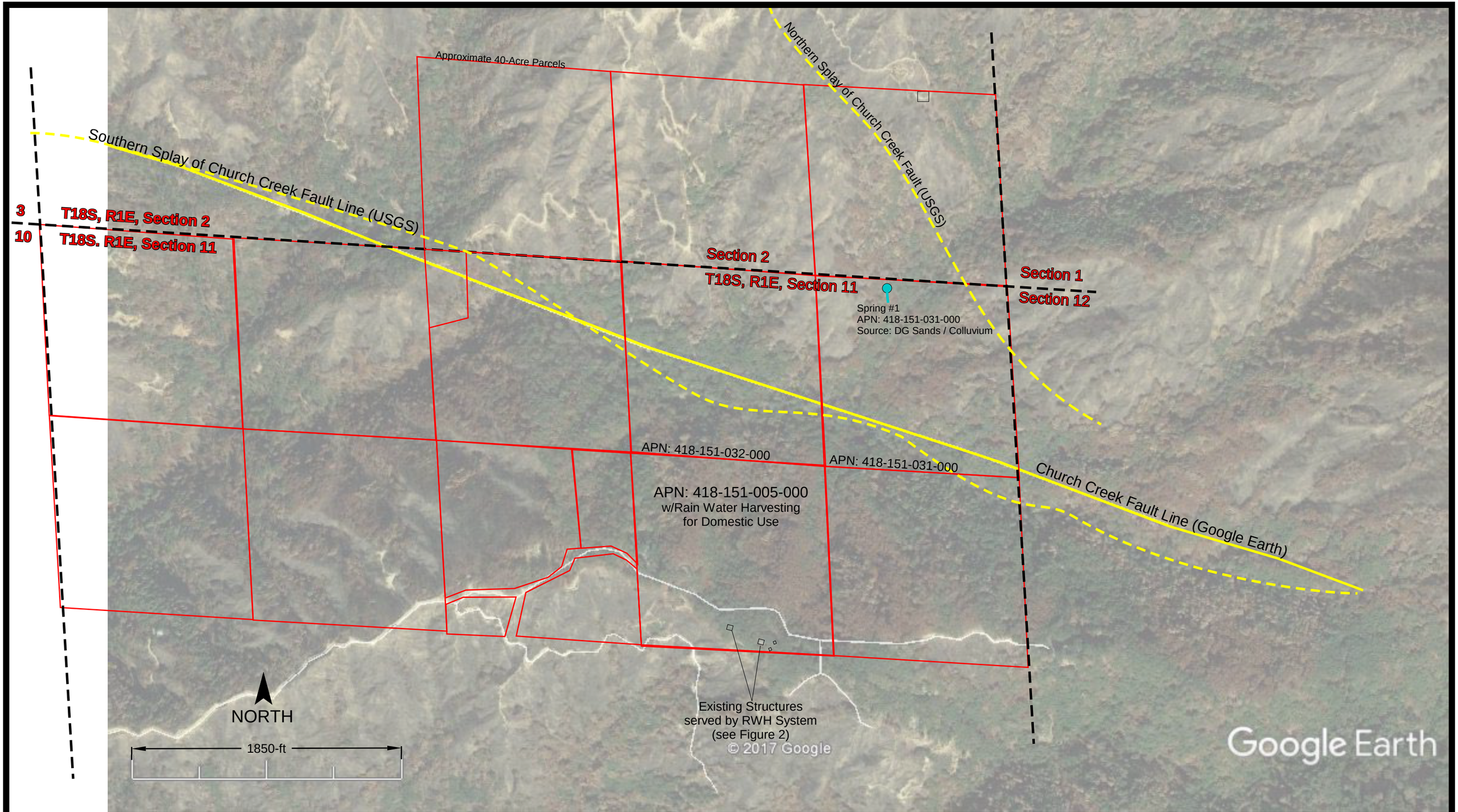
GEOLOGIC MAP

APN: 418-151-005-000

MONTEREY COUNTY, CALIFORNIA

FIGURE 3

By: AB; 1/29/2018
Maehr/Figures/SiteMap



BIERMAN Hydrogeologic A Professional Company

Hydrogeologic Consulting & Water Resource Management

SPRING SITING MAP

APN: 418-151-005-000

MONTEREY COUNTY, CALIFORNIA

FIGURE 4

By: AB; 7/26/2017
Maehr/Figures/SpringsitingMap

Appendix A

Easement for Spring Box and One-Inch Water Pipe Installation and Maintenance

Joseph F. Pitta
Monterey County Recorder
Recorded at the request of
Filor

CRROBERTA
3/02/1999
15:35:49

DOCUMENT: 9917070

Titles: 1 / Pages: 9
Fees... 32.00
Taxes..
Other...
AMT PAID 32.00

RECORDING REQUESTED BY

PATRICK MOORE

AND WHEN RECORDED MAIL TO

PATRICK MOORE
240 CONGRESS STREET
PACIFIC GROVE, CALIFORNIA 93950

EASEMENT FOR SPRING BOX AND ONE INCH WATER PIPE INSTALLATION AND MAINTENANCE

THIS DEED REGARDING EASEMENT FOR THE INSTALLATION OF A SPRING BOX AND its' accompanying one inch in diameter or less water pipe.

WHEREAS, Grantor is the owner of that certain real property constituting ASSESSORS'S PARCEL NUMBERS 418-151-031 AND 418-151-032, situated in the County of Monterey, State of California more particularly described as follows:

LOT NUMBERED 2, IN SECTION 11, TOWNSHIP 18, SOUTH, RANGE 1 EAST, MOUNT DIABLO BASE AND MERIDIAN; AND

LOT NUMBERED 3, IN SECTION 11, TOWNSHIP 18, SOUTH, RANGE 1 EAST, MOUNT DIABLO BASE AND MERIDIAN;

WHEREAS, GRANTEE is the owner of that certain real property constituting ASSESSORS'S PARCEL NUMBER 418-151-005, situated in the County of Monterey, State of California, more particularly described as follows:

LOT NUMBERED 6, IN SECTION 11, TOWNSHIP 18, SOUTH, RANGE 1 EAST, MOUNT DIABLO BASE AND MERIDIAN;

WHEREAS, GRANTOR has agreed to convey a perpetual easement to Grantee for the installation and exclusive use of a "spring" and "spring box" to be located in that approximate location as identified and noted on the attached "Exhibit A".

BAP

ACKNOWLEDGEMENTS

STATE OF Minnesota)

COUNTY OF Hennepin)

On January 6th, 1999, before me, James F Gamble Notary Public, personally appeared Barbara A. Patch,
Personally known to me (or proved to me upon satisfactory evidence) to be the person(s) whose name(s) is (are) subscribed to the within instrument and acknowledged that he/she/they executed the same in his/her/their authorized capacity(ies) and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of the person(s) acted, executed the instrument.

WHINESS my hand and official seal.

Signature J F Gamble
NOTARY PUBLIC

JAMES F. GAMBLE
NOTARY PUBLIC - MINNESOTA
HENNEPIN COUNTY
My Commission Expires Jan. 31, 2000

WHEREAS, Grantor has agreed to convey a perpetual easement to Grantee for the installation and use of a water pipe not to exceed one inch in diameter. Said water pipe to be located along the approximate line as identified and noted on the attached "Exhibit A".

WHEREAS, Grantor hereby grants to Grantee a perpetual easement to Divert water from a spring. Said spring being heretofore located, identified, and accepted as satisfactory for the purposes and uses of Grantee, by Grantee. Said spring being identified and located on attached "Exhibit A".

WHEREAS, Grantor hereby grants to Grantee a perpetual easement for the installation, maintenance, repair and or replacement of said "spring box" and its' accompanying one inch or less diameter pipe line. All costs of construction, installation, improvement , repair, replacement of said "spring box" and its' accompanying one inch or less diameter pipe line shall be born by the Grantee.

In consideration for the grant of easement herein, Grantee shall pay to Grantor the sum of TWENTY THOUSAND DOLLARS ($20,000.00), receipt of which is hereby acknowledged by Grantor.

This deed may be executed in any number of counterparts, each of which shall be deemed to be an original, but all of which together shall constitute one and the same instrument. The provisions of this Deed shall bind and inure to the benefit of the respective heirs, successors and assigns of the Grantor and Grantee.

Dated: January 6, 1999 Grantor Barbara A. Patch
BARBARA A . PATCH

Dated:_____ Grantee:_____
PATRICK MOORE

Dated:_____ Grantee:_____
JEANNE ELLIS

Dated_____ Grantee:_____
CHARLES ELLIS

RECORDING REQUESTED BY

PATRICK MOORE

AND WHEN RECORDED MAIL TO:

PATRICK MOORE
240 CONGRESS STREET
PACIFIC GROVE, CALIFORNIA 93950

EASEMENT FOR SPRING BOX AND ONE INCH WATER PIPE INSTALLATION AND MAINTENANCE

THIS DEED REGARDING EASEMENT FOR THE INSTALLATION OF A SPRING BOX AND its' accompanying one inch in diameter or less water pipe.

WHEREAS, Grantor is the owner of that certain real property constituting ASSESSORS'S PARCEL NUMBERS 418-151-031 AND 418-151-032, situated in the County of Monterey, State of California more particularly described as follows:

LOT NUMBERED 2, IN SECTION 11, TOWNSHIP 18, SOUTH, RANGE 1 EAST, MOUNT DIABLO BASE AND MERIDIAN; AND

LOT NUMBERED 3, IN SECTION 11, TOWNSHIP 18, SOUTH, RANGE 1 EAST, MOUNT DIABLO BASE AND MERIDIAN;

WHEREAS, GRANTEE is the owner of that certain real property constituting ASSESSORS'S PARCEL NUMBER 418-151-005, situated in the County of Monterey, State of California, more particularly described as follows:

LOT NUMBERED 6, IN SECTION 11, TOWNSHIP 18, SOUTH, RANGE 1 EAST, MOUNT DIABLO BASE AND MERIDIAN;

WHEREAS, GRANTOR has agreed to convey a perpetual easement to Grantee for the installation and exclusive use of a "spring" and "spring box" to be located in that approximate location as identified and noted on the attached "Exhibit A".

BMP

WHEREAS, Grantor has agreed to convey a perpetual easement to Grantee for the installation and use of a water pipe not to exceed one inch in diameter. Said water pipe to be located along the approximate line as identified and noted on the attached "Exhibit A".

WHEREAS, Grantor hereby grants to Grantee a perpetual easement to Divert water from a spring. Said spring being heretofore located, identified, and accepted as satisfactory for the purposes and uses of Grantee, by Grantee. Said spring being identified and located on attached "Exhibit A".

WHEREAS, Grantor hereby grants to Grantee a perpetual easement for the installation, maintenance, repair and or replacement of said "spring box" and its' accompanying one inch or less diameter pipe line. All costs of construction, installation, improvement , repair, replacement of said "spring box" and its' accompanying one inch or less diameter pipe line shall be born by the Grantee.

In consideration for the grant of easement herein, Grantee shall pay to Grantor the sum of TWENTY THOUSAND DOLLARS ($20,000.00), receipt of which is hereby acknowledged by Grantor.

This deed may be executed in any number of counterparts, each of which shall be deemed to be an original, but all of which together shall constitute one and the same instrument. The provisions of this Deed shall bind and inure to the benefit of the respective heirs, successors and assigns of the Grantor and Grantee.

Dated: January 6, 1999 Grantor Barbara A. Patch
BARBARA A. PATCH

Dated: ~~2/21/99~~ March 1, 1999 Grantee:
PATRICK MOORE

Dated: 2-21-99 Grantee: Jeanne Ellis
JEANNE ELLIS

Dated 2/21/99 Grantee: Charles Ellis
CHARLES ELLIS

ACKNOWLEDGMENTS

STATE OF NY)
) ss.
COUNTY OF NY)

On February 24, 1999, before me, Barbara Monsolino, Notary Public, personally appeared Charles Ellis, personally known to me (or proved to me upon satisfactory evidence) to be the person(s) whose name(s) is(are) subscribed to the within instrument and acknowledged that he/she/they executed the same in his/her/their authorized capacity(ies) and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

Signature Charles Ellis

BARBARA MONSOLINO
NOTARY PUBLIC, State of New York
No. 41-4998758
Qualified in Queens County
Certified in New York County
Commission Expires March 19, 2000

STATE OF NY)
) ss.
COUNTY OF NY)

Barbara Monsolino

On February 24, 1999, before me, Barbara Monsolino, Notary Public, personally appeared Jessie Ellis, personally known to me (or proved to me upon satisfactory evidence) to be the person(s) whose name(s) is(are) subscribed to the within instrument and acknowledged that he/she/they executed the same in his/her/their authorized capacity(ies) and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

Signature Jessie Ellis

BARBARA MONSOLINO
NOTARY PUBLIC, State of New York
No. 41-4998758
Qualified in Queens County
Certified in New York County
Commission Expires March 19, 2000

Barbara Monsolino

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California

County of Monterey

On 3/1/99 (Date) before me, KATHERINE L. PETTY (Name and Title of Officer (e.g., "Jane Doe, Notary Public"))

personally appeared PATRICK MOORE (Name(s) of Signer(s))

X personally known to me — OR — ☐ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

KATHERINE L. PETTY
COMM. #1060021
Notary Public — California
MONTEREY COUNTY
My Comm. Expires JUN 9 1999

WITNESS my hand and official seal.

Katherine L. Petty
Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document

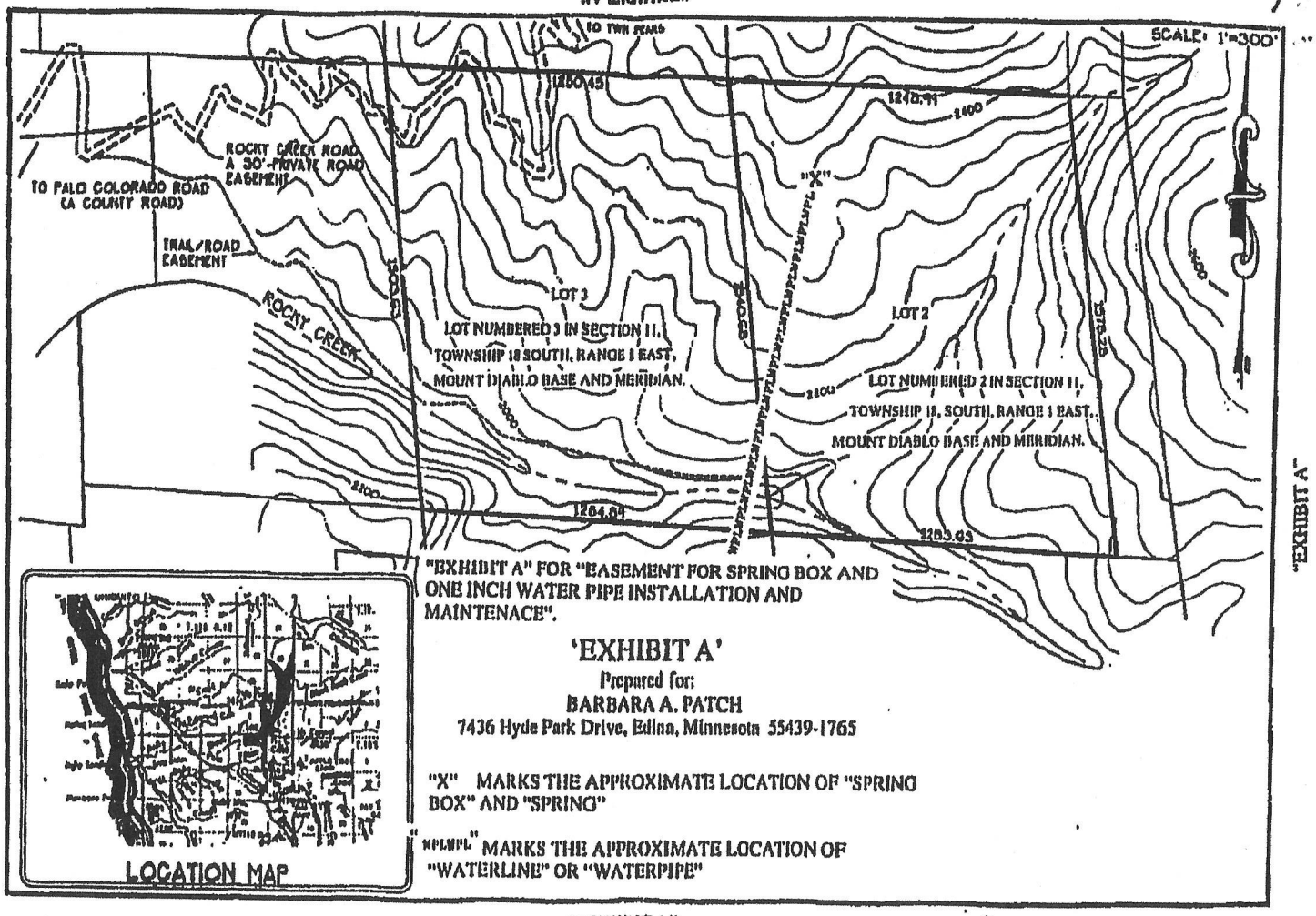
Title or Type of Document: Easement for Spring Box and One Inch Water Pipe Installation and Maintenance

Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

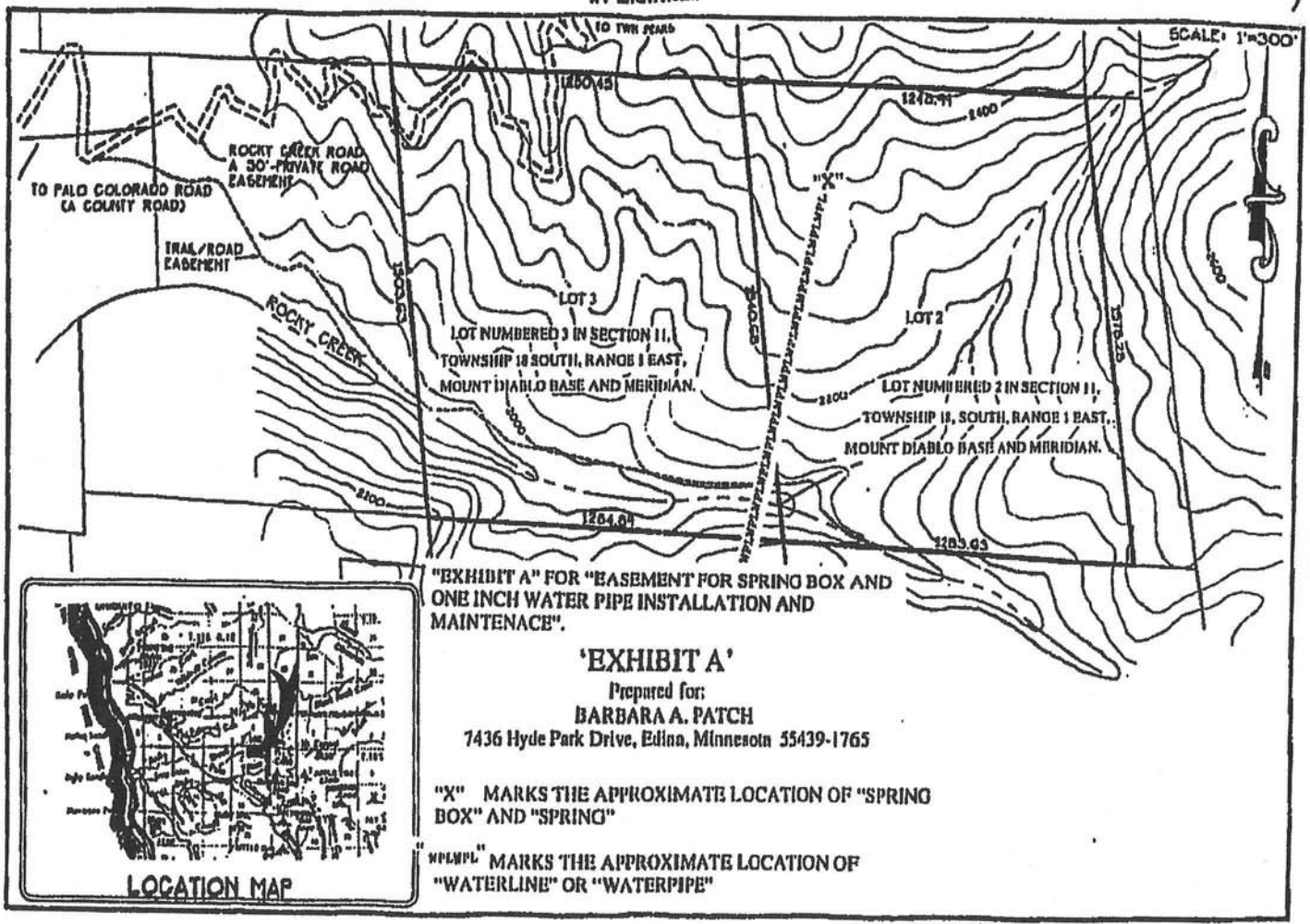
Signer's Name: Individual	Signer's Name:
☒ Individual	☐ Individual
☐ Corporate Officer — Title(s):	☐ Corporate Officer — Title(s):
☐ Partner — ☐ Limited ☐ General	☐ Partner — ☐ Limited ☐ General
☐ Attorney-in-Fact	☐ Attorney-in-Fact
☐ Trustee	☐ Trustee
☐ Guardian or Conservator	☐ Guardian or Conservator
☐ Other:	☐ Other:
Top of thumb here	Top of thumb here
Signer Is Representing:	Signer Is Representing:



"EXHIBIT A"

LOT NUMBERED 2 IN SECTION 11, TOWNSHIP 18, SOUTH, RANGE 1 EAST, MOUNT DIABLO BASE AND MERIDIAN.
AND
LOT NUMBERED 3 IN SECTION 11, TOWNSHIP 18 SOUTH, RANGE 1 EAST, MOUNT DIABLO BASE AND MERIDIAN.

constituting ASSESSORS'S PARCEL NUMBERS 418-151-031 AND 418-151-032, situated in the County of Monterey, State of California



LOT NUMBERED 2 IN SECTION 11, TOWNSHIP 18, SOUTH, RANGE 1 EAST, MOUNT DIABLO BASE AND MERIDIAN.
AND
LOT NUMBERED 3 IN SECTION 11, TOWNSHIP 18 SOUTH, RANGE 1 EAST, MOUNT DIABLO BASE AND MERIDIAN.

constituting ASSESSORS'S PARCEL NUMBERS 418-151-031 AND 418-151-032, situated in the County of Monterey, State of California

Appendix B

Laboratory Analytical Results - Spring and RWH Analysis

Monterey Bay Analytical Services
4 Justin Court Suite D, Monterey, CA 93940
831.375.MBAS
www.MBASinc.com
ELAP Certification Number: 2385

Tuesday, August 01, 2017

Bierman Hydrogeologic
Aaron Bierman
3153 Redwood Dr.
Aptos, CA 95003

Lab Number: AB71522

Collection Date/Time: 7/17/2017 11:00 Sample Collector: BIERMAN A Client Sample #:
Submittal Date/Time: 7/17/2017 17:30 Sample ID Coliform Designation:

Sample Description: Spring #1

Analyte	Method	Unit	Result	Qual	PQL	MCL	Date Analyzed	Analyst:
Aggressivity Index	Calculation		**11.2**				7/31/2017	LRH
Alkalinity, Total (as CaCO3)	SM2320B	mg/L	**95**		10		7/25/2017	LM
Aluminum, Total	EPA200.8	µg/L	**551**		5	1000	7/26/2017	MW
Antimony, Total	EPA200.8	µg/L	**Not Detected**		0.5	6	7/26/2017	MW
Arsenic, Total	EPA200.8	µg/L	**Not Detected**		0.5	10	7/26/2017	MW
Barium, Total	EPA200.8	µg/L	**22**		5	1000	7/26/2017	MW
Beryllium, Total	EPA200.8	µg/L	**Not Detected**		0.5	4	7/26/2017	MW
Bicarbonate (as HCO3-)	SM2320B	mg/L	**116**		10		7/31/2017	LRH
Bromide	EPA300.0	mg/L	**Not Detected**		0.1		7/17/2017	BS
Cadmium, Total	EPA200.8	µg/L	**Not Detected**		0.25	5	7/26/2017	MW
Calcium	EPA200.7	mg/L	**21**		0.5		7/27/2017	MW
Carbonate as CaCO3	SM2320B	mg/L	**Not Detected**		10		7/31/2017	LRH
Chloride	EPA300.0	mg/L	**12**		1	250	7/17/2017	BS
Chromium, Total	EPA200.8	µg/L	**2**		1	50	7/26/2017	MW
Color, Apparent (Unfiltered)	SM2120B	Color Units	**Not Detected**		3	15	7/18/2017	MP
Copper, Total	EPA200.8	µg/L	**Not Detected**		2	1300	7/26/2017	MW
Cyanide	QuikChem 10-204	µg/L	**Not Detected**	SS	5	200	7/27/2017	MP
Fluoride	EPA300.0	mg/L	**0.2**		0.1	2.0	7/17/2017	BS
Hardness (as CaCO3)	SM2340B/Calc	mg/L	**85**		10		7/31/2017	LRH
Hydroxide	SM2320B	mg/L	**Not Detected**		10		7/31/2017	LRH
Iron	EPA200.7	µg/L	**579**		10	300	7/27/2017	MW
Langlier Index, 15°C	SM2330B		**-0.64**				7/31/2017	LRH
Langlier Index, 60°C	SM2330B		**-0.03**				7/31/2017	LRH
Lead, Total	EPA200.8	µg/L	**Not Detected**		1	15	7/26/2017	MW
Magnesium	EPA200.7	mg/L	**8.0**		0.5		7/27/2017	MW
Manganese, Total	EPA200.7	µg/L	**Not Detected**		10	50	7/27/2017	MW
MBAS (Surfactants)	SM5540C	mg/L	**Not Detected**		0.05	0.50	7/19/2017	HM
Mercury, Total	EPA200.8	µg/L	**Not Detected**		0.2	2	7/26/2017	MW
Nickel, Total	EPA200.8	µg/L	**Not Detected**		5	100	7/26/2017	MW
Nitrate as NO3	EPA300.0	mg/L	**Not Detected**		1	45	7/17/2017	BS
Nitrate as NO3-N	EPA300.0	mg/L	**Not Detected**		0.1	10	7/17/2017	BS
Nitrate+Nitrite as N	EPA300.0	mg/L	**0.3**		0.1		7/17/2017	BS
Nitrite as NO2-N	EPA300.0	mg/L	**0.2**		0.1	1.0	7/17/2017	BS
Odor Threshold at 60 C	SM2150B	TON	**3**		1	3	7/19/2017	MP
o-Phosphate-P, Dissolved	EPA300.0	mg/L	**Not Detected**		0.1		7/17/2017	BS
pH (Laboratory)	SM4500-H+B	pH (H)	**7.5**		0.1		7/17/2017	BS
Potassium	EPA200.7	mg/L	**2.5**		0.5		7/27/2017	MW
QC Anion Sum x 100	Calculation	%	**103%**				7/31/2017	LRH

mg/L: Milligrams per liter (=ppm) ug/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit
H = Analyzed ouside of hold time E = Analysis performed by External Laboratory; See External Laboratory Report attachments.
D = Method deviates from standard method due to insufficient sample for MS/MSD T = Temperature Exceedance

Monterey Bay Analytical Services
4 Justin Court Suite D, Monterey, CA 93940
831.375.MBAS
www.MBASinc.com
ELAP Certification Number: 2385

Tuesday, August 01, 2017

Bierman Hydrogeologic
Aaron Bierman
3153 Redwood Dr.
Aptos, CA 95003

Lab Number: **AB71522**

Collection Date/Time:	7/17/2017	11:00	Sample Collector:	BIERMAN A	Client Sample #:
Submittal Date/Time:	7/17/2017	17:30	Sample ID		Coliform Designation:

Sample Description: Spring #1

Analyte	Method	Unit	Result	Qual	PQL	MCL	Date Analyzed	Analyst:
QC Anion-Cation Balance	Calculation	%	**1**				7/31/2017	LRH
QC Cation Sum x 100	Calculation	%	**105%**				7/31/2017	LRH
QC Ratio TDS/SEC	Calculation		**0.62**				7/24/2017	LRH
Selenium, Total	EPA200.8	µg/L	**1**		1	50	7/26/2017	MW
Silver, Total	EPA200.8	µg/L	**Not Detected**		1	100	7/26/2017	MW
Sodium	EPA200.7	mg/L	**14**		0.5		7/27/2017	MW
Specific Conductance (E.C)	SM2510B	µmhos/cm	**226**		1	900	7/20/2017	HM
Sulfate	EPA300.0	mg/L	**4**		1	250	7/17/2017	BS
Thallium, Total	EPA200.8	µg/L	**Not Detected**		0.5	2	7/26/2017	MW
Total Diss. Solids	SM2540C	mg/L	**140**		10	500	7/20/2017	MP
Turbidity	EPA180.1	NTU	**6.9**		0.05	5.0	7/19/2017	OW
Zinc	EPA200.7	µg/L	**Not Detected**		10		7/27/2017	MW

Sample Comments: Odor: musty SS:Secondary Source recovery exceeds laboratory control limit.

Report Approved by David Holland, Laboratory Director

mg/L: Milligrams per liter (=ppm) ug/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit
H = Analyzed ouside of hold time E = Analysis performed by External Laboratory; See External Laboratory Report attachments.
D = Method deviates from standard method due to insufficient sample for MS/MSD T = Temperature Exceedance

Bierman Hydrogeologic
Aaron Bierman
3153 Redwood Dr.
Aptos, CA 95003
abierman@comcast.net (831)334-2237

MBAS
Monterey Bay Analytical Services
4 Justin Court Suite D, Monterey, CA 93940
831.375.MBAS
www.MBASinc.com
ELAP Certification Number: 2385

 Tuesday, August 01, 2017

Lab Number: **AB71521**

Collection Date/Time: 7/17/2017 10:00 Sample Collector: BIERMAN A Client Sample #:

Submittal Date/Time: 7/17/2017 17:30 Sample ID Coliform Designation:

Sample Description: Spring #1

Analyte	Method	Unit	Result	Qual	PQL	MCL	Date Analyzed	Analyst:
E. Coli	Colitag	MPN/100mL	**Present**		1		7/17/2017	MW
Total Coliform	Colitag	MPN/100mL	**Present**		1		7/17/2017	MW

Sample Comments:

mg/L: Milligrams per liter ug/L : Micrograms per liter PQL : Practical Quantitation Limit MCL: Maximum Contamination Level
H = Analyzed ouside of hold time E = Analysis performed by External Laboratory; See Report attachments. T = Temperature Exceedance

Hydrogeologic Consulting & Water Resource Mg
Aaron Bierman
3153 Redwood Dr
Aptos, CA 95003

MBAS
Monterey Bay Analytical Services
4 Justin Court Suite D, Monterey, CA 93940
831.375.MBAS (6227)
www.MBASinc.com
ELAP Certification Number: 2385

Wednesday, February 21, 2018

Lab Number: 180206_15-01

Collection Date/Time: 2/6/2018 9:00 Sample Collector: Maehr T Client Sample #:

Submittal Date/Time: 2/6/2018 12:28 Sample ID:

Sample Description: Maehr Property, Rain Water Harvest

Analyte	Method	Unit	Result	Dil.	Qual	PQL	MCL	Anal. Date	Anal. Time	Analyst
Alkalinity, Total (as CaCO3)	SM2320B	mg/L	ND	1		10		2/8/2018	11:47	LM
Aluminum, Total	EPA200.8	µg/L	46	1		5	1000	2/7/2018	15:43	MW
Anion-Cation Balance	Calculation	%	42	1						
Antimony, Total	EPA200.8	µg/L	ND	1		0.5	6	2/7/2018	15:43	MW
Arsenic, Total	EPA200.8	µg/L	ND	1		1	10	2/7/2018	15:43	MW
Barium, Total	EPA200.8	µg/L	14	1		5	1000	2/7/2018	15:43	MW
Beryllium, Total	EPA200.8	µg/L	ND	1		0.5	4	2/7/2018	15:43	MW
Bicarbonate (as HCO3-)	SM2320B	mg/L	ND	1		10				
Bromide	EPA300.0	mg/L	ND	1		0.1		2/7/2018	17:04	HM
Cadmium, Total	EPA200.8	µg/L	ND	1		0.2	5	2/7/2018	15:43	MW
Calcium	EPA200.7	mg/L	2	1		1		2/8/2018	13:41	HM
Carbonate as CaCO3	SM2320B	mg/L	ND	1		10				
Chloride	EPA300.0	mg/L	2	1		1		2/7/2018	17:04	HM
Chlorine Residual,Total (Laboratory)	SM4500-Cl G	mg/L	ND	1		0.05		2/7/2018	16:00	BS
Chromium, Total	EPA200.8	µg/L	3	1		1	50	2/7/2018	15:43	MW
Color, Apparent (Unfiltered)	SM2120B	Color Units	50	5		15	15	2/7/2018	16:46	LM
Copper, Total	EPA200.8	µg/L	6	1		2	1300	2/7/2018	16:31	MW
Cyanide, Available	OIA-1677-09	µg/L	ND	1	IH	3	150	2/20/2018	7:15	BS
Fluoride	EPA300.0	mg/L	0.1	1		0.1	2	2/7/2018	17:04	HM
Hardness (as CaCO3)	SM2340B/Calc	mg/L	ND	1		10				
Hydroxide	SM2320B	mg/L	ND	1		10				
Iron, Total	EPA200.7	µg/L	130	1		10	300	2/8/2018	13:41	HM
Langlier Index, 15°C	SM2330B	NA	-4.79	1						
Langlier Index, 60°C	SM2330B	NA	-3.96	1						

mg/L : Millgrams per liter (=ppm) ug/L : Micrograms per liter (=ppb) PQL : Practical Quantitation Limit MCL : Maximum Contamination Level
H = Analyzed outside of hold time E = Analysis performed by External Laboratory; See Report attachments T = Temperature Exceedance
MDL = Method Detection Limit J = Result is less than PQL

Hydrogeologic Consulting & Water Resource Mg
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www.MBASinc.com
ELAP Certification Number: 2385

Wednesday, February 21, 2018

Lead, Total	EPA200.8	µg/L	13	1		1	15	2/7/2018	15:43	MW
Magnesium	EPA200.7	mg/L	ND	1		1		2/8/2018	13:41	HM
Manganese, Total	EPA200.7	µg/L	25	1		10	50	2/8/2018	13:41	HM
MBAS (Surfactants)	SM5540C	mg/L	ND	1		0.05		2/7/2018	14:01	HM
Mercury, Total	EPA200.8	µg/L	ND	1		0.5	2	2/7/2018	15:43	MW
Nickel, Total	EPA200.8	µg/L	9	1		1	100	2/7/2018	15:43	MW
Nitrate as N	EPA300.0	mg/L	ND	1		0.1	10	2/7/2018	17:04	HM
Nitrate+Nitrite as N	EPA300.0	mg/L	ND	1		0.1		2/7/2018	17:04	HM
Nitrite as N	EPA300.0	mg/L	ND	1	IJ	0.1	1	2/7/2018	17:04	HM
Odor Threshold at 60 C	SM2150B	TON	6	1		1	3	2/7/2018	16:26	LM
Orthophosphate as P	EPA300.0	mg/L	0.26	1	LM	0.1		2/7/2018	17:04	HM
Perchlorate	EPA314.0	ug/L	ND	1		0.5	6	2/12/2018	15:24	HM
pH (Laboratory)	SM4500-H+B	pH (H)	6.0	1		0.1	10	2/6/2018	16:35	KC
Potassium	EPA200.7	mg/L	6.45	1		1		2/8/2018	13:41	HM
QC Anion Sum x 100	Calculation	%	47	1						
QC Cation Sum x 100	Calculation	%	114	1						
QC Ratio TDS/SEC	Calculation	NA	2.06	1	ME			2/12/2018	10:05	LM
Selenium, Total	EPA200.8	µg/L	ND	1		1	50	2/7/2018	15:43	MW
Silver, Total	EPA200.8	µg/L	ND	1	LN	1	100	2/7/2018	15:43	MW
Sodium	EPA200.7	mg/L	2	1	IJ	1		2/8/2018	13:41	HM
Specific Conductance (EC)	SM2510B	µmhos/cm	32	1		1	900	2/6/2018	15:15	HM
Sulfate	EPA300.0	mg/L	ND	1		1		2/7/2018	17:04	HM
Thallium, Total	EPA200.8	µg/L	ND	1		0.5	2	2/7/2018	15:43	MW
Total Dissolved Solids	SM2540C	mg/L	66	1	ME	10	500	2/12/2018	10:05	LM
Turbidity	EPA180.1	NTU	1.40	1		0.05	1	2/7/2018	16:21	LM
Zinc, Total	EPA200.7	µg/L	407	1		10	5000	2/8/2018	13:41	HM

Comments: IH: LCS and/or CCV below acceptance limits. IL: RPD exceeds laboratory control limit
LM: MS and/or MSD above acceptance limits. LN: MS and/or MSD below acceptance limits.
ME: Initial analysis within holding time but required confirmation.

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Wednesday, February 21, 2018

Lab Number: 180206_15-01

Collection Date/Time:	2/6/2018	9:00	Sample Collector:	Maehr T	Client Sample #:
Submittal Date/Time:	2/6/2018	12:28	Sample ID:		Coliform Designation:

Sample Description: Maehr Property, Rain Water Harvest

Analyte	Method	Unit	Result	Qual	Dil.	PQL	Anal. Date	Anal. Time	Analyst
Coliform, E Coli	Colitag-24hr	MPN/100mL	Absent		1	1	2/6/2018	15:00	MW
Coliform, Total	Colitag-24hr	MPN/100mL	Present		1	1	2/6/2018	15:00	MW

Comments:

Report Approved by:
David Holland, Laboratory Director

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180206-15

BIERMAN
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CHAIN -OF-CUSTODY RECORD

PROJECT NAME AND JOB #: Maehr Property

LABORATORY: Monterey Bay Analytical Services

SEND CERTIFIED RESULTS TO: abierman@comcast.net

TURNAROUND TIME: Standard | 24hr Rush | 48hr Rush | 72hr Rush

Sampler: Theo Maehr

Sample Date: 2-6-18 9am

Sample Identification	Sample Depth (ft, bTOC)	Time Sampled	Matrix	SAMPLE CONTAINERS					REQUESTED ANALYSIS							
									Domestic Water Analysis			Additional Water Quality Analysis				
				946-mL Poly Bottle	500-mL Glass	250-mL Poly Bottle	8-oz. Poly Bottle	100-mL Poly Bottle	General Mineral	General Physical	Inorganic Constituents	Asbestos	Perchlorate	Chromium VI	E-coli & Total Coliform (P / A)	Cl_2 Residual
01 Rain Water Harvest	Surface	09:00	H_2O	X	X	X	X	X	X	X	X		X		X	X

Receiving Temp: 9.1°C

	RELEASED BY:	Date & Time		RECEIVED BY:	Date & Time	(circle 1)		
1.)	Theo Maehr	2-6-18 12:25	→		2/6/18 12:28	Ambient	Refrigerated	Frozen
2.)			→			Ambient	Refrigerated	Frozen

NOTES:

- Please analyze for VOCs by EPA method 8260
- For MTBE-analyzed samples with non-detectable results (ND) but having elevated detection limits, please confirm by EPA Method #8260.
- Please use MDL (Minimum Detection Limit) for any diluted samples.

Title22.xls

1802206 _15

Sample Condition Upon Receipt

COC Info

Was temp acceptable? Chemistry ≤6°C Micro ≤10°C (YES) NO NA <2 Hr Is there evidence of chilling? (YES) NO NA

Did bottles arrive intact? (YES) NO NA

Did bottle labels agree with COC? (YES) NO NA

Discrepency Documentation:

Person Contacted: _____ Method: In Person/Phone/Email _____

Problem _____

_____

Resolution _____

_____

Person Contacted: _____ Method: In Person/Phone/Email _____

Problem _____

_____

Resolution _____

_____

Sample Split/Filtration

Lab ID	Cont. Size	Pres	Date/Initials

Lab ID	Cont. Size	Pres	Date/Initials

Comments

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