Barrella, Donald

Subject: FW: Anthem Winery - reply to 1/21/20 memorandum

From: Jeff Atlas <jlasf@aol.com>
Sent: Monday, February 3, 2020 12:10 PM
To: Barrella, Donald <Donald.BARRELLA@countyofnapa.org>
Subject: Re: Anthem Winery - reply to 1/21/20 memorandum

Don, here is the text. (There is a photo from the hill showing that there is no intervisibility.)

To: Don Barrella
From: Jeff Atlas
Re: Anthem Winery - 1/21/20 Memorandum

The 1/21/20 memorandum about the proposed Anthem Winery road contains several inaccuracies. Paul Rowe, Kevin Block, and REAX Engineering will address some of these, but I have a few questions:

Paragraph 5: Saying the exceptions are "unique and unmatched" implies these same standards have been rejected in other cases and this road has an unprecedented number of exceptions.

Question: Has any other road application has ever contained as many exceptions?

Paragraph 6: The statement, "Line of sight is maintained for incoming and egressing vehicles through the flagpole section of the roadway," is false. There is no line of sight due to the steep grade, as shown in photo below.

Question: How was line of sight determined?

Paragraph 7: As REAX commented, the emergency ingress/egress plans are untested. PGE now cuts power during high fire risk times.

Question: Will this system work during power cuts or outages?

Paragraph 9: Mr. Rowe will address the comment, "..the approval did not consider easement restrictions as part of the request for exception to the standard gate width." These easements impact the safety of the main entrance. Firetrucks from the nearest firehouse on Trower must make a left turn into the driveway.

Question: If delayed while entering, won't a firetruck block BOTH lanes of Dry Creek Road because there is no Left Turn Lane? Wouldn't a designated Left Turn Lane make it safer?

Paragraph 10: The plan shows an easement area used as a turn-out on the East side of the bridge. This easement cannot be used, so there is no turn-out.

Question: Aren't turnouts required for both directions of a one-way bridge?

Paragraph 12: When Anthem purchased the defunct Jepson Winery, access to Redwood Road was already a permitted commercial road for a 30,000 gallon winery.

Question: Is that road still permitted for a 30K gallon winery?

Planning told Anthem they might need to replace the one-way bridge with a two-lane bridge, before they built it.

Question: Why is the one-way bridge cited as a factor?

There is a sharp dog-leg turn just off Redwood Road that makes access appear difficult.

Question: Is Planning aware the easement allows direct access and this turn can be eliminated?

Question: Did Anthem ever submit plans to improve this road?

Question: How was it determined to be "possibly infeasible" when Anthem never tried to improve it?

Question: Did Planning suggest the Dry Creek Road access before or after Anthem purchased the second parcel?

Thank you for your prompt reply.

Jeff Atlas
3173 Dry Creek Road
Napa, CA

Barrella, Donald

Subject: FW: Anthem Winery expansion

From: Pam Jackson <scnapapam@gmail.com>
Date: Monday, Feb 03, 2020, 1:56 PM
To: Morrison, David <David.Morrison@countyofnapa.org>
Subject: Anthem Winery expansion

Dear Director Morrison,

I am very concerned about the planned expansion of Anthem Winery. The installation of a dangerously narrow and long access road (with 16 road exceptions) presents a major modification of a hillside that will cause serious erosion and water supply issues below.

As to the number of trees to be removed and buildings added, we have to come to terms with the cumulative effects of this expansion on increasing our climate change at an even faster pace. We need to take a second look at our moral compass to plan ahead and take action against furthering global warming to the point of not being able to grow grapes in our valley.

I do not live in the area but have lived in Napa for over 40 years, and I am deeply concerned with the planned deforestation and resultant erosion, carbon release and disruption of the ancient valley oaks in this area.

Thank you for taking a hard look at your decisions on hillside vineyards and wineries.

Pamela Jackson

Comments on Anthem WAA Submittal
Walt Brooks Feb.2, 2020

The following is an analysis and review of Anthem Tier 1 modification dated Jan 2019.

Summary

Although Anthem's updated WAA document corrected the unrealistic 100% recovery rates for rainwater and winery processing water the water analysis continues to have issues that will affect the viability of the project. The Anthem project should be commended for their use of water saving and recycling technologies but the water availability only works out if we assume no issues with their wells AND at the same time achieving State of the Art results from the water saving techniques. This is unrealistic planning and for some parts of the plan unenforceable by the county. There is no reserve in this proposal, low or irregularly distributed rainfall years or a small degradation in any of the wells or water saving systems puts the project immediately into a water deficit situation. A more realistic approach would be to design a project that is balanced using the currently available ground water resources and then to utilize these advanced water saving strategies to mitigate against the eventual decline in well productivity and during drought years. It is clear that the property will struggle to support any additional vineyards and a fully functioning winery even at the 30K gallon permit level and that if the full permit and ECP request is approved having an adequate water supply is highly unlikely.

Groundwater/ well issues

- **The property has serious groundwater issues** as demonstrated by the need to use 7 wells to meet the needs of the 2 residences, vineyards and winery. These wells are distributed over the two Anthem parcels and the average production of an individual well is just 1GPM. **There appears not to be any strong wells on the properties.**

- **All nearby properties have experienced failure or degradation of wells**. Although dismissed in their analysis as anecdotal many wells on neighboring properties are poor performers and have consistently degraded by factors of 2 or more when used heavily over a period of 5-10 years

- **Most neighbors have struggled** when they need more water to find a viable spot to drill a new well and once found must drill quite deep. Several wells are now in the range of 600 to 900 ft.

- **The project proposes an unrealistic 365 day per year 12 hour per day pumping of the wells**. This allows no time for well repair, replacement, maintenance or reconditioning. None of the neighboring properties have been able to utilize such an aggressive duty cycle without significant degradation in pumping rates. The project wells have never been subjected to this kind of long-term pumping so their ability to support this sustained pumping is unknown.

- **The Anthem project proposes doubling the pumping rate of the wells during drought year**. The WAA water balance only works if you make this assumption. They propose a pumping rate that exceeds the recharge rate for these years. Drought years are not the time to stress wells as the water table drops. This is NOT a

recommended practice for dealing with low rain year water demands. In-fact the opposite is recommended, reducing water demands and reduced well pumping coupled with increasing storage is broadly recommended. (see reference links below).

- **The reliance of project and non-project wells seems intertwined.** While designating wells 3,6, and 8 as project wells, the water balance relies on 3.79 acre-feet per year from non-project wells 1,4,5,7. They assert that these wells will continue to produce at their current rate. That is highly unlikely. Before adding the demands of the new requested vineyard acreage and a winery these non-project wells must have had some difficulties at the end of dry seasons as Anthem was forced to haul water in the past. The demand and water use on all the wells should be monitored.

- **Water Hauling for the project is not effectively limited**. In the findings and recommendation for the project the County attempts to prohibit the hauling of water to support the project but since some wells also support the 2 residences when a well fails that supplies a residence will Anthem be allowed to haul water for health and safety issues for the houses? Are there limitations on any other residential buildings being added or other residential water uses, like landscaping, added?

Advanced Technology Issues

- **The Rainwater collection (85%) winery processing water recycling (90%) must consistently perform at a high level to make the water balance work**.

- **The analysis of collected rainwater to be used for winery processing is inconsisten**t, 53% of rainwater is “dirty” water collected off of outdoor area and parking (page 6 of Tier 1 Water Use Calculation revised 1/9/19) and is only suitable for irrigation, the 47 % from roof system is less than the amount required to support winery processing. Two separate water storage systems that cannot be mixed are required, further limiting options in terms of capturing water.

- **Subsurface drip irrigation (40% reduction) and use of low water demand grape varietals (50% reduction) must be utilized for the plan to work.** These reductions are not universally accepted and cannot be reasonably monitored or enforced by the county in the future.

  The plan still claims 40 % reduction in water requirement for irrigation using SDI (Sub Surface Drip Irrigation). Although this technology has shown the ability to reduce irrigation water requirements it also suffers from numerous problems and many vineyards have abandoned this due to issues with pests, undetectable leaks, mechanical damage, root intrusion, emitter clogging and the requirements for detailed flow and pressure monitoring. More complex water quality treatment is usually required since there is no opportunity to clean the emitters.

- **The plan still claims a 70% reduction in water for one acre of low water varietal.** The county cannot require certain varietals be planted nor that the combination of low water varietal and SSI be used in the future.

Other Considerations:

- Since the two Anthem parcels are independent and the possibility exists that parcel 035-460-038 can be sold at a later date the search for future water sources could be restricted to the original Anthem parcel (035-470-046). Recommendation: require that the two parcels be combined since the Anthem project is critically dependent on both parcels to meet its water needs and enough grapes to support the estate production.

- **No allowance for water demands of the proposed 3 acres of new plants-**young vines need full irrigation for first 3 to 5 years, deficit strategies are not recommended

- **No allowance for additional water demands for vine protection during heat spikes**, climate change models indicate that Napa will experience more frequent heat spikes in the future.

- **No allowance for additional water demands of replants due to disease or age**.

Reference links:

https://agrilifeextension.tamu.edu/library/water/protect-your-water-well-during-drought/

https://communityenvironment.unl.edu/managing-your-private-drinking-water-well-during-drought

http://ucmanagedrought.ucdavis.edu/Agriculture/Crop_Irrigation_Strategies/Winegrapes/

February 2, 2020

Gary S Margadant
4042 Mount Veeder Road
Napa CA 94558
gsmargadant@gmail.com
707 291 0361 Cell

Napa County Planning Commission

Joelle Gallagher, Dist 1, joellegPC@gmail.com
Dave Whitmer Dist 2, Dave.Whitmer@countyofnapa.org, CHAIR
Anne Cottrell, Dist 3, anne.cottrell@lucene.com
Andrew Mazotti, Dist 4, andrewmazotti@gmail.com
Jeri Hansen-Gill, Dist 5, JeriGillPC@outlook.com

Charlene Gallina, Charlene.Gallina@countyofnapa.org
David Morrison, David.Morrison@countyofnapa.org

re: Anthem Winery, P14-00320-MOD, P14-00321-VAR, and P14-00322-ECPA, before the Planning Commission on February 5, 2020

Dear Commission Members and Mr.Morrison

In the coming years to January 2022, the Napa County approach to Sustainable GroundWater Managment within the County and the Napa Valley Sub-Basin will be changing as the SGMA law is implemented by the California Department of Water Resource (DWR) and the Napa County Administration (NCA).

The most current event is the Formation of the Napa County Sustainable Groundwater Agency on January 7, 2020 after an introduction on December 17, 2019. The Board of Supervisors formed the Agency and appointing themselves alone onto the Agency, and now the hard work begins as the Agency must complete a Sustainable Groundwater Plan for the subbasin by January 2022. It is going to be two years of hard work and inclusion of the Stakeholders as required by Code Chapters 1 thru 12 of the Sustainable Groundwater Management.

And now we have a project before the Planning Commission that illustrates many aspects of Sustainable Groundwater Management, from the Past efforts of Napa

County to the current requirements of SGMA and the physical location limitations of the Sub-Basin as delineated by DWR mapping of the Aquifer. The Aquifer western border parallels Dry Creek road and lies a short distance (100m+) to the west of the Road, cutting through the neighborhood surrounding the proposed Anthem Winery The Winery location is not within the Sub-Basin Boundary, yet many of the neighboring homes and businesses are located within the boundary, presenting a wealth of measures that can be employed to manage the Aquifer Sustainably for all stakeholders. Many of these measures are to be found within the documents for this winery modification as it works its way through Planning Department and Planning Commission. The document of high interest that pertain to my comments are attached:

1. The Current Staff Report for the 2/5/2020 Commission Agenda Placement 7A
2. Luhdorff and Scalmanini Consulting Engineers (LSCE), Review Memo dated January 27, 2020 (file # 19-1-116, submitted to the Planning Commission for the 2/5/2020 meeting.
3. Luhdorff and Scalmanini Consulting Engineers (LSCE) Review of Draft Memorandum "Results of Aquifer Testing of Project Wells and Napa County Tier 1 Water Availability Analysis for Proposed Anthem Winery", dated August 10, 2017 (project 17-01-038) and submitted to the Planning Commission for 10/3/2018 meeting.
4. Luhdorff and Scalmanini Consulting Engineers (LSCE) Comments on Proposed Anthem Winery Draft Peer Review Response from Richard C. Slade & Associates , October 19, 2017, dated January 22, 2018 (Project No. 17-1-060) and submitted to the Planning Commission for 10/3/2018 meeting.

#4 is of particular interest since LSCE describes its findings and recommendations that are pertinent to the understanding of the Sustainable Use and management of the Groundwater Resources by conditioning many needs within the Conditions of Approval for the Use Permit; an excellent way to verify any of the engineered water demands required to operate a winery of the proposed size and complexity.

All engineers have agreed that the Groundwater is limited and spotty on the Winery Parcels and in the Winery Wells, placing greater dependence on the careful and sustainable management of the Aquifer Resources. Recommendation 1 suggests the use of "flow meter data and updated groundwater hydrographs to demonstrate prior rates of groundwater production in prior yearsand groundwater level stability in the time since the Draft WAA was originally submitted". These measurements are extremely important in the Managment of the Aquifer for any location in Napa County and the sub basin and can be mandated by the GSA to solve Groundwater Problems areas.

Recommendations 5, 6 and 9 urge similar flowmetering .

Yet none of the Recommended Conditions of Approval (COA) appeared in the COA's proposed for the Planning Commission review and possible approval on 10/3/2018 or any subsequent meeting of the PC for the Anthem Winery proposal.

In the #2 document from LSCE, the conclusion reiterated the need for project-specific condition of approval, so the county will be able to verify that the Project is able to realize the proposed sources of supply consistent with the WAA.

Instead the project documents avoid any discussion of rigorous measurement and begin to use words such as: "appropriate and plausible", "anticipated", "likely to be sufficient", "plausible", and the Document #4 was dropped from the project. Document #1 described how the Project was dropped from the Commission Agenda on 1/16/209 to be renoticed to a future date so that groundwater, access and land use issues primarily focused around visitation and production capacity in context of the site's location and constraints, as well as project modifications proposed by the applicant could be presented and assessed.

In other words, so much for Groundwater adequacy and measurement verification to manage the Aquifer Sustainably. True, this winery is outside the boundary of the Napa Sub Basin (Aquifer) but that does not mean that Napa County can ignore the management of the Common Groundwater Aquifer and arbitrarily jeopardize the landowner, neighboring property investments and business ventures along with their health and safety.

I suggest that the Planning Commission investigate and develop proper and effective COA's to verify that the Groundwater is adequate and viable for the project proposal, and perform them in stages like building inspections for a new home, starting with the groundwork, the foundation, the floor, etc., etc.. Otherwise the proposal is likely to be insufficient or over estimated, ripe for failure.

Please, whatever you do, avoid the Carneros Inn Syndrom, where broken promises, bad estimates and investments are fobbed off onto others at their expense.

Respectively,

Gary S Margadant

A Tradition of Stewardship
A Commitment to Service

Agenda Date: 2/5/2020
Agenda Placement: 7A

Napa County Planning Commission
Board Agenda Letter

TO:	Napa County Planning Commission
FROM:	Charlene Gallina for David Morrison - Director Planning, Building and Environmental Services
REPORT BY:	Donald Barrella, Planner III - 707-299-1338
SUBJECT:	Anthem Winery, P14-00320-MOD, P14-00321-VAR, and P14-00322-ECPA

RECOMMENDATION

JULIE ARBUCKLE / ANTHEM WINERY / USE PERMIT MODIFICATION # P14-00320-MOD, VARIANCE #P14-00321-VAR, VIEWSHED, EXCEPTION TO THE NAPA COUNTY ROAD AND STREET STANDARDS, AND AGRICULTURAL EROSION CONTROL PLAN #P14-00322-ECPA

CEQA Status: Consideration and possible adoption of a Mitigated Negative Declaration. According to the proposed Mitigated Negative Declaration, the proposed project would not have any potentially significant environmental impacts after implementation of mitigation measures (or MM's). MM's are proposed for the following area(s) Biological Resources, Geology and Soils, and Noise. The project site is not included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5.

Request: Approval of a Use Permit Major Modification for an existing winery permit to allow the following: (a) an increase in annual permitted production capacity from 30,000 to 50,000 gallons; (b) the construction of a new 10,388 sq. ft. Winery Facility that includes a 1,508 sq. ft. Tasting Room, a 1,724 sq. ft. Office, Catering and Conference Room, and approximately 5,485 sq. ft. of outdoor marketing areas; (c) the development of 29,053 sq. ft. of caves including the on-site placement and storage of spoils; (d) an increase in on-site parking from 2 spaces to 22 spaces; (e) the development of winery support facilities (water tanks, septic system, and rainwater harvesting and winery process water recycling and reuse systems); (f) an increase in the number of employees from 1 part-time employee to 7 full-time and 5 part-time employees; (g) a change in the in the winery's hours of operation from 9:00 AM to 5:00 PM Monday through Sunday to 8:00 AM to 8:00 PM Monday through Sunday (production hours) and 10:00 AM to 6:00 PM Monday through Sunday (visitation hours), and marketing events 11:00 AM to ~~12:00 AM~~ 10:00 PM Monday through Sunday; (h) a marketing plan that includes daily tours and tastings by appointment with a maximum of ~~256~~ 224 visitors per week and ~~36~~ 31 annual marketing events [~~24~~ 22 30-person events, 2 50-person events, ~~10~~ 6 100-person events, and 1 200-person event ~~1 300-person event~~] resulting in a maximum of ~~15,532~~ 13,208 annual visitors, and on-site consumption of wine produced on-site; and (i) the reconfiguration of an existing access driveway including the construction of a clear span bridge and approximately 650 feet of new driveway to provide adequate access to the winery. The project also includes an Exception to the Napa County Road and Street

Standards for reduced commercial driveway widths and for road grades exceeding 18%, a Variance to allow construction of the proposed winery a minimum of 65 feet from the applicant's own private access drive where a minimum 300-foot setback is required, a Viewshed request; and, an Agricultural Erosion Control Plan for the installation and maintenance of approximately 1.19 acres of new vineyard. The project would be completed in three phases: Phase I includes construction of the driveway, parking, septic system, production structures (Fermentation Buildings and Bottling Room), outdoor tasting area, and the cave water storage tanks; Phase II includes construction of the remainder of the caves; and Phase III includes construction of the tasting room and the office/catering/conference room building. The project is located on an approximate 44.8 acre holding within the Agricultural Watershed (AW) zoning district that consists of two parcels: i) the “Winery Parcel” (3454 Redwood Road, APN 035-470-046) an approximate 27.23 acre parcel located on the east side of Redwood Road approximately 1.5 miles north of its intersection with Browns Valley Road; and ii) the “Access Parcel” (3123 Dry Creek Road, APN 035-460-038) an approximate 17.54 acre parcel located on the west side of Dry Creek Road approximately 1.7 miles north of its intersection with Redwood Road (or approximately 0.4 miles north of its intersection with Linda Vista Avenue). Access to the winery is proposed from Dry Creek Road.

Staff Recommendation: Adopt the Mitigated Negative Declaration and approve the Exception to the Napa County Roads & Street Standards, the Variance, the Viewshed, the Use Permit modification, and the Agricultural Erosion Control Plan, as conditioned.

Staff Contact: Donald Barrella, Planner III, (707) 299-1338 or Donald.barrella@countyofnapa.org

Applicant: Julie & Justin Arbuckle, Trustees of the Arbuckle Family Trust dated May 5, 2016; (707) 227-0722 or jarbuckle@sbcglobal.net

Applicant Representative: Rob Anglin, Holman Teague Roche Anglin LLP.; (707) 927-4280 or anglin@htralaw.com

EXECUTIVE SUMMARY

Proposed Actions:

That the Planning Commission open the public hearing, take testimony and:

1. Adopt of the Mitigated Negative Declaration and Mitigation Monitoring and Reporting Program (MMRP) based on recommended Findings 1-7 in Attachment A (State Clearinghouse #2018-082072);
2. Approve the Exception to the Napa County Road & Street Standards, based on Findings 8-9 of Attachment A and subject to the recommended conditions of approval in Attachment B;
3. Approve the Variance request P14-00321-VAR, based on recommended Findings 10-14 of Attachment A and subject to the recommended conditions of approval in Attachment B;
4. Approve the Viewshed request based on recommended Findings 15-21 of Attachment A and subject to the recommended conditions of approval in Attachment B;
5. Approve Use Permit request P14-00320-MOD based on recommended Findings 22-26 of Attachment A, and subject to the recommended conditions of approval in Attachment B; and
6. Approve Agricultural Erosion Control Plan P14-00322-ECPA, based on the recommended Findings and conditions of approval in Attachment C.

Discussion:

On October 3, 2018, the Planning Commission held a public hearing to consider a use permit modification and

related requests as described in detail within the October 3, 2018 Staff Report. Several comment letters and emails were received prior to this hearing which focused on the following issues: i) groundwater availability and use, and the adequacy of the Project's Water Availability Analysis (WAA) and the assumptions utilized therein; ii) access to the site including the number and extent of requested exceptions to the County Road and Street Standards (RSS) and if adequate emergency ingress and egress would be provided; and iii) general land use concerns resulting from increased traffic, noise, and safety on public roadways and neighboring properties due to increased visitation and marketing, and increase production capacity.

At the conclusion of the October 3rd hearing the Commission continued the item to the December 5, 2018 hearing, and requested clarification on: the Project's WAA conclusions; the adequacy of the proposed access and exceptions to the County Road and Street Standards; the visitation and marketing numbers in relation to marketing and visitation numbers for 30,000 gallon wineries; that additional information be provided on the viewshed request; the overall erosion and hydrology/runoff associated with the Agricultural Erosion Control Plan; and any County responsibility related to the private tree easement with the adjacent property to the north (Lands of Damery: APN 035-460-034; 3185 Dry Creek Road).

No additional information or responses was available or presented at the December 5, 2018 hearing, primarily because the applicant was considering modifications to the project as proposed at the October 3, 2018 hearing. Therefore, staff requested and the Commission granted a further continuance to the January 16, 2019 Commission hearing to allow the applicant sufficient time to consider project revisions and prepare and provide additional information, as well as allow staff additional time to review any project modifications. No additional testimony was taken at this hearing.

At the time of finalization and publication of the January 16, 2019 hearing report, no additional information or project modifications had been provided to present at the hearing. Therefore, the application was dropped from the Commission Agenda so that the project could be re-noticed to a future date. However, the applicant provided a re-submittal package on January 11, 2019, that included modifications to the project as originally proposed. In summary the revisions included the following: i) a reduction in visitation to a maximum of 224 visitors per week from 256 visitors per week, and a reduction in marketing events from 36 annual events to 31 annual events, resulting in a reduction of 2,324 annual visitors from 15,532 visitors to 13,208 visitors; ii) a 1,350 sq. ft. reduction in landscaping from 36,070 sq. ft. to 34,720 sq. ft.; and ii) ending all winery events by 10:00 PM rather than 12:00 AM.

The October 3, 2018 agenda item, including correspondence and the applicant's and public's presentations is available at: (http://services.countyofnapa.org/AgendaNet/GranicusMeetingDocuments.aspx?id=5364). The December 5, 2018 agenda item, including correspondence received up to October 5th is available at: (http://services.countyofnapa.org/AgendaNet/GranicusMeetingDocuments.aspx?id=5368). The January 16, 2019 agenda item is available at: (http://services.countyofnapa.org/AgendaNet/GranicusMeetingDocuments.aspx?id=5719) Correspondence received after the December 5, 2018 hearing are attached to this report (Attachment J). Staff has also included alternatives to the proposed project below for the Commission's consideration.

FISCAL & STRATEGIC PLAN IMPACT

Is there a Fiscal Impact? No

County Strategic Plan pillar addressed:

ENVIRONMENTAL IMPACT

Consideration and possible adoption of a Mitigated Negative Declaration (MND) dated August 30, 2018. According to the proposed MND, the proposed project would not have any potentially significant environmental impacts after implementation of mitigation measures. Mitigation measures are proposed for the areas of biological resources, geology and soils, and noise. The project site is not included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5.

While several comments letters/correspondence were received in response to public hearing notification, only three comment letters appear to be specific to the MND: a September 19, 2018 letter from Bernadette Brooks, a October 1, 2018 letter from CalTrans, and a October 2, 2018 letter from the CA Department of Fish and Wildlife (CDFW).

The CDFW comment questions if there are potentially significant impacts to oak woodland and appropriate mitigation. As indicated in the MND, while the project would remove approximately 1.1 acres of oak woodland, it would retain approximately 25.4 acres of the site's 26.5 acres of oak woodlands resulting in less than significant impacts to oak woodlands and consistency with Policy CON-24, thereby not requiring mitigation. The winery use permit civil plans for the project that are included/referenced in the MND included a breakdown of tree removal, identifying that approximately 52 oak trees and 8 bay trees would be removed as part of winery development, and approximately 30 oak trees and 38 bay trees would be removed as part of access development. The CDFW letter also identifies potential permitting associated with the take of special-status species, and the need for a Lake and Streambed Alteration Agreement (LSAA or 1601 permit) for the diversion/alteration of watercourses or impacting riparian vegetation. As indicated in the MND, potential impacts to special-status species would be reduced to a less than significant level with implementation of Mitigation Measures BIO-1 thought BIO-3, and there is no riparian vegetation located within the project area. Additionally, project conditions of approval (if the project is approved) will include the provision requiring any/all Local, State and Federal permits necessary to implement and operate this project shall be obtained.

As detailed in the MND, the project site is over two miles from the closest state maintained roadways, and is not anticipated to change or effect the existing or future Level of Service (LOS) on roadways within the area or contribute a significant number of trips to the overall roadway system. For these reasons there is no nexus between the project and state roadways requiring the implementation of fair share contributions or a transportation demand management program. However, consistent with current County practice proposed project conditions of approval will include the provision requiring a Traffic Demand Management Plan be developed for the project.

Specific to noise impacts, the Environmental Noise Assessment (Illlingworth & Rodkin, Inc., July 2017) shows that marketing events being held outside, except for the 300-person marketing event, are not expected to exceed prescribed Daytime or Nighttime standards provided they end or are moved inside by 10:00 PM. The proposed modifications to the marketing plan, which would eliminate the 300-person event and end all events by 10:00 PM would minimize potentially significant impacts to a less than significant level; therefore, Mitigation Measure NOI-1 would no longer be necessary. Proposed project modifications would not affect the analysis or mitigation associated with geology and soils; therefore, Mitigation Measure GEO-1 will still need to be implemented. Information associated with the Brooks' comment letter is detailed below under ***Groundwater*** and within Attachments E and F.

Based on review of the comments received and proposed modifications to the project, no new potentially significant impacts beyond those identified in the MND would occur, no new or additional mitigation measures, or project revisions, must be added to reduce impacts to a less than significant level, and none of the grounds for recirculation of the MND as specified in State CEQA Guidelines Section 15073.5 have been identified.

BACKGROUND AND DISCUSSION

This application was dropped from the Commission Agenda on January 16, 2019, to be re-noticed to a future date so that groundwater, access, and land use issues primarily focused around visitation and production capacity in context of the site's location and constraints, as well as project modifications proposed by the applicant could be presented and assessed. Revisions to the project as proposed and presented on October 3, 2018 (as detailed in the Recommendation Section of this report) are identified by ~~strikethrough~~ and underline. Revisions to the proposed findings and conditions of approval as presented on October 3, 2018, are also identified in this format.

Material and information submitted by the applicant or prepared by County Staff, including consultants contracted by the County, on or after January 11, 2019 that are include as attachments to this report are listed below.

1. Winery Comparison Analysis and Summary of Changes (Attachment D)
2. Tier I Water Use Calculations dated January 2019 (Attachment E)
2. Luhdorff and Scalmanini Consulting Engineers Memo dated January 27, 2020 (Attachment F)
3. Engineering Division Memo dated January 21, 2020 (Attachment G)
5. Viewshed Exhibit UP 4.1 dated January 2019 (Attachment H)
4. Applicant 2019 Submittal and Supplemental Documents (Attachment I)

Please note that the *Applicant 2019 Submittal and Supplemental Documents* Attachment includes the following documents: Submittal Cover Letter, Applicant January 2019; Response to Comments Letter, RSA+ January 2019; Proposed Reductions Chart, Applicant January 2019; Winery Comparison Chart 30,000-50,000 Gallons, Applicant, January 2019; Access Retaining Wall Logistics Plan/Letter, Ledcor Group November 2018; Tree Easement Document; Water System Feasibility Study, RSA+ March 2019; Winery Wastewater Feasibility Study, RSA+ January 2019; Hydrology Report, RSA+ January 2019; Agricultural Erosions Control Plan RSA+ January 2019; and Landscape Plan, Claud Schmidt January 2019.

Correspondence received after the November 5, 2018 hearing are attached to this report (Attachment J).

Project Revisions and Modifications:

The Winery Comparison Analysis and Summary of Changes (Attachment D) presents a comparison of the modifications made to the original October 3, 2018 project that are presented in this report. In summary, the modifications to the proposed project include the following: reduction in marketing and visitation from 36 annual events to 31 annual events, and an overall reduction in visitation by 2,324 visitors annually from 15,532 visitors to 13,208 visitors; a 1,350 square foot (sq. ft.) reduction in landscaping from 36,070 sq. ft to 34,720 sq. ft.; and ending all winery events at 10:00 PM rather than 12:00 AM. No other operational, structural or site plan changes to the project as proposed and presented on October 3, 2018 (other than the reduction in landscaping area) have been made.

Specific to visitation, maximum weekly visitation has been reduced to 224 visitors per week, from 256 visitors per week. Specific to the 31 marketing events, the following has been proposed: 22 events per year with a maximum of 30 guests (from 24 events); two events per year with a maximum of 50 guests (from zero events); six events per year with a maximum of 100 guests (from 10 events); and, one event per year with a maximum of 200 guests (no change). The previously proposed one event per year with a maximum of 300 guests has been eliminated from the proposed marking plan.

The primary reason for these modifications is to reduce overall anticipated winery water use due to adjusted water supply and availability calculations taking into account a more plausible rainwater harvesting system capture efficiency of 85% and a process wastewater recycling system efficiency of 90% (Tier 1 Water Use Calculations, RSA+, January 9, 2019), rather than the 100% efficiency rates utilized for these systems in the original water supply and use calculations (RSA+, June 5, 2018).

The modification to end events by 10:00 PM is a result of Board of Supervisors established policy (i.e. customs and practices) that marketing events end by 10:00 PM, which was included in the recommended conditions of approval of the original proposal and are also included in the modified project and reflected in the recommended conditions of approval (Attachment B).

Commission Consideration:

Consistent with staff's October 2018 assessment, there is adequate documentation in the record as of the issuance of this staff report to consider approval of the proposed project. However, given the setting and site constraints as demonstrated by the need for a setback variance and road and street standards exceptions, including the water supply and the extent the site would need to be manipulated to provide adequate access and accommodate an expanded winery of the requested production and visitation level, in conjunction with the multiple phases necessary to develop an operational winery at this site (or otherwise increase the sites entitled winery operations to the requested levels), this site may not be wholly appropriate for a winery facility with the proposed level of operations.

While staff is recommending the project as revised may be approved with incorporation of proposed conditions of approval (Option 1 below), and as noted in the Executive Summary Section, staff is providing the Commission with decision making alternatives/options that include a no project alternative, a reduced production alternative, a reduced visitation and marketing alternative, and a vineyard only alternative (See Decision Making Options 1 through 5 below).

Discussion Points:

Visitation and Marketing - The attached Winery Comparison Analysis and Summary of Changes (Attachment D) compares the Anthem Winery (as modified) with wineries that currently have an annual permitted production capacity of 50,000 gallons. As shown in Attachment D, the average and median annual visitation for similar production capacity wineries is 9,343 and 8,000 (respectively), with average and median weekly visitors being 159 and 105 (respectively) and average and median annual marketing visitors being 1,073 and 832 (respectively). The number of marketing events averages 27 with a median of 15 events. The requested annual visitation (as modified) for tours and tastings and marketing all fall above the average and median visitation for similar production size winery facilities with 13,208 visitors a year. With respect to requested weekly visitors and marketing visitors (as revised), these also fall above the average and median weekly visitors and marketing visitors for similar production capacities with 224 weekly visitors and 1,560 annual marketing visitors. The project as modified would have the second highest visitation rate of wineries within approximately one mile (the Woolls Ranch Winery located approximately 0.5 miles to the northwest has an annual visitation of 22,840 guests), and would have approximately one and a half the average and median visitation rates of wineries with a similar production limit of 50,000 gallons.

As requested by the Commission, marketing and visitation numbers for wineries with a 30,000 gallon production limitation are being provided for comparison purposes. Presently 30,000 gallon wineries have an average annual visitation of approximately 6,904 visitors (annual median visitation 5,841), an average weekly visitation of 119 visitors (median weekly visitation 105), and average 730 marketing visitors (median marketing visitors 550). The number of marketing events averages 33 with a median of 15 events (Source: Napa County, November 20, 2019 Staff Report, Fontanella Family Winery, #P18-00431-UP). Given site access, water availability, and neighborhood context the Commission may wish to consider visitation consistent with the average and median visitation of 50,000 gallon wineries of approximately 9,000 annual visitors and approximately 150 weekly visitors, or visitation consistent with 30,000 gallon wineries of approximately 7,000 annual visitors and approximately 120 weekly visitors: Use Permit #96006 that covers the project site has a 30,000 gallon production limitation.

As previously indicated, the application also requests temporary tasting/marketing within the existing 1,600 square

foot winery cave and associated crush pad while the proposed winery is being constructed. Staff has recommended denial of this request because these existing facilities are not designed or constructed to accommodate public access and use. The scope of the recommended conditions of approval (Attachment B) is crafted to exclude this project component, and require all improvements be made to the winery prior to commencement of visitation and marketing events.

Groundwater - Comments on groundwater and the Project's WAA (Richard C. Slade & Associates 2017 - Attachment J of the October 3, 2018 Staff Report) received in conjunction with the October 3, 2018 hearing, including comments received through public testimony/presentations at that hearing, were directed to the County's groundwater consultant, Luhdorff and Scalmanini Consulting Engineers (LSCE), for review and response. The proposed revisions to the project presented by the applicant, including reduced visitation and landscaping, and utilizing reduced capture efficiencies for the rainwater harvesting system at a 85% capture efficiency and winery process water recycling/reuse system at a 90% capture efficiency in the project's Tier 1 Water Use Calculations (RSA+, Revised January 9, 2019 - Attachment E) were also directed to LSCE to include in their review.

The Revised Tier 1 Water Use Calculations indicate that overall water use for both existing and proposed uses on both the Project/Winery Parcel and the Access Parcel is anticipated to be 6.72 AF/yr, with 1.6 AF/yr of this total being attributed to winery use (Winery water use has been reduced approximately 0.32 AF/yr as compared to the October 3, 2018 project from 1.92 AF/yr to 1.6 AF/yr). Of this total water use the Tier 1 Calculations identify that overall groundwater use would range from 4.71 AF/yr during average rainfall years and 5.4 AF/yr during drought years, and that the proposed rainwater harvesting system is estimated to yield between 0.63 AF/yr to 1.32 AF/yr (based on an 85% efficiency rate and drought and normal rainfall years: respectively), and reclaimed winery process water would provide up to 0.69 AF/yr (based on a 90% efficiency rate).

As previously indicated, the County originally had LSCE conduct an adequacy review of the Project WAA (Attachment K of the October 3, 2018 Staff Report). LSCE's previous review found that the assumptions utilized in the Project WAA calculated groundwater recharge potential during average rainfall years of approximately 11.02 acre-feet per year (AF/yr) and approximately 5.29 AF/yr during dry rainfall years are appropriate and plausible. Their review also identified that the WAA also demonstrated through its aquifer testing at the three Project wells that project groundwater use would be operationally constrained by the effective pumping capacities/rates of the Project wells. LSCE has also confirmed that the aquifers supporting the Anthem Project Wells are not connect to surrounding aquifers, as identified in their original conclusions.

The applicant, in order to design a conservative project in terms of groundwater use, and to take into account the operational constrains of the project wells, is limiting overall groundwater use on the Project/Winery Parcel and the Access Parcel commensurate with anticipated recharged potential during drought conditions (i.e. 5.29 AF/yr) as well as supplement the project's water supply through the installation and use of rainwater harvesting and winery process water recycling/reuse systems. Furthermore, as identified in the proposed conditions of approval, staff is recommending that groundwater use be limited to 4.71 AF/yr which is the anticipated groundwater use during average rainfall years as identified in the Tier 1 Water Use Calculations.

LSCE's subsequent review of the groundwater comments, the revised project, and the revised Tire 1 Water Use Calculations are presented in their January 27, 2020 memo (*Water Availability Analysis Review for the Proposed Anthem Winery, Major Use Permit Modification P14-00320-UP,* Luhdorff & Scalmanini Consulting Engineers, January 27, 2020 - Attachment F). LSCE's review has concluded that the Project WAA has been prepared consistent with County guidance, appropriately takes into account anticipated efficiencies of the rainwater harvest and process water recycling in water supply calculations, and reflects the relatively limited water supply available for the project. Based on this analysis, it is anticipated that projected water supplies will likely be sufficient to meet proposed use in both average and dry year conditions.

Road and Street Standard (RSS) Exception and Access - As previously indicated, the RSS Exception Request

(Attachment G - October 3, 2018 Staff Report) was necessitated by the project proposal and physical and legal limitations/constraints resulting from the 20.09 foot wide 1,700 long flagpole section of the Access Parcel's connection with Dry Creek Road that is proposed to provide access to the expanded winery. This section of the access drive would consist of a 16 to 18 foot wide paved travel way, and a 14 foot wide travel way for the clear span bridge, resulting in exceptions to allow relief from: providing two 10 foot wide traffic lanes with 22 feet of horizontal clearance, the 22 foot wide turnouts, and for road grades exceeding 18% slope (but not exceeding 20%) without the required transition zones of 10% in two driveway segments. The remaining access drive located west of the proposed clear span bridge has been designed to comply applicable standards. In order to support adequate emergency access as a result of, and in combination with, the RSS Exception requests an Emergency Ingress/Egress Plan (RSA+, June 5, 2018, Anthem Winery Driveway Entry Option 2 Plans) was included in the RSS Exception request to provide additional measures to avoid delays in emergency equipment response. Review of that plan by the Napa County's Engineering Division, Public Works Department and Fire Marshal concluded that the Emergency Ingress/Egress Plan in combination with the proposed access improvements would provide sufficient emergency access to and from the project site.

Comments received on and after the October 3, 2018 hearing specific to the proposed access drive improvements, the Emergency Ingress/Egress Plan, and the RSS Exceptions (in particular the REAX Engineering letter and Paul K. Rowe letter both dated October 2, 2018, and the Block and Block LLP October 3 2018 hearing presentation, among others) have been forwarded to the Engineering Division and Fire Marshal for review and response and to reaffirm the County's original determination that the proposed RSS Exception requests satisfies the standards for an exception. As indicated in the Engineering Response Memo dated January 21, 2020 (Attachment G), while the extent of the exception request is unique and unmatched when compared to other exception requests in Napa County given the siting and construction constraints and limitations, the proposed access in conjunction with its associated components (including the Emergency Ingress/Egress Plan) satisfies the standards for an exception, and has been designed to the maximum extent practical to provide the same overall practical affect.

With regard to the proposed clear span bridge and as indicated in the MND, Redwood Creek a blue-line stream generally abuts the western periphery of the Winery and Access Parcels (which is located approximately 0.25 miles west of the proposed bridge), and there are two unnamed blue-line tributaries located approximately 0.25 miles to the northeast and southeast of the project site. Other than Redwood Creek, there are no other identified (i.e. blue-line) streams located within the project area (also see: USGS maps; Napa County GIS Streams layer; and Firstcarbon Solutions, October 13, 2017, Biological Resources Assessment, Anthem Winery and Vineyards, Road Project). Staff has confirmed that the project would not alter a blue-line stream. The MND also indicated that the project would not substantially alter the drainage patterns on-site or off-site in a manner that would cause flooding or a significant increase in erosion or siltation on or off the project site. As conditioned the project would require incorporation of best management practices and would be subject to the Napa County Stormwater Ordinance, which would require the implementation of runoff and sediment and erosion control measures, as applicable, during construction activities and post construction operations. Typically, these include implementation of a Stormwater Pollution Prevention Plan (SWPPP) during construction and implementation of a Stormwater Control Plan for a Regulated Project for operational activities.

As indicated in the Environmental Impact Section of this report, the CDFW provided a comment letter on the MND identifying the need for a Lake and Streambed Alteration Agreement (LSAA or 1601 permit) for construction activities that would divert or alter a watercourse (or drainages including Class II drainages) or that would impact riparian vegetation. As indicated in the MND, the project would not physically alter any watercourses/drainages, and there is no riparian vegetation located within the project area. Additionally, as previously indicated and included in the proposed conditions of approval, there is a provision requiring any/all Local, State and Federal permits necessary to implement and operate this project shall be obtained, if one is eventually needed.

Variance - Please see Variance Analysis contained in the October 3, 2018 staff report wherein staff recommended the Commission could make the required variance findings.

Viewshed - As previously indicated in the October 3, 2018 staff report, Dry Creek Road and Redwood Road are viewshed roads, and that due to project siting, site topography, and existing vegetation associated with Redwood Creek and along Redwood Road the proposed winery structures would not be visible from Redwood Road. The Project's revised Viewshed Analysis also demonstrates approximately 20% of the proposed Winery Facility would be visible from Dry Creek Road and the Napa Valley floor as sited and designed.

The applicant has provided an updated viewshed exhibit that utilized the same simulation points as presented in the October 3, 2018 project viewshed exhibit (Plan Sheet UP 4.1) and that includes a simulation of the project site's access with its intersection with Dry Creek Road, primarily to determine the visibility of proposed retaining walls associated with access drive expansion and improvement. Based on the simulation points there are no noticeable differences between the October 2018 exhibit and the January 2019 exhibit. Additionally, based on subsequent off-site inspections and aerial imagery review and interpretation there are only brief and filtered views of the access drive as viewed from an approximate 300 foot northbound section of Dry Creek Road located approximately 400 feet north of the Winery's access point, or from the driveway of 3185 Dry Creek Road to the driveway of 3171/3177/3167 Dry Creek Road.

While the proposed access improvements will include cut and fill slopes and retaining walls to construct, their limited height (typically no greater than 6 feet) and construction material (wood), in conjunction with the limited off-site views of these walls, they are anticipated to have a limited effect on the landscape. However, the residences abutting the north side of the access drive (3173 Dry Creek Road, Lands of Atlas; and 3163 Dry Creek Road, Lands of Sparby) will have pronounced view of the expanded access and associated retaining walls.

Agricultural Erosion Control Plan (ECPA) - Specific to ECPA hydrology and erosion review and technical adequacy, ECPAs are subject to General Plan Conservation Policies CON-48 and CON-50(c). Policy CON-48 requires post-development sediment erosion conditions (i.e., soil loss) be less than or equal to pre-development conditions, and Policy CON-50c requires peak runoff following development cannot be greater than predevelopment conditions. In short these Policies require no net increase in soil loss, erosion and runoff as a result of land use changes as compared to existing conditions. As disclosed in the Project’s Initial Study and supporting documentation the vineyard has been designed to result in a slight decrease in soil loss and no change runoff as compared to existing conditions.

The revised Vineyard ECPA (January 2019) was submitted to make minor adjustments to the rainfall rate modeling variable/value utilized in the soil loss calculations and the post-project curve number modeling value utilized in the hydrologic modeling (TR-55), to recognize more recent rainfall rates and accepted modeling value for no-till cover crops, that were identified as a result of ongoing review of the application by Engineering Division staff. These adjustments did not materially change modeling results, in that the vineyard development is still anticipated to slightly reduce soil loss and there would be no change in runoff rates as compared to existing conditions.

Tree Easement - County staff and County Counsel have reviewed the Tree Easement (Document ID#1995-02895, recorded December 27, 1995, Napa County Records - see Attachment I) that enjoins the Winery/Project Parcel with the adjacent property the north (APN 035-460-034, 3185 Dry Creek Road, Land of Damery). Because the easement is a private agreement that is specific to these private properties it is civil matter; therefore, it is neither under the Commission's purview nor does it obligate the Commission to consider this easement in its deliberations for the requested actions.

Additionally, as disclosed in the project Initial Study and shown in the project plans, no trees are proposed to be removed as part of vineyard development associated with this project.

Compliance - As previously indicated the subject winery was included in the 2016 Winery Audit and no violations or compliance issues were identified, and #98301-ECPA was modified by the Planning Director on March 11, 2009 (#P08-00345-ECPA), to address compliance matters occurring as part of its installation.

On November 19, 2018 and May 2, 2019, site inspections were conducted by Planning Division staff to confirm there were no winery violations occurring, and inspect potential erosion issues. These inspections did not identify any potential winery violations, or identify substantial erosion or runoff due to human-induced alteration of vegetation by the applicant.

On January 24, 2019, a complaint was received regarding the placement/re-placement of a winery sign located on Redwood Road that was associated with the existing winery located on the Project/Winery Parcel. Review by the Code Enforcement Division did not uncover any approvals for the sign in the records of Use Permit #96006 or that an encroachment permit was ever issued for the sign. Therefore, the sign was subsequently removed by the owner.

There are no open or pending code violations on Winery Parcel of the Access Parcel and the County is not aware of any compliance issues on the properties.

Public Comments – Correspondence received after the December 5, 2018 hearing are attached to this report (Attachment J).

Decision Making Options:

As noted in the Executive Summary Section and above, staff is recommending that the project can be approved with conditions of approval as described in Option 1 below. Other decision making options for the Commission's consideration include, but are not limited to, a reduced production alternative, a reduced visitation and marketing alternative, a vineyard only alternative, or denying the project. The Commission may also consider any combination of the below options or develop other options not listed.

Option 1 - Owner/Applicant's Proposal (As Modified)

Disposition - This option would result in approval of the expansion of the existing 30,000 gallon winery to 50,000 gallon per year winery with visitation and marketing, a variance, a viewshed request, an exception request to the Roads and Street Standards, and an Agricultural Erosion Control Plan. Staff recommends approval of this option as the request is consistent with the Zoning Ordinance, applicable General Plan policies, and other County regulations. The requested visitation and marketing program is proportionate in size to a recently approved 50,000 gallon per year production winery with by appointment visitation and marketing activities within the immediate area. An adequate water supply system has been demonstrated to be available to implement and operate the project, the applicant proposes to incorporate GHG reduction measures as part of the project, and there will be no significant unavoidable environmental impacts associated with the project with implementation of identified mitigation measures and conditions of approval. As indicated in the Visitation & Marketing Section above, staff is not recommending approval of temporary marketing event or visitation occur or be conducted during construction of the expanded winery.

Action Required - Follow the proposed action listed in Executive Summary. If proposed conditions of approval are to be amended, specify conditions to be amended at time motion is made. This option has been analyzed for its environmental impacts pursuant to CEQA, which were found to be less than significant with incorporation of project specific mitigation measures and conditions of approval.

Option 2 – Reduced Visitation and Marketing Alternatives

Disposition - This option would result in a decrease in the proposed visitation and marketing program numbers. Based on the averages for similar capacity wineries identified in the Winery Comparison Table (Attachment D), the winery could be limited commensurate with the visitation and marketing averages for a 50,000 gallon wineries,

which would reduce annual visitation by approximately 4,000 visitors (from 13,208 visitors to approximately 9,300 visitors).

Alternatively, if due to the site's characteristics, constraints, or context it is determined that a visitation and marketing program consistent with the site's current 30,000 gallon production capacity would be more appropriate given these factors, the winery could be limited commensurate with the visitation and marketing averages for a 30,000 gallon wineries, which would reduce annual visitation by approximately 5,000 visitors (from 13,208 visitors to approximately 7,000 visitors). Staff also suggests reevaluating the number of requested employees if one of these alternative is considered.

Action Required - Follow the proposed actions listed in the Executive Summary and amend scope and project specific conditions of approval to require the reduction of the proposed visitation and marketing program. If major revisions of the conditions of approval are required, staff recommends the item be continued to a future date.

Option 3 - Reduced Production Alternative

Disposition - This option would reduce the annual production to approximately 30,000 gallons that is closer to existing and entitled on-site vineyard production, which is anticipated to be approximately 8,000 gallons annually (10 acres of grapes x 5 tons per acre x 165 gallons of wine per ton of grapes). This alternative would better align production capacity with existing and proposed on-site vineyard (including vineyard currently being developed), and the uncertainty of a reliable long term grape source as a result of contracting with independent grape growers on an ongoing basis to supply necessary fruit to achieve maximum production levels.

Action Required - Follow the proposed actions listed in the Executive Summary and amend scope and project specific conditions of approval to require an annual production limit of 30,000 gallons. If major revisions of the conditions of approval are required, staff recommends the item be continued to a future date.

Option 4 - Vineyard Alternative

Disposition - This option would only consider the proposed Agricultural Erosion Control Plan (#P14-00322-ECPA) for the development of approximately 1.19 acres of new vineyard at the project site.

Action Required - Given the Mitigate Negative Declaration prepared for the project includes extensive information and analysis not germane to the small amount of vineyard being considered, should the Commission consider this option staff recommends remanding ECPA Application #P14-00322-ECPA back to the Planning Division for preparation and circulation of a Mitigated Negative Declaration specific to vineyard development for consideration and action by the Planning Director pursuant to NCC Section 18.108.070(B). It is anticipated that this could be accomplished in a fairly short timeframe because all of the necessary information is already available for the preparation of a vineyard only Negative Declaration.

Option 5 - Deny Proposed Project

Disposition - In the event the Commission determines that the project does not, or cannot meet the required findings for the granting of the Napa County Road & Street Standard Exception, the grating of a variance, or the granting of a modified use permit, the Commissioners should identify what aspect or aspects of the project are in conflict with the required findings. State Law requires the Commission to adopt findings, based on the General Plan and County Code, setting forth why the proposed Use Permit and exception request is not being approved.

In addition to the standard findings, consideration should be given to appropriate production levels given available grape resources and sourcing, appropriate levels of visitation and marketing given the location of a winery and characteristics of surrounding wineries, configuration and characteristics of local roadways utilized to access the

site including site access itself to provide appropriate and adequate access, and the need for a variance. In short given the local context of the winery site, and the efforts and requests necessary to accommodate the winery, the Commission may find this site is not appropriate for a winery of the requested production and visitation level.

Action Required - Commission would take tentative motion to deny the project and remand the matter to staff for preparation of required findings to return to the Commission on a specific date.

Additionally, the Commission may continue the item to a future hearing date at its discretion.

SUPPORTING DOCUMENTS

A . Revised Recommended Findings UP, VAR, RSS Exception, Viewshed

B . Revised Recommended Conditions UP, VAR, RSS Exception, Viewshed

C . Revised Recommended ECPA Findings and Conditions

D . Winery Comparison Analysis and Summary of Changes

E . Tier 1 Water Use Calculations January 2019

F . LSCE Water Availability Analysis Review January 2020

G . Engineering Division Road & Street Standard Exception Memo January 2020

H . Viewshed Exhibit January 2019

I . Applicant 2019 Submittal & Supplemental Documents

J . Correspondence

K . Graphics

Napa County Planning Commission: Approve

Reviewed By: Charlene Gallina

“F”

Luhdorff and Scalmanini Consulting Engineers, Review Memo

Anthem Winery P14-00320-MOD and Exception to Road and Street Standards,
Variance P14-00321-VAR and Viewshed, and
Agricultural Erosion Control Plan P14-00322-ECPA
Planning Commission Hearing Date (Wednesday, February 5, 2020)

Luhdorff & Scalmanini
Consulting Engineers

January 27, 2020
File No. 19-1-116

Mr. Donald Barrella
Napa County Department of Planning, Building & Environmental Services
Engineering and Conservation Division
1195 Third St., #210
Napa, CA 94559

SUBJECT: Water Availability Analysis Review for the Proposed Anthem Winery, Major Use Permit Modification (P14-00320)

Dear Mr. Barrella:

In response to your request, Luhdorff & Scalmanini, Consulting Engineers (LSCE) has reviewed revised documents related to the proposed Use Permit modification (P14-00320) for the Anthem Winery, which includes an increase in permitted winery production capacity, increased vineyard acreage, and marketing program expansion (Project). The Project documentation describes three sources of water that would supply new uses: groundwater from three wells (referred to as Wells 3, 6, and 8), harvested rainwater, and reclaimed winery process water. As requested by Napa County, this letter provides a summary of the Project's Water Availability Analysis (WAA) and comments on the adequacy of the WAA.

We previously provided two rounds of peer review of the Project WAA, including the WAA Memorandum by Richard C. Slade and Associates (RCS) and the accompanying Tier 1 Water Use Calculations by RSA+. The two prior rounds of peer review are documented in a memorandum dated August 10, 2017 and a letter dated January 22, 2018. This letter addresses revisions to the Project and the WAA incorporated since the October 2018 Planning Commission hearing. Those Project revisions include:

- reductions in the proposed uses of water through reductions in the number of marketing events and reductions of landscape irrigation demands,
- reductions in the projected availability of water supplies from harvested rainwater and reclaimed winery process water, consistent with published references and County guidance.

500 First Street
Woodland, CA 95776
(530) 661-0109
www.lsce.com

This letter provides our review of the revised WAA including revised water use calculations dated January 9, 2019.[1] Because the Project has been revised since our previous review, this letter takes precedence over our prior August 2017 memorandum and January 2018 letter.

SUMMARY OF REVISED PROJECT WAA FINDINGS

Since the October 2018 Napa County Planning Commission hearing, the WAA has been revised to reflect a reduction in the proposed water use and reductions in the projected availability of water supplies from rainwater harvesting and winery process water reclamation.

As part of the Tier 1 analysis, the WAA estimates all current and future water use on the Project parcels. The WAA also identifies sources of supply that will meet the Project water demands, including through a parcel-specific analysis of groundwater recharge. The WAA evaluates groundwater recharge potential on the Project parcels and concludes that average annual recharge to groundwater is 11.02 acre-feet/year (AF/yr) and 5.49 AF/yr in during drought periods. The analysis of groundwater recharge potential is unchanged from the version presented to the Planning Commission in October 2018.

Total current and proposed uses of groundwater on the Project parcels is expected to be 4.71 AF/yr in average years and 5.40 AF/yr in dry years, proposed production of groundwater across all three Project wells is 0.92 acre-feet (AF) in average years and 1.61 AF in dry years (**Table 1**). While this suggests that the proposed use of groundwater would not exceed an amount that would result in long-term reductions of groundwater levels or depletions of groundwater storage, the WAA also demonstrates, through aquifer testing at the three Project wells, that Project groundwater use would be operationally constrained by the effective pumping capacity of the Project wells. The WAA accounts for the physical constraints on Project well capacity, in part by reducing the proposed uses of water proposing to develop new sources of supply from harvested rainwater and reclaimed winery process water.

[1] RSA+, "Tier 1 Water Use Calculations *for Anthem Winery, 3454 Redwood Rd, Napa, CA*" revised, January 9, 2019. Prepared for Julie Arbuckle.

Table 1. Applicant-Estimated Existing and Proposed Water Use by Source of Supply (Acre-Feet/Year)

	Groundwater (GW)				Reclaimed Process Wastewater	Harvested Rainwater	Total
	Non-Project		Project	Total GW			
	4	1,5,7	3,6,8				
Existing Use – Average Year (WAA)	0.15	3.64	0.60	4.39	0	0	4.39
Proposed Project – Average Year (WAA)	0.15	3.64	0.92	4.71	0.69	1.32	6.72
Proposed Project – Dry Year (WAA)	0.15	3.64	1.61	5.40	0.69	0.63	6.72

The revised WAA reflects reductions in the proposed uses of water for marketing events and visitation and new landscaping. In total, the proposed use of water by the Project has been reduced by 0.32 AF/yr. As a result, the planned water use for winery and hospitality activities is 1.6 AF/yr, reduced from 1.92 AF/yr in the version of the Project reviewed in October 2018 (**Table 2**).

Table 2: Proposed Anthem Winery – Water Uses by Type (Acre-Feet/Year)

	Residential	Vineyard	Winery/ Hospitality	Total
Existing Project				
Parcel 1 (APN: 035-460-038)	0.75	0	-	0.75
Parcel 2 (APN: 035-470-046)	0.75	2.89	0	3.64
			Total	**4.39**
Proposed Project				
Parcel 1 (APN: 035-460-038)	0.75	0.62		1.37
Parcel 2 (APN: 035-470-046)	0.75	3.00	1.60	5.35
			Total	**6.72**

Revisions to the WAA incorporated since the October 2018 Planning Commission hearing also reflect more limited projections of water availability from the proposed new sources: rainwater harvesting and

winery process water reclamation. The availability from rainwater harvesting has been reduced to account for inefficiencies and losses consistent with guidance from the American Rainwater Catchment Systems Association (ARCSA).[2] Specifically, the revised WAA anticipates that the Project will be able to capture and reuse 85% of rainfall received in average years and dry years. The revised WAA also anticipates that the Project will be able to reclaim and reuse 90% of winery process water, consistent with public comments received at the October 2018 Planning Commission hearing.

The revised Tier 1 water use calculations, provided as part of the WAA, includes tables showing the monthly project water balance by source of supply and type of use.[3] These water balance summaries also show how water from each of the three sources (groundwater, harvested rainwater, and reclaimed process water) will be stored to facilitate use of water to meet demands that occur after the water is collected. The proposed water storage capacity of 480,000 gallons is sufficient to contain the projected maximum single month storage requirement of approximately 346,000 gallons in average years and 265,000 gallons in dry years (**Table 3**).

Table 3: Proposed Anthem Winery –Projected Maximum Water Storage (Gallons)

	Average Year (Gallons)	Dry Year (Gallons)
Maximum Groundwater Storage	0	39,102
Maximum Reclaimed Process Water Storage	113,387	113,387
Maximum Harvested Rainwater Storage	233,768	113,261
Maximum Single Month Total Storage, All Sources	346,022 (April)	264,895 (April)

COMMENTS RECEIVED ON THE WATER AVAILABILITY ANALYSIS

Several commenters who own, or have recently owned parcels, with water supply wells near the Project parcels have noted their experiences with dry wells, declining well yields over time, and limited well yields. Comments about the limited yield of wells on other parcels are consistent, anecdotally, with the

[2] Boulware, E.W.B. 2009. "*Rainwater Catchment Design and Installation Standards*". American Rainwater Catchment Systems Association. August 28, 2009.

[3] RSA+, "Tier 1 Water Use Calculations *for Anthem Winery, 3454 Redwood Rd, Napa, CA*" revised, January 9, 2019. Prepared for Julie Arbuckle.

findings of the aquifer testing performed by RCS for the Anthem Winery WAA. In the case of APN 035-460-036, which adjoins the Anthem parcels, commenters described two "dry wells". Public Well Completion Reports show that there were two dry test holes drilled in 2004 and 2009, but both test holes were abandoned at the time of drilling rather than being converted to completed wells. See Well Completion Reports E0099860 and E013575, Attachment A. This distinction is important because a dry borehole or test well that is never converted to a functional well is quite different from an operational well that ceases to function. The proposed Conditions of Approval for the Anthem Winery account for the likelihood that groundwater availability may be vary from one location to another by requiring that future sources of water (including wells not analyzed as part of the WAA) be evaluated if needed to supply the project in the future.

The Anthem Winery WAA acknowledges that well yields estimated by well drillers through short-term airlift tests lasting only a few hours typically overstate long-term well yields and do not provide useful data for evaluating aquifer parameters. These limitations are also noted in the County's WAA Guidance Document. The Anthem Winery WAA does not rely on well yields estimated by well drillers in the determination of the available groundwater supply for the Project. Instead, the Anthem Winery WAA uses measured groundwater production data collected at the three project wells during controlled tests to support the determination of pumping capacities for each well and for the three wells in combination. That approach is consistent with the County's WAA Guidance Document.

Actual well yields may vary with time due to various factors including changing groundwater levels in the wells, the condition of the pump installed in the well, and the condition of the well. For the Anthem Winery WAA, several sources of information were used to evaluate the availability of groundwater, these include well yields estimated from aquifer testing conducted for the WAA calculated groundwater recharge rates, and a calculated total groundwater storage volume potentially accessible by the project wells.

CONCLUSION

The extent of peer review provided for this project reflects the relatively limited water supply available for the Project. While water supply constraints are not unique to this Project, the Project has received additional scrutiny due to the relatively limited capacity of the Project wells documented by the WAA, the reliance on estimates of water use for existing uses, and the proposal to develop new sources of supply from harvested rainwater and reclaimed winery process water to meet the majority of new water demands.

The revised Project incorporates more limited projections of the availability of water from harvested rainwater and reclaimed winery process water than were initially proposed. The revised Project also incorporates reductions in the proposed uses of water through reductions in the number of marketing events and reductions of landscape irrigation demands. Information provided as part of the WAA show that projected water supplies will likely be sufficient to meet the proposed demands under average year and dry year conditions. Through the implementation of project-specific conditions of approval, the

County will be able to verify that the Project is able to realize the proposed sources of supply consistent with the WAA.

We appreciate the opportunity to provide this review. If you have any questions, or wish to discuss any of the above, we would be pleased to respond.

Sincerely,

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Reid Bryson
Senior Hydrologist

Enclosure

CC: Vicki Kretsinger Grabert, LSCE

35-460-36

ORIGINAL
File with DWR

Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. e0099860

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. TH#1-'09

Date Work Began 10/6/2009, Ended 10/12/2009

Local Permit Agency Napa County Environmental Mgmt

Permit No. E09-00448 Permit Date 10/6/2009

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL — HORIZONTAL — ANGLE — (SPECIFY)

DRILLING METHOD ROTARY FLUID AIR

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	20	BROWN CLAY
20	60	SHALE
60	75	SHALE & CLAY
75	100	SHALE
100	225	SHALE & CLAY
225	230	SHALE & SANDSTONE
230	240	SHALE
240	275	HARD SHALE
275	330	SHALE
330	360	HARD SHALE
360	385	SHALE & CLAY
385	400	HARD SHALE
400	430	SHALE & CLAY
430	560	SOFT SHALE
560	660	SHALE
660	780	SHALE & CLAY

TOTAL DEPTH OF BORING 780 (Feet)

TOTAL DEPTH OF COMPLETED WELL _____ (Feet)

WELL OWNER

Name [redacted]

Mailing Address [redacted]

CITY [redacted] STATE [redacted] ZIP [redacted]

WELL LOCATION

Address 3099 Dry Creek Road

City Napa CA

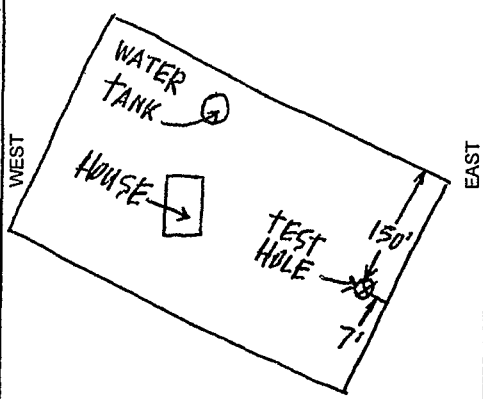
County Napa

APN Book 035 Page 460 Parcel 030

Township _____ Range _____ Section _____

Latitude _____ DEG. MIN. SEC. _____ DEG. MIN. SEC.

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
— Deepen
— Other (Specify)

— DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG"

PLANNED USES (✓)

WATER SUPPLY
✓ Domestic — Public
— Irrigation — Industrial

MONITORING —
TEST WELL ✓
CATHODIC PROTECTION —
HEAT EXCHANGE —
DIRECT PUSH —
INJECTION —
VAPOR EXTRACTION —
SPARGING —
REMEDIATION —
OTHER (SPECIFY) —

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER _____ (Ft.) BELOW SURFACE 1

DEPTH OF STATIC WATER LEVEL _____ (Ft.) & DATE MEASURED _____

ESTIMATED YIELD 0 (GPM) & TEST TYPE AIR LIFT

TEST LENGTH _____ (Hrs.) TOTAL DRAWDOWN _____ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	780	9								

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	3			✓	SOIL
3	31		✓		CHIPS
31	780			✓	PEA GRAVEL

ATTACHMENTS (✓)

— Geologic Log
— Well Construction Diagram
— Geophysical Log(s)
— Soil/Water Chemical Analysis
— Other _____

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

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

NAME HUCKFELDT WELL DRILLING, INC.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

2110 Penny Lane ADDRESS — Napa CITY — CA STATE — 94559 ZIP

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE — 10/19/09 DATE SIGNED — 439-746 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

35-460-36

ORIGINAL
File with DWR

Page 1 of 1

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. e013575

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./ STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. TW #1-'04

Date Work Began 5/17/2004, Ended 5/20/2004

Local Permit Agency Napa County Environmental Mgmt

Permit No. 96-12577 Permit Date 12/17/2003

GEOLOGIC LOG

ORIENTATION (✓) ✓ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD ROTARY FLUID AIR

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain, size, color, etc.*
0	20	BROWN CLAY
20	199	90% SHALE/ 10% CLAY
199	205	SANDSTONE
205	400	SHALE & CLAY
400	460	CLAY
460	600	60% SHALE/ 40% CLAY
		BACKFILLED TEST WELL WITH PEA GRAVEL
		TO 35'. INSTALLED BENTONITE CHIPS
		TO 5'. CONCRETE TO 3'. NATURAL MATERIAL
		TO SURFACE.

RECEIVED
JUN - 1 2004
DEPT. OF ENVIRONMENTAL MANAGEMENT

TOTAL DEPTH OF BORING 600 (Feet)

TOTAL DEPTH OF COMPLETED WELL ___ (Feet)

WELL OWNER

Name [redacted]

Mailing Address [redacted]

CITY [redacted] STATE [redacted] ZIP [redacted]

WELL LOCATION

Address 3099 Dry Creek Road

City Napa CA

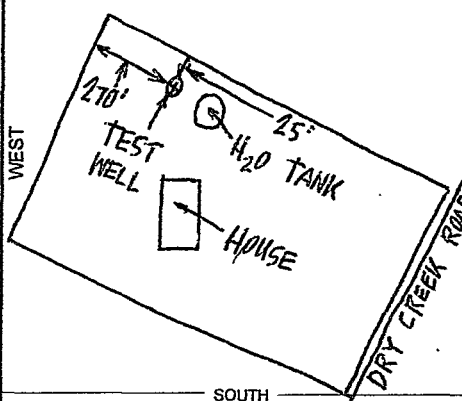
County Napa

APN Book 35 Page 460 Parcel 30

Township ___ Range ___ Section ___

Latitude ___ DEG. MIN. SEC. ___ DEG. MIN. SEC.

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. **PLEASE BE ACCURATE & COMPLETE.**

ACTIVITY (✓)

✓ NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG"

PLANNED USES (✓)

WATER SUPPLY
___ Domestic ___ Public
___ Irrigation ___ Industrial

MONITORING ___
TEST WELL ✓
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	600	9								

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	3			✓	SOIL
3	5	✓			CONCRETE
5	35		✓		CHIPS
35	600			✓	GRAVEL

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analysis
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

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

NAME HUCKFELDT WELL DRILLING (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

2110 Penny Lane ADDRESS Napa CITY CA STATE 94559 ZIP

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE

05/26/04 DATE SIGNED

439-746 C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

RAINWATER CATCHMENT DESIGN

AND

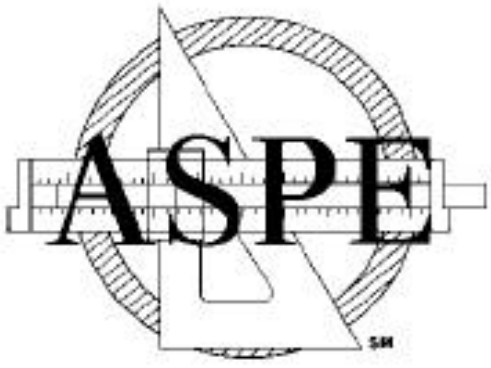
INSTALLATION STANDARDS

by

Chairman
E. W. Bob Boulware, P.E.

Contributors:
Timothy Pope - Dennis Lye, PhD- Billy A. Kniffen
Joseph Wheeler - William Morris - Richard Jennings
Jack Shultz, P.E.- Will Ed Winters, P.E. - Cado Daily - John Kight, P.E.

August 28, 2009



RAINWATER CATCHMENT DESIGN AND INSTALLATION STANDARDS

TABLE OF CONTENTS

1.0 SCOPE

1.1 General

1.1.1 Rainwater Catchment System is defined as a system that utilizes the principal of collecting and using precipitation from a rooftop or other manmade, above ground collection surface.

1.1.2 This Rainwater Catchment Design and Installation Standard, (hereinafter referred to as the *Standard*) has been developed by a joint effort of the American Rainwater Catchment Systems Association (ARCSA) and the American Society of Plumbing Engineers (ASPE). The purpose of this standard is to assist engineers, designers, plumbers, builders / developers, local government, and end users in safely implementing a rainwater catchment system. This standard is intended to apply to new rainwater catchment installations, as well as alterations, additions, maintenance and repairs to existing installations.

1.1.3 The standards mentioned herein are intended to be consistent with, and complimentary to, the requirements of the Uniform Plumbing Code, International Plumbing Code, National Institute of Health, and local Board of Health. However, installers are advised to consult with the plumbing authority regarding local conditions, requirements and restrictions.

1.2 PERFORMANCE OBJECTIVES

1.2.1 Rainwater systems are capable of producing high quality water, to levels meeting public utility standards, but only if properly maintained by the system owner or operator. The objectives of this Standard are to provide guidance in how to provide and maintain a healthy alternative to utility provided water, and to optimize rainwater utilization, while ensuring that:

A. Consumers of rainwater are safeguarded from illness as a consequence of poor design, installation, maintenance or illegal work.

B. The public is safeguarded from injury or loss of amenity due to a failure of the supply, installation, maintenance, or operation of the rainwater catchment system.

C. The Rainwater System will serve to maintain and enhance the quality of the environment while ensuring compliance with the intent of relevant regulations and government officials.

1.2.2 This Standard applies to the following applications

A. Non-Potable

B. Potable

C. Fire Protection

D. Agricultural

E. Industrial

1.3 UNITS OF MEASUREMENT

1.3.1 Values are stated in U.S. Customary Units and shall be considered as the standard.

1.4 RELATED STANDARDS

1.4.1	NSF International Protocol P151:	Health Effects From Rainwater Catchment System Components.
1.4.2	NSF / ANSI 61:	Drinking Water System Health Effects.

End of Section

2.0 ACCEPTABLE MATERIALS AND COMPONENTS

2.1 General

2.1.1 The following standards are referenced in this document.

2.1.2 The listing of a reference in this consensus standard shall imply the application of the latest issue, revision or affirmation, including all referenced documents listed therein.

2.2 Related Standards

2.2.1 American National Standards Institute (ANSI)

A. ANSI A21.10 ANSI Standards for Ductile-Iron and Gray-Iron Fittings.

B. ANSI B16.22 Wrought Copper and Copper Allow Solder Joint Pressure Fittings.

2.2.2 ASTM International (ASTM)

A. ASTM B 32 Specifications for Solder Metal.

B. ASTM B 75 Specifications for Seamless Copper Tub.

C. ASTM B 828 Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings

.

D. ASTM B 638 Test Method for Tensile Properties of Plastics.

E. ASTM B 695 Test Method for Compressive Properties of Rigid Plastics.

F. ASTM D 1599 Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tube and Fittings.

G. ASTM D 1600 Terminology for Abbreviated Terms Relating to Plastics.

H. ASTM 1785 Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedule 40, 80, and 120.

I. ASTM D 2104 Specification for Polyethylene (PE) Plastic Pipe, Schedule 40.

J. ASTM D 2241 Specification for Poly Vinyl Chloride (PVC) Pressure Plastic Pipe.

K. ASTM D 2282 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR).

L. ASTM 2466 Standard Specification for Poly Vinyl Chloride (PVC) Plastic Fittings, schedule 40.

M. ASTM 2467 Standard Specification for Poly Vinyl Chloride (PVC) Plastic Fittings, Schedule 80.

N. ASTM D 2447 Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.

O. ASTM D 2468 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40.11

P. ASTM D 2657 Practice for Heat-Joining Polyolefin Pipe and Fittings.

Q. ASTM D 2661 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.

R. ASTM D 2665 Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

S. ASTM D 2855 Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

T. ASTM D 2949 Specification for 3.25-in. Outside Diameter Poly (Vinyl Chloride)(PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

U. ASTM D 3261 Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

V. ASTM D 3311 Specification for Drain, Waste, and Vent (DWV) Plastic Fittings.

W. ASTM D 3350 Specification for Polyethylene Plastics Pipe and Fittings Materials.

X. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials.

Y. ASTM E 412 Terminology Relating to Plastic Piping Systems.

Z. ASTM F 628 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core.

Aa. ASTM F 714 Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

Bb. ASTM F 1866 Specification for Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings.

Cc. ASTM F 1901 Specification for Polyethylene (PE) Pipe and Fittings for Roof Drain Systems.

2.2.3 American Water Works Association (AWWA)

A. AWWA C110 Standard for Ductile-Iron and Gray-Iron Fittings, 3 in.- 48 in. (76 mm-1,219 mm), for Water C606 Grooved and Shouldered Joints.

B. AWWA C.606 Grooved and Shoulder Joints.

2.2.4 Cast Iron Soil Pipe Institute (CISPI)

A. CISPI 301

B. CISPI 310 Specification for Couplings for Use In Connection With Hubless Cast Iron Soil Pipe and Fittings For Sanitary and Storm Drain Waste and Vent Piping Applications.

2.2.5 American Society of Mechanical Engineers (ASME)

A. ASME A 112.6.4 Roof, Deck and Balcony Drains.

2.2.6 Copper Development Association (CSA)

A. Copper Tube Handbook.

2.2.7 Crane Technical Paper No. 410, - Flow of Fluids Through Valves, Fittings and Pipe,@ 1988.

2.2.8 International Organization for Standardization (ISO)

A. ISO 899 Plastics- Determination of Tensile Creep Behavior.

2.2.9 National Weather Service

A. NWS HYDRO-35 Five to Sixty Minute Precipitation Frequency of the Eastern and Central United States.

B. National Climate Data Center http://www.ncdc.noaa.gov/oa/ncdc.html

2.2.10 NOAA Technical Memorandum

A. NOAA Short Duration Rainfall Frequency Relations for California.

B. NOAA Short Duration Rainfall Frequency Relations for the Western United States.

2.2.11 NSF International

A. Protocol P151: Health Effects from Rainwater Catchment System Components.

B. NSF / ANSI Standard 14: Plastic Piping System Components and Related Materials.

C. NSF / ANSI Standard 42: Drinking Water Treatment Units--Aesthetic Effects.

D. NSF / ANSI Standard 53: Drinking Water Treatment Units-- Health Effects.

E. NSF / ANSI Standard 55: Ultraviolet Microbiological Water Treatment Systems.

F. NSF / ANSI Standard 58: Reverse Osmosis Drinking Water Treatment Systems.

G. NSF / ANSI Standard 60: Drinking Water System Chemicals Health Effects.

H. NSF / ANSI Standard 61: Drinking Water System Components Health Effects

2.2.12 American Public Health Association

A. Standard Methods for the Examination of Water and Wastewater.

End of Section

3.0 DESIGN AND INSTALLATION REQUIREMENTS

3.1 Collection Parameters.

3.1.1 All piping and plumbing component materials used in the installation of a rainwater harvesting system shall be as approved for the specific use per local plumbing code, or be listed by an ANSI accredited product certification program as available.

A. Collection roofing, gutters, piping, fittings, valves, screens, down spouts, leaders, flushing devices, tanks, and liners, shall be approved for the intended use.

B. All tank interior surfaces, and equipment shall be washed clean before they are put into service.

C. For water storage volumes less than 360 gallons (1,363 liters), or intended for minor utility, irrigation and garden use, no treatment is required.

D. Water level control devices that control pumps, makeup water valves, etc, in contact with the water supply, shall be mercury free devices.

E. Overhanging vegetation and proximity to air borne pollution sources are to be avoided.

F. These standards do not apply to the collection of rainwater from vehicular parking or other similar surfaces.

3.1.2 For non-potable water applications,

A. The collection surface may be constructed of any above-ground, hard surface, impervious material.

B. Harvested rainwater must be filtered or treated to an appropriate quality suitable for intended use. No treatment is required for sub surface irrigation, agricultural, or garden use. For above surface Irrigation, the local authority having jurisdiction should be consulted regarding required water quality.

3.2 Conveyance System

3.2.1 The Roof Drainage System. Gutters and downspouts used to collect rainwater shall comply with the following:

A. All piping, plumbing components, and material used shall be manufactured of material approved for the intended application, conforming to the standards described herein in Chapter 2, and meeting the intent of applicable Building and Plumbing Codes.

B. Gutter and down spout systems leading to the cistern shall be fitted with debris excluder or equivalent device.

3.2.2 Washers and Pre-filtration. All collected rainwater, for potable water application, shall pass through a roof washer or pre-filtration system before the water enters the cistern(s). Roof washer systems shall meet the following design requirements:

A. A sufficient amount of rainwater shall be wasted, and not allowed to enter the cistern, to wash accumulated debris from collection surface. Approximate amount of rainfall to be wasted shall be adjustable as necessary to minimize cistern water contamination. (See Chapter Five, *Acceptable Piping Schematics*, for guidance in determining pre-wash water volume)

B. The inlet to the roof washer shall be provided with a debris screen that protects the roof washer from the intrusion of waste and vermin. The debris screen shall be corrosion resistant and shall have openings no larger than 0.5 inches and no smaller than 0.25 inches nominal. Pre-filters which have a self-cleaning design are not required to have the aforementioned debris screen.

Exception: This item is not required for pre-filters which provide their own method of diverting the prescribed first flush.

C. Water drained from the first-flush diverter or pre-filter will be piped away from the storage tank and terminate in a location which will not cause damage to property or cause erosion.

D. If more than one cistern is used a screen, roof washer or pre-filtration system shall be provided for each cistern.

Exception: Where cisterns are interconnected to supply water in series, a single pre filter will be permitted

E. First flush diverters and pre-filters shall be provided with an automatic means of self draining between rain events.

F. Roof washers shall be readily accessible for regular maintenance.

G. Pre-filtration screens or filters shall be maintained consistent with manufacturer=s specifications.

3.3 CISTERNS / STORAGE. The following are the minimum requirements for cisterns:

3.3.1 General:

A. Cisterns may be used as storm-water collection points that help to minimize flood damage, while providing a reservoir for later use. Cisterns shall have access to allow inspection and cleaning.

3.3.2 Installation:

A. Cisterns may be installed either above or below grade

B. Tank shall comply with the Administrative Authority having jurisdiction, local building codes and ordinances, and / or as certified by a structural engineer.

C. Above grade plastic tanks shall be certified by the manufacturer for intended application.

D. Above grade cisterns shall be protected from direct sunlight and shall:

1. Be constructed using opaque, UV resistant, materials: i.e. heavily tinted plastic, lined metal, concrete, wood, or painted to prevent algae growth,

or

2. Have specially constructed sun barriers e.g. installed in garages, crawlspaces, sheds, etc.

E. Below grade cisterns, located outside of the building, shall be provided with manhole risers a minimum of 4 inches above surrounding grade and / or installed in such a way as to prevent surface or ground water from entering through the top of any fittings.

F. Where the installation requires a foundation, the foundation shall be flat and shall be designed to support the cistern weight when the cistern is full consistent with bearing capability of adjacent soil.

G. In areas where sustained freezing temperatures occur, provisions will be made to keep cistern and the related piping from freezing.

H. All cisterns shall be installed in accordance with the manufacturer's installation instructions.

1. Underground tanks shall comply with OSHA's construction Industry Standards Part 1926 Subpart P, Fall protection rules and regulations and any local codes relating to excavation and backfill technique or safety.

2. Above grade tanks shall be installed on a sturdy and level, foundation or platform, adequately secured with adequate drainage.

I. In a situation where the soil can become saturated, an underground tanks shall be ballasted, or otherwise secured, to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold down ballast should meet or exceed the buoyancy force of the tank, calculated as follows:

Example:

1. Buoyant force of Cistern (lbs) =

Cistern Volume (cubic feet) x 62.4 (lbs / cubic foot) e.g.

For 1000 gallon tank, Buoyant force will be 1000 gallons x (1 cubic foot / 7.48 gallons) x 62.4 (lbs / cubic foot

= 8342 lbs

2. If concrete used as ballast, the volume needed will be:

Volume (cubic feet) = 8342 lbs x cubic feet / 150 lbs

= 55.6 cubic feet (2.1 cubic yards)

J. Cisterns shall be provided with a means for draining and cleaning.

K. All cistern openings shall be protected from unintentional entry by humans or vermin. Manhole covers shall be provided and shall be secured to prevent tampering.

1. Where an opening is provided that could allow the entry of personnel, the opening shall be marked,

"DANGER - CONFINED SPACE@.

3.3.3 Inlets, Outlets and Openings.

A. Cistern inlets shall be provided to permit water to enter tank with minimum turbulence.

B. The overflow outlet, or flap valve, shall be protected with a screen having openings no greater than 0.125 inches, or as otherwise appropriate, for preventing entrance of insects or vermin entering the cistern.

1. Overflow outlet shall be sized in accordance with prevailing gutter and down spout requirements.

2. Water from the cistern overflow shall be discharged in a manner consistent with local storm water runoff requirements and as approved by the local authority having jurisdiction, or may be allowed to infiltrate excess collected water into the aquifer.

3.4 PUMP.

3.4.1 Where a pump is provided in conjunction with the rainwater harvesting system, the pump shall meet the following provisions:

A. The pump and all other pump components shall be listed and approved for use with potable water systems.

B. The pump shall be capable of delivering a minimum of 15 psig residual pressure at the highest and / or most remote outlet served. Minimum pump pressure shall allow for friction and other pressure losses. Maximum pressures shall not exceed 80 psig. A pressure reducing valve shall be provided at water branch distribution piping if the pump is capable of exceeding 75 psig.

3.5 FILTRATION. Filtration shall meet the following provisions

3.5.1 Where rainwater is used for non-potable use and for non critical operations, such as irrigation, wash down, etc., a final stage filtration system is not required.

3.5.2 Where rainwater is used for non-potable use, interior to an occupied facility, for makeup for laundry, toilets, process, etc.; the water is to be filtered as a safeguard against sediment or discoloration, and for proper operation of valves or other devices.

3.6 PIPING

3.6.1 There shall be no direct connection of any rainwater harvesting pipe system and a public utility- provided domestic potable water pipe system without an approved back flow device.

3.6.2 Separation shall be maintained between potable and non potable water systems at all times. Cross connections, without proper protection in accordance with local applicable plumbing code, will not be permitted.

A. All material used as part of a rainwater harvesting system shall be as listed for the purpose intended, as designated by local applicable code.

B. Where rainwater harvesting pipe and potable water pipe are installed in the same trench, wall cavity, or other location, the potable water pipe shall be separated by a minimum distance of twelve inches (12") above the rainwater - harvesting pipe. Both pipes shall be installed below local frost depth.

3.6.3 Piping Materials.

A. Rainwater distribution water piping, fittings and other related system components shall be suitable for domestic water application as indicated in the applicable local building and / or plumbing code, or as otherwise described in Section 2.

B. Plastic piping shall be protected from UV radiation by a factory apply protective coating, or painted with a compatible latex paint. Piping and solvent cements shall be approved for the intended use.

3.6.4 Labeling. If a Rainwater Harvesting System is applied to any building, facility or residence, it shall be so indicated as follows:

A. All rainwater supplied fixtures, not specifically treated for potable water use, shall be prominently labeled

"NON-POTABLE - DO NOT DRINK@

B. Non-potable water piping shall be designated by colored bands and solid color piping as specified by the authority having jurisdiction or national code agencies, and labeled:

ANON POTABLE - RAINWATER"

C. Outlets and fixtures served with harvested rainwater shall be easily recognizable by color or a symbol for non-potable water.

3.6.5 Inspections. Rainwater harvesting systems are considered a private water system under the responsibility of the building owner / operator, and shall be minimally inspected according to the following schedule:

A. Inspection of all elements before they are covered (rough-in inspection)

B. Final inspection including testing.

C. In addition to testing required by the code for plumbing systems, the following also apply:

1. Testing and Commissioning

2. Piping. A flow test shall be preformed through the system to the point of water distribution and disposal. In addition, the water distribution system shall be tested and proved tight at the operating pressure. Where the manufacturer permits, a 50-psi hydrostatic test may substitute for the test above. All lines and components shall be watertight.

D. Other inspections as needed to assure proper system operation.

3.6.6 System Maintenance. It is the property owner=s responsibility to maintain the system components according to manufactures written recommendations.

3.6.7 Rainwater harvesting systems shall be maintained in functioning order for the life of the system.

A. Filtration and Disinfection systems shall be serviced in accordance with manufactures recommendations.

B. System Abandonment. If the owner of a rainwater harvesting system elects to cease use of, or fails to properly maintain such system, they shall abandon the system. To abandon the system, the system owner shall minimally:

1. Remove or disable all system connecting piping to utility provided water system..

2. Replace the rainwater harvesting pipe system with an approved potable water supply pipe system. Where an existing potable pipe system is already in place, fixtures may be re-connected to the existing system.

3. Secure cistern from accidental access by sealing or locking tank inlets and access points, and / or filling with sand or equivalent.

3.7 POTABLE RAINWATER APPLICATIONS

3.7.1 Collection Surfaces for potable water applications shall be as noted in 3.1.1 above but shall also be made of non-toxic material.

A. Painted surfaces are only acceptable if paint has been certified to ensure the toxicity level of the paint is acceptable for drinking water contact. Lead, chromium or zinc based paints are not permitted.

B. Enameled Steel.

C. Flat Roofs: Roof products shall be certified to NSF Protocol P151.

D. Collection of water from vehicular parking surfaces is prohibited.

Not approved for potable water

E. Wood / Cedar shake roofing.

F. Copper roofing materials.

G. Lead flashing is not approved for potable water.

Not Recommended for Potable Water or to be used with caution.

H. Bitumen / Composition roofing.

I. Galvanized, zinc-coated metal.

3.7.2 Cistern Inlets:

A. Methodology of water entering cistern shall be to maintain A quiet flow A in the cistern by minimizing splashing and disturbance of sediment in bottom of cistern.

B. For potable water applications, and recommended for maintaining good water quality, the pipe entering the cistern shall terminate in a return bend elbow pointed upward at the bottom of the tank, or equivalent calming device.

3.7.3 Cistern outlets shall be provided with floating inlet to draw water from the cistern just below the water surface.

A. Alternate: Cistern outlet to be located at least 4 inches above the bottom of the cistern.

3.7.4 Cisterns shall be intended for potable water use.

A. Cisterns shall be certified for use with potable water with NSF, or recognized equivalent. Plastic tanks shall be constructed of virgin plastic and shall adhere to requirements of NSF / ANSI Standard 61.

B. Cisterns shall not be connected directly to a public or community water supply without approved back-flow protection. Make-up water to rainwater storage tanks, when provided, may be made through a reverse pressure principle back flow device or an air gap per local plumbing codes.

C. If installed below grade, cisterns shall be separated from sanitary waste piping a distance as recommended by local authority having jurisdiction, or local plumbing codes, and up gradient from septic field piping where applicable.

3.7.5 Filtration

A. Carbon filtration may be provided for reduction of taste, odor and organic chemicals.

B Filtration and Disinfection systems shall be located after water storage tank and as close to the final point of use as possible.

C. All particulate filtration shall be installed upstream of disinfection systems.

D. Filters shall be adequate size to extend service time and must be comply with NSF / ANSI Standard 53.

3.7.6 Water Disinfection

A. Chlorination: Chlorination may be used with an automated demand feed system, and if used, shall enable adequate contact time and residual according to local health authorities.

B. Ozone: Ozone may be used with an approved ozone system ensuring adequate contact time with the ozone. Provision must be made to off- gas ozone to a safe environment.

C. Ultra-violet disinfection may be used and shall be provided between final filtration (5 micron maximum) and final point of use.

3.7.7 Operation and Maintenance

A. After several cycles of rain harvesting, a initial sample of the resultant accumulated water shall be tested for compliance according to procedures listed in the latest edition of Standard Methods for the Examination of Water and Wastewater (ALPHA).

B. For a Private System, prior to placing the water system into service, water quality testing, at a minimum shall be performed for E. Coli, Total Coliform, and heterotrophic bacteria. Subsequent periodic testing to assess the ongoing integrity of ths system is recommended.

C. For a Public System (defined as a system where 25 different persons consume water from the system over a 60 day period):

1. In addition to the above tests, water shall be tested for cryptosporidium.

2 Subsequent annual tests shall be made for Total Coliform, E Coli, Heterotrophic bacteria and any chemicals of concern.

3 Records of test results shall be maintained for at least two (2) years.

End of Section

4.0 DEFINITIONS

In addition to definitions used in the Uniform and International Plumbing Codes, the following definitions apply to rainwater harvesting systems:

1. AUXILIARY SUPPLY:	Water supply that is arranged and protected from contamination that is available to provide an alternate means of filling a cistern.
2. CALMING INLET:	A device that permits water to enter a storage tank with minimal disturbance to particles that may have settled to bottom of the tank. See Quiescent Flow.
3. CISTERN :	The central storage component of the rainwater harvesting system. Protection and maintenance of the cistern is essential for the health of the system.
4. CODE:	Refers to the local written authority i.e. the Uniform Plumbing Code, International Plumbing Code, NSF International, etc.
5. COLLECTION AREA:	Area from which rainwater is collected for use in a rainwater harvesting system (e.g. roof area).
6. DEBRIS EXCLUDER:	A screen or other device installed on the gutter or down spout system to prevent the accumulation of leaves, needles, or other debris in the system.
7. DISINFECTION:	Reduction of viable micro-organisms to a level that is deemed suitable for the intended application. Typical units of measure are Colony Forming Units per deca-liter (cfu / dl).
8. DRY RUN PROTECTION:	System for protecting the water pump against running dry.
9. EVAPORATION FIELD:	Element in the ground that is filled with gravel, ballast or special non-permeable plastic elements and that stores rainwater that is fed into it on an intermediate basis before the water evaporates into the atmosphere or seeps into the surrounding soil.
10. FILTRATION:	Physical removal of liquid-borne contaminants by means of separation from the output flow. Particulate filtration removes suspended particles (measured in units of Total Suspended Solids (TSS); while other forms of filtration, such as carbon / absorption filtration, removes dissolved compounds measured in units of Total Dissolved Solids (TDS).

11. GROUND WATER:	Water that saturates into the ground and no longer flows across the surface, it is considered “Groundwater”
12. FIRE SPRINKLER RESERVE:	Volume of water needed for fire protection that is not available for any other use and accessible only by the fire pump
13. FLAT:	Having a slope no greater than 1 in 50.
14. HARVESTED WATER:	Process water system for utilizing rainwater for potable, non-potable, industrial or irrigation application.
15. LEACH FIELD, EVAPORATION / TRANSPIRATION FIELD:	Element in the ground that is filled with gravel, ballast or special permeable plastic elements and that stores rainwater that is fed into it on an intermediate basis before the water seeps into the surrounding soil.
16. MINIMUM WATER VOLUME:	Recoverable water volume that is constrained by the process such that neither sediment nor scum can be sucked into the deliverable water.
17. OVERFLOW LEVEL:	The highest level that water from a drainage system can rise to.
18. OVERFLOW LINE:	Line for leading away rainwater when the rainwater reservoir is full, e.g. into the sewage system or a seepage system
19. PIPING SYSTEM:	Pipes that conveys the harvested rainwater and distributes it to various fixtures.
20. POINT OF USE:	A point in a domestic water system, nearest to a water consuming plumbing fixture, where water is used.
21. PRECIPITATION:	Water that has precipitated from the atmosphere (e.g. rain, snow, mist, dew)
22. PRECIPITATION CHARACTERISTICS:	Characteristics of a precipitation event (e.g. intensity, duration)
23. PRIVATE WATER SYSTEM:	System used by less than 25 persons over a 60 day period.
24. PROCESS WATER:	Water to be used for household and commercial applications.
25. PROCESS WATER LINE:	System of lines from the process water pump to the individual points at which water is drawn.

26. PROCESS WATER PUMP:	Pumps process water from the rainwater reservoir to the points at which it is drawn.
27. PROCESS WATER REQUIREMENTS:	Planning value for the process water amount that is expected to be required in a specified period of time.
28. PUBLIC WATER SYSTEM:	System that is used by 25 or more different persons over a 60 day period.
29. QUANTITY OF PRECIPITATION:	Precipitation at a certain place, expressed as the water height over a horizontal area for a span of time under consideration .
30.QUIESCENT INFLOW:	Routing of rainwater into rainwater reservoirs so that the existing sediment is not activated in the rainwater reservoir and an immediate sedimentation of solids is possible.
31. RAINWATER :	Water from natural precipitation that was not contaminated by use.
32. RAINWATER HARVESTING SYSTEM:	Water system for utilizing rainwater, consisting of a cistern(s), pipe, fittings, pumps and/or other plumbing appurtenances, required for and/or used to harvest and distribute rainwater.
33. RAINWATER LINE:	Supply, drainage, overflow and emptying lines of a rainwater harvesting system.
34. RAINWATER YIELD:	Net water volume (water inflow) ,determined over a certain period of time, available for use as process water. Typically this is approximately 80% of theoretical collectable rainwater.
35. RETURN ELBOW :	A section of pipe with a 180-degree bend.
36. ROOF DRAINAGE SYSTEM:	A system, comprised of roof drains, overflow drains, scuppers, gutters and down spouts, used to convey the rainwater from the roof surface to the roof washer and the cistern.
37. ROOF SURFACE :	The surface rainwater harvesting systems rely on for the collection of rainwater that has fallen on a building roof.
38. ROOF WASH OR ROOF WASHER:	A device or method for removal of sediment and debris from collection surface by diverting initial rainfall from entry into the cistern(s). Also called a First Flush Device
39. SCREEN:	A filtration device, constructed of corrosion resistant wire or other approved mesh, having openings in determined sizes.

40. SEDIMENTATION:	Separation of solids from the water via gravity.
41. SLOPE OR SLOPING:	Having a slope greater than 1 in 50.
42. SUB-SURFACE IRRIGATION:	Water that is applied below ground level, and is not directly exposed to the above ground surface and/or surrounding air.
43. SUCTION LINE:	Water pump inlet piping.
44. SUN BARRIERS :	A cover, or erected structure, specifically to shelter a cistern from the direct rays of the sun.
45. SUPPLEMENTAL SUPPLY:	Equipment for providing a supplemental supply of drinking water or non-drinking water into process water systems
46. SURFACE IRRIGATION:	Water that is applied above ground level and is directly exposed to the above ground surface and/or air.
47. SURFACE WATER:	Any rain water that touches the ground and flows across the surface of the ground (roadway, parking surface, gully, creeks, streams etc.) to be termed “surface water”.
48. SYSTEM CONTROL UNIT:	Control unit for the automatic operation of the rainwater harvesting system .
49. TRANSFER PUMP:	A mechanical device to transfer collected water from down spouts to remote cisterns.
50.USEFUL VOLUME:	Volume that can be completely used during operation (Typically .80 - .90 of storage volume).
51. YIELD COEFFICIENT:	Ratio of the rainwater annually flowing into the rainwater harvesting system to the total amount of rainwater in the accompanying precipitation area , allowing for leakage, splashing, evaporation, etc. (Typically .75 - .90).

End of Section

5.0 ACCEPTABLE PIPING SCHEMATICS

Figure 1: Potable and / or Non-Potable Water

Figure shows an above ground application in a non-freeze environment. In an environment where freezing is possible, tank should be moved to a heated environment or buried below the frost line, as shown in the following details.

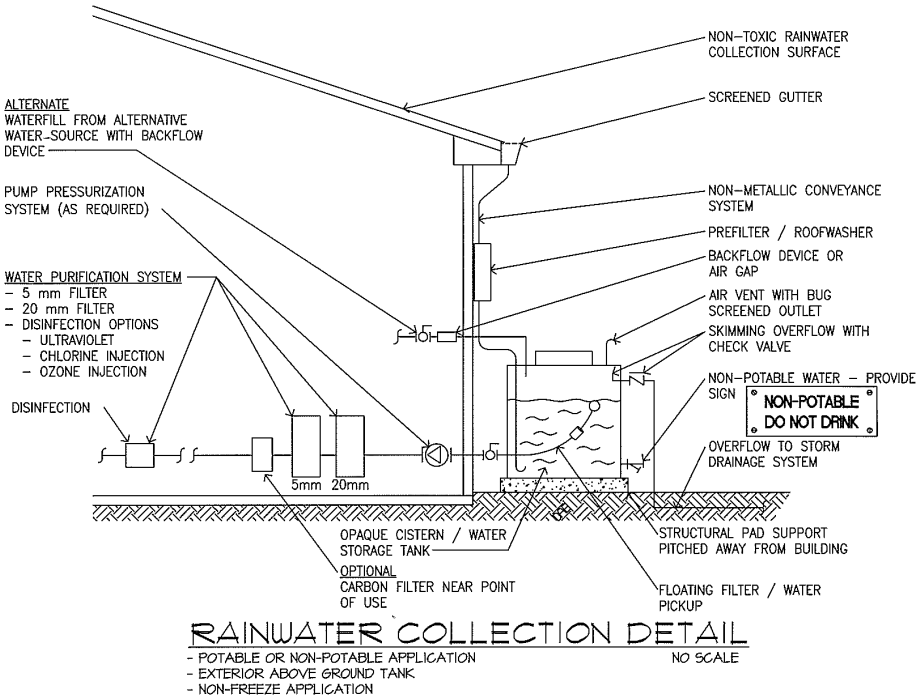


Figure 1

Figure 2: Underground Exterior Cistern for Potable Application.

Where carbon filters are used, they may be put down stream of chlorine and ozone disinfection systems, but are recommended to be upstream of Ultraviolet disinfection systems. Where soil saturation is a possibility, it is recommended that the combined weight of the tank and ballast must meet or exceed the buoyancy upward force of an empty cistern. This buoyance force (lbs.) is equal to the volume of the tank (cubic feet) x 62.4 lbs / cubic feet, or tank volume (gallons) x 8.34 lbs / gallon water

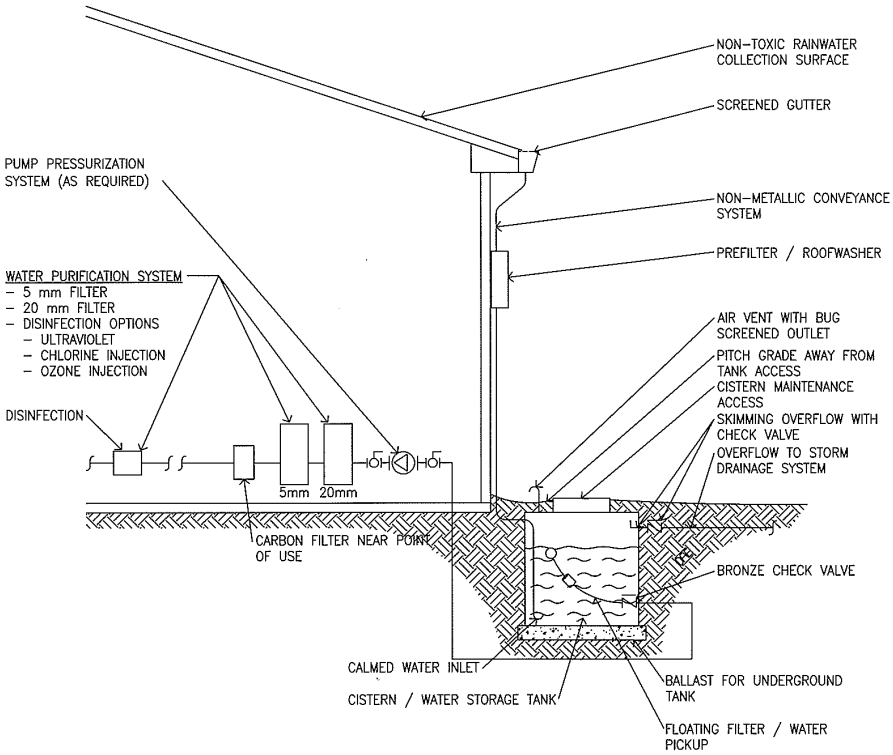


Figure 2

Figure 3: Non-Potable Water

This application is suitable for lawn and plant irrigation or process water makeup. Filters to remove particulate may be added to improve water quality in order o avoid problems with sprinkler or process devices. Signage marking water outlets as " Non-Potable, Do Not Drink " are required in a public environment and highly recommended elsewhere.

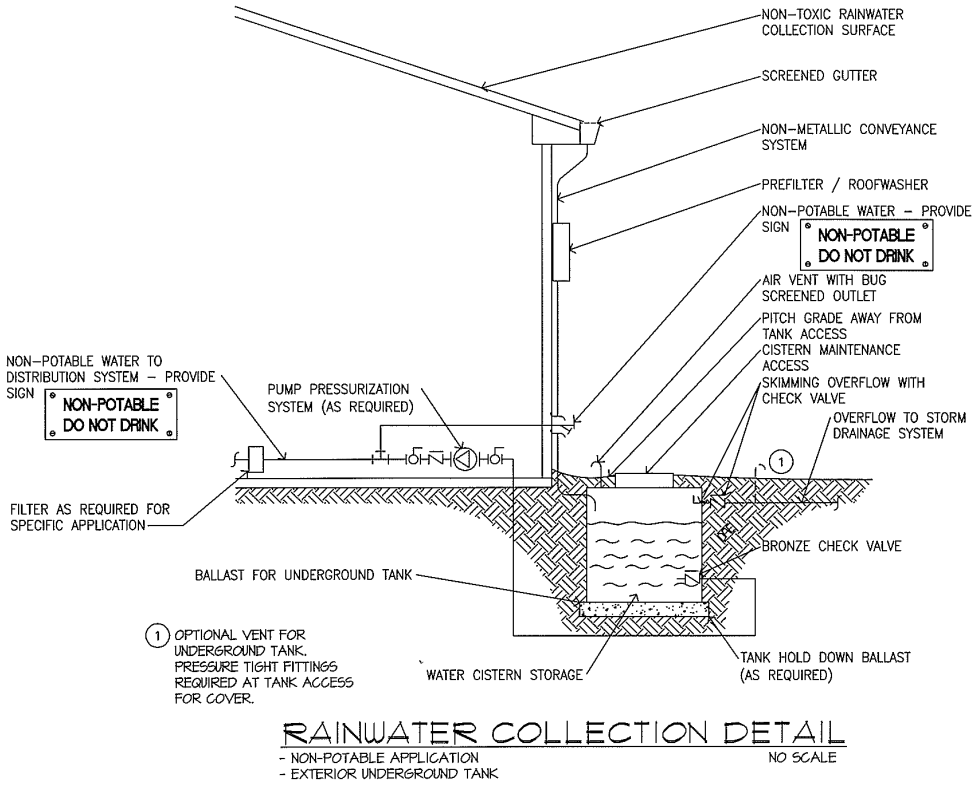


Figure 3.

Figure 4: Potable and Non-Potable Water

Installing a water storage tank in a heated environment is preferred for an installation subject to freezing. Appropriate signage is necessary to label non-potable water outlets.

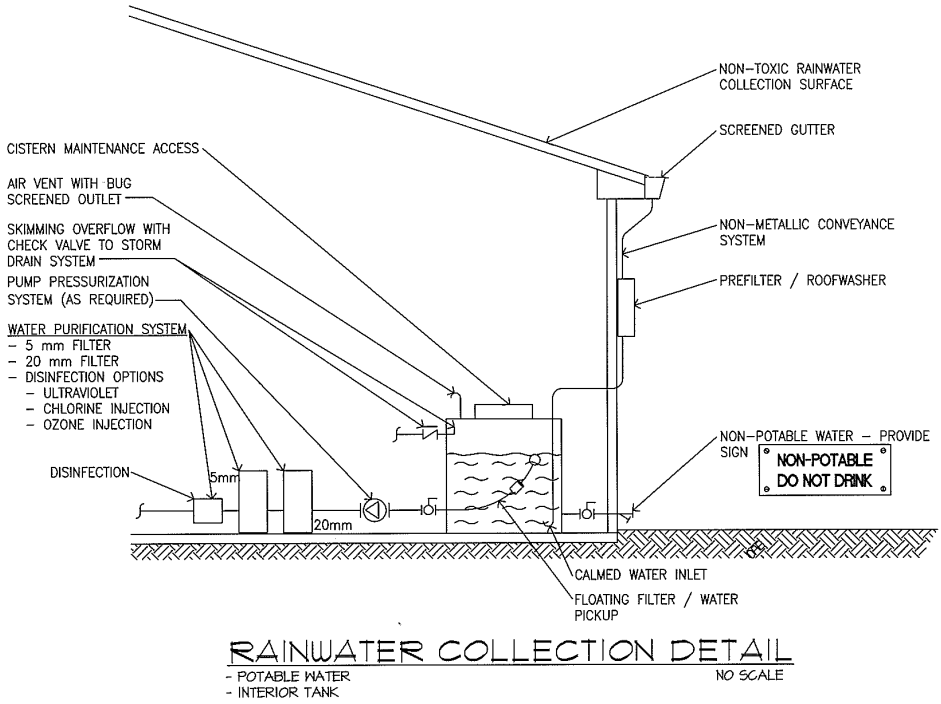


Figure 4.

5.1 ROOF WASHER

Roof Washers are commonly used to waste the initial water coming off the collection surface before being allowed to fill the cistern. Commonly used roof wash amounts are indicated below, but may be varied to reflect actual site and seasonal conditions**.**

Estimated Roof Contamination Potential

High Contamination [1]	Medium Contamination	Low Contamination[2]
.03" / 8mm	.01" / 2 mm	.002" / .5mm

Notes:

(1) High Contamination is considered to have high content of organic debris from animal waste, adjacent trees, and / or airborne contamination.

(2) Low Contamination is considered to either have frequent rainfall to keep collection surface clean, and / or minimal non toxic contamination.

(3) Sample Calculation: 1000 square foot collection surface, medium contamination:

Gallons = .01" rain x 1000 Square Feet x .623 gallons / square foot - inch:
= 6.23 gallons

Figure 5.

There are many different styles of roof wash devices. The simplest versions involve filling a stand pipe section of piping that contains adequate volume, that once full, then overflows into the cistern.(See Figure 6). A short coming of this concept is that it allows mixing from the contaminated pre-wash volume and the water to be saved in the cistern.

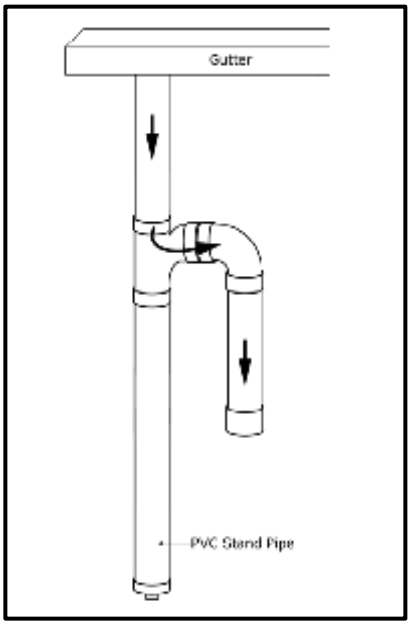


Figure 6.

Another commercially available first flush diverter (See Figure 7.) attempts to address the mixing issue by using a stand pipe and floating ball. Once the standpipe is filled with the pre-wash water, a floating ball seals off the remaining flow preventing the pre-wash water from being mixed with the remaining flow. The remaining rainfall is then diverted to the
cistern. This device has a drain at the bottom that allows diverted water to slowly drain after each rainfall event and a clean-out plug to clean out any accumulated debris.

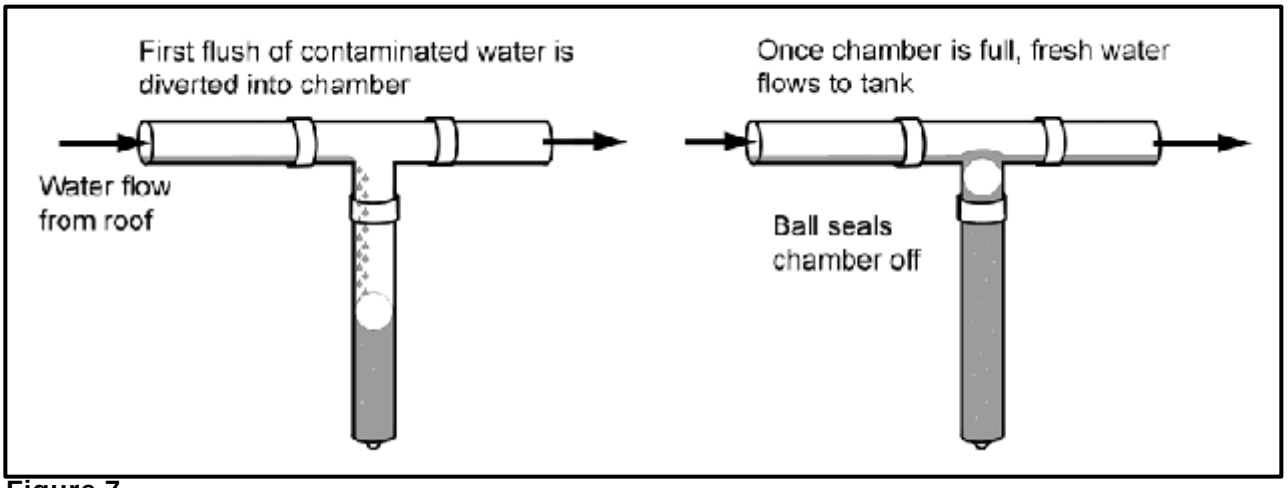


Figure 7.

Other commercially available combination pre-filter and roof wash devices are available to help maintain the water quality of the rainwater harvesting system.

The volume of pre-wash for a nominal 4" (4.046 inch actual) diameter PVC pipe can be determined as follows in Figure 8a.

4" PVC Pipe Storage Volume

Length : feet (meters)	Volume: gallons (liters)
1 (.3)	.7 (2.6)
3 (.9)	2.0 (7.6)
5 (4.6)	3.3 (12.5)
10 (3.0)	6.7 (25.4)
15 (4.6)	10.5 (38.1)

Figure 8a.

The volume of pre-wash for a nominal 6" (6.065 inch actual) diameter PVC pipe can be seen in Figure 8b.

6" PVC Pipe Storage Volume

Length : feet (meters)	Volume: gallons (liters)
1 (.3)	1.5 (5.7)
3 (.9)	4.5 (17.0)
5 (4.6)	7.5 (28.4)
10 (3.0)	15.0 (56.8)
15 (4.6)	22.5 (85.2)

Figure 8b.

Maintenance Worksheet for _____

	Change UV light	Change or Rinse Filters	Test For Bacteria	Clean First Flush	Check for leaks	Test for Giardia/Cryptos-poridium
Frequency:	Annually	Quarterly or as needed	Quarterly	Quarterly or after each rain	After Each Rain or Quarterly	initially and as required
Date Done						
Date Done						
Date Done						
Date Done						

Date	Meter Reading	Date	Meter Reading	Date	Meter reading	Date	Meter Reading	Date	Meter Reading	Date	Meter Reading

Installer: name; Phone
Test Water: ____Health Department; address/phone_____ (retain all records)
Order UV Light From (Size):_____
Order Filters (Size and Specs)____ From_____

Calculation Procedure

Step 1: Estimate demand:

Interior Water Requirement*: On average, a conserving American household uses 45.2 gallons per person/day to operate toilets, showers, clothes washers, sinks, and other water -using fixtures and appliances. Water demand can be minimized by using water efficient water fixtures. An example of how to estimate water demand is shown as follows:

Residential Indoor Water Use

Fixture	Flow Rate (per use or min) **	Average # uses/day or min/day per person	Daily Demand / person (gal)	Number of people in household	Household Total Daily Demand/ (gal)	Household Total Monthly demand (gal)	Household Total Yearly demand (gal)
Toilets	1.6	5.1	8.16	3	24.48	742	8,935
Shower (based on 2.5 gal/min)	1.66	5.3	8.80	3	26.39	800	9,634
Faucets (based on 2.5 gal/min)	1.66	8.1	13.45	3	40.34	1,222	14,723
Dishwasher (1997- 2001) (gal/use)	4.5	0.1	0.45	3	1.35	41	493
Clothes washer (1998 - 2001) (gal/use)	27	0.37	9.99	3	29.97	908	10,939
Total Demand					**122.5**	**3,713**	**44,724**

*Source: "Handbook of Water Use and Conservation" Amy Vickers, 2001, Waterplow Press, Amherst, MA, ISBN I-931579-07-5

** Actual Flow (MFR)

Irrigation Water Requirement: Water used to irrigate landscaping often equals or exceeds interior water use. Supplemental irrigation water requirements can be greatly reduced by the use of 3 inches or more of top mulch, selecting native plants or plants that thrive in regions with similar climate, and using passive rainwater techniques. Because plant water needs vary greatly depending on soils, climate, plant size, etc. it is recommended that a calculator for your region
be referenced. For calculators, visit the ARCSA website at: www.arcsa.org.

Step 2: Sizing the Collection System

The collection surface is often dictated by architectural constraints, such as roof area, etc. The amount of surface area, based on the needed water volume, is described as follows:

Surface Area (Square Feet) = Demand (Gallons) / 0.623 x Precipitation Density (inches) x system efficiency

Note:

- 0.623 (gallons / square foot / inch) conversion factor = 7.48 (gallons / cubic foot) / 12 (inches per foot). 1 inch of water covering 1 square foot of surface area = 0.623 gallons
- Surface area is horizontal projection of roof surface and not actual surface area (measure the area the roof covers, not the actual roof).
- Precipitation Density period consistent with time period being considered (monthly, yearly, etc)
- This coefficient accounts for collection system loss from leakage, evaporation, roof composition, etc. Roof coefficients are approximately 0.80 – 0.85.

Step 3: Sizing the Storage[1]

Once the area of roof catchment has been determined and the average rainfall has been established the maximum amount of rain that can be collected can be calculated using the formula:

Run-off (Gallons) = A x (Rainfall - B) x Roof Area

A is the efficiency of collection and values of 0.80-0.85 (i.e. 80-85% efficiency) have been used.

B is the loss associated with adsorption and wetting of surfaces and a value of .08 inches per month (2.0 inches per year) has been used (eg Martin, 1980).

Rainfall should be expressed in Inches and ***Roof Area*** in Square Feet

[1]Adapted from Martin, T.J. (1980). *Supply aspects of domestic rainwater tanks.* South Australian Department of Environment, Adelaide.

The maximum volumes of rainwater that can be collected from various areas of roof and at a range of average annual rainfalls are shown in Appendix III. This information should only be used as an initial guide. If the maximum volumes are less than the annual water demand then either the catchment area will need to be increased or water demand will need to be reduced.

The next step is to calculate the size of the tank. The tank needs to be large enough to ensure that:

1. The required volume of water can be collected by the tank.

2. The volume of water in the tank will be sufficient to meet demand during the drier months or through periods of low or no rainfall.

The simplest way of checking a tank size estimated to provide water throughout an average year is to use monthly rainfall data and to assume that at the start of the wetter months the tank is empty. The following formula should then be used for each month:

Vt = V t-1 + (Run-off - Demand)

Vt = theoretical volume of water remaining in the tank at the end of the month
V t-1 = volume of water left in the tank from the previous month.
Run-off should be calculated as discussed above (***A*** = 0.80, ***B*** = .08 inches).

Starting with the tank empty then ***Vt-1*** = 0. If after any month ***Vt*** exceeds the volume of the tank then water will be lost to overflow. If ***Vt*** is ever a negative figure then demand exceeds the available water. Providing the calculated annual run-off exceeds the annual water demand, ***Vt*** will only be negative if periodical overflows reduce the amount of water collected so that it is less than the demand.

Tank size is not necessarily based on collecting total roof run-off. For example, the maximum water that can be collected from a roof area of 20 square feet with a monthly rainfall of 4.0 inches, will be about 40 gallons. If the water demand is less than this, some overflow may occur while demand is still met. If water demand is to be met throughout the month, the tank should be large enough so that ***Vt*** is never negative.

Calculations should be repeated using various tank sizes until ***Vt*** is 0 at the end of every month. The greater the values of ***Vt*** over the whole year, the greater the security of meeting water demand when rainfalls are below average or when dry periods are longer than normal.

The greater the security, the higher the cost of the tank.

Step 4: System Adjustment

To optimize performance and cost, going back through the calculation modifying surface area and the cistern storage capacity is recommended.

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
BIRMINGHAM AP,AL	30	5.45	4.21	6.10	4.67	4.83	3.78	5.09	3.48	4.05	3.23	4.63	4.47	53.99
HUNTSVILLE, AL	30	5.52	4.95	6.68	4.54	5.24	4.22	4.40	3.32	4.29	3.54	5.22	5.59	57.51
MOBILE, AL	30	5.75	5.10	7.20	5.06	6.10	5.01	6.54	6.20	6.01	3.25	5.41	4.66	66.29
MONTGOMERY, AL	30	5.04	5.45	6.39	4.38	4.14	4.13	5.31	3.63	4.22	2.58	4.53	4.97	54.77
ANCHORAGE, AK	30	0.68	0.74	0.65	0.52	0.70	1.06	1.70	2.93	2.87	2.09	1.09	1.05	16.08
ANNETTE, AK	30	9.67	8.05	7.96	7.37	5.73	4.72	4.26	6.12	9.49	13.86	12.21	11.39	100.83
BARROW, AK	30	0.12	0.12	0.09	0.12	0.12	0.32	0.87	1.04	0.69	0.39	0.16	0.12	4.16
BETHEL, AK	30	0.62	0.51	0.67	0.65	0.85	1.60	2.03	3.02	2.31	1.43	1.37	1.12	16.18
BETTLES,AK	30	0.84	0.61	0.55	0.38	0.85	1.43	2.10	2.54	1.82	1.08	0.90	0.87	13.97
BIG DELTA,AK	30	0.34	0.41	0.22	0.20	0.77	2.38	2.77	2.11	1.03	0.73	0.59	0.39	11.94
COLD BAY,AK	30	3.08	2.59	2.48	2.30	2.65	2.89	2.53	3.59	4.51	4.54	4.79	4.33	40.28
FAIRBANKS, AK	30	0.56	0.36	0.28	0.21	0.60	1.40	1.73	1.74	1.12	0.92	0.68	0.74	10.34
GULKANA,AK	30	0.45	0.52	0.36	0.22	0.59	1.54	1.82	1.80	1.44	1.02	0.67	0.97	11.40
HOMER, AK	30	2.61	2.04	1.82	1.21	1.07	0.96	1.45	2.28	3.37	2.77	2.87	3.00	25.45
JUNEAU, AK	30	4.81	4.02	3.51	2.96	3.48	3.36	4.14	5.37	7.54	8.30	5.43	5.41	58.33
KING SALMON, AK	30	1.03	0.72	0.79	0.94	1.35	1.70	2.15	2.89	2.81	2.10	1.54	1.39	19.41
KODIAK, AK	30	8.17	5.72	5.22	5.48	6.31	5.38	4.12	4.48	7.84	8.36	6.63	7.64	75.35
KOTZEBUE, AK	30	0.55	0.42	0.38	0.41	0.33	0.57	1.43	2.00	1.70	0.95	0.71	0.60	10.05
MCGRATH, AK	30	1.04	0.74	0.81	0.66	1.02	1.45	2.32	2.75	2.36	1.46	1.46	1.44	17.51
NOME, AK	30	0.92	0.75	0.60	0.65	0.74	1.14	2.15	3.23	2.51	1.58	1.28	1.01	16.56
ST. PAUL ISLAND, AK	30	1.74	1.25	1.12	1.12	1.21	1.41	1.91	2.96	2.79	2.70	2.87	2.13	23.21
TALKEETNA, AK	30	1.45	1.28	1.26	1.22	1.64	2.41	3.24	4.53	4.35	3.06	1.78	1.96	28.18
UNALAKLEET, AK	30	0.40	0.31	0.39	0.35	0.55	1.25	2.15	2.92	2.10	0.89	0.66	0.47	12.44
VALDEZ, AK	30	6.02	5.53	4.49	3.55	3.08	3.01	3.84	6.62	9.59	8.58	5.51	7.59	67.41
YAKUTAT, AK	30	13.18	10.99	11.41	10.80	9.78	7.17	7.88	13.27	20.88	24.00	15.17	15.85	160.38
FLAGSTAFF, AZ	30	2.18	2.56	2.62	1.29	0.80	0.43	2.40	2.89	2.12	1.93	1.86	1.83	22.91
PHOENIX, AZ	30	0.83	0.77	1.07	0.25	0.16	0.09	0.99	0.94	0.75	0.79	0.73	0.92	8.29
TUCSON, AZ	30	0.99	0.88	0.81	0.28	0.24	0.24	2.07	2.30	1.45	1.21	0.67	1.03	12.17
WINSLOW, AZ	30	0.46	0.53	0.61	0.27	0.36	0.30	1.18	1.31	1.02	0.90	0.55	0.54	8.03
YUMA, AZ	30	0.38	0.28	0.27	0.09	0.05	0.02	0.23	0.61	0.26	0.26	0.14	0.42	3.01
FORT SMITH, AR	30	2.37	2.59	3.94	3.91	5.29	4.28	3.19	2.56	3.61	3.94	4.80	3.39	43.87
LITTLE ROCK, AR	30	3.61	3.33	4.88	5.47	5.05	3.95	3.31	2.93	3.71	4.25	5.73	4.71	50.93
NORTH LITTLE ROCK, AR	30	3.37	3.27	4.88	5.03	5.40	3.51	3.15	2.97	3.53	3.81	5.74	4.53	49.19
BAKERSFIELD, CA	30	1.18	1.21	1.41	0.45	0.24	0.12	0.00	0.08	0.15	0.30	0.59	0.76	6.49
BISHOP, CA	30	0.88	0.97	0.62	0.24	0.26	0.21	0.17	0.13	0.28	0.20	0.44	0.62	5.02
EUREKA, CA.	30	5.97	5.51	5.55	2.91	1.62	0.65	0.16	0.38	0.86	2.36	5.78	6.35	38.10
FRESNO, CA	30	2.16	2.12	2.20	0.76	0.39	0.23	0.01	0.01	0.26	0.65	1.10	1.34	11.23
LONG BEACH, CA	30	2.95	3.01	2.43	0.60	0.23	0.08	0.02	0.10	0.24	0.40	1.12	1.76	12.94
LOS ANGELES AP, CA	30	2.98	3.11	2.40	0.63	0.24	0.08	0.03	0.14	0.26	0.36	1.13	1.79	13.15
LOS ANGELES C.O., CA	30	3.33	3.68	3.14	0.83	0.31	0.06	0.01	0.13	0.32	0.37	1.05	1.91	15.14
MOUNT SHASTA, CA	30	7.06	6.45	5.81	2.65	1.87	0.99	0.39	0.43	0.87	2.21	5.08	5.35	39.16
REDDING, CA	30	6.50	5.49	5.15	2.40	1.66	0.69	0.05	0.22	0.48	2.18	4.03	4.67	33.52
SACRAMENTO, CA	30	3.84	3.54	2.80	1.02	0.53	0.20	0.05	0.06	0.36	0.89	2.19	2.45	17.93
SAN DIEGO, CA	30	2.28	2.04	2.26	0.75	0.20	0.09	0.03	0.09	0.21	0.44	1.07	1.31	10.77
SAN FRANCISCO AP, CA	30	4.45	4.01	3.26	1.18	0.38	0.11	0.03	0.07	0.20	1.04	2.49	2.89	20.11

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SAN FRANCISCO C.O., CA	30	4.72	4.15	3.40	1.25	0.54	0.13	0.04	0.09	0.28	1.19	3.31	3.18	22.28
SANTA BARBARA, CA	30	3.57	4.28	3.51	0.63	0.23	0.05	0.03	0.11	0.42	0.52	1.32	2.26	16.93
SANTA MARIA, CA	30	2.64	3.23	2.94	0.91	0.32	0.05	0.03	0.05	0.31	0.45	1.24	1.84	14.01
STOCKTON, CA	30	2.71	2.46	2.28	0.96	0.50	0.09	0.05	0.05	0.33	0.82	1.77	1.82	13.84
ALAMOSA, CO	30	0.25	0.21	0.46	0.54	0.70	0.59	0.94	1.19	0.89	0.67	0.48	0.33	7.25
COLORADO SPRINGS, CO	30	0.28	0.35	1.06	1.62	2.39	2.34	2.85	3.48	1.23	0.86	0.52	0.42	17.40
DENVER, CO	30	0.51	0.49	1.28	1.93	2.32	1.56	2.16	1.82	1.14	0.99	0.98	0.63	15.81
GRAND JUNCTION, CO	30	0.60	0.50	1.00	0.86	0.98	0.41	0.66	0.84	0.91	1.00	0.71	0.52	8.99
PUEBLO, CO	30	0.33	0.26	0.97	1.25	1.49	1.33	2.04	2.27	0.84	0.64	0.58	0.39	12.39
BRIDGEPORT, CT	30	3.73	2.92	4.15	3.99	4.03	3.57	3.77	3.75	3.58	3.54	3.65	3.47	44.15
HARTFORD, CT	30	3.84	2.96	3.88	3.86	4.39	3.85	3.67	3.98	4.13	3.94	4.06	3.60	46.16
WILMINGTON, DE	30	3.43	2.81	3.97	3.39	4.15	3.59	4.28	3.51	4.01	3.08	3.19	3.40	42.81
WASHINGTON DULLES AP, D.C		3.05	2.77	3.55	3.22	4.22	4.07	3.57	3.78	3.82	3.37	3.31	3.07	41.80
WASHINGTON NAT'L AP, D.C.	30	3.21	2.63	3.60	2.77	3.82	3.13	3.66	3.44	3.79	3.22	3.03	3.05	39.35
APALACHICOLA, FL	30	4.87	3.76	4.95	3.00	2.62	4.30	7.31	7.29	7.10	4.18	3.62	3.51	56.51
DAYTONA BEACH, FL	30	3.13	2.74	3.84	2.54	3.26	5.69	5.17	6.09	6.61	4.48	3.03	2.71	49.29
FORT MYERS, FL	30	2.23	2.10	2.74	1.67	3.42	9.77	8.98	9.54	7.86	2.59	1.71	1.58	54.19
GAINESVILLE, FL	30	3.51	3.39	4.26	2.86	3.23	6.78	6.10	6.63	4.37	2.50	2.17	2.56	48.36
JACKSONVILLE, FL	30	3.69	3.15	3.93	3.14	3.48	5.37	5.97	6.87	7.90	3.86	2.34	2.64	52.34
KEY WEST, FL	30	2.22	1.51	1.86	2.06	3.48	4.57	3.27	5.40	5.45	4.34	2.64	2.14	38.94
MIAMI, FL	30	1.88	2.07	2.56	3.36	5.52	8.54	5.79	8.63	8.38	6.19	3.43	2.18	58.53
ORLANDO, FL	30	2.43	2.35	3.54	2.42	3.74	7.35	7.15	6.25	5.76	2.73	2.32	2.31	48.35
PENSACOLA, FL	30	5.34	4.68	6.40	3.89	4.40	6.39	8.02	6.85	5.75	4.13	4.46	3.97	64.28
TALLAHASSEE, FL	30	5.36	4.63	6.47	3.59	4.95	6.92	8.04	7.03	5.01	3.25	3.86	4.10	63.21
TAMPA, FL	30	2.27	2.67	2.84	1.80	2.85	5.50	6.49	7.60	6.54	2.29	1.62	2.30	44.77
VERO BEACH, FL	30	2.89	2.45	4.20	2.88	3.80	6.03	6.53	6.04	6.84	5.04	3.04	2.19	51.93
WEST PALM BEACH, FL	30	3.75	2.55	3.68	3.57	5.39	7.58	5.97	6.65	8.10	5.46	5.55	3.14	61.39
ATHENS, GA	30	4.69	4.39	4.99	3.35	3.86	3.94	4.41	3.78	3.53	3.47	3.71	3.71	47.83
ATLANTA, GA	30	5.03	4.68	5.38	3.62	3.95	3.63	5.12	3.67	4.09	3.11	4.10	3.82	50.20
AUGUSTA,GA	30	4.50	4.11	4.61	2.94	3.07	4.19	4.07	4.48	3.59	3.20	2.68	3.14	44.58
COLUMBUS, GA	30	4.78	4.48	5.75	3.84	3.62	3.51	5.04	3.78	3.07	2.33	3.97	4.40	48.57
MACON, GA	30	5.00	4.55	4.90	3.14	2.98	3.54	4.32	3.79	3.26	2.37	3.22	3.93	45.00
SAVANNAH, GA	30	3.95	2.92	3.64	3.32	3.61	5.49	6.04	7.20	5.08	3.12	2.40	2.81	49.58
HILO, HI	30	9.74	8.86	14.35	12.54	8.07	7.36	10.71	9.78	9.14	9.64	15.58	10.50	126.27
HONOLULU,HI	30	2.73	2.35	1.89	1.11	0.78	0.43	0.50	0.46	0.74	2.18	2.27	2.85	18.29
KAHULUI, HI	30	3.74	2.36	2.35	1.75	0.66	0.23	0.49	0.53	0.39	1.05	2.17	3.08	18.80
LIHUE, HI	30	4.59	3.26	3.58	3.00	2.87	1.82	2.12	1.91	2.69	4.25	4.70	4.78	39.57
BOISE, ID	30	1.39	1.14	1.41	1.27	1.27	0.74	0.39	0.30	0.76	0.76	1.38	1.38	12.19
LEWISTON, ID	30	1.14	0.95	1.12	1.31	1.56	1.16	0.72	0.75	0.81	0.96	1.21	1.05	12.74
POCATELLO, ID	30	1.14	1.01	1.38	1.18	1.51	0.91	0.70	0.66	0.89	0.97	1.13	1.10	12.58
CHICAGO,IL	30	1.75	1.63	2.65	3.68	3.38	3.63	3.51	4.62	3.27	2.71	3.01	2.43	36.27
MOLINE, IL	30	1.58	1.51	2.92	3.82	4.25	4.63	4.03	4.41	3.16	2.80	2.73	2.20	38.04
PEORIA, IL	30	1.50	1.67	2.83	3.56	4.17	3.84	4.02	3.16	3.12	2.77	2.99	2.40	36.03
ROCKFORD, IL	30	1.41	1.34	2.39	3.62	4.03	4.80	4.10	4.21	3.47	2.57	2.63	2.06	36.63
SPRINGFIELD, IL	30	1.62	1.80	3.15	3.36	4.06	3.77	3.53	3.41	2.83	2.62	2.87	2.54	35.56
EVANSVILLE, IN	30	2.91	3.10	4.29	4.48	5.01	4.10	3.75	3.14	2.99	2.78	4.18	3.54	44.27
FORT WAYNE, IN	30	2.05	1.94	2.86	3.54	3.75	4.04	3.58	3.60	2.81	2.63	2.98	2.77	36.55
INDIANAPOLIS, IN	30	2.48	2.41	3.44	3.61	4.36	4.13	4.42	3.82	2.88	2.76	3.61	3.03	40.95
SOUTH BEND, IN	30	2.27	1.98	2.89	3.62	3.50	4.19	3.73	3.98	3.79	3.27	3.39	3.09	39.70
DES MOINES, IA	30	1.03	1.19	2.21	3.58	4.25	4.57	4.18	4.51	3.15	2.62	2.10	1.33	34.72

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DUBUQUE, IA	30	1.28	1.42	2.57	3.49	4.12	4.08	3.73	4.59	3.56	2.50	2.49	1.69	35.52
SIOUX CITY, IA	30	0.59	0.62	2.00	2.75	3.75	3.61	3.30	2.90	2.42	1.99	1.40	0.66	25.99
WATERLOO, IA	30	0.84	1.05	2.13	3.23	4.15	4.82	4.20	4.08	2.95	2.49	2.10	1.11	33.15
CONCORDIA, KS	30	0.66	0.73	2.35	2.45	4.20	3.95	4.20	3.24	2.50	1.84	1.45	0.86	28.43
DODGE CITY, KS	30	0.62	0.66	1.84	2.25	3.00	3.15	3.17	2.73	1.70	1.45	1.01	0.77	22.35
GOODLAND, KS	30	0.43	0.44	1.20	1.51	3.46	3.30	3.54	2.49	1.12	1.05	0.82	0.40	19.76
TOPEKA, KS	30	0.95	1.18	2.56	3.14	4.86	4.88	3.83	3.81	3.71	2.99	2.31	1.42	35.64
WICHITA, KS	30	0.84	1.02	2.71	2.57	4.16	4.25	3.31	2.94	2.96	2.45	1.82	1.35	30.38
GREATER CINCINNATI AP	30	2.92	2.75	3.90	3.96	4.59	4.42	3.75	3.79	2.82	2.96	3.46	3.28	42.60
JACKSON, KY	30	3.56	3.68	4.38	3.79	5.16	4.67	4.59	4.13	3.77	3.18	4.20	4.27	49.38
LEXINGTON, KY	30	3.34	3.27	4.41	3.67	4.78	4.58	4.81	3.77	3.11	2.70	3.44	4.03	45.91
LOUISVILLE, KY	30	3.28	3.25	4.41	3.91	4.88	3.76	4.30	3.41	3.05	2.79	3.81	3.69	44.54
PADUCAH KY	30	3.47	3.93	4.27	4.95	4.75	4.51	4.45	2.99	3.56	3.45	4.53	4.38	49.24
BATON ROUGE, LA	30	6.19	5.10	5.07	5.56	5.34	5.33	5.96	5.86	4.84	3.81	4.76	5.26	63.08
LAKE CHARLES, LA	30	5.52	3.28	3.54	3.64	6.06	6.07	5.13	4.85	5.95	3.94	4.61	4.60	57.19
NEW ORLEANS, LA	30	5.87	5.47	5.24	5.02	4.62	6.83	6.20	6.15	5.55	3.05	5.09	5.07	64.16
SHREVEPORT, LA	30	4.60	4.21	4.18	4.42	5.25	5.05	3.99	2.71	3.21	4.45	4.68	4.55	51.30
CARIBOU, ME	30	2.97	2.06	2.57	2.64	3.28	3.31	3.89	4.15	3.27	2.99	3.12	3.19	37.44
PORTLAND, ME	30	4.09	3.14	4.14	4.26	3.82	3.28	3.32	3.05	3.37	4.40	4.72	4.24	45.83
BALTIMORE, MD	30	3.47	3.02	3.93	3.00	3.89	3.43	3.85	3.74	3.98	3.16	3.12	3.35	41.94
BLUE HILL, MA	30	4.78	4.06	4.79	4.32	3.79	3.93	3.74	4.06	4.13	4.42	4.64	4.56	51.22
BOSTON, MA	30	3.92	3.30	3.85	3.60	3.24	3.22	3.06	3.37	3.47	3.79	3.98	3.73	42.53
WORCESTER, MA	30	4.07	3.10	4.23	3.92	4.35	4.02	4.19	4.09	4.27	4.67	4.34	3.80	49.05
ALPENA, MI	30	1.76	1.35	2.13	2.31	2.61	2.53	3.17	3.50	2.80	2.33	2.08	1.83	28.40
DETROIT, MI	30	1.91	1.88	2.52	3.05	3.05	3.55	3.16	3.10	3.27	2.23	2.66	2.51	32.89
FLINT, MI	30	1.57	1.35	2.22	3.13	2.74	3.07	3.17	3.43	3.76	2.34	2.65	2.18	31.61
GRAND RAPIDS, MI	30	2.03	1.54	2.59	3.48	3.35	3.67	3.56	3.78	4.28	2.80	3.35	2.70	37.13
HOUGHTON LAKE, MI	30	1.61	1.25	2.05	2.29	2.57	2.93	2.75	3.72	3.11	2.26	2.14	1.75	28.43
LANSING, MI	30	1.61	1.45	2.33	3.09	2.71	3.60	2.68	3.46	3.48	2.29	2.66	2.17	31.53
MARQUETTE, MI	30	2.60	1.85	3.13	2.79	3.07	3.21	3.01	3.55	3.74	3.66	3.27	2.43	36.31
MUSKEGON, MI	30	2.22	1.58	2.36	2.91	2.95	2.58	2.32	3.77	3.52	2.80	3.23	2.64	32.88
SAULT STE. MARIE, MI	30	2.64	1.60	2.41	2.57	2.50	3.00	3.14	3.47	3.71	3.32	3.40	2.91	34.67
DULUTH, MN	30	1.12	0.83	1.69	2.09	2.95	4.25	4.20	4.22	4.13	2.46	2.12	0.94	31.00
INTERNATIONAL FALLS, MN	30	0.84	0.64	0.96	1.38	2.55	3.98	3.37	3.14	3.03	1.98	1.36	0.70	23.93
MINNEAPOLIS-ST.PAUL, MN	30	1.04	0.79	1.86	2.31	3.24	4.34	4.04	4.05	2.69	2.11	1.94	1.00	29.41
ROCHESTER, MN	30	0.94	0.75	1.88	3.01	3.53	4.00	4.61	4.33	3.12	2.20	2.01	1.02	31.40
SAINT CLOUD, MN	30	0.76	0.59	1.50	2.13	2.97	4.51	3.34	3.93	2.93	2.24	1.54	0.69	27.13
JACKSON, MS	30	5.67	4.50	5.74	5.98	4.86	3.82	4.69	3.66	3.23	3.42	5.04	5.34	55.95
MERIDIAN, MS	30	5.92	5.35	6.93	5.62	4.87	3.99	5.45	3.34	3.64	3.28	4.95	5.31	58.65
TUPELO, MS	30	5.14	4.68	6.30	4.94	5.80	4.82	3.65	2.67	3.35	3.38	5.01	6.12	55.86
COLUMBIA, MO	30	1.73	2.20	3.21	4.16	4.87	4.02	3.80	3.75	3.42	3.18	3.47	2.47	40.28
KANSAS CITY, MO	30	1.15	1.31	2.44	3.38	5.39	4.44	4.42	3.54	4.64	3.33	2.30	1.64	37.98
ST. LOUIS, MO	30	2.14	2.28	3.60	3.69	4.11	3.76	3.90	2.98	2.96	2.76	3.71	2.86	38.75
SPRINGFIELD, MO	30	2.11	2.28	3.82	4.31	4.57	5.02	3.56	3.37	4.83	3.47	4.46	3.17	44.97
BILLINGS, MT	30	0.81	0.58	1.12	1.74	2.48	1.89	1.28	0.85	1.34	1.26	0.75	0.67	14.77
GLASGOW, MT	30	0.35	0.26	0.47	0.75	1.72	2.20	1.78	1.25	0.98	0.71	0.39	0.37	11.23
GREAT FALLS, MT	30	0.68	0.51	1.01	1.40	2.53	2.24	1.45	1.65	1.23	0.93	0.59	0.67	14.89
HAVRE, MT	30	0.47	0.36	0.70	0.87	1.84	1.90	1.51	1.20	1.03	0.62	0.45	0.51	11.46
HELENA, MT	30	0.52	0.38	0.63	0.91	1.78	1.82	1.34	1.29	1.05	0.66	0.48	0.46	11.32
KALISPELL, MT	30	1.47	1.15	1.11	1.22	2.04	2.30	1.41	1.25	1.20	0.96	1.45	1.65	17.21

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
MISSOULA, MT	30	1.06	0.77	0.96	1.09	1.95	1.73	1.09	1.15	1.08	0.83	0.96	1.15	13.82
GRAND ISLAND, NE	30	0.54	0.68	2.04	2.61	4.07	3.72	3.14	3.08	2.43	1.51	1.41	0.66	25.89
LINCOLN, NE	30	0.67	0.66	2.21	2.90	4.23	3.51	3.54	3.35	2.92	1.94	1.58	0.86	28.37
NORFOLK, NE	30	0.57	0.76	1.97	2.59	3.92	4.25	3.74	2.80	2.25	1.72	1.44	0.65	26.66
NORTH PLATTE, NE	30	0.39	0.51	1.24	1.97	3.34	3.17	3.17	2.15	1.32	1.24	0.76	0.40	19.66
OMAHA EPPLEY AP, NE	30	0.77	0.80	2.13	2.94	4.44	3.95	3.86	3.21	3.17	2.21	1.82	0.92	30.22
OMAHA (NORTH), NE	30	0.76	0.77	2.25	3.07	4.57	3.84	3.75	2.93	3.03	2.49	1.67	0.95	30.08
SCOTTSBLUFF, NE	30	0.54	0.58	1.16	1.79	2.70	2.65	2.13	1.19	1.22	1.01	0.80	0.56	16.33
VALENTINE, NE	30	0.30	0.48	1.11	1.97	3.20	3.01	3.37	2.20	1.61	1.22	0.72	0.33	19.52
ELKO, NV	30	1.14	0.88	0.98	0.81	1.08	0.67	0.30	0.36	0.68	0.71	1.05	0.93	9.59
ELY, NV	30	0.74	0.75	1.05	0.90	1.29	0.66	0.60	0.91	0.94	1.00	0.63	0.50	9.97
LAS VEGAS, NV	30	0.59	0.69	0.59	0.15	0.24	0.08	0.44	0.45	0.31	0.24	0.31	0.40	4.49
RENO, NV	30	1.06	1.06	0.86	0.35	0.62	0.47	0.24	0.27	0.45	0.42	0.80	0.88	7.48
WINNEMUCCA, NV	30	0.83	0.62	0.86	0.85	1.06	0.69	0.27	0.35	0.53	0.66	0.80	0.81	8.33
CONCORD, NH	30	2.97	2.36	3.04	3.07	3.33	3.10	3.37	3.21	3.16	3.46	3.57	2.96	37.60
MT. WASHINGTON, NH	30	8.52	7.33	9.42	8.43	8.21	8.36	8.02	8.08	8.55	7.66	10.49	8.84	101.91
ATLANTIC CITY AP, NJ	30	3.60	2.85	4.06	3.45	3.38	2.66	3.86	4.32	3.14	2.86	3.26	3.15	40.59
ATLANTIC CITY C.O.,NJ	30	3.44	2.88	3.79	3.25	3.16	2.46	3.36	4.16	3.02	2.71	2.96	3.18	38.37
NEWARK, NJ	30	3.98	2.96	4.21	3.92	4.46	3.40	4.68	4.02	4.01	3.16	3.88	3.57	46.25
ALBUQUERQUE, NM	30	0.49	0.44	0.61	0.50	0.60	0.65	1.27	1.73	1.07	1.00	0.62	0.49	9.47
CLAYTON, NM	30	0.30	0.27	0.62	0.99	2.08	2.21	2.81	2.69	1.56	0.74	0.54	0.32	15.13
ROSWELL, NM	30	0.39	0.41	0.35	0.58	1.30	1.62	1.99	2.31	1.98	1.29	0.53	0.59	13.34
ALBANY, NY	30	2.71	2.27	3.17	3.25	3.67	3.74	3.50	3.68	3.31	3.23	3.31	2.76	38.60
BINGHAMTON, NY	30	2.58	2.46	2.97	3.49	3.55	3.80	3.49	3.35	3.59	3.02	3.32	3.03	38.65
BUFFALO, NY	30	3.16	2.42	2.99	3.04	3.35	3.82	3.14	3.87	3.84	3.19	3.92	3.80	40.54
ISLIP, NY	30	4.27	3.33	4.76	4.13	3.90	3.71	2.93	4.48	3.39	3.63	3.86	4.13	46.52
NEW YORK C.PARK, NY	30	4.13	3.15	4.37	4.28	4.69	3.84	4.62	4.22	4.23	3.85	4.36	3.95	49.69
NEW YORK (JFK AP), NY	30	3.62	2.70	3.79	3.75	4.13	3.59	3.92	3.64	3.50	3.03	3.48	3.31	42.46
NEW YORK (LAGUARDIA AP), NY		3.56	2.75	3.93	3.68	4.16	3.57	4.41	4.09	3.77	3.26	3.67	3.51	44.36
ROCHESTER, NY	30	2.34	2.04	2.58	2.75	2.82	3.36	2.93	3.54	3.45	2.60	2.84	2.73	33.98
SYRACUSE, NY	30	2.60	2.12	3.02	3.39	3.39	3.71	4.02	3.56	4.15	3.20	3.77	3.12	40.05
ASHEVILLE, NC	30	4.06	3.83	4.59	3.50	4.42	4.38	3.87	4.30	3.72	3.18	3.82	3.40	47.07
CAPE HATTERAS, NC	30	5.84	3.94	4.95	3.29	3.92	3.82	4.95	6.56	5.68	5.31	4.93	4.56	57.75
CHARLOTTE, NC	30	4.00	3.55	4.39	2.95	3.66	3.42	3.79	3.72	3.83	3.66	3.36	3.18	43.51
GREENSBORO-WNSTN-SALM-NC		3.54	3.10	3.85	3.43	3.95	3.53	4.44	3.71	4.30	3.27	2.96	3.06	43.14
RALEIGH, NC	30	4.02	3.47	4.03	2.80	3.79	3.42	4.29	3.78	4.26	3.18	2.97	3.04	43.05
WILMINGTON, NC	30	4.52	3.66	4.22	2.94	4.40	5.36	7.62	7.31	6.79	3.21	3.26	3.78	57.07
BISMARCK, ND	30	0.45	0.51	0.85	1.46	2.22	2.59	2.58	2.15	1.61	1.28	0.70	0.44	16.84
FARGO, ND	30	0.76	0.59	1.17	1.37	2.61	3.51	2.88	2.52	2.18	1.97	1.06	0.57	21.19
GRAND FORKS, ND	30	0.68	0.58	0.89	1.23	2.21	3.03	3.06	2.72	1.96	1.70	0.99	0.55	19.60
WILLISTON, ND	30	0.54	0.39	0.74	1.05	1.88	2.36	2.28	1.48	1.35	0.87	0.65	0.57	14.16
AKRON, OH	30	2.49	2.28	3.15	3.39	3.96	3.55	4.02	3.65	3.43	2.53	3.04	2.98	38.47
CLEVELAND, OH	30	2.48	2.29	2.94	3.37	3.50	3.89	3.52	3.69	3.77	2.74	3.38	3.14	38.71
COLUMBUS, OH	30	2.53	2.20	2.89	3.25	3.88	4.08	4.62	3.72	2.92	2.31	3.19	2.93	38.52
DAYTON, OH	30	2.60	2.29	3.29	4.03	4.17	4.21	3.75	3.49	2.65	2.72	3.30	3.08	39.58
MANSFIELD, OH	30	2.63	2.17	3.36	4.17	4.42	4.52	4.23	4.60	3.44	2.68	3.76	3.26	43.24
TOLEDO, OH	30	1.93	1.88	2.62	3.24	3.14	3.80	2.80	3.19	2.84	2.35	2.78	2.64	33.21
YOUNGSTOWN, OH	30	2.34	2.03	3.05	3.33	3.45	3.91	4.10	3.43	3.89	2.46	3.07	2.96	38.02
OKLAHOMA CITY, OK	30	1.28	1.56	2.90	3.00	5.44	4.63	2.94	2.48	3.98	3.64	2.11	1.89	35.85
TULSA, OK	30	1.60	1.95	3.57	3.95	6.11	4.72	2.96	2.85	4.76	4.05	3.47	2.43	42.42

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
ASTORIA, OR	30	9.62	7.87	7.37	4.93	3.28	2.57	1.16	1.21	2.61	5.61	10.50	10.40	67.13
BURNS,OR	30	1.18	1.11	1.24	0.85	1.05	0.66	0.40	0.45	0.50	0.72	1.11	1.30	10.57
EUGENE, OR	30	7.65	6.35	5.80	3.66	2.66	1.53	0.64	0.99	1.54	3.35	8.44	8.29	50.90
MEDFORD, OR	30	2.47	2.10	1.85	1.31	1.21	0.68	0.31	0.52	0.78	1.31	2.93	2.90	18.37
PENDLETON, OR	30	1.45	1.22	1.26	1.13	1.22	0.78	0.41	0.56	0.63	0.99	1.63	1.48	12.76
PORTLAND, OR	30	5.07	4.18	3.71	2.64	2.38	1.59	0.72	0.93	1.65	2.88	5.61	5.71	37.07
SALEM, OR	30	5.84	5.09	4.17	2.76	2.13	1.45	0.57	0.68	1.43	3.03	6.39	6.46	40.00
SEXTON SUMMIT, OR	30	4.71	4.29	3.92	2.38	1.35	0.94	0.35	0.61	1.20	2.93	5.32	5.18	33.18
ALLENTOWN, PA	30	3.50	2.75	3.56	3.49	4.47	3.99	4.27	4.35	4.37	3.33	3.70	3.39	45.17
ERIE, PA.	30	2.53	2.28	3.13	3.38	3.34	4.28	3.28	4.21	4.73	3.92	3.96	3.73	42.77
HARRISBURG, PA	30	3.18	2.88	3.58	3.31	4.60	3.99	3.21	3.24	3.65	3.06	3.53	3.22	41.45
MIDDLETOWN/HARRISBURG APT		3.18	2.88	3.58	3.31	4.60	3.99	3.21	3.24	3.65	3.06	3.53	3.22	41.45
PHILADELPHIA, PA	30	3.52	2.74	3.81	3.49	3.89	3.29	4.39	3.82	3.88	2.75	3.16	3.31	42.05
PITTSBURGH, PA	30	2.70	2.37	3.17	3.01	3.80	4.12	3.96	3.38	3.21	2.25	3.02	2.86	37.85
AVOCA, PA	30	2.46	2.08	2.69	3.28	3.69	3.97	3.74	3.10	3.86	3.02	3.12	2.55	37.56
WILLIAMSPORT, PA	30	2.85	2.61	3.21	3.49	3.79	4.45	4.08	3.38	3.98	3.19	3.62	2.94	41.59
BLOCK IS.,RI	30	3.68	3.04	3.99	3.72	3.40	2.77	2.62	3.00	3.19	3.04	3.77	3.57	39.79
PROVIDENCE, RI	30	4.37	3.45	4.43	4.16	3.66	3.38	3.17	3.90	3.70	3.69	4.40	4.14	46.45
CHARLESTON AP,SC	30	4.08	3.08	4.00	2.77	3.67	5.92	6.13	6.91	5.98	3.09	2.66	3.24	51.53
CHARLESTON C.O.,SC	30	3.62	2.62	3.83	2.44	2.77	4.96	5.50	6.54	6.13	3.02	2.18	2.78	46.39
COLUMBIA, SC	30	4.66	3.84	4.59	2.98	3.17	4.99	5.54	5.41	3.94	2.89	2.88	3.38	48.27
GREENV'L-SPARTANB'RG AP, SC		4.41	4.24	5.31	3.54	4.59	3.92	4.65	4.08	3.97	3.88	3.79	3.86	50.24
ABERDEEN, SD	30	0.48	0.48	1.34	1.83	2.69	3.49	2.92	2.42	1.81	1.63	0.75	0.38	20.22
HURON, SD	30	0.49	0.57	1.67	2.29	3.00	3.28	2.86	2.07	1.80	1.59	0.89	0.39	20.90
RAPID CITY, SD	30	0.37	0.46	1.03	1.86	2.96	2.83	2.03	1.61	1.10	1.37	0.61	0.41	16.64
SIOUX FALLS, SD	30	0.51	0.51	1.81	2.65	3.39	3.49	2.93	3.01	2.58	1.93	1.36	0.52	24.69
BRISTOL-JOHNSON CTY TN	30	3.52	3.40	3.91	3.23	4.32	3.89	4.21	3.00	3.08	2.30	3.08	3.39	41.33
CHATTANOOGA, TN	30	5.40	4.85	6.19	4.23	4.28	3.99	4.73	3.59	4.31	3.26	4.88	4.81	54.52
KNOXVILLE, TN	30	4.57	4.01	5.17	3.99	4.68	4.04	4.71	2.89	3.04	2.65	3.98	4.49	48.22
MEMPHIS, TN	30	4.24	4.31	5.58	5.79	5.15	4.30	4.22	3.00	3.31	3.31	5.76	5.68	54.65
NASHVILLE, TN	30	3.97	3.69	4.87	3.93	5.07	4.08	3.77	3.28	3.59	2.87	4.45	4.54	48.11
OAK RIDGE,TN	30	5.13	4.50	5.72	4.32	5.14	4.64	5.16	3.39	3.75	3.02	4.86	5.42	55.05
ABILENE, TX	30	0.97	1.13	1.41	1.67	2.83	3.06	1.70	2.63	2.91	2.90	1.30	1.27	23.78
AMARILLO, TX	30	0.63	0.55	1.13	1.33	2.50	3.28	2.68	2.94	1.88	1.50	0.68	0.61	19.71
AUSTIN/CITY, TX	30	1.89	1.99	2.14	2.51	5.03	3.81	1.97	2.31	2.91	3.97	2.68	2.44	33.65
AUSTIN/BERGSTROM, TX	30	2.21	2.02	2.36	2.63	5.12	3.42	2.03	2.51	2.88	3.99	3.02	2.53	34.72
BROWNSVILLE, TX	30	1.36	1.18	0.93	1.96	2.48	2.93	1.77	2.99	5.31	3.78	1.75	1.11	27.55
CORPUS CHRISTI, TX	30	1.62	1.84	1.74	2.05	3.48	3.53	2.00	3.54	5.03	3.94	1.74	1.75	32.26
DALLAS-FORT WORTH, TX	30	1.90	2.37	3.06	3.20	5.15	3.23	2.12	2.03	2.42	4.11	2.57	2.57	34.73
DALLAS-LOVE FIELD, TX	30	1.89	2.31	3.13	3.46	5.30	3.92	2.43	2.17	2.65	4.65	2.61	2.53	37.05
DEL RIO, TX	30	0.57	0.96	0.96	1.71	2.31	2.34	2.02	2.16	2.06	2.00	0.96	0.75	18.80
EL PASO, TX	30	0.45	0.39	0.26	0.23	0.38	0.87	1.49	1.75	1.61	0.81	0.42	0.77	9.43
GALVESTON, TX	30	4.08	2.61	2.76	2.56	3.70	4.04	3.45	4.22	5.76	3.49	3.64	3.53	43.84
HOUSTON, TX	30	3.68	2.98	3.36	3.60	5.15	5.35	3.18	3.83	4.33	4.50	4.19	3.69	47.84
LUBBOCK, TX	30	0.50	0.71	0.76	1.29	2.31	2.98	2.13	2.36	2.57	1.70	0.71	0.67	18.69
MIDLAND-ODESSA, TX	30	0.53	0.58	0.42	0.73	1.79	1.71	1.89	1.77	2.31	1.77	0.65	0.65	14.80
PORT ARTHUR, TX	30	5.69	3.35	3.75	3.84	5.83	6.58	5.23	4.85	6.10	4.67	4.75	5.25	59.89
SAN ANGELO, TX	30	0.82	1.18	0.99	1.60	3.09	2.52	1.10	2.05	2.95	2.57	1.10	0.94	20.91

NORMALS 1971-2000	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
SAN ANTONIO, TX	30	1.66	1.75	1.89	2.60	4.72	4.30	2.03	2.57	3.00	3.86	2.58	1.96	32.92
VICTORIA, TX	30	2.44	2.04	2.25	2.97	5.12	4.96	2.90	3.05	5.00	4.26	2.64	2.47	40.10
WACO, TX	30	1.90	2.43	2.48	2.99	4.46	3.08	2.23	1.85	2.88	3.67	2.61	2.76	33.34
WICHITA FALLS, TX	30	1.12	1.58	2.27	2.62	3.92	3.69	1.58	2.39	3.19	3.11	1.68	1.68	28.83
MILFORD, UT	30	0.73	0.77	1.21	0.99	0.94	0.44	0.76	1.04	0.92	1.12	0.77	0.58	10.27
SALT LAKE CITY, UT	30	1.37	1.33	1.91	2.02	2.09	0.77	0.72	0.76	1.33	1.57	1.40	1.23	16.50
BURLINGTON, VT	30	2.22	1.67	2.32	2.88	3.32	3.43	3.97	4.01	3.83	3.12	3.06	2.22	36.05
LYNCHBURG, VA	30	3.54	3.10	3.83	3.46	4.11	3.79	4.39	3.41	3.88	3.39	3.18	3.23	43.31
NORFOLK, VA	30	3.93	3.34	4.08	3.38	3.74	3.77	5.17	4.79	4.06	3.47	2.98	3.03	45.74
RICHMOND, VA	30	3.55	2.98	4.09	3.18	3.96	3.54	4.67	4.18	3.98	3.60	3.06	3.12	43.91
ROANOKE, VA	30	3.23	3.08	3.84	3.61	4.24	3.68	4.00	3.74	3.85	3.15	3.21	2.86	42.49
OLYMPIA, WA	30	7.54	6.17	5.29	3.58	2.27	1.78	0.82	1.10	2.03	4.19	8.13	7.89	50.79
QUILLAYUTE, WA	30	13.65	12.35	10.98	7.44	5.51	3.50	2.34	2.67	4.15	9.81	14.82	14.50	101.72
SEATTLE C.O., WA	30	5.24	4.09	3.92	2.75	2.03	1.55	0.93	1.16	1.61	3.24	5.67	6.06	38.25
SEATTLE SEA-TAC AP, WA	30	5.13	4.18	3.75	2.59	1.78	1.49	0.79	1.02	1.63	3.19	5.90	5.62	37.07
SPOKANE, WA	30	1.82	1.51	1.53	1.28	1.60	1.18	0.76	0.68	0.76	1.06	2.24	2.25	16.67
WALLA WALLA WA	30	2.25	1.97	2.20	1.83	1.95	1.15	0.73	0.84	0.83	1.77	2.85	2.51	20.88
YAKIMA, WA	30	1.17	0.80	0.70	0.53	0.51	0.62	0.22	0.36	0.39	0.53	1.05	1.38	8.26
BECKLEY, WV	30	3.23	2.96	3.63	3.43	4.39	3.92	4.78	3.45	3.23	2.64	2.88	3.09	41.63
CHARLESTON, WV	30	3.25	3.19	3.90	3.25	4.30	4.09	4.86	4.11	3.45	2.67	3.66	3.32	44.05
ELKINS, WV	30	3.43	3.20	3.92	3.53	4.77	4.61	4.84	4.26	3.83	2.86	3.42	3.44	46.11
HUNTINGTON, WV	30	3.21	3.09	3.83	3.33	4.41	3.88	4.46	3.88	2.80	2.73	3.32	3.37	42.31
GREEN BAY, WI	30	1.21	1.01	2.06	2.56	2.75	3.43	3.44	3.77	3.11	2.17	2.27	1.41	29.19
LA CROSSE, WI	30	1.19	0.99	2.00	3.38	3.38	4.00	4.25	4.28	3.40	2.16	2.10	1.23	32.36
MADISON, WI	30	1.25	1.28	2.28	3.35	3.25	4.05	3.93	4.33	3.08	2.18	2.31	1.66	32.95
MILWAUKEE, WI	30	1.85	1.65	2.59	3.78	3.06	3.56	3.58	4.03	3.30	2.49	2.70	2.22	34.81
CASPER, WY	30	0.58	0.64	0.90	1.52	2.38	1.43	1.29	0.73	0.98	1.14	0.82	0.62	13.03
CHEYENNE, WY	30	0.45	0.44	1.05	1.55	2.48	2.12	2.26	1.82	1.43	0.75	0.64	0.46	15.45
LANDER, WY	30	0.52	0.54	1.24	2.07	2.38	1.15	0.84	0.57	1.14	1.37	0.99	0.61	13.42
SHERIDAN, WY	30	0.77	0.57	1.00	1.77	2.41	2.02	1.11	0.80	1.38	1.41	0.80	0.68	14.72
GUAM, PC	30	5.58	5.11	4.24	4.16	6.39	6.28	11.66	16.17	13.69	11.88	9.34	6.11	100.61
JOHNSTON ISLAND, PC	30	1.64	1.29	2.01	1.86	1.14	0.87	1.40	2.07	2.46	2.78	4.78	2.70	25.00
KOROR, PC	30	11.20	9.65	8.79	9.45	11.27	17.54	16.99	14.47	11.65	13.41	11.62	12.33	148.37
KWAJALEIN, MARSHALL IS., PC		5.12	3.73	3.82	7.63	8.62	8.86	10.24	10.42	11.82	11.46	10.74	7.94	100.40
MAJURO, MARSHALL IS, PC	30	8.09	6.86	8.43	11.30	11.53	11.09	12.41	11.95	11.96	13.73	12.81	11.50	131.66
PAGO PAGO, AMER SAMOA, PC		14.02	12.14	11.15	11.16	10.43	5.94	5.76	6.43	7.36	10.03	11.16	13.38	118.96
POHNPEI, CAROLINE IS., PC	30	12.52	9.78	13.96	16.94	19.41	17.06	16.72	16.37	14.94	16.30	14.74	15.87	184.61
CHUUK, E. CAROLINE IS., PC	30	8.58	8.77	8.15	10.94	11.29	12.82	12.45	15.09	13.12	10.69	11.09	10.98	133.97
WAKE ISLAND, PC	30	1.40	1.89	2.38	2.11	1.70	1.95	3.44	5.62	4.82	4.27	2.78	1.87	34.23
YAP, W CAROLINE IS., PC	30	7.24	5.45	6.14	5.58	8.15	13.46	13.25	14.41	13.53	12.25	8.82	9.34	117.62
SAN JUAN, PR	30	3.02	2.30	2.14	3.71	5.29	3.52	4.16	5.22	5.60	5.06	6.17	4.57	50.76

“K”

Water Availability Analysis Review

Containing the Following:

- Luhdorff & Scalmanini Consulting Engineers, August 10, 2017, Peer Review of the Slade & Associates April 2017 Aquifer Test and Tier 1 Water Availability Analysis (WAA) for Anthem Winery
- Luhdorff & Scalmanini Consulting Engineers, January 22, 2018, Peer Review Comments on the of the Slade & Associates October 2017 Peer Review Response of the Aquifer Test and Tier 1 Water Availability Analysis (RCS April 2017)
- Public Works Department Memo Dated August 14, 2018

Anthem Winery P14-00320-MOD and Exception to Road and Street Standards,
Variance P14-00321-VAR and Viewshed, and
Agricultural Erosion Control Plan P14-00322-ECPA
Planning Commission Hearing Date (Wednesday, October 3, 2018)

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

GROUNDWATER RESOURCES
HYDROLOGY · DEVELOPMENT · MANAGEMENT

Memorandum

DATE: August 10, 2017 PROJECT: 17-01-038

TO: **Mr. Donald Barrella**

FROM: Vicki Kretsinger Grabert, Debra M. Cannon P.G., Barbara Dalgish P.G., Reid Bryson

SUBJECT: **REVIEW OF DRAFT MEMORANDUM "RESULTS OF AQUIFER TESTING OF PROJECT WELLS AND NAPA COUNTY TIER 1 WATER AVAILABILITY ANALYSIS FOR PROPOSED ANTHEM WINERY"**

Luhdorff & Scalmanini, Consulting Engineers (LSCE) is pleased to provide this memorandum describing our review of the April 10, 2017 Draft Memorandum "Results of Aquifer Testing of Project Wells and Napa County Tier 1 Water Availability Analysis for Proposed Anthem Winery" by Richard C. Slade & Associates LLC (RCS), prepared as part of the project documentation for the pending Use Permit modification (P14-00320). Anthem Winery seeks to modify previously approved land uses authorized by vineyard conversion permits (Permit Nos. 98301 and P12-00401) and prior Use Permits[1] to allow an increase in wine production capacity from 30,000 gallons per year (GPY) to 50,000 GPY, marketing program expansion (e.g., visitation and events), and an increase in total permitted vineyard acreage of 0.95 acres with additional vineyard expansion of 2.29 acres based on prior permit approval. These land use modifications are proposed to occur on two adjoining parcels: 035-460-038 and 035-470-046[2], referenced in the RCS draft WAA as Parcel 1 and Parcel 2, respectively. Napa County is obligated by the California Environmental Quality Act (CEQA) to demonstrate that the local aquifer can support the existing and proposed project groundwater use and has requested that LSCE review the draft Anthem Water Availability Analysis (draft WAA).

The WAA Guidance Document (May 12, 2015) is to provide guidance to answer the following questions:

> "Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?"

Documents provided by Napa County include:

- A June 3, 1996 memo by Bartelt Engineering "Proposed winery waste septic system for Jessup Cellars Barrel Room" that estimates wastewater volumes and rates of wastewater production

[1] A 1996 Use Permit authorizing winery production and a subsequent Use Permit modification are referenced in documents provided to LSCE for this review, although records of permit approval and any conditions of approval were not provided to LSCE.

[2] Page 2 of the draft WAA, under paragraph a of the heading "Site Conditions", initially descries Parcel 2 as APN 032-470-046.

associated with a proposed 30,000 GPY winery with no employees and no public tours, tasting, or special events to be held at the facility.

- A July 3, 1996 memo by Bartelt Engineering "Phase One Water Availability Analysis for Jessup Cellars Barrel Room (APN 35-470-020)" that estimates total water use of 6.64 acre-feet per year (AFY) based on Napa County Department of Public Works estimated quantities by use including a primary residence (0.75 AFY), livestock (0.09 AFY), 30,000 GPY winery (0.80 AFY), five acres of vineyard (5 AFY). The memo states that water for all uses would be provided through two wells producing 35 gallons per minute (GPM) and 5 GPM, respectively.

- An October 10, 1996 memo from the Napa County Department of Public Works "Jessup Cellars-Water Availability Analysis" that describes a pump test of a "proposed winery project well". The tested well was apparently the higher capacity existing well referenced in the July 3, 1996 memo by Bartelt Engineering, based on the pumping rate used during the test. The Department of Public Works memo describes the tested well as a "new well"[3] having a total depth of approximately 220 feet and a static water level, on October 9, 1996, of 120 feet. A 30-minute test was run at a constant rate of 13 GPM. The water level in the pumped well is reported to have declined about 40 feet during the test. The memo appears to refer interchangeably to a "second, on-site well" and an "on-site monitoring well" (located approximately 150 feet from the pumped well), which is reported to have been "unaffected by the pump test". The memo also describes a "neighboring well", which was apparently not monitored during the test. The memo is difficult to interpret given the lack of detail regarding the wells that it references and the lack of documentation of the test methods and data collected.

- A November 15, 1996 memo by Bartelt Engineering "Jessup Cellars Use Permit 96006-UP, APN 35-470-020" response to Napa County Planning Commission's concerns: that recalculates the winery water usage to be 75,500 GPY (0.23 AFY) with a daily average demand of 207 gallons per day (GPD) and a peak daily water usage of 1,242 GPD. The memo also proposes three conditions of approval:

    - Water use will be metered and provided to Napa County Planning Department on an annual basis.

    - Two water storage tanks will be installed: a 10,500-gallon tank for winery use and a 3,200 gallon tank for fire purposes.

    - The project well (new well) will be pumped for 2 hours at 13 GPM and water levels will be monitored in the "Old well" and the Lemon Well (on the adjacent property to the

[3] It is not clear from the October 10, 1996 memo which well on the Jessup Cellars/Anthem parcels is referred to as the "new well". Well completion reports (WCRs) provided to LSCE by Napa County for this review include two that were constructed prior to October 9, 1996; however, the older of those, WCR 430082, has a total well depth of 213 feet and was constructed in December 1991, while the younger well, WCR 557077, has a total well depth of 345 feet and was constructed in August 1995.

north). During the test, the Lemon Well will be pumped to determine if pumping of this well will affect water levels of wells on the Wood property.

- A July 14, 2000 letter by Bartelt Engineering "Water Availability Analysis for Jessup Cellars Winery, APN 035-470-021—proposed Use Permit Modification affirming that the approved winery was "in current production" and requesting that crushing be allowed at the facility. The letter provides water use estimates for what were then "current" uses totaling 1.97 AFY (including one residence [0.75 AFY], livestock [0.09 AFY], 0.6 vineyard acres [0.60 AFY], and winery without crush [0.53 AFY]. The letter also estimates that water use on the parcel would increase, due to the addition of crush operations at the winery and planting of previously permitted vineyard acreage, to 7.16 AFY (including one residence [0.75 AFY], livestock [0.04 AFY], 5.5 vineyard acres [5.5 AFY], and winery with crush (0.87 AFY). The letter also references the following events/documents:
    - A December 7 to 11, 1996 pump test conducted by McLean and Williams, Inc. The Bartelt Engineering letter apparently included an attachment documenting the "test format and results", although that attachment was not included with the letter provided to LSCE.
    - A December 18, 1996 Use Permit approval by the Napa County Planning Commission for the establishment of a 30,000 GPY winery, "consisting of 1,600 square feet plus a bathroom and a tank pad for two fermentation tanks…." According to the excerpt provided in the July 14, 2000 letter by Bartelt Engineering, the 1996 Use Permit disallowed public tours, tasting, retail sales (even by appointment), marketing events, crush, office uses, and case goods storage. Conditions of approval for the 1996 Use Permit were apparently included as an attachment to the July 2000 letter by Bartelt Engineering, although that attachment was not included with the letter provided to LSCE.
- Erosion Control Plan Application (ECPA) P12-00401 Attachment D, Phase 1 Water Availability Analysis for parcels 035-360-027 and 035-470-020. This undated document calculates an allowable groundwater allotment of 22.32 AFY for the project parcels based on a total area of 43.63 acres and a 0.5 acre-foot per acre annual groundwater use allocation. The document shows that vineyard acreage was proposed to increase from 5.77 acres to 8.58 acres, with a corresponding increase in water use from 2.89 AFY to 4.30 AFY. Other water uses on the project parcels were shown to be unchanged between existing and future conditions, with residential use of 1.1 AFY, winery use of 2.65 AFY, and landscaping use of 1.5 AFY. Total "current" use was shown to be 8.14 AFY, and total "future" use was shown to be 9.83 AFY.

Based on information provided in the draft WAA, it is understood that current water uses on Parcels 1 and 2 total 4.39 AFY and proposed water uses will be 7.03 AFY (**Table 1**). Current water uses include only residential use, with one residence on each of the project parcels, and irrigation for 5.77 acres of vineyard on Parcel 2. It is understood that the previously approved 30,000 GPY winery is either not currently in operation or is not using water. Similarly, it is understood from the draft WAA Appendix that

the Permit P12-00401 accounted for five wine trade/industry visitors per week, although the winery does not currently host wine trade visitors.

Table 1. Summary of Existing and Proposed Water Uses, Anthem Winery Use Modification Permit Application P14-00320 (adapted from RSA+ Tier 1 Water Use Calculations, Revised April 7, 2017)

	Water Use (AFY)			
	Residential	**Vineyard**	**Winery**	**Total**
Existing Project				
Parcel 1	0.75	0	-	0.75
Parcel 2	0.75	2.89	0	3.64
Total				**4.39**
Proposed Project				
Parcel 1	0.75	0.62	-	1.37
Parcel 2	0.75	2.99	1.92	5.66
Total				**7.03**

This review focused on three aspects of the draft WAA:

- Aquifer Testing Review
- Groundwater Recharge Calculation Review
- Water Use Calculation Review

AQUIFER TESTING REVIEW

A review of the aquifer test data and interpretation by RCS included reviewing the text, figures, and tables presented in association with on-site well construction, aquifer testing, and aquifer test analysis. The following summary of aquifer tests performed on three project wells provides the pertinent information for review. Aquifer tests were performed on the three project wells (Wells 3, 6, and 8) at separate times in March 2016, after a period of 4.5 days of baseline water level monitoring during which no wells were pumped. Wells were observed to recover during this baseline water level monitoring period; however, the duration of the period does not seem to have been considered significant enough by RCS to have been removed from the curve-fitting aquifer test analysis. Each well was pumped for a period of 24 hours and allowed to recover for two days. Wells 3 and 6, located approximately 175 feet apart, experienced drawdown during each other's pumping tests, but Well 8 had no discernible effect on any on-site wells.[4] **Table 2** summarizes the results of these aquifer tests.

[4] The draft WAA notes that one on-site well, Well 4, was not monitored during aquifer testing, "because it is not considered to be a project well and because of its distance to the aquifer test wells."

Table 2. Aquifer Test Summary, Anthem Winery Use Modification Permit Application P14-00320 Project Wells 3, 6, and 8 (March 2016)

Pumping Well	Pumping Rate (GPM)	Pumping Duration (hrs)	Total Drawdown in Pumped Well (ft)	Specific Capacity (GPM/ft drawdown)	Drawdown Influence Comment	Percent Water Level Recovery After 2 Days
Well 3	1.1	24	39	0.03	Only Well 6 experienced 8.5 ft of drawdown	72%
Well 6	1.1	24	45.4	0.02	Only Well 3 experienced 3.9 ft of drawdown	85%
Well 8	6.9[5]	24	303.2	0.02	No discernible influence on any project well	40%

RCS reports that they utilized Aqtesolv software to "perform the automatic curve fitting procedures" to analyze the drawdown and recovery data for the wells in each test. However, only two wells' drawdown and/or recovery curve matches are presented for analysis of the aquifer tests in the draft WAA: Well 3 (as a pumping well and as an observation well during the aquifer test at Well 6) and Well 6 (as an observation well during the aquifer test at Well 3). The draft WAA claims that the "…curve fitting portion of these analyses were determined to be unreliable for many of these solutions and thus were deemed to not be valid; thus these curves are not presented". It seems likely that type curves were not deemed valid due to several factors, including: use of the "automatic curve fitting procedures" that the Aqtesolv software offers, rather than matching the curves manually for different portions of the drawdown and recovery curves using their knowledge of the subsurface and aquifer materials; also, it is likely that there are boundary conditions present (e.g., faulting, geologic facies changes, etc.) influencing the drawdown and recovery curves making them unable to fit an analytical type curve for the entirety of the drawdown and recovery datasets.

The ability to fit the drawdown and recovery type curves to portions of the data would have allowed for insight into the aquifer materials close to the pumping well and further away from the well, depending on the portion of the curve fitted. Early drawdown can sometimes be influenced by well borehole effects, while later in the test, drawdown can be affected by local aquifer materials (or fractures) in the immediate vicinity. Even later in the test, drawdown data can be interpreted to represent aquifer materials (or fractures) that are distal or farther away from the well. The fact that Well 3 and Well 6 experienced drawdown during each other's pumping indicates that there are connections (via aquifer materials or fractures) within a lateral distance of 175 feet at depths above 310 feet below ground surface, where the two wells have similarly positioned screened intervals. The absence of drawdown at Well 8 due to pumping at Well 3 (which is just over 400 feet away) or Well 6 (about 575 feet away), despite the fact that Well 8 also is perforated above and below 300 feet below ground surface, indicates that the aquifer materials have limited horizontal extent or connection. These conclusions of limited

[5] The pumping rate in Well 8 was increased for an unreported reason to an unreported pumping rate during the last 90 minutes of the test.

vertical and horizontal extent or lack of connection (in the case of a fractured rock aquifer) were also made in the draft WAA.

Further testing of Well 8 in July 2016 occurred about four months after previous project well tests to help determine the pumping rate that can be sustained for Well 8, as pumping at 6.9 GPM resulted in less groundwater produced over the long-term.[6] In order to better represent the pumping behaviors that could occur in project wells, Well 8 was tested by pumping at lower discharge rates for 12 hours and allowed to recover for 12 hours, for a period of 5 days. The results of this testing are tabulated in **Table 3** below.

Table 3. Aquifer Test Summary, Anthem Winery Use Modification Permit Application P14-00320 Project Well 8 (July 2016)

	Day 1	Day 2	Day 3	Day 4	Day 5
Duration	12 hours on, 12 hours off	12 hours on, 12 hours off	12 hours on, 12 hours off	12 hours on, 12 hours off	12 hours on, 6 days off
Pumping Rate	2.7 GPM	3.3 GPM	2.4 GPM	1.2 GPM	1.2 GPM
Drawdown	93.8 ft	106.2 ft	60.5 ft	20.4 ft	24.9 ft
Recovery:	45.4 ft or 48%	52.4 ft or 49%	38.2 ft or 63%	28.1 ft or 138%[1]	--
Specific Capacity (GPM/ft drawdown)	0.029	0.031	0.04	0.059	0.048

[1] Drawdown and recovery results from pumping Well 8 at lower rates resulted in continuing recovery to levels seen prior to Day 4.

The additional testing in Well 8 was not analyzed to determine transmissivity values, so the only aquifer parameters of transmissivity and storativity are available from the three Aqtesolv curve-fitting exercises presented for Well 3 and Well 6. The transmissivity values of 3, 6, and 17 GPD/ft are low (converted into 0.4, 0.8, and 2.3 ft2/d), which, when converted to hydraulic conductivity using RCS's reported aquifer saturated thickness of 295 feet[7], results in 0.0014, 0.0027, and 0.0078 ft/d. These are very low conductivities. As a check, it is good practice to compare the aquifer test results to an empirical equation that can be used to convert specific capacity to transmissivity. RCS applied this empirical relationship of $T \approx 1{,}750*(Q/s)$[8], to Wells 3 and 6 only. It is unclear why RCS did not apply this empirical equation to the other aquifer test data. **Table 4** provides this analysis for comparison to the three curve-fitted transmissivity values.

[6] The draft WAA states: "…Well 8 likely could not sustain an operational pumping rate of 6.9 GPM."
[7] RCS reportedly used 295 feet for the aquifer saturated thickness for both Well 3 and Well 6 curve-fitting aquifer test analyses, based on conditions at the deeper well, Well 6.
[8] Where (*Q/s*) is the specific capacity of the pumping well: *Q* is the discharge or pumping rate in GPM and *s* is the drawdown in the pumped well in feet; and 1,750 is an empirical constant for a semi-confined aquifer system.

Table 4. Comparison of Aquifer Test Results, Anthem Winery Use Modification Permit Application P14-00320

Project Well	Pump/ Observation	Analysis Method	Specific Capacity (GPM/ft drawdown)	Transmissivity (GPD/ft)	Storativity
Well 3	Pumped well	Theis Confined Aquifer Solution Drawdown and Recovery curve-fitting	-	6	-
Well 6	Observation well during Well 3 pumping	Moench Case 2 Leaky Aquifer Solution Drawdown and Recovery curve-fitting	-	3	4.7×10^{-7}
Well 3	Observation well during Well 6 pumping	Moench Leaky Aquifer Solution Drawdown and Recovery curve-fitting	-	17	9.5×10^{-5}
Well 3	2-day pumping at 1.1 GPM	Empirical conversion of Specific Capacity for semi-confined aquifer	0.03	52	-
Well 6	2-day pumping at 1.1 GPM	Empirical conversion of Specific Capacity for semi-confined aquifer	0.02	35	-
Well 8	2-day pumping at 6.9 GPM	Empirical conversion of Specific Capacity for semi-confined aquifer	0.02	35[1]	-
Well 8	12-hr pumping at 2.7 GPM	Empirical conversion of Specific Capacity for semi-confined aquifer	0.029	50.8[1]	-
Well 8	12-hr pumping at 3.3 GPM	Empirical conversion of Specific Capacity for semi-confined aquifer	0.031	54.3[1]	-
Well 8	12-hr pumping at 2.4 GPM	Empirical conversion of Specific Capacity for semi-confined aquifer	0.04	70[1]	-
Well 8	12-hr pumping at 1.2 GPM	Empirical conversion of Specific Capacity for semi-confined aquifer	0.059	103.3[1]	-
Well 8	12-hr pumping at 1.2 GPM	Empirical conversion of Specific Capacity for semi-confined aquifer	0.048	84[1]	-

[1] Values calculated by LSCE for this review.

The draft WAA does not discuss or explain why the transmissivity values differ greatly between the curve-fitting method and the empirical method; the transmissivity values using the curve-fitting approach are much lower compared to the empirical method converting specific capacity to transmissivity. This is likely since the empirical method only considers the drawdown aspect and ignores the recovery, whereas the curve-fitting approach attempts to utilize both drawdown and recovery to determine a transmissivity value. The transmissivity values produced by the curve-fitting approach likely

represent more of a regional spatial area and are more indicative of longer-term pumping conditions. The conversion of specific capacity offers transmissivities that likely represent local aquifer conditions specific to each well.

The ability of the aquifer to transmit groundwater to each of the project wells depends on the transmissivity and storativity of the subsurface materials that the wells penetrate. The transmissivities and storativities from the RCS aquifer testing indicate very low values for each parameter. The aquifer testing indicates limited potential for project wells to significantly impact off-site wells, as the nature of the aquifer materials in the vicinity of the three project wells limits the extent of their influence, spatially. The lack of complete water level recovery in the pumped wells over a recovery period equivalent to the pumping period during most tests indicates that well capacities will be reduced when the aquifers are exercised at even relatively low pumping rates (e.g., 1 GPM or less) on a continual basis, as proposed for this project. Pumping both Well 3 and Well 6 at the same time would also produce mutual well interference, and concurrent pumping would likely not be attainable over the long-term.[9] The draft WAA does not address the impact that mutual well interference will likely have on feasible, long-term well capacities for Well 3 and Well 6.

GROUNDWATER RECHARGE CALCULATION REVIEW

The draft WAA approaches the determination of a parcel-specific water use criterion based on available long-term rainfall data and published relationships between rainfall and groundwater recharge for the Redwood Creek watershed. The draft WAA provides a summary of available precipitation data in the project vicinity, which include three reported precipitation gages and two spatial datasets. Two of the precipitation gages are described as being approximately 6 miles southeast of the project parcels and at elevations of approximately 60 feet above mean sea level (asl).[10] The third precipitation gage is described as being located approximately 0.75 to 0.8 miles west of the project parcels "at a similar elevation (± 360 ft asl) as that of the subject property…." Separately, the draft WAA notes that elevations at the project parcels range from approximately 180 ft asl to 420 ft asl.

The spatial datasets include an isohyetal map of average annual precipitation for 1900 to 1960 published by Napa County and the 1981 to 2010 water year (WY) average annual precipitation dataset published by the PRISM Climate Group at Oregon State University. The various average annual precipitation datasets presented in the draft WAA are summarized in **Table 5**. Due to various factors including the period of record and location, the draft WAA relies on a value of 30 inches per year determined from the PRISM Climate Group average annual precipitation dataset.

For this review, precipitation data from the USGS California Basin Characterization Model (BCM) were analyzed to compare with the values provided by RCS. The BCM represents major soil-water processes, including precipitation, runoff, evapotranspiration, and groundwater recharge in monthly water balance calculations conducted for different historical and predicted climate conditions (Flint et al., 2013). Among the advantages of the BCM relative to single precipitation gage datasets is that the BCM has been applied to represent hydrologic processes across all of Napa County at a grid resolution of 18

[9] This does not mean that these two wells cannot work in conjunction, but pumping at the same time would likely result in reduced capacities in both wells. Cycling one well on and the other well off might offer some relief from the mutual well interference in Wells 3 and 6.

[10] The draft WAA acknowledges that those two gages are located near to each other, according to location information provided by the California Data Exchange Center and Western Regional Climate Center, and are likely to be the same gage.

acres. The BCM also incorporates recent data through 2010, and it accounts for hydrologic processes over 30-year periods (specifically 1921 to 1950, 1951 to 1980, and 1981 to 2010). This means that water balance outputs from the BCM are available in a spatially continuous format representing longer periods of record to account for inter-annual variability. This review utilizes the most recent BCM long-term average annual summaries for observed precipitation and calculated groundwater recharge from the most recent available 30-year period, 1981 through 2010.

The BCM output indicates that average annual precipitation during water years 1981 to 2010 at the Anthem Winery parcels was 32.85 inches (**Table 5**). The difference of 2.85 inches is a 9.5% increase relative to the 30 inches per year value used by RCS in the draft WAA.

Table 5. Summary of Precipitation Data Sources and Average Annual Precipitation, Anthem Winery

Precipitation Gage or Data Source	Data Source	Distance from Project Parcels	Elevation (feet, asl)	Period of Record	Average Annual Precipitation (inches)
NSH – Napa Fire Department	California Data Exchange Center	6 miles	35[1]	WY 1905 to WY 2016[2]	24.4
Napa State Hospital	Western Regional Climate Center	6 miles	60	January 1893 to December 2016[3]	24.7
Redwood Creek at Mt. Veeder Rd	Napa County /OneRain	0.8 miles	360	WY 2001 to WY 2016	34.6
1981 – 2010 Average Annual Precipitation	PRISM Climate Group	0 miles	-	WY 1981 to WY 2010	30
Isohyetal_cnty	Napa County	0 miles	-	1900 - 1960	32
1981 – 2010 Average Annual Precipitation	USGS California Basin Characterization Model	0 miles	-	WY 1981 to WY 2010	32.85

[1] The draft WAA states that the NSH – Napa Fire Department gage is at an elevation of approximately 60 feet asl; however, as of June 23, 2017 the California Data Exchange Center website shows the elevation of that gage to be 35 feet asl.

[2] Due to missing data in water years 1981 and 1982, RCS omitted those years from the calculation of average annual precipitation at the NSH – Napa Fire Department gage.

[3] The draft WAA reports that "there are several missing months and/or years of rainfall data missing between 1897 and 1902, and between 1915 and 1916" from the WRCC precipitation gage record.

WY = Water Year, the 12-month period beginning October 1 and ending September 30 of the following calendar year. Water years are designated by the calendar year in which they end.

asl = above sea level

The draft WAA then calculates potential groundwater recharge, on an average annual basis, for the entire 44.8 acres covered by the project parcels. For their calculations RCS references the water budget analysis contained in the Updated Hydrogeologic Conceptualization and Characterization of Conditions (LSCE and MBK, 2013). RCS cites the finding from LSCE and MBK (2013) that average annual groundwater recharge in the Redwood Creek Watershed is 10% of average annual precipitation and

applies that percentage to the 30 inches of average annual precipitation at the project parcels to arrive at an estimate of average annual groundwater recharge of 11.2 AFY. The draft WAA then considers the potential for land surface slope to influence recharge at the parcel-scale and arrives at reduced estimate of average annual groundwater recharge of 11.02 AFY, 4.0 acres of the project parcels have slopes that are greater than 30 degrees and these are excluded from the potential recharge calculation.

As described above, the BCM represents hydrologic processes within 18-acre grid cells that span Napa County. Through its primary calculations the BCM calculates surface runoff and recharge (defined as water percolating below the zone of evapotranspiration in a given soil profile) for monthly time increments. Using a series of secondary equations, the runoff and recharge values calculated at monthly intervals for individual 18-acre grid cells can be aggregated across watershed areas and to distinguish further between shallow groundwater that eventually emerges as baseflow in a stream or river and deeper groundwater that is more likely to remain in the subsurface. For the project parcels, the BCM calculates average annual groundwater recharge to be 38.54 AFY across the entirety of the project parcels (i.e., 44.8 acres).

For the Redwood Creek Watershed, an analysis using the BCM secondary equations shows that the long-term ratio of deep percolation to potential recharge is 0.83.[11] Based on that value, the average annual deep percolation of infiltrated water to groundwater at the project parcels becomes 31.98 acre-feet (AF) (**Table 6**). This is 26% of the average annual rainfall of 122.66 AFY at the project parcels.

Table 6. Anthem Winery Average Annual Groundwater Recharge Summary, California Basin Characterization Model

		1981 - 2010 Average Annual Precipitation			1981 - 2010 Average Annual Groundwater Recharge Potential			1981 - 2010 Average Annual Deep Percolation	
Parcel	**Acres**	**(inches)**	**(AF)**	**(AF/Acre)**	**(inches)**	**(AF)**	**(AF/Acre)**	**(AF)**	**(AF/Acre)**
Parcel 1	19.8	32.99	54.50	**2.75**	9.81	**16.20**	**0.82**	**13.44**	**0.68**
Parcel 2	25.0	32.75	68.16	**2.73**	10.73	**22.34**	**0.89**	**18.54**	**0.74**
Parcels Combined	44.8	32.85	122.66	**2.74**	10.32	**38.54**	**0.86**	**31.98**	**0.71**
Deep percolation represents 83% of BCM recharge on an annual basis for the Redwood Creek watershed based on an analysis of water years 1988 to 2010.									

Among the attributes of the BCM is that it incorporates geologic data into its calculations of recharge. Flint et al. (2013) note that other published hydrologic models that incorporate geologic bedrock

[11] This analysis incorporates monthly BCM outputs for runoff and recharge across the Redwood Creek Watershed for the period from water years 1988 to 2010, the base period established for the water budget analysis and sustainable yield determination presented in the Napa Valley Subbasin Basin Analysis Report (LSCE, 2016). Monthly data for these two BCM outputs were post-processed using the secondary BCM equations to arrive at monthly values for shallow groundwater (with the potential to leave the subsurface as baseflow in the Creek) and deep groundwater (without the potential to become baseflow) components of the overall BCM recharge output. Because the BCM secondary equations allow for accumulation of deep groundwater over time with a delay relative to the initial percolation below the zone of evapotranspiration, the deep groundwater and recharge volumes were aggregated by water year and then compared on an annual basis for this analysis.

properties are “computationally intensive and cover small areas”. The BCM includes direct consideration of the influence of underlying geology on the ability of water in the soil profile to percolate deeper into the saturated zone. However, the BCM geologic dataset is based on a coarse-scale (i.e., 1:750,000) state-wide map (Jennings, 1977). For this reason, in this area the BCM may provide a more generous estimate of the potential for recharge to occur if the BCM grid cells at the project location are mapped as having underlying geologic properties consistent with the Napa Valley alluvium rather than reflecting the more restrictive geologic sedimentary rock formations depicted in Figure 3 of the draft WAA and logged by the drillers of Wells 1, 2, 3, 5, 6, 7, and 8. This could be the case at the Anthem Winery project parcels.

The draft WAA constrains the estimate of potential groundwater recharge further by omitting portions of the project parcels located opposite a fault that is mapped as crossing the property. The three project wells (Well 3, Well 6, and Well 8) are all located west of the fault in an area determined by RCS to be 30.0 acres. With this constraint, RCS calculates average annual groundwater recharge to be 7.0 AFY, when accounting for reduced recharge on areas within those 30.0 acres with slopes greater than 30 degrees.

While the draft WAA’s consideration of the fault is instructive, the actual location of the fault relative to the project wells, and by extension, the area of the project parcels located on the same side of the fault as the project wells is questionable. The fault is mapped by the California Geological Survey at a scale of 1:24,000 and given an “approximate” designation. Based on the groundwater level data and results of the aquifer testing presented in the draft WAA, the greater limitation on groundwater production on the project parcel is not the amount of water potentially available to recharge groundwater occurring on the parcel so much as the physical properties of the aquifer materials encountered by the three project wells, which limit the amounts and timing of recharge and the ability of the wells to produce groundwater.

WATER USE CALCULATION REVIEW

This section provides a review of the WAA Appendix-Tier 1 Water Use Calculation, Anthem Winery by RSA+. Water use and supply from this document are summarized in the tables below for both the existing and proposed projects. The “Approved” project is not evaluated here because it was presented for comparison purposes only. Demands are based on estimates of use (e.g., residential, vineyard, and winery) not on actual metered data. **Table 7** itemizes the vineyard acres that currently exist on the project parcels, previously approved acreage to be planted (permit P12-00401), and acreage newly proposed under permit application P14-00320.

Table 7. Existing, Approved, and Proposed Vineyard Acres, Anthem Winery

Parcel	Existing	*New, Currently Unplanted Acreage*		Total Acres
		Previously Approved, to be Planted (P12-00401)	Proposed with pending permit application (P14-00320	
Parcel 1	0	1.66	0.90	2.56
Parcel 2	5.77	0.63	0.05	6.25[1]
Total	**5.77**	**2.29**	**0.95**	**8.81**

[1] The applicant proposes to remove 0.20 acres of the existing 5.77 acres of vineyard on Parcel 2 as part of permit application P14-00320.

Table 8. Existing and Proposed Project Demands

Demand (AFY)				
	Residential	**Vineyard**	**Winery**	**Total**
Existing Project				
Parcel 1	0.75	0	-	0.75
Parcel 2	0.75	2.89	0	3.64
Total				**4.39**
Proposed Project				
Parcel 1	0.75	0.62	-	1.37
Parcel 2	0.75	2.99	1.92	5.66
Total				**7.03**

Table 9. Existing and Proposed Project Supply

Supply (AFY)							
	Groundwater Wells				**Reclaimed Process Wastewater**	**Harvested Rainwater**	**Total**
	Non-Project		**Project**	**Total GW**			
Parcel	4	1,5,7	3,6,8				
Existing Project							
Average Year							
Parcel 1	0.15		0.6	.75	-	-	
Parcel 2		3.64		3.64	-	-	
Total	**0.15**	**3.64**	**0.6**	**4.39**	**0**	**0**	**4.39**
Proposed Project							
Average Year							
Parcel 1	0.15		0.92	1.07	0	0.3	1.37
Parcel 2		3.64		3.64	0.77	1.25	5.66
Total	**0.15**	**3.64**	**0.92**	**4.71**	**0.77**	**1.55**	**7.03**
Dry Year							
Parcel 1	0.15		1.22	1.37	0	0	1.37
Parcel 2		3.64	0.50	4.14	0.77	0.75	5.66
Total	**0.15**	**3.64**	**1.72**	**5.51**	**0.77**	**0.75**	**7.03**

The existing demand on the project parcels, met entirely by groundwater, totals 4.39 AFY for 5.77 acres of vineyards and two residences (**Tables 8 and 9**). The proposed project will increase total water use to 7.03 AFY for 8.81 acres of vineyards in addition to other site uses (e.g., residences and winery). These proposed demands are to be met by groundwater (4.71 AFY in an average rainfall year and 5.51 AF in a

dry year), harvested rainwater (2.32 AFY and 1.52 AFY in average and dry years), and from winery process water (0.77 AFY in both average and dry years). This represents an increase in proposed groundwater pumping of 0.32 AFY in average years and 1.12 AFY in dry years.

The following observations are derived from a review of the draft WAA, well construction information provided by Napa County, and other supporting documentation provided by Napa County.

1. Project wells on Parcel 1 are Wells 3, 6, and 8 drilled in 2001, 2014, and 2015, respectively. These wells have provided water for existing uses (0.60 AFY)[12] and will provide 0.92 AFY (1.1 GPM for 365 days/year and 12 hrs/day) for the proposed project in an average year and 1.72 AFY in a drought year (2.1 GPM 365 days/year and 12 hrs/day).

    a. The draft WAA does not clearly document plans to store water pumped by project wells in winter for use during the dry season. Page 1 of the Appendix includes only the following general statement, "Water storage will be provided on site to normalize pump rates throughout the year." In separate documentation, the applicant provided the County site plans that depict four water tanks located in the cave area, where each tank has a storage capacity of about 100,000 gallons (Backen, Gillam Kroeger Architects, 2017) . Additionally, other plan documents, submitted as part of the Anthem Winery Use Permit Plans, show eight 10,000-gallon poly tanks located near the septic field for storage of irrigation and drinking water (RSA$^+$, 2017).

    b. The draft WAA assumes there are no known neighboring wells within 500 ft of project wells. However, a property north of Parcel 1 within 100 ft of "Project Well" 6 has a house and landscaping and may have a well that would trigger a Tier 2 evaluation to analyze well interference. The water source for this dwelling and/or landscaping should be identified.

2. Non-project wells on Parcel 2 are Wells 1, 4, 5, and 7.

    a. The draft WAA assumes that the amount pumped from Wells 1,5,7 (3.64 AFY) can be sustained into the future, however, the draft WAA also describes that water was trucked to the project parcels for two years ending in August 2014, after which time Wells 7 and 8 were installed. The draft WAA does not provide any detail as to how much water was trucked to the project parcels each year.

    b. Well 4 is reported to be an existing source of supply and is included as a future source of supply. The draft WAA Appendix shows that only 20% (0.15 AFY) of the Parcel 1 residence demand is provided by Well 4 (page 7 of Tier 1 Water Use Calculation, draft WAA Appendix).

        i. The draft WAA does not describe how water is currently or will be transported from Well 4 to the Parcel 1 residence over a distance of over 2,000 ft.

[12] Source: page 6, Appendix Tier 1 Water Use Calculations, Draft Results of Aquifer Testing of Project Wells and Napa County Tier 1 Water Availability Analysis For Proposed Anthem Winery

ii. Table 1 in the draft WAA shows the lowest estimated flow rate for Well 4 to be 1.4 GPM. The draft WAA does not include any records to demonstrate that Well 4 has provided 0.15 AFY to the residence on Parcel 1 in prior years.

3. The following proposed categories have no water use allocation in the draft WAA:
    a. 20 ft Vineyard Avenue
    b. 10 ft Vineyard Avenue
    c. Native Bunch Grasses (0.41 acres)
4. The draft WAA proposes that 100% (0.77 AFY) of reclaimed winery process water will be available for water supply; however, the draft WAA does not describe what the reclaimed water will be used for[13]. While site plans, particularly the Utility Plan (RSA+, 2017), show some engineering design details, there is no accompanying documentation that describes any required treatment or how the project will achieve zero losses of winery process water.[14]
5. In an average year, the draft WAA proposes that 1.55 AF of rainwater will be collected and used to augment water supplies; however, no engineering design is provided to demonstrate how and where this water will be captured and stored for later use. The draft WAA lacks a discussion of whether the design is subject to evaporation losses and whether those losses are accounted for in the projected volume of rainwater to be put to use at a later time.
6. The draft WAA does not provide documentation to support the reduced irrigation demand attributed to the "low-water varietal" proposed to be planted on a portion of Parcel 1.

FINDINGS AND RECOMMENDATIONS

Based on the review of the draft WAA and related documentation provided by Napa County, this section summarizes key findings and recommendations. A prior permit appears to have authorized groundwater uses based on an allocation of 0.5 AF per acre for a single parcel where the initial vineyard and winery operation was established, as part of the then Jessup Cellars Winery. In July 2000 that amounted to 7.79 AFY at Parcel 2, which was then described as covering 15.57 acres.[15] The County previously used that allocation rate for projects outside of designated groundwater deficient areas that were also outside of the Napa Valley Floor. Although the owner, or previous owners, have apparently not used the amount of groundwater authorized historically, groundwater conditions at the site indicate poorly permeable formations that limit groundwater production. The applicant indicates an intent to keep the proposed water uses for this application below the amount of groundwater authorized historically. However, groundwater supplies are limited, and the applicant proposes to meet demands by supplementing groundwater supplies with other sources of water including reclaimed winery process water and rainwater harvesting.

[13] The RSA+ Utility Plan (April 2017) notes that treated process waste water is planned to be used for irrigation.
[14] The RSA+ Utility Plan (April 2017) shows eight 10,000-gallon poly tanks to contain "IRR", "PWW", and "DW". It is anticipated that IRR is stored water for irrigation; "DW" is stored domestic water. "PWW" refers to process waste water stored for irrigation.
[15] The annual groundwater use authorization for Parcel 2 is referenced in the July 14, 2000 Bartelt Engineering letter that references parcel number 035-470-021, believed to now be designated as parcel number 035-470-046.

The total projected water uses, including proposed and existing water uses, are small, based on the estimate provided, and would not risk significantly reducing the availability of groundwater at the regional or basin scale. However, the project faces limitations between what groundwater may be available in the form of groundwater recharge and what the project wells are actually able to produce.

FINDINGS

1. The aquifer testing reported by RCS indicates very low values for two aquifer parameters that define an aquifer's ability to transmit and store water. This indicates limited potential for project wells to significantly impact off-site wells, as the nature of the aquifer materials in the vicinity of the three project wells limits the extent of their influence, spatially. However, since no specific off-site wells are acknowledged in the draft WAA, it is not clear whether any such wells may be subject to influence by the project wells.

2. The draft WAA does show that even the very low pumping rates proposed to occur at Wells 3 and 6 would affect groundwater levels in the other of those two wells. Pumping both Well 3 and Well 6 at the same time would produce mutual well interference, and concurrent pumping would likely not be attainable over the long-term.[16] The draft WAA does not address the impact that mutual well interference will have on feasible, long-term well capacities for Well 3 and Well 6.

3. The draft WAA provides a conservative estimate of groundwater recharge at the parcel-scale. Using a water budget analysis of recharge for the overall Redwood Creek watershed, the draft WAA also accounts for potential limitations on groundwater recharge due to steep slopes and fault boundaries to estimate an average annual recharge rate of 7.0 AFY.

4. Existing water uses are based on calculated estimates, rather than actual pumpage amounts. The November 15, 1996 memo mentions that water use was recommended (but not required) to be metered and provided to Napa County Planning Department on an annual basis. It is unclear whether water use has been metered and reported.

5. Total proposed demand is 7.03 AFY, and this is to be met by 2.32 AFY of non-groundwater sources (e.g., reclaimed process wastewater and harvested rainwater). The mechanics and facilities needed to accomplish this are not explained in the draft WAA (e.g., storage of 1.55 AF of rainwater in winter until use in summer and storage and reuse of 0.77 AF of process water without losses). As described above, site plans provided by the applicant show some engineering design details related to stored rainwater and treated process waste water.

6. The draft WAA assumes project wells would be pumped 12 hours per day for 365 days/yr. It is unclear, based on the analysis presented, whether this could actually be accomplished. Mutual well interference observed between Well 3 and Well 6 is not addressed with respect to the implications for reduced well production capacity. Water storage plans for the pumped groundwater are not explained in the draft WAA. Site plans provided by the applicant show the amount and location of planned water storage.

[16] This does not mean that these two wells cannot work in conjunction, but pumping at the same time would likely result in reduced capacities in both wells. Cycling one well on and the other well off might offer some relief from the mutual well interference in Wells 3 and 6.

7. It appears that a neighboring well or wells within 500 ft of project wells may be located near the northern border of Parcel 1 where a house and vineyard are within about 100 ft of Project Well 6. Structures located west of Well 3 on an adjacent parcel could also have associated wells within 500 ft of that project well. The water source for this dwelling and/or landscaping should be identified.

8. Appendix E of the WAA—Guidance Document, "Determining water use numbers with multiple parcels", states, "There will be cases where one person or entity owns multiple contiguous parcels and requests that the total water allotment below all of his or her parcels be considered in the Water Availability Analysis." However, "to protect future property owners, certain safeguards must be in place to ensure that the water allotment and transfer between parcels is clearly documented and recorded…."

    a. It appears that Parcel 1 water will be used on Parcel 2 when in a "dry year" 0.5 AF of groundwater will need to be transferred to Parcel 2.

    b. Appendix E states that If there is a transfer of water between parcels this "must be documented using the form provided by the Department of Public Works."

9. The draft WAA does not consider the potential for streamflow depletion by the three project wells. Although all three of the project wells have capacities below 10 GPM and would therefore have the Tier 3 criteria presumptively met if they are greater than 500 ft from the creek, Well 3 does have a surface seal of less than 50 ft and casing perforations above 100 ft, which could result in a potentially significant influence on streamflow.

RECOMMENDATIONS

The following recommendations are intended to provide clarity to the applicant as to the actions that should be taken to provide sufficient information for assessing current and proposed water uses, long-term well capacity, and overall water supply availability as described in the draft WAA.

1. Provide an analysis of the effect of mutual well interference between Wells 3 and 6, sufficient to address the effect on each well's capacity at pumping rates and schedules sufficient to meet the total project demand. If the analysis results in a recommendation for increased rates of groundwater pumping at Well 8 or supplying groundwater for the proposed project from non-project wells, those changes should also be analyzed to demonstrate feasibility.

2. Provide documentation or details identifying the location of wells on properties to the north and west of Parcel 1 which may be close enough to experience an impact from proposed project Wells 3 and 6, and to confirm that there are no wells on these properties that are within 500 feet of said wells. Well Completion Reports requested from the Department of Water Resources can assist identification of neighboring wells at distances less than 500 feet from proposed Project wells.

3. Provide details in the WAA regarding the proposed groundwater production schedule, winery process water schedule, and the existing or proposed means for treating and storing sufficient

groundwater, reclaimed winery process water, and captured rainwater to provide the water supply needed for the proposed project.

4. Provide slope mapping to show the acreage over 30 degrees that occurs within the holding so that the effect of ground slope on the recharge potential can be confirmed.
5. If not already done, install groundwater flow meters with totalizers on all wells on all project and non-project wells to determine the volumes of groundwater extracted at regular intervals.
6. Record quarterly static groundwater levels in all project and non-project wells for three years.
7. Detail the amounts of water trucked to supply water uses at the project parcels during the two years referenced in the draft WAA to quantify the shortfall.
8. Provide details as to how existing water uses were supplied in 2015 and 2016 (e.g., whether Wells 6 and 8 or other water sources were used to meet demands on Parcel 2).

REFERENCES

Backen, Gillam, Kroeger-Architects. 2017. Anthem Winery and Vineyards, LLC, Floor Plan Lower Level/Caves. April 10, 2017.

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Luhdorff and Scalmanini, Consulting Engineers (LSCE) and MBK Engineers (LSCE and MBK). 2013. Updated Hydrogeologic Conceptualization and Characterization of Conditions. Prepared for Napa County.

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January 22, 2018
Project No. 17-1-060

Mr. Donald Barrella
Napa County Department of Planning, Building & Environmental Services
Engineering and Conservation Division
1195 Third St., #210
Napa, CA 94559

SUBJECT: Comments on Proposed Anthem Winery Draft Peer Review Response from Richard C. Slade & Associates, October 19, 2017

Dear Mr. Barrella:

This letter refers to the October 19, 2017 Draft Memorandum by Richard C. Slade & Associates (RCS), titled: *Response to Peer Review Letter Regarding Napa County Tier 1 Water Availability Analysis by RCS For Proposed Anthem Winery* (Draft Peer Review Response). The Draft Peer Review Response provides responses to nine recommendations and findings contained in the August 10, 2017 Memorandum by Luhdorff & Scalmanini, Consulting Engineers (LSCE), which provides a peer review of the April 10, 2017 *Draft Napa County Tier 1 Water Availability Analysis for the Proposed Anthem Winery* (Draft WAA) by RCS.

The following paragraphs provide our comments on the responses provided by RCS and identify remaining areas where additional data are needed to support the conclusions of the Draft WAA. Recommended Conditions of Approval for the Use Permit sought for the proposed Anthem Winery are also included below, based on the information provided to date.

Response to LSCE Recommendation 1

The response addresses the request for additional analysis of the effects of mutual well interference between Well 3 and Well 6 by presenting multiple scenarios for average and drought water year types. The various scenarios indicate how the total project daily groundwater demand for proposed additional uses of groundwater could be met by utilizing only Well 8 (in average water years only) or by utilizing Well 8 in combination with Wells 3 and/or Well 6 pumping at rates below flow rates tested during the aquifer testing at each well in 2016. All scenarios presented for drought water years rely on at least one of Wells 3 and 6 to meet the projected daily drought water year groundwater demand of 1,584 gallons. These scenarios would likely avoid significant mutual well interference, if implemented as described. However, the response does not include any additional data, such as flowmeter data and updated groundwater level hydrographs to demonstrate prior rates of groundwater production in prior years and groundwater level stability in the time since the Draft WAA was originally submitted. See the list of additional data needed to support the Draft WAA conclusions following the Response to LSCE Finding 9, below.

Recommended Conditions of Approval

The additional information provided in the Draft Peer Review Response indicates that under the proposed project, groundwater produced at Well 8 on Parcel 2 would be used to meet the demands of the residence on Parcel 1 in both average water years and drought water years (see **Appendix A, Table 9-Rev**).

A. It is recommended that the County condition the Anthem Winery Use Permit on recording the planned transfer of groundwater from Parcel 2 to supply existing residential uses on Parcel 1, as described in Appendix E of the Water Availability Analysis Guidance Document (Napa County, 2015).

Response to LSCE Recommendation 2

This response addresses the request for documentation and details relating to efforts made to identify wells on adjacent properties within 500 feet of proposed project wells. Well construction information for two additional wells are included with the Draft Peer Review Response. No additional data are needed, and no conditions of approval are recommended relative to Recommendation 2.

Response to LSCE Recommendation 3

The revised RSA+ Memo appended to the Draft Peer Review Response provides two additional pages detailing monthly water balances, including projected water storage needs, for average water years and drought water years. These two water balances detail water demands by type of use (including "vineyard", "residential", "winery domestic water", "winery process water", and "winery landscape irrigation") and sources of supply that will be used to meet the demands through a combination of current month water production and water stored from prior months. The monthly water balance calculations show the maximum monthly storage needs to be 130,732 gallons for reclaimed process water and 282,319 gallons for harvested rainwater. The maximum total storage required in any single month, according to the RSA+ water balance tables, would be 409,560 gallons in April of an average water year.

The monthly water balance calculations from RSA+ show that new water use for vineyard irrigation (0.73 acre-feet/year) will be supplied entirely by reclaimed winery process water. Apparently, the winery process water will be generated on Parcel 2, where the winery is located. Page 2 of 7 in the RSA+ Memo shows that new uses for vineyard irrigation will primarily occur on Parcel 1. This transfer between parcels was not clearly described in the April 10, 2017 Draft WAA and implies that the vineyard expansion on Parcel 1 could not occur until the winery is operational and generating reclaimed process water.

Consistent with the Draft WAA, the monthly water balance calculations show that winery process water use of 0.77 acre-feet/year will be recaptured and reused entirely, without losses. The proposed rate of winery process water use of 5 gallons of water per gallon of wine produced

is 29% less than the rate of 7 gallons of water per gallon of wine produced included in the Water Availability Analysis Guidance Document (Napa County, 2015).

The Draft Peer Review Response does not appear to include any additional information about the water tanks or other facilities that the applicant will use to store water, as indicated in the monthly water balances, or for other needs such as fire safety. The Draft WAA includes a figure showing eight 10,000 tanks to be located near the future winery building. The County previously provided LSCE with a figure from Backen Gillam Kroeger Architects depicting 400,000 gallons of "water tank-cave" storage in the winery cave, although these tanks and their planned use are not referenced in the Draft WAA. This response does not appear to include any new information that addresses the design of the recycled water and rainwater catchment systems nor the planned efficiency of those systems, and the potential for losses due to evaporation or other means that may impact the project's ability to achieve the projected supplies from these new sources. See the list of additional data needed to support the Draft WAA conclusions following the Response to LSCE Finding 9, below.

Recommended Conditions of Approval

The additional information provided in the Draft Peer Review Response indicate that under the proposed project, 85% of the reclaimed winery process water generated on Parcel 2 by future winery operations will be transferred to Parcel 1 to supply 2.56 acres of proposed additional vineyards (see **Appendix A, Table 9-Rev)**.[1]

B. It is recommended that the County condition the Anthem Winery Use Permit on recording the planned transfer of reclaimed winery process water from Parcel 2 to supply the proposed additional vineyard acreage on Parcel 1, as described in Appendix E of the Water Availability Analysis Guidance Document (Napa County, 2015).

C. It is recommended that the County condition the Anthem Winery Use Permit to ensure that the proposed vineyard expansion on Parcel 1 does not occur until the water source for that vineyard, the proposed winery and process water reclamation system, are operational.

D. It is recommended that the County condition the Anthem Winery Use Permit to require that the Applicant verify that they have, or will install, water storage capacity sufficient to meet the maximum monthly storage requirements (in addition to any storage required for

[1] The water balance tables provided in the RSA+ Appendix to the Peer Review Response show that the only source of supply for the additional proposed vineyards on both parcels will be 0.73 acre-feet/year to be generated by winery process water reclamation on Parcel 2. The table on Page 1 of 7 of the RSA+ Appendix shows that 0.62 acre-feet/year of the proposed additional vineyard irrigation use will occur on Parcel 1.

fire safety or other purposes) as demonstrated in the water balance information provided in the revised RSA+ Memo appended to the Draft Peer Review Response.

Response to LSCE Recommendation 4

As requested, the response provides an additional figure that is consistent with the summary of land surface slopes in the Draft WAA. No additional data are needed, and no conditions of approval are recommended relative to Recommendation 4.

Response to LSCE Recommendation 5

The response clarifies that all wells on the Anthem parcels were previously equipped with totalizing flowmeters, with the exceptions of Well 4 and Well 2, the latter being damaged and planned to be destroyed. The response states that the owner will provide a totalizing flowmeter for Well 4 in the future.

This response raises additional questions as to why no flowmeter data are presented in the Draft WAA to support estimates of existing water uses and well production capacities, particularly given the very low pumping capacities demonstrated by aquifer tests reported in the Draft WAA and the need to import water to the parcels to meet existing demands in 2013 and 2014. See the list of additional data needed to support the Draft WAA conclusions following the Response to LSCE Finding 9, below.

Recommended Conditions of Approval

E. It is recommended that the County condition the Anthem Winery Use Permit on reporting flowmeter data from all wells and other water sources used to supply the project water uses for a period of five years from the completion of vineyard expansion or start of winery production, whichever is later.

Response to LSCE Recommendation 6

The response indicates that the applicant intends to continue monitoring groundwater levels with pressure transducers at all six wells currently outfitted with that equipment. In addition, the applicant will begin monitoring groundwater levels in Well 4 quarterly.

Recommended Conditions of Approval

F. It is recommended that the County condition the Anthem Winery Use Permit in part on reporting groundwater level data from all wells on the property for a period of five years from the completion of vineyard expansion or start of winery production, whichever is later. Monitoring should be conducted at least quarterly by electronic sounder or pressure transducer.

Response to LSCE Recommendation 7

The response states an amount of water trucked to the property in 2013 and 2014 along with the beginning and ending dates of trucking for both years. Additional justification is provided for the need to truck water to the property in those years. No supporting documentation is provided to confirm the amounts of water and timing of delivery. See the list of additional data needed to support the Draft WAA conclusions following the Response to LSCE Finding 9, below.

Recommended Conditions of Approval

G. It is recommended that the County condition the Anthem Winery Use Permit in part on a requirement that water not be imported to the project parcels from sources not evaluated in the WAA.

Response to LSCE Recommendation 8

The response provides some additional detail regarding the sources of supply to Parcels 1 and 2 in 2015 and 2016, during continued drought conditions following two years when water was trucked to the property. The additional details focus largely on Well 8, constructed in 2015. The response clarifies that Well 8 "is not needed to meet the existing water demands on Parcel 1 or Parcel 2" (p. 6). Among the additional information provided is that "in early November 2016, Well 8 was connected to the water tank that serves Parcel 2 and was pumped occasionally in order to prevent its groundwater from becoming stagnant and contaminated" (p. 6). However, the hydrograph for Well 8 (Draft WAA, Figure 7G) appears to show that Well 8 was pumped frequently (i.e., several times per week) during April, May, and June 2016 and again from September 2016 through early February 2017. The pumping pattern shown in the hydrograph does not resemble the occasional pumping described in the Draft Peer Review Response Memo. See the list of additional data needed to support the Draft WAA conclusions following the Response to LSCE Finding 9, below.

Response to LSCE Finding 9

The response provides additional information, including geologic cross sections, demonstrating that Wells 3, 6, and 8 are unlikely to be hydraulically connected to Redwood Creek. No additional data are needed, and no conditions of approval are recommended relative to Finding 9.

Data Needed to Support Draft WAA Conclusions

1. Given the very low pumping capacities demonstrated by aquifer tests reported in the Draft WAA and the need to import water to the parcels to meet existing demands in both 2013 and 2014, the Applicant should present all available flowmeter data and updated groundwater hydrographs at all monitored wells to document the ability of both the project wells and non-project wells to meet existing demands, to demonstrate the feasibility of pumping scenarios presented in the Draft Peer Review Response, and to support the conclusions of the Draft WAA.

2. The Draft Peer Review Response and Draft WAA project a water demand for winery processes that is 29% below the rate referenced in the Water Availability Analysis Guidance Document (Napa County, 2015). The Applicant should provide a detailed rationale and documentation to support the proposed lower rate or recalculate the projected demand for winery process water use based on a rate of 7 gallons of water per gallon of wine produced.

3. The Draft Peer Review Response and Draft WAA project that all winery process water will be recaptured and reused without losses. The Applicant should provide a detailed rationale and documentation to support the projected 100% efficiency of winery process water reclamation or recalculate the available supply to account for losses.

4. The Applicant should provide supporting documentation to confirm the amounts of water and timing of delivery of water imported to the parcels in 2013 and 2014.

We appreciate the opportunity to provide this review. If you have any questions, or wish to discuss any of the above, we would be pleased to respond.

Sincerely,

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

Vicki Kretsinger Grabert
President/Senior Principal Hydrologist

Reid Bryson
Project Hydrologist

Enclosure: Appendix A

APPENDIX A

- Table 9-Rev (below) is a revision to the Table 9 previously prepared by LSCE and included in the August 10, 2017 Peer Review Memo. The table documents sources of supply and location of use, by project parcel.

- Information in the Table 9-Rev is revised compared to the version originally presented in August 10, 2017 LSCE Memo based on additional information provided in the Draft Peer Review Response by RCS. The revisions demonstrate how the proposed project will involve ongoing transfers of water between the two project parcels.

- As shown in the "Existing Project – Average Year" section, information provided to date indicate that the existing uses of water are all supplied by sources located on the same parcel.

- Additional information provided by RCS describe how the planned future groundwater production by Project Well 8 will be used. According to the pumping scenarios presented by RCS in the Draft Peer Review Response, in both average and drought water years, groundwater produced at Well 8 on Parcel 2 would be transferred to Parcel 1 to supply existing residential uses. As Table 9-Rev shows, the existing residential demand is currently met by Project Wells 3 and 6 (and Non-Project Well 4).

- The water balance tables provided in the RSA+ Appendix to the Draft Peer Review Response show that the only source of supply for the additional proposed vineyards on both parcels will be 0.73 acre-feet/year to be generated by winery process water reclamation on Parcel 2. The table on Page 1 of 7 of the RSA+ Appendix shows that 0.62 acre-feet/year of the proposed additional vineyard irrigation use will occur on Parcel 1.

- The table on Page 6 of 7 in the RSA+ Appendix to the Draft Peer Review Response indicates that a small percentage, 6.5%, of the roof area used to harvest rainwater for the proposed project is located on Parcel 1. However, the water balance tables provided by RSA+ also show that all harvested rainwater would be used for winery uses, which will occur on Parcel 2, per the table on Page 1 of 7 of the RSA+ Appendix.

Table 9-Rev. Applicant-Estimated Existing and Proposed Project Water Use by Source of Supply

Use by Parcel	Source of Supply (Acre-Feet/Year)							Parcel Use Total
	Groundwater (GW)					Reclaimed Process Wastewater (generated on **Parcel 2**)	Harvested Rainwater (generated on **Parcel 1** and **Parcel 2**)	
	Non-Project		Project		Total GW			
	Parcel 1 **Well 4**	Parcel 2 **Wells 1,5,7**	Parcel 1 **Wells 3,6**	Parcel 2 **Well 8**				
	Existing Project - Average Year							
Parcel 1 Uses	0.15	-	0.6	-	0.75	-	-	0.75
Parcel 2 Uses	-	3.64	-	-	3.64	-	-	3.64
Source Total	**0.15**	**3.64**	**0.6**	**0**	**4.39**	**0**	**0**	**4.39**
	Proposed Project - Average Year							
Parcel 1 Uses	0.15	-	0 – 0.27	0.33 – 0.6†	0.75	0.62§	0.00	1.37
Parcel 2 Uses	-	3.64	-	0.32	3.96	0.15	1.55*	5.66
Source Total	**0.15**	**3.64**	**0 – 0.27**	**0.65 – 0.92**	**4.71**	**0.77**	**1.55**	**7.03**
	Proposed Project - Dry Year							
Parcel 1 Uses	0.15	-	0.11 – 0.51	0.09 – 0.49†	0.75	0.62§	0.00	1.37
Parcel 2 Uses	-	3.64	-	1.12	4.76	0.15	0.75*	5.66
Source Total	**0.15**	**3.64**	**0.11 – 0.51**	**1.21 – 1.61**	**5.51**	**0.77**	**0.75**	**7.03**

† The Draft Peer Review Response (dated October 19, 2017) include a range of scenarios whereby all uses of groundwater not met by Wells 1, 4, 5, and 7 (estimated to be 0.92 AFY in average years and 1.72 AFY in drought years) could be met either entirely by Well 8 or primarily by Well 8 with lesser contributions from Wells 3 and 6. Under all scenarios, some groundwater would be transferred from Well 8 to Parcel 1 in every year.

§ The water balance tables provided in the RSA+ Appendix to the Draft Peer Review Response show that the only source of supply for the additional proposed vineyards on both parcels will be 0.73 acre-feet/year to be generated by winery process water reclamation on Parcel 2. The table on Page 1 of 7 of the RSA+ Appendix shows that 0.62 acre-feet/year of the proposed additional vineyard irrigation use will occur on Parcel 1.

* The table on Page 6 of 7 in the RSA+ Appendix to the Draft Peer Review Response indicates that a small percentage, 6.5%, of the roof area used to harvest rainwater for the proposed project is located on Parcel 1. However, the water balance tables provided by RSA+ also show that all harvested rainwater would be used for winery uses, which will occur on Parcel 2, per the table on Page 1 of 7 of the RSA+ Appendix.

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A Tradition of Stewardship
A Commitment to Service

Department of Public Works

1195 Third Street, Suite 101
Napa, CA 94559
www.countyofnapa.org

Steven E. Lederer
Director

MEMORANDUM

To:	Planning Department Charlene Gallina	From:	Department of Public Works Steven Lederer
Date:	August 14, 2018	Re:	Anthem Winery #P14-00320-UP Water Availability Analysis 3454 Redwood Road APN 035-470-046

Charlene:

The Department of Public Works in collaboration with Luhdorff & Scalmanini Consulting Engineers (L&S) have reviewed the Water Availability Analysis (WAA) responses provided in the memorandum prepared by Richard C. Slade & Associates LLC (RCS)., dated March 23, 2018. The March 2018 RCS memo was prepared in response to comments by L&S dated January 22, 2018 in response to L&S's peer review of the Project's April 2017 Water Availability Analysis prepared by RCS.

The following summarizes our review of the documentation and responses provided in March 23, 2018 RCS letter.

Item 1 (Updated Hydrographs and Totalizer Data for Project Wells 3, 6, and 8)

a. The memorandum dated 3/22/2018 addresses the request for additional data, and the Applicant's consultant notes "based on the available data, the total groundwater extraction at the property does not appear to have exceeded the estimates presented in the RSA+ Tier 1 calculations for existing uses" (p.2).
    1. The groundwater pumping data provided do show that the three project wells have produced enough water annually to meet the existing annual demands documented in the WAA, although the data show that Well 8 has supplied the majority of the groundwater produced by all three wells in two of the three years. This is inconsistent with the statement in the Draft Addendum to the WAA, dated October 19,2017, that "Well 8 was drilled and constructed to help support the proposed project, and is not need[ed] to meet the existing water demands on Parcel 1 or Parcel 2" (p. 5).
    2. As requested, the water level hydrographs included in the 3/22/2018 memorandum provide updated groundwater data through February 2018. The updated hydrographs, along with the reported groundwater pumping volumes, highlight the relatively limited capacity of the project wells.

The response is sufficient in providing additional information to demonstrate adequate groundwater availability to meet current demands, though the Applicant's consultant may want to provide clarification as to the need for using Well 8 to meet existing groundwater demands. The additional data also highlight the need for conditions of approval, as described on our letter dated January 22, 2018 (also see below), to ensure that groundwater conditions and water use are tracked and reported going forward, and to ensure that the three project wells are able to meet increased future groundwater demands over multiple years and different water year types.

Item 2 (regarding the 5 gallon water/1 gallon wine rate of use for the proposed winery)

a. The response provides additional professional opinion from consultants RSA+ that the proposed winery is designed to meet the stated rate of water use for winery processes.

Item 3 (regarding the lack of losses anticipated in recycling winery process water for re-use to meet irrigation demands)

a. The response by consultants RSA+ provides additional information, as requested, specifying that the project incorporates infrastructure and operation Best Management Practices to minimize losses.

Item 4 (additional documentation for 2013 and 2014 trucked water deliveries)

a. The response addresses the request for documentation to support the summary presented in the WAA, and is sufficient to meet the need for the additional data that we identified.

Based on the County's review, in collaboration with L&S, of the documentation provided in the Project's April 10, 2017 Water Availability Analysis, and subsequent October 19, 2017 and March 23, 2018 peer review responses, the County has determined the WAA to be adequate. This determination has been made because the WAA adequately discloses potential impacts of the project, which are anticipated to be less than significant. Additionally, conditions of approval developed for this project, as described below, are anticipated to maintain potential impacts at a less than significant level. The proposed Conditions of Approval for this project have been developed in collaboration with L&S. Any changes in use may necessitate additional conditions for approval.

Feel free to contact the Public Works Department or L&S with any questions, or if you would like to discuss this matter further.

<u>Recommended Conditions of Approval:</u>

4.9 GROUND WATER MANAGEMENT - WELLS

This condition is implemented jointly by the Public Works and PBES Departments:

The permittee shall be required (at the permittee's expense) to record well monitoring data (specifically, static water level no less than quarterly, and the volume of water no less than monthly). Such data will be provided to the County, if the PBES Director determines that substantial evidence indicates that water usage at the winery is affecting, or would potentially affect, groundwater supplies or nearby wells. If data indicates the need for additional monitoring, and if the applicant is unable to secure monitoring access to neighboring wells, onsite monitoring wells may need to be established to gauge potential impacts on the groundwater resource utilized for the

project. Water usage shall be minimized by use of best available control technology and best water management conservation practices.

In order to support the County's groundwater monitoring program, well monitoring data as discussed above will be provided to the County if the Director of Public Works determines that such data could be useful in supporting the County's groundwater monitoring program. The project well will be made available for inclusion in the groundwater monitoring network if the Director of Public Works determines that the well could be useful in supporting the program.

In the event that changed circumstances or significant new information provide substantial evidence[1] that the groundwater system referenced in the Use Permit would significantly affect the groundwater basin, the PBES Director shall be authorized to recommend additional reasonable conditions on the permittee, or revocation of this permit, as necessary, to meet the requirements of the County Code and to protect public health, safety, and welfare.

4.20 OTHER CONDITIONS APPLICABLE TO THE OPERATIONAL ASPECTS OF THE PROJECT

a. The project parcels (Parcel 1, 3123 Dry Creek Road, APN 035-460-038; and Parcel 2, 3454 Redwood Road, APN 035-470-046) shall be limited overall to **4.71 acre-feet of groundwater per year** for all groundwater consuming activities on the project parcels. Specifically, Parcel 1 shall be limited to 0.75 acre-feet of groundwater per year, and Parcel 2 shall be limited to 3.96 acre-feet of groundwater per year. A Groundwater Demand Management Program shall be developed and implemented for the project property as outlined in COA 6.15(a) below.

b. The planned transfer of groundwater from Parcel 2 (3454 Redwood Road: APN 035-470-046) to supply existing residential uses on Parcel 1 (3123 Dry Creek Road: APN 035-460-038), shall be documented and memorialized through the recordation of an "Agreement for Grant of Easement and Water Right" as described in Appendix E of the Water Availability Analysis Guidance Document (Napa County, 2015). The Agreement shall be on a form approved by the County and shall be recorded by the owner/permittee prior to commencement of any activities authorized by #P14-00320-UP.

c. The planned transfer of reclaimed winery process wastewater from Parcel 2 (3454 Redwood Road: APN 035-470-046), to supply the proposed additional vineyard acreage on Parcel 1 (3123 Dry Creek Road: APN 035-460-038), shall be documented and memorialized through the recordation of an "Agreement for Grant of Easement and Water Right" as described in Appendix E of the Water Availability Analysis Guidance Document (Napa County, 2015). The Agreement shall be on a form approved by the County and shall be recorded by the owner/permittee prior to commencement of any activities authorized by #P14-00320-UP or #P14-00322-ECPA.

d. The applicant/Permittee shall verify prior to issuance of a certificate of occupancy, that water storage capacity sufficient to meet the maximum monthly storage requirements exists on-site (1.26 acre-feet), in addition to any storage required for fire safety, as detailed in the water balance information provided in the revised "*Tier 1 Water Use Calculations*" prepared by RSA+ August 30, 2017. The "*Tier 1 Water Use Calculations*" are also appended the Peer Review Response dated October 19, 2017 prepared by Richard C.Slade & Associates LLC.

e. No new or existing on-site or off-site water sources, other than that evaluated as part of this Use Permit (#P14-00320-UP) and Agricultural Erosion Control Plan (#P14-00322-ECPA) shall be used for winery operations or vineyard irrigation. Any other proposed irrigation source, including but not limited to wells, imported water, new or existing ponds/reservoir(s) or other surface water impoundments, to serve the winery or vineyard, shall not be allowed without

[1] Substantial evidence is defined by case law as evidence that is of ponderable legal significance, reasonable in nature, credible and of solid value. The following constitute substantial evidence: facts, reasonable assumptions predicated on facts; and expert opinions supported by facts. Argument, speculation, unsubstantiated opinion or narrative, or clearly inaccurate or erroneous information do not constitute substantial evidence.

additional environmental review, if necessary, and may be subject to a modification to this UP and ECPA.

6.15 OTHER CONDITIONS APPLICABLE TO THE PROJECT PERMITTING PROCESS

a. Groundwater Demand Management Program

1. The permittee shall install a meters on each well serving the project parcels (i.e. Parcels 1 and 2) and on any other water sources used to supply the project water (i.e. rainwater harvesting system and reclaimed/recycled winery process wastewater system). Each meter shall be placed in a location that will allow for the measurement of all groundwater, harvested rainwater and reclaimed water use on the project parcels. Additionally, groundwater level data for each well serving the project parcels shall be recorded and reported as described in 5 and 7 below. Prior to the issuance of a grading or building permit for the winery or commencement of vineyard development, the permittee shall submit for review and approval by the Director of Public Works a groundwater demand management plan which includes a plan for the location and the configuration of the installation of a meter on all wells serving the parcels (including method of groundwater level measurement), and the installation of a meter on all other winery water source.
2. The Plan shall identify how best available technology and best management water conservation practices will be applied throughout the parcels.
3. The Plan shall identify how best management water conservation practices will be applied where possible in the structures on site. This includes but is not limited to the installation of low flow fixtures and appliances.
4. As a groundwater consuming activity already exists on the properties, meter installation and monitoring shall begin immediately.
5. For the first twelve months of operation under the Use Permit, the applicant/permittee shall read the meters at the beginning of each month and provide the data to the Public Works Director and the Planning Department monthly. If the water usage on the properties exceeds, or is on track to exceed, 4.71 acre-feet per year, or if the permittee fails to report, additional reviews and analysis and/or a corrective action program at the permittee's expense, shall be required and shall be submitted to the Public Works Director and the PBES Director for review and action.
6. The permittee's wells shall be included in the Napa County Groundwater Monitoring program if the County finds the well suitable.
7. At the completion of the reporting period per 5 above, and so long as the water usage is within the 4.71 acre-feet per year as specified above, the permittee may begin the following meter reading schedule:
    a. On or near the first day of each month the permittee shall read the water meters, and provide the data to the Public Works Director during the first weeks of April and October. The Public Works Director, or his designated representative, has the right to access and verify the operation and readings of the meters during regular business hours.
    b. Water monitoring data collection and reporting shall be conducted for a minimum of five years from the start of winery production or the completion of the vineyard, whichever is later.

9.9 OTHER CONDITIONS APPLICABLE PRIOR TO ISSUANCE OF A FINAL CERTIFICATE OF OCCUPANCY

a. All required meters shall be installed and all groundwater usage monitoring required in COA 4.20(a) and 6.15(a) shall commence prior to final occupancy.

From:	elizabeth herron
To:	Barrella, Donald; Morrison, David
Subject:	Anthem Winery proposal
Date:	Sunday, February 2, 2020 8:41:48 PM

Dear Supervisor Barrella and Supervisor Morrison:

I'm writing in appreciation for your hesitation to support the expansion of Anthem Winery. Their plans do not take into account the fragility of the upland watershed or the dangerously narrow one-lane road, which as we learned with the Atlas Peak fire just a few years ago would be completely inadequate in case of a fire. And fires are more likely than ever before.

Over the past decade, we have had to come to terms with the effects of climate change — long arid summer and fall months, unpredictable winds and weather, and bigger, more intense, more frequent fires.

Our First Responders have been called upon to deal with saving lives in highly dangerous situations as well as fighting fires with entirely new strategies. Narrow rural roads can make their job impossible. While it may serve a private interest, approval of an expanded winery and tasting room at the end of such a road cannot possibly be in the public good. On the contrary, it poses a significant danger.

Given what we now know about our changing climate, we need to hold an educated watershed consciousness more than ever to protect the uplands where remaining oak woodlands have long been nature's way of replenishing our aquifers and protecting native soil.

Already existing small wineries and tasting rooms can only be losers when newer competitive projects are approved. While it may be disappointing to newer property owners, their disappointment cannot be what determines the decisions of the Supervisors and/or the planning department. There is simply no way around the fact that at a certain point, growth has to be limited.

Sincerely,
Elizabeth Herron

Elizabeth C. Herron, PhD
poetherron@gmail.com
707-823-3722
www.elizabethherron.net

From:	Iris Barrie
To:	Barrella, Donald
Subject:	Anthem Winery public comment for 2/5/20 meeting
Date:	Sunday, February 2, 2020 10:32:42 AM

Dear Mr. Barrella,

Please add my voice to those objecting to the modifications being requested by Anthem Winery to increase wine production, special events and visitations.

In its present form, it honors the Ag Preserve intentions and farming of agricultural land. Any modification will endanger the water supply, contribute to erosion of sensitive watershed, endanger residents' safety by occluding egress in a fire emergency on a one-lane road in a moderate to high-fire danger area, disrupt wildlife habitat and significantly affect the quality of life of neighbors with noise and traffic.

Thank you,

Iris Barrie
219 Montecito Blvd.
Napa

From:	Walt Brooks
To:	Barrella, Donald; Cottrell, Anne
Subject:	Anthem Cave Size Comparison
Date:	Sunday, February 2, 2020 8:03:27 AM
Attachments:	Caves larger than Anthem.docx

Hi Don and Anne,

As you know many of us whether Anthem neighbors or not are concerned about the huge cave planned for Anthem. Our concerns are mainly that there may be unintended consequences due to such a large land change. Once such a huge change to the land happens it will be almost impossible to undo any negative impact. We think the cave is out of scale for the parcel and overkill for a family winery.
But knowing that wringing of hands does not help make a case I decided to look at the facts.
I decided to research how large a cave do most of the wineries in Napa have.

What I found was shocking, the Anthem request to build a 29,053 sq ft cave is huge by any comparison.
Of the over 500 wineries in the Napa County database only 15 (see below) have caves larger than what Anthem is requesting. None of which can be characterized as a small family winery!

The cave data I found adds to my many concerns that the plans for Anthem overly impact the area and are built for a bigger plan/dream than their parcels should or can handle. The cave data is from the Napa County Winery Database dated Oct. 2019. (The data is also provided in a document attached below for better readability.)

Sorry to be late with this submittal but the idea just came to me to compare cave sizes.
Any questions please feel free to contact me.
Thanks for your thoughtful consideration,

Bernie Brooks
(408) 314-1991

Anthem's request is 2 1/2 to 3 times larger than :

Wineries with caves within 1 mile (3) AVG. = 7,600 sq ft

30 K wineries with caves (12) AVG = 9,477 sq ft

50 K by appt wineries with caves (7) AVG =

12,035 sq ft

THE ONLY WINERIES WITH LARGER CAVES ARE :

Winery	Cave size sq. ft.	Gallons permitted	Tours/Tasting
Castello Di Amoroso	30,000	250 K	PUB
Cliff Lede	31,300	120 K	PUB
Far Niente	39,000	175 K	PUB
Heitz Wine Cellars	30,000	144 K	PUB
Hudson Vineyards	38,240	80 K	APPT
Jarvis Vineyards	51,724	40 K	APPT
Mountain Peak	33,424	100 K	APPT
Napa Valley Reserve	42,000	48 K	APPT
Palmaz	55,000	35 K	APPT
Pine Ridge	31,830	300 K	PUB
Rutherford Hill	38,100	640 K	PUB
Schramsberg Vineyards	54,071	180	

K	APPT		
Stags Leap Wine Cellars		34,860	330
K	PUB		
Sterling Vineyards		41,000	1,500
K	PUB		
William Hill		30,000	720
K	APPT		

Wineries with Caves larger than Anthem request for 29,053 sq ft.

Winery	Cave size sq. ft.	Gallons permitted	Tours/Tasting
Castello Di Amoroso	30,000	250 K	PUB
Cliff Lede	31,300	120 K	PUB
Far Niente	39,000	175 K	PUB
Heitz Wine Cellars	30,000	144 K	PUB
Hudson Vineyards	38,240	80 K	APPT
Jarvis Vineyards	51,724	40 K	APPT
Mountain Peak	33,424	100 K	APPT
Napa Valley Reserve.	42,000	48 K	APPT
Palmaz	55,000	35 K	APPT
Pine Ridge	31,830	300 K	PUB
Rutherford Hill	38,100	640 K	PUB
Schramsberg Vineyards	54,071	180 K	APPT
Stags Leap Wine Cellars	34,860	330 K	PUB
Sterling Vineyards	41,000	1,500 K	PUB
William Hill	30,000	720 K	APPT

Wineries with caves within 1 mile (3) AVG. = 7,600 sq ft

30 K wineries with caves (12) AVG = 9,477 sq ft

50 K by appt wineries with caves (7) AVG = 12,035 sq ft

Data from Napa County Winery Database Listing - Oct. 2019

January 31, 2020

Regarding: Anthem Winery Permit Modification

Dear Planning Commissioners,

I am writing this as a Sonoma County resident with a long history of family currently living and working in Napa. Myself and my family are been extremely concerned with the impacts of the lack of attention in Napa County to our watersheds.

In Napa County you have the zoning protections of the Ag Watershed, and Anthem Winery is in this protected zone.
Allowing development at the scale of this current major modification application of Anthem Winery is short sighted and will have a serious long term impact on the area.

It threatens water supply in an area known for water problems, as well as threatens erosion in an area prone to landslides and highly erodible soils.

The need to protect Napa from this type of overdevelopment is dire.

I ask you to keep Anthem at their already permitted 30K winery.

I understand that Anthem are choosing to ignore the provisions of a protected tree easement of ancient oaks at the time our trees are our most valuable resource in combating the ravages of increasing temperatures, atmospheric storms, eroding soils, and uncertain water supply.

On behalf of myself and my family I ask that this area remain undisturbed beyond replanting of oaks which are disturbed in other areas of the current plans for tree cutting (over 100 mature trees, about 2/3 old growth oaks).

Urgently Yours;

Jon Charles Lucca CEO
Artist Untied

1/29/2020

Mark Warrington
3440 Redwood Road
Napa CA 94558

Subject: Anthem Winery Expansion

Dear Napa County Planning Commissioners

I am writing to you regarding the Anthem Winery Expansion Project. Our families' property (my mother, Dotia Scriven's residence) is at 3440 Redwood Road. The property is in a family trust of which I am a trustee.

She has lived there since 1986. Her former Neighbor Mr. Stan Woods lived up on the hill to the northwest at 3454 Redwood Road. Mr. Woods and another neighbor used a narrow courtesy access across my mother's property to access the easement that they have on the 3500 Redwood Road property (parcel #035010055000). The deeded easement on that parcel abuts my mother's property. It is very narrow and appears to be 12' in width. It is accessed by an almost 90 degree turn and there always seems to me some new fence damage due to the tight radius.

Mr. Woods and his son in law Mark Jessup approached my mother and my deceased stepfather George "Dan" Scriven regarding a small wine cave that his son in law wanted to build on the property. Mark Jessup was a local successful

businessman and wanted to follow his dream of hobby winemaking. According to Stan there was not to be any crushing or fermenting as his properties water wells could not support that type of operation.

Since that time in the 1990's there have been a few small expansions of the wine operation and Mark Jessup opened up a retail tasting storefront in Yountville to market his wines. Several vineyard blocks were planted up on the hill.

Mr. Woods passed away and eventually the property at 3454 Redwood road changed hands.

My stepfather "Dan" Scriven passed away in 1992 and I became very involved with the property helping my mother with things that she could not do, "The Guy Stuff".

In the last 10-12 years my mother's water supply has become unreliable, in the mid summer and well into the fall. She has seen both of her wells stop pumping enough water for her. This has forced my mother to hire Bingham's Potable Water Service to truck in water to her residence. Some month's water bills from Mr. Bingham have been as high as $2400.00 for one month. But $1200.00- $1400.00 a month is a more accurate average of what she spends on water deliver from mid June through October and sometimes well into November.

The hydrologist's report and rebuttal of that that report by Walt of the Dry Creek Alliance showed that Anthem has insufficient water on their property for their expansion and that their winery and vineyard operation have a significant impact on their Redwood Road neighbor's water supplies. My mother is not the only person on Redwood Road that is having water trucked in. I see the water trucks going up and

down the road all of the time during the summer months that coincide with when the grapes are being watered.

I would like to point out several reasons why the Anthem winery expansion should be denied.

1. The water issues in that area are going to greatly impact the neighbors possibly forcing them to have to pay more for potable water deliver. My mothers well output could be measured at 20-30 gallons per day in late august or early September. After learning the facts regarding what properties are effected by the water currently used up at Anthem I believe that Mark Jessup's vineyards up on the hill and the County allowing expansion up there into a full blown winery are part of the cause for my mothers summer water problems.

2. The anthem proposal and water report shows the expected water usage at roughly half of what the industry normal is. According to a family friend who's family has been in the wine production business for over 25 years in the Napa Valley said that 8-10 gallons per visitor is more realistic water usage estimate in regards to vistors that come for tours or tastings. Also a winery that engages in custom crush operations will use 2-3 times the amount of water due to cleaning and flushing equipment in between the small lots for different individual customers.

3. The Redwood Road side access is does not even meet current standards for a residential driveway. It may exceed the 18 degree uphill grade in portions of the driveway and is 10' wide. Commercial projects such as the Anthem Winery Expansion require an18'

driveway with a 2' improved shoulder. This is so cars can pass each other when traveling in opposite directions. The lack of that required driveway width posses a significant safety hazard in the event of a first responder (Cal Fire, AMR, or Napa County Sheriff's Office) dispatch. In the event of a sudden evacuation for a wildfire or other significant event all it takes is for one vehicle to stall or break down and everyone that is behind them will become trapped. Or if EMS is summoned a 2 minute delay for a vehicle to back up to a wide spot or turn out could be the difference between living and dyeing.

It is my understanding that the driveway situation on the Dry Creek Road side is equally narrow and does not meet county standards.

4. Stan Woods allowed Mark Jessup to follow his dream of becoming a vintner. For the most part they respected their neighbors and never considered placing a commercial endeavor with 1000's of visitors into the neighborhood. Instead Jessup Cellars respected those that lived around their facility and they opened a tasting salon in Yountville. It was the right way to pursue his dream.

Because of the reasons above and likely more the project as proposed does not meet County Road standards, it will also likely fail the ground water element of CEQA.

This one doesn't fit…

Respectfully,
Mark Warrington

Received: Janaury 29, 2020

Dear Planning Commissioners,

I am writing requesting that you not approve the Major Modification and ECP for Anthem as submitted.

Our neighborhood has met with all of you to show you the impact of the proposed project on several of us. My husband and I share approximately 3000 feet of property line with the Arbuckles. This not only includes the area of the proposed bridge over a class II stream on our joint property line, but also a recorded tree easement which they are violating.

I have written several letters addressing the tree easement, the area of the bridge and the erosion there, as well as an area of erosion near our home from runoff on the Arbuckle's property. The area near our home is one addressed in an e-mail from Ron Anglin, stating that he, Don Barrella, Phil Blake, and Julie Arbuckle walked the area in November 2018 and that they "did not see any significant erosion in the area of the proposed vineyard or immediately below it." I attach photos of this area, currently under evaluation by NRSC. As more atmospheric storms are predicted to hit California, this area is particularly vulnerable. Any disturbance of soils (defined as highly erodible and threats of landslides) threatens more runoff and erosion.

For the above reasons, I ask you not to approve any more vineyard until we understand why there is so much more runoff and how to handle it. Deep ripping the savanna, also an issue in terms of the protections of the tree easement, may well contribute to more runoff.

My concerns for the integrity of our hillside lands, the fire safety, the magnitude of the ask for 50K gallons versus the 30K already permitted, the hours of operation, the noise and lights, are addressed by our neighborhood group and I will not repeat them. This is forcing a winery event center into a remote area with problematic water supply and quality, moderate to high fire danger, and a driveway that requires 16 various road exemptions to be approved. Please deny an increase in gallonage which would allow traffic from various labels bringing in grapes, etc., commercializing this fragile, quiet hillside even more, stressing all of our resources.

Regards,
Donald Harms and Patricia Damery
3185 Dry Creek Road
Napa

c. David Morrison
Don Barrella
Pictures attached.
Taken at property line and just below on our property

This is the area below the still intact footbridge. Notice the undercutting erosion of the bank. Picture taken on Harms/Damery land looking downhill. This continues to get worse with increased water drainage

See Photos: These photos are taken from the area below our goat barn. Drainage from the Arbuckle proposed vineyard comes through this area and has increased since 2014, washing out a foot bridge and causing severe erosion. That year was the year of the earthquake and of their drilling a well close to our property line. The drainage has increased since that time. We are having the cause of the erosion investigated by NRCS and Liz Colby.

More photos of gully below footbridge.

This area is below washed out footbridge looking up toward Arbuckle property. We are losing a number of trees as the gully deepens and widens.

Arrow points to second, washed out footbridge

Gully between collapsed footbridge and property line.

Barrella, Donald

From: Debby Fortune <debbyfortune@gmail.com>
Sent: Tuesday, January 28, 2020 3:31 PM
To: Barrella, Donald
Subject: Anthem Winery hearing /environmental commentary

To: Mr. Don Barrella and The Napa County Planning Commission
From: Deborah Fortune Walton
Re: Anthem Winery hearing/2.5.2020

At a time of climate crisis, when every mature tree is a lifeline to our survival; and at a time of impending water crises, when water is at a premium in areas such as the Anthem winery, why would our county commissioners condone actions that would damage the watershed, and further stress limited ground water needed by the entire community, in favor of a clutch of vanity wine brands that exist only for its owners' personal delight and profit?

While I am not opposed to the current 30,000 gallon existing winery, I am shocked by the requested expansions, the exceptions, the increases in traffic, visitation, events, noise, light pollution, destruction of natural features, removal of mature oaks, potential water drainage damage, and the obvious potential great need for more water in an area with a dwindling resource. These are unacceptable as options.

These expansions are highly out of scale for the location, and will have serious, long-term negative impacts upon the community, the natural status of the area, and the quality of life for both humans and wildlife.

This commission cannot continue to appease and coddle wealthy play-grounders and their selfish dreams that leave behind a scorched-earth wake here in Napa County long after they are gone.

All that makes this county unique, beautiful, and safe for its great amount of biodiversity, is now threatened by these types of developments and their cumulative, devastating impacts.

Though I do not live in this neighborhood, I feel its pain. I see my beloved Coombsville negatively impacted daily. What hurts one of us, hurts us all.

Wisdom and foresight are required at this juncture in our history on this land.

Please find ways to make good choices for the long-term existence of our valley as we know and love it, and for the health of our community.

Thank you for your time and attention.

Sincerely,

Deborah Fortune Walton
26 Jacks Lane
Napa, CA 94558
home: 707-226-7152
mobile: 510-697-6991

Barrella, Donald

From: paul@progenywinery.com
Sent: Wednesday, January 29, 2020 4:05 PM
To: Barrella, Donald
Subject: Anthem Winery Amended Use Permit APN 035-470-046

Dear Napa Valley Planning Commissioners and Mr. Barrella,

Please let me introduce myself and explain my reasons for supporting the Anthem Winery Application to Modify Its Use Permit. As the owner of Progeny Winery located on Woolls Ranch, I am quite familiar with the process of a winery application, and the attendant challenges of seeking even the most modest of modifications of winery production, visitation or construction. Fortunately, our project of several years ago received unanimous approvals from both the Planning Commission and on appeal to the Board of Supervisors. Since that approval, we constructed a Hospitality facility that has garnered architectural awards, and is featured in Heather Hebert's book titled "The New Architecture of Wine." We are very proud to have added to the beauty of our lovely valley, and employed a significant number of citizen contributors to the Napa economy.

Additionally, I serve as the President of the Mt. Veeder Appellation Council, the association of wine growers and winery owners on Mt. Veeder. While I do not speak for that organization in this letter, my service over the past 6 years affords me significant perspective on many of the issues raised by applications such as Anthem's. Having reviewed their plans, and witnessed the steps they have taken to hear and modify their application based upon comments by neighbors, they deserve commendation for patience and thoughtful community support. For applicants to forego their own economic interests when trying to appease the "not in my backyard" constituency, the challenges become most daunting.

I'm certain that you've received many supporting comments about how the Anthem plan fits well into the surrounding area, provides sustainable "green" measures, improves the scope of water usage, increases fire safety for our first responders, and requests a very modest increase in production and visitation. For that reason, I'd rather focus on a few issues others may have overlooked.

One of the concerns in our valley has been the increased number of car trips. When you look at the size of Mt. Veeder's land area, there currently are very few winery related trips on our rural roads. This likely reflects the lack of permitted tasting rooms in the Mt. Veeder AVA. Thus, a visitor must come to one of our properties, then return to the traffic on the main roads of the valley. If we could add the Anthem visitation to the Mt. Veeder available options, then we improve the possibility of creating a Mt. Veeder "day" of tasting at 3-4 properties, without returning to the more congested areas along Highway 29 or Silverado Trail. For the quality of Mt. Veeder wines, the wine consuming public has lagged in getting to know us. Approval of this modification will help greatly on this issue, enhancing the overall stature of Mt. Veeder and Napa on a national and international level.

The second point I wish to emphasize involves the disingenuous nature of the opponents who loudly proclaim that the neighborhood will be overrun with visitors, cars and commercial activity. We heard those shouts during the lengthy hearing on our permit. No one ever discusses what really happened after the permit issued. Now, several years later, I believe our neighbors (with one exception) have been pleased with our operation. We, like the Arbuckles, produce wine in the higher price space. We don't need, or want, hordes of visitors. Rather, we look for the discerning buyer, who feels comfortable with our price range. They are fewer and further between. On most days, we see two or three groups only. If the group is 8 people, more often than not, they have a driver with an SUV or small Sprinter. That's two to three additional cars per day, cars that then may visit Hess or Fontanella afterwards. Not much of a burden to the neighbors at all.

Finally, I must mention the tremendous help given by Anthem during 2017. Initially, their access between Redwood Road and Dry Creek road would have become a salvation to us if we needed an alternative route

out of our property. Their application proposal includes an improvement to the road that will provide a secondary outlet. When the subsequent large landslide occurred on Redwood road during the rainstorms, we couldn't have easily reached our property for the several weeks that clean-up required without the Anthem driveways.

I am wishful that a pre-existing commitment in Southern California did not preclude my attendance at the hearing on the 5th of February. It would be a great pleasure to appear in person to support this wonderful application. This project shows just what talented, thoughtful, caring and compassionate Napa winery citizens can do to improve the well-being of all our residents. I hope the Planning Commission will approve this reduced application wholeheartedly with a unanimous vote in favor.

Please feel free to contact me directly, if you have questions, or if I might be of further help.

Cordially,

paul woolls
proprietor
Progeny Winery

Barrella, Donald

From: Karie Nuccio <kariesue10@aol.com>
Sent: Thursday, January 30, 2020 4:31 PM
To: Barrella, Donald
Subject: Anthem Winery- major modification use permit #P14-00320-MOD

Dear Mr Barrella,
We are writing on behalf of the Arbuckle family, and their request for a use permit to modify their Anthem winery. We live on the adjacent property at 3452 Redwood Road. The Arbuckles have been excellent neighbors from the beginning, always considerate of us, and how their various plans and projects would affect us. We know them to be good, kind, honest people, who we trust to do the right thing, and highly recommend that you grant them permission to proceed with their plans by granting them the use permit.
Thank you, sincerely,
Sal and Karie Nuccio

Sent from my iPad

Sent from my iPad