

EXHIBIT D

NAPA VALLEY VINEYARD ENGINEERING, INC.
176 MAIN STREET, SUITE B
ST. HELENA, NAPA VALLEY, CALIFORNIA 94574
(707) 963-4927 nvvedla@comcast.net

DREW L. ASPEGREN, P.E.
CIVIL ENGINEER

HARDTEN FAMILY VINEYARD

WATER DEMAND AND WATER AVAILABILITY ANALYSIS April 2, 2021

It is proposed that the new vineyard (1.49 net acres) and the existing vineyard (7.01 net acres) will be irrigated using groundwater. This analysis presents water demand for a total ultimate buildout of ±8.50 net vine acres with a 7'x4' spacing (1556 vines/acre), and a recently permitted residence.

Water Demand

The average annual vineyard water demand is:

$(8.50 \text{ vine acres})(1,556 \text{ vines/ac}) = 13,226 \text{ vines}$

$(13,226 \text{ vines})(60 \text{ gal/vine/yr})/(325,851 \text{ gal/af}) = 2.44 \text{ afa (acre-feet per annum)}$

It is anticipated that during a dry year, vineyard irrigation would include one additional irrigation cycle, or an additional 5 gallons/vine (0.20afa)

Peak irrigation is expected to be 5 gallons/vine/week. Assuming a 5 day irrigation cycle, average daily operation will irrigate 2,645 vines (13,226 vines/5 days); allowing for 15% increase because of varying convenient irrigation set sizes, peak daily irrigation will cover ± 3,045 vines. Peak daily demand is then 15,225 gallons (3,045 vines x 5 gal).

Also, a small two bedroom residence has recently been permitted. There will be no irrigated landscape. For this analysis, it will be assumed that two residents will live there full time, with two guests for up to forty days per year. Domestic water demand is:

Residents: (2 people)(75 gal/day)(365 days/yr)	= 54,750 gal/yr
Guests: (2 people)(75 gal/day)(40 days/yr)	= 6,000 gal/yr
Total Domestic water demand	= 60,750 gal/yr
	= 0.18 afa

Peak Domestic water demand: 4 people @ 75 gal/day = 300 gpd

Total average annual demand for all uses = 2.62 afa and 2.82 afa during a dry year;
peak daily demand = 15,525 gallons/day.

Attached (Attachments A-1, A-2) is the driller's log, and an aquifer test for the well which indicates a production rate of 110 gallons per minute. At that rate, the well will need to operate less than 2.5 hours/day to meet peak daily demand. On the low end, at a

pumping rate of 25 gpm, the well would need to operate about 10¹/₂ hours/day to meet peak demand.

Water Availability

The soils mapped for the subject property are Aiken loam and Hambright Rock outcrop, both of which are derived from the underlying volcanic parent material. It has been estimated that only about 9-13% of rainfall which falls on these volcanics can percolate into the underlying formation and appear in the deep aquifers (USGS Water Resources Investigation 77-82, Michael Johnson, 1977); the remaining 87-91% flows off site as direct runoff or is held in the topsoils to be evapotransported by surface vegetation.

The 13.00 acre parcel overlies these volcanic formations, and the average annual rainfall is 33" (Napa County Flood Control and Water Conservation District Isohyetal Rainfall Map, 1975). On average, the property will receive ±36 af of rainfall (13.00 ac x 33" = 35.75 af). Using a conservative estimate of 10% appearing as annual groundwater recharge, it is expected that the Hardten property would average about 3.58 af to the groundwater supply annually.

The Isohyetal Rainfall map shows that Hardten Family Vineyard (33"/yr) receives about 3.13% more rainfall than St. Helena (32"/yr). NOAA rainfall records for St. Helena show that 26.27" fell during 2014-15. We consider 2014-15 to be a "dry year" (±77% of average). Extrapolating this to the project site shows that 27.09" fell during 2014-15. Using the same analysis presented above, it is expected that for 2014-15, ±29.35 acre-feet (af) would have fallen on the 13.00 acre project area, and ±2.94 af would have appeared as groundwater.

Conclusions

Total average annual water demand is ±2.62 afa, or about 73% of the subject property's average annual groundwater recharge (2.62/3.58 = 73.18%). Further, during a dry year, the 2.82 afa total water demand then would be ±95% (2.82/2.94) during the 2014/15 rainfall contribution to groundwater. Over the long term, it is expected that using groundwater to support the proposed project will not diminish the underlying aquifer. Even during a dry year, it is expected that vineyard irrigation would not have diminished the underlying aquifer.

Attached is a portion of the Capell Valley Quad sheet (Attachment B) showing the project site and the existing well which supports the vineyard. A circle has been drawn, centered on the well showing no known wells within 500' of the existing well.



QUADRUPPLICATE
Use to comply with
local requirements

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

Do not fill in

No. **119676**

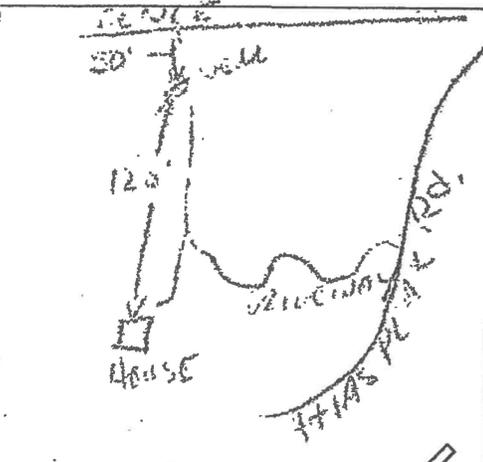
Notice of Intent No. _____
Local Permit No. or Date _____

State Well No. _____
Other Well No. _____

(1) **OWNER:** Name _____
Address _____
City _____ Zip _____
(2) **LOCATION OF WELL** (See instructions):
County Napa Owner's Well Number 33-010-50
Well address if different from above _____
Township _____ Range _____ Section _____
Distance from cities, roads, railroads, fences, etc. _____

(12) **WELL LOG:** Total depth 420 ft. Depth of completed well 420 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	2	Topsoil
2	25	Red clay grey rock
25	50	Red & grey rock, hard
50	125	Black & red rock, hard frac. stringers hard grey rock
135	150	Dk. brown & red rock, hard
150	195	black & red rock, hard
195	225	Red, black & grey rock, soft
225	300	Red & grey rock, hard
300	325	Black rock stringers red rock
325	420	Black & dk. grey rock stringers red rock fractured



(3) **TYPE OF WORK:**
New Well Deepening
Reconstruction
Reconditioning
Horizontal Well
Destruction (Describe destruction materials and procedures in Item 12)
(4) **PROPOSED USE:**
Domestic
Irrigation
Industrial
Test Well
Stock
Municipal
Other

WELL LOCATION SKETCH

(5) **EQUIPMENT:**
Rotary Reverse
Cable Air Diameter of bore 8 3/4"
Other Bucket Packed from _____ to _____
(6) **GRAVEL PACK:**
Yes No Size 8 3/4"
Packed from _____ to _____
(7) **CASING INSTALLED:**
Steel Plastic Concrete
(8) **PERFORATIONS:**
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	300	8	200	300	420	3/4"

(9) **WELL SEAL:**
Was surface sanitary seal provided? Yes No If yes, to depth 20 ft.
Were strata sealed against pollution? Yes No Interval _____ ft.
Method of sealing grout

(10) **WATER LEVELS:**
Depth of first water, if known 325 ft.
Standing level after well completion 90 ft.

(11) **WELL TESTS:**
Was well test made? Yes No If yes, by whom? driller
Type of test Pump Bailer Air lift
Depth to water at start of test 90 ft. At end of test 420 ft.
Discharge 50 gal/min after 1 hours Water temperature _____
Chemical analysis made? Yes No If yes, by whom? _____
Was electric log made? Yes No If yes, attach copy to this report

Work started 10/22 19 85 Completed 10/29 19 85
WELL DRILLER'S STATEMENT:
This well was drilled, under my jurisdiction and this report is true to the best of my knowledge and belief.
SIGNED _____ (Well Driller)
NAME Doshier and Gregson Drilling, Inc.
(Person, firm, or corporation) (Typed or printed)
Address 5365 Napa-Vallejo Highway
City Vallejo Zip 94589
License No. 294001 Date of this report 10/30/85

ATTACH A1



5365 BROADWAY STREET
 AMERICAN CANYON, CA 94503-9678
 Contractor's License #258826

Napa (707) 226-9698 Vallejo (707) 642-9698

FAX (707) 226-1648

Report of Water Well Test

To: Caymus Vineyards
 P.O. Box 268
 Rutherford, Ca 94573

Site: 3393 Atlas Peak Rd
 Napa, Ca 94558
 30hp Test Pump

Date/Time	Gallons per minute	Pumping Level	Psi	Water Clarity
10-04-18 7:30am	150	225'	20	clear
7:35	148	314'	20	
7:40	148	345'	18	
7:45	145	364'	18	
7:50	140	374'	15	
8:00	135	384'	15	
8:15	130	396'	10	
8:30	130	402'	5	clear
8:45	130	408'	5	
9:00	130	410'	5	
9:15	125	412'	0	
9:30	125	424'	0	clear
9:45	120	436'		
10:00	120	440'		
10:15	120	440'		
10:30	118	445'	0	clear
10:45	118	446'		
11:00	118	448'		
11:15	118	448'		
11:30	118	452'	0	clear
11:45	115	453'		
12:00pm	115	456'		
12:15pm	115	460'		continued

All Major Brands Available

ATTACH A-2 (1/2)



5365 BROADWAY STREET
 AMERICAN CANYON, CA 94503-9678
 Contractor's License #258826

Napa (707) 226-9698 Vallejo (707) 642-9698

FAX (707) 226-1648

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Report of Water Well Test

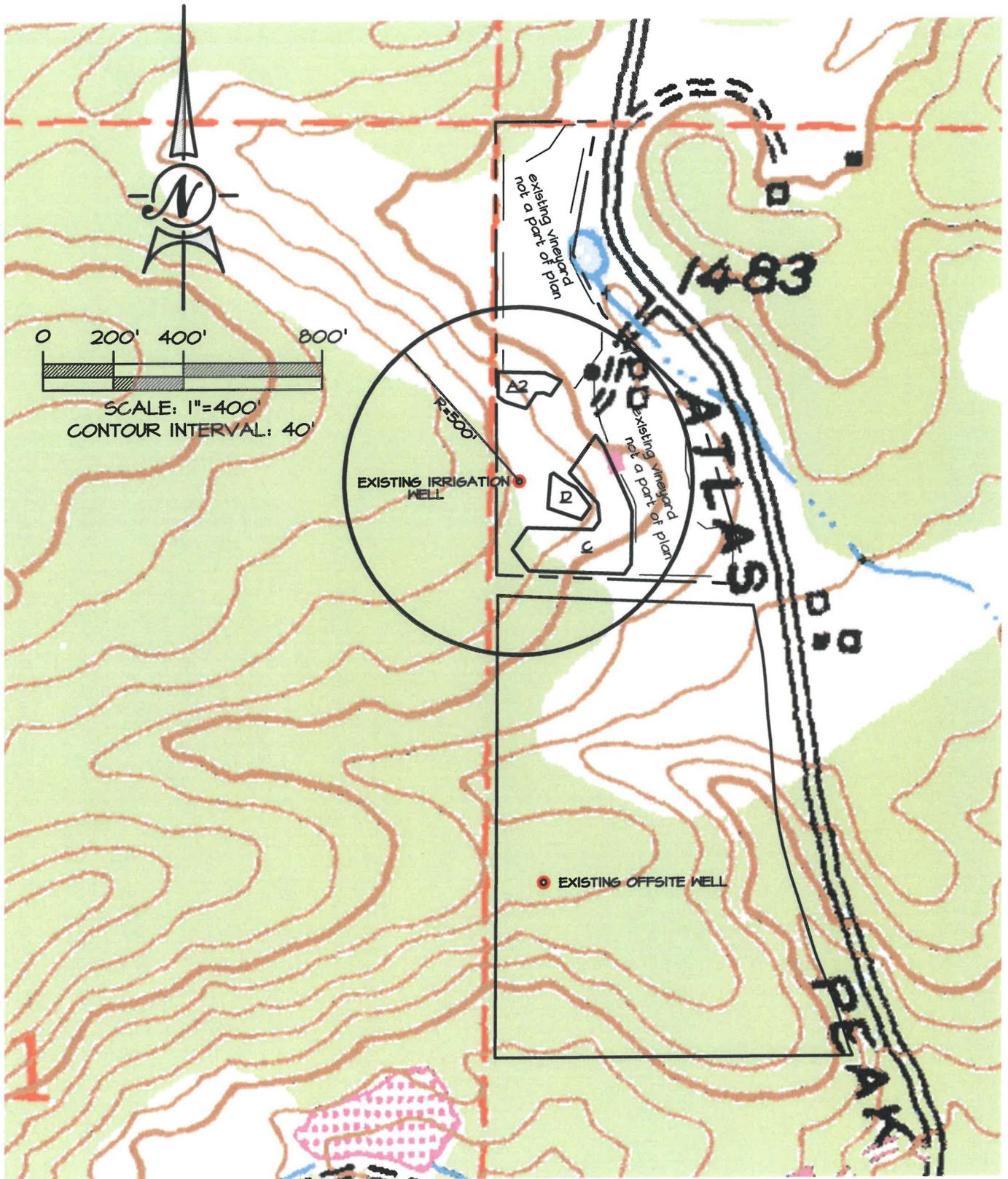
To: Caymus Vineyards
 P.O. Box 268
 Rutherford, Ca 94573

Site: 3392 Atlas Peak Rd
 Napa, Ca 94558
 30hp Test Pump

Date/Time	Gallons per minute	Pumping Level	Psi	Water Clarity
continued from previous page:				
10-04-18 12:30pm	115	468'	0	clear
12:45	115	468'		
1:00	115	468'		
1:15	115	468'		
1:30	110	468'	0	clear
1:45	110	468'		
2:00	110	468'		
2:15	110	468'		
2:30	110	468'	0	clear
2:45	110	468'		
3:00	110	468'		
3:15	110	468'		
3:30pm	110	468'	0	clear
<p>These are the results after an 8 hour test using D-G Test equipment. Gallons per minute produced at time of final test: 110 Pumping Level at conclusion of test: 468' Results of above reported test not warranted beyond this date.</p>				

All Major Brands Available

ATTACH A2 (2/2)



ATTACHMENT B

HARDTEN FAMILY VINEYARD
WELL LOCATION MAP