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Septic Feasibility Report

Kenefick Winery Use Permit P16-00021-UP
Planning Commission Hearing March 6, 2019

DELTA CONSULTING & ENGINEERING
OF ST. HELENA

SEPTIC FEASIBILITY REPORT

FOR THE

KENEFICK RANCH WINERY USE PERMIT

PROJECT LOCATED AT

2200 PICKETT ROAD
CALISTOGA, CA 94515

COUNTY: NAPA
APN: 020-340-007

INITIAL SUBMITTAL: DECEMBER 18, 2015
REVISION #1 (NO CHANGES): JANUARY 10, 2017

PREPARED FOR REVIEW BY:

NAPA COUNTY PLANNING, BUILDING AND ENVIRONMENTAL SERVICES
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I. INTRODUCTION

Kenefick Ranch is applying to the County of Napa for a Use Permit to construct a winery for the on-site production of wine and for hospitality purposes. This report has been prepared to evaluate the feasibility of treating and disposing the wastewater flows for both domestic and process wastewater from the proposed winery development.

Kenefick Ranch Winery is currently proposing the following uses that contribute to the wastewater flows on-site:

- *Production Capacity:* 20,000 Gallons Wine / Year
- *Employees:* 4 full-time/part-time
- *Daily Visitors (By Appointment):* 12/day
- *Marketing Events*: 10/Year with 30 guests
- *Wine-Auction Related Events:* 1/Year with 50 guests

To limit the impact on the wastewater system, all special events will use portable toilets and outside catering.

Wastewater sources on the parcel currently consist of a main residence, two farm worker housing structures, and a vineyard management office. The main residence is plumbed to its own conventional septic system. The farm worker housing consists of two (2) separate two-bedroom housing structures that share a common conventional septic system installed under Napa County permit number E08-00305. This system (E08-00305) was designed by Doug Sterk, P.E., to accommodate additional flows from a future 24,000 gallon per year winery development. The system was installed by Blakeley Construction, Inc. who included additional lines to the leach field above what was required in Doug Sterk's design. The vineyard office was connected to this system under permit E13-00165. The primary option for treating and disposing of wastewater generated by the proposed winery will be connecting to this existing conventional system. The following sections provide a description of this existing system and its capacity, proposed winery design flows, and any upgrades necessary to accommodate additional loading to the system.

II. EXISTING WASTEWATER FLOWS AND TREATMENT SYSTEMS

A. Wastewater Generation

Domestic Wastewater
The existing conventional wastewater treatment system (E08-00305) currently treats domestic wastewater from the two (2) existing two-bedroom farm worker houses and a one (1) employee vineyard management office. Based on Napa County guidelines and regulations, the total peak daily design flow from the two houses and the vineyard office is 620 gallons.

Process Wastewater
There is currently no winery process wastewater generated on-site.

B. Existing Wastewater Treatment System

The existing conventional wastewater treatment system (E08-00305) was designed for two (2) two-bedroom farm worker houses and 850 gallons per day of combined process and domestic wastewater from the future winery for a total of 1,450 gallons per day. The system was designed by Douglas Sterk, P.E., in June 2008 based on existing and proposed future developments as well as the site soils documented in site evaluation E08-00043. The design included septic tanks for the farm worker housing and winery, gravity flow transmission pipes, and 1,100 linear feet of conventional leach field. The original design and site evaluation report can be seen in Appendix 4.

Blakeley Construction installed the conventional wastewater system based on Douglas Sterk's design. Per the "As-Built" drawing prepared by Blakeley Construction in Appendix 4, each residence flows to a 1,500 gallon septic tank before transmitting effluent through a gravity flow pipe across the adjacent vineyards. The pipe outfalls to a distribution box which transfers the effluent to the conventional leach field which consists of a total of 1,400 linear feet of leach line using gravel trenches. The winery process and domestic wastewater septic tanks shown in Douglas Sterk's design were not installed at the time of the leach field, and have not yet been installed. The flow chart on the following page details the existing DW treatment system.

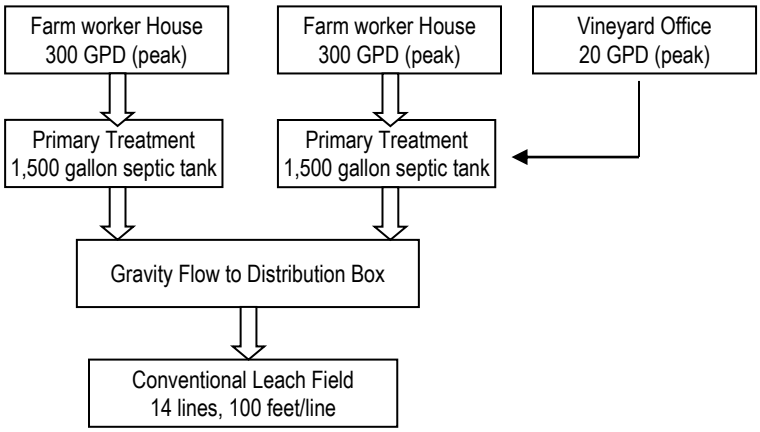


Figure 1: Existing Domestic Wastewater Treatment System Schematic

System Capacity

The original system design only specified 1,100 linear feet of leach line. Per instruction by Tom Kenefick, Blakeley Construction installed an additional 300 linear feet of leach line during construction of the system. The additional leach lines were installed within the approved test pit area and provide capacity above the original 1,450 gallon/day design. Calculations for the total system capacity are based on an application rate of 0.33 gallons/ft/day, the existing trench with a 3" diameter leach line pipe and 18" of gravel below the pipe, and 1,400 linear feet of leach line.

$$\left(\frac{Gal/Day}{Application\ Rate}\right) = Area, SqFt \qquad \left(\frac{Area}{Sidewall\ Credit}\right) = LF\ Leach\ Line$$

$$(LF\ Leach\ Line\ X\ Sidewall\ Credit\ X\ Application\ Rate) = Gal/Day$$

$$\left(1{,}400\ LF\ X\ 3.5\frac{Ft2}{Ft}X\frac{0.33Gal}{Ft2}/Day\right) = \mathbf{1{,}617\ Gal/Day}$$

Based on the total system capacity of 1,617 gal/day and the existing use of 620 gal/day, an additional **997 gal/day** is available for the proposed winery development.

III. WASTEWATER TREATMENT OPTIONS

A. Domestic Wastewater Generation

The DW generated at the Kenefick Ranch Winery is dependent on the proposed daily number of employees and visitors present at the winery. The marketing plan, presented in the introduction of this report, details the maximum number of guests the winery wishes to serve in one day, as well as the maximum number of permanent and temporary employees that the winery needs to functionally operate. In terms of wastewater generation, this gives the maximum number of people that will be contributing to the daily peak wastewater flow rate. Based on the proposed marketing plan and Napa County Regulations[1], Delta Consulting & Engineering developed the following estimates for DW design flows:

Employees (max):	4 x 15 gallons/day = 60
Tasting Visitors (max):	12 x 3 gallons/day = 36
Peak Daily Flow:	**96 gallons/day (Use 100 GPD)**

By providing portable toilets during large marketing events, the daily peak flows can be reduced to a level that will not require any improvements to the existing leach field.

B. Process Wastewater Generation

The estimation of (PW) generated at the Kenefick Ranch Winery is dependent on the proposed annual production of wine. The marketing plan, presented in the introduction of this report, indicates that the winery would like to produce 20,000 gallons of wine per year. Based on the proposed marketing plan and Napa County Regulations, Delta Consulting & Engineering developed the following estimates for PW design flows:

Napa County Method
(1.5 x 20,000 gallons wine) / 45 days crush = **667 gallons / day (Use 675 GPD)**

C. Treatment Options

Treatment Option #1 – Connect to Existing System

The primary option for the treatment and dispersal of wastewater will be connecting the winery development to the existing conventional septic system. Septic tanks with effluent filters will be provided for each waste stream to reduce pollutants in the wastewater prior connecting to the existing leach lines. Effluent from the septic tanks will be combined into one transmission line to transfer combined wastewater to the existing conventional leach lines. The sections below detail the proposed

[1] Napa County Regulations for Design, Construction, and Installation of Alternative Sewage Treatment Systems, Appendix 1, Table 4, 2006.

components of the winery wastewater treatment system.

Primary Collection and Treatment

Separate process and domestic wastewater plumbing systems in the proposed winery will convey each waste stream to its own respective septic tank. Septic tanks are typically sized to provide a minimum of three days hydraulic retention time (HRT).

The minimum size septic tank for PW is 2,000 gallons based on the peak PW daily flow of 675 gallons and three days HRT. The minimum size septic tank for DW is 300 gallons based on the peak DW daily flow of 100 gallons and three days HRT. However, a minimum septic tank size of 1,200 gallons will be provided for the DW.

In addition to adequate HRT provided, each tank will be fitted with an effluent filter designed to screen solids larger than 1/32."

Connect to Existing Leach Field

Effluent from the septic tanks will be collected and conveyed via gravity through a sewer pipe to the existing distribution box at the existing leach field. The existing leach field has a capacity of 1,617 gallons per day. Currently, the system has a peak demand of 620 gallons per day from the existing vineyard office and farm worker housing. The proposed winery development will contribute a total peak flow of 775 gallons per day. The combined wastewater flows from the existing and proposed developments will contribute a peak flow 1,395 gallons per day. As the existing capacity exceeds the total peak demand, no improvements will be made to the existing leach field.

Reserve Area

A reserve area must be specified in the event that the primary system fails. Conventional treatment systems require the reserve area to equally match the size of the primary area. Based on the proposed wastewater flows of 1,395 gallons per day, the soil application rate 0f 0.33 gallons/sqft/day, and the sidewall credit of 3.5ft^2/ft, the reserve area would require a minimum 1,210 linear feet of leach line. This can adequately be accommodated within the approved test pit area. See the existing leach field site map in Appendix 3 for the proposed reserve area layout.

Treatment Option #2 – Connect DW to Existing System, Treat PW for Vineyard Irrigation

The second option for treating wastewater generated at the proposed winery development is to separate the process and domestic wastewater into two separate systems. With this option, the domestic wastewater would be routed to the existing conventional septic system as detailed above. However, the process wastewater would be routed to a separate system to provide a higher level of treatment, allowing the water to be recycled as vineyard irrigation. To meet local water quality regulations, the wastewater must be treated to reduce the 5 day Bio-Chemical Oxygen Demand (BOD5) and the Total Suspended Solids (TSS) to below 160 mg/L and 80 mg/L, respectively. The treatment process will include solids removal, nutrient and pH balancing, aeration, and secondary filtration. The steps below provide a brief outline of the PW treatment components and expected effluent quality.

1,500 Gallon Minimum Primary Settling Tank System

In an advanced PW treatment system, the primary settling system is not used to provide a significant reduction in BOD5. Because of the high organic content the wastewater, dissolved oxygen is rapidly depleted, resulting in anaerobic conditions. A primary settling system that provides too many days of

storage can disrupt the efficiency of downstream treatment components. As such, the primary settling tank is sized to provide approximately 2.0 days of storage during peak loading conditions.

The main purpose of the primary settling tank will be the reduction of TSS. In addition to the 2.2 days of storage provided, the tank will be fitted with an effluent filter designed to screen solids larger than 1/32." A 50-90% reduction in TSS is expected through this stage of treatment.

Nutrient Addition and pH Balance

Process wastewater is typically nitrogen deficient and acidic, two properties that make it difficult for bacteria to thrive and consume the organics present in wastewater. In order to optimize the treatment process, nutrients and chemicals must be added to the process wastewater. Ideally, chemicals required to improve the treatment process will be added to the effluent during the aeration process. For this treatment system, the addition of chemicals will be accomplished by pumping a slurry mix into aeration tank. The slurry will be mixed within the tank until the optimal pH and nitrogen levels are reached. Monitors will be installed within the tank to automate the addition and mixing of the slurry and wastewater. The nutrient and pH adjustment chemicals at the winery will be monitored and administered by a contracted maintenance consultant.

1,500 Gallon Minimum Aeration Tank

The aeration tank is a critical part of the treatment process. It supplies oxygen to the wastewater and supports the bacteria population that consumes organic matter. The aeration tank must be sized to provide adequate hydraulic retention time for biological activity to take place (8-24 hours). The amount of oxygen supplied must be determined by the BOD5 reduction expected in this stage of treatment.

With this option, a 1,500 gallon holding tank will provide a hydraulic retention time of approximately 2.2 days at peak loading conditions. The BOD5 influent concentration is expected to be 5,000 mg/L at peak loading conditions. The amount of oxygen supplied will be sized to reduce the BOD5 concentration in the wastewater to 400 mg/L. Because most aerators give their oxygen supply in pounds of oxygen per day (lbs O2 / day), the desired reduction in BOD5 must be converted from a concentration to lbs O2 / day in order to select the appropriate aerator configuration. The conversion is shown below:

BOD5 (lbs/day) = (Daily Flow MGD) x (BOD5 Concentration mg/L) x (Conversion Constant 8.34 lbs/gal)
BOD5 (lbs/day) = (0.0005 MGD) x (5,000 - 400 mg/L) x (8.34 lbs/gal)
BOD5 (lbs/day) = **25 lbs/day**

From the calculation shown above, the bacteria will require 25 lbs O2 / day in order to consume the organic matter in the wastewater. Aeration can be achieved by pumps and mixing nozzles within the tank or above ground blowers that force air into the wastewater. The air delivery system will be determined at the construction document phase.

It is assumed that there will be no reduction of TSS in the aeration tank.

A summary of the wastewater strength characteristics after the aeration tank is shown below:

BOD5 = **400 mg/L**
TSS = **250 mg/L**

Wastewater from the aeration tank will either flow via gravity, or be pumped to the next stage of the

treatment system.

1,500 Gallon Minimum Secondary Settling Tank

Secondary settling is an important part of a treatment system that involves aeration. The aerators in the aeration tank will keep solids suspended in solution because of the air bubbles that are forced through the wastewater. Additionally, the rapid growth of bacteria forms colonies that flocculate and contribute to the TSS concentration. Providing a still environment for the solids and flocculants to settle out of solution is critical to maintaining low TSS concentrations and preventing solids buildup in pumps and filters. Typically, secondary settling basins are sized to provide 1-2 days of hydraulic retention time. The proposed 1,500 gallon tank for secondary settling will provide 2.2 days of hydraulic retention time. There will be no baffle, and the tank will be fitted with an effluent filter sized to screen solids larger than 1/64" in diameter. The secondary settling tank is expected to further reduce the TSS by through gravitational settling and filter screening. The settling tank is also expected to provide a 10% reduction in BOD5, as biological processes will continue to take place in the tank. A summary of the estimated wastewater strength characteristics after this stage of treatment are shown below:

BOD5 = **360 mg/L**
TSS = **200 mg/L**

Wastewater from the secondary settling tank will flow via gravity to the next stage of the treatment system.

Orenco Advantex Filtration System

To further reduce wastewater strength to surface drip irrigation standards, an additional stage of biological treatment will be added to system after the secondary settling tank. The Advantex textile filter, manufactured by Orenco, is a fixed media filter designed to reduce BOD5 and TSS in the effluent.

Properly sized Orenco Advantex units can reduce up to 90% of the BOD5 and TSS present in wastewater. To maximize the treatment process and prevent fouling in the filter, Orenco recommends that a peak daily load of 0.08 pounds of BOD5 per square foot of filter area per day (lbs/sqft/day) should not be exceeded. In order to calculate the expected load to the filter, the daily flow rate and influent wastewater concentration must be known. It is estimated that the aeration system will reduce the BOD5 in the wastewater to 360 mg/L. The conversion to pounds of BOD5 is estimated using the equation described in the aeration tank section above.

BOD5 (lbs/day) = (0.000667 MGD) x (360 mg/L) x (8.34 lbs/gal)
BOD5 (lbs/day) = 2.0 lbs/day

To determine the amount of filter area required for adequate treatment, the expected daily BOD5 loading must be divided by the unit loading rate recommended by Orenco.

Minimum Filter Area (sqft) = (2.0 BOD5 lbs/day) / (0.08 lbs/sqft/day)
Minimum Filter Area (sqft) = 25.0 sqft

For this system, two AX-20 filters are recommended. Each AX-20 unit provides 20 sqft of filter area. Due to the excess filter area of 40 sqft, it is assumed that the system will provide a 90% reduction in BOD5 and TSS under normal operating conditions. A summary of the estimated wastewater strength characteristics after this stage of treatment are shown below:

BOD5 = **36 mg/L**
TSS = **20 mg/L**

The AX-20 units require an additional tank and pump system to be installed to circulate wastewater through the filters. Per manufacturer specifications, the re-circulation tank must be sized to store at least 80% of the peak daily flow. For this project, a minimum tank size of 1,200 gallons is recommended for the re-circulation tank. After filtration in the AX-20 units, treated wastewater will be transferred via gravity or pumping to a tank for final storage prior to dispersal to the vineyard irrigation system.

6,000 Gallon Minimum Irrigation Storage Tank

During the rainy season, recycled water to be used for surface irrigation must be stored for 48 hours before, during, and 48 hours after storm events. Fortunately, the wastewater generated daily during the rainy season is typically much lower than what is generated during harvest. The minimum storage volume is calculated based on the estimated number storage days required and the average daily flow into the tank. A water balance calculation was created to determine the minimum storage volume required and can be found in Appendix 5.

Surface Drip Vineyard Irrigation System

The drip irrigation system is sized based on the total amount of vineyards required to disperse the peak daily flow during harvest. A water balance calculation detailing the site soil, hydrological properties, and proposed flow rates has been prepared to determine the required vineyard area and can be seen in Appendix 5. The proposed surface drip irrigation system will require a minimum 3,500 linear feet of vineyard rows, or approximately 0.65 acres of the 20+ acres of vineyards on-site.

IV. CONCLUSION

The Kenefick Ranch Winery is proposing an annual wine production of 20,000 gallons, two full-time and two part-time employees, a maximum of 12 daily visitors, and marketing events that host up to 50 people. Large marketing events held at the winery will use portable facilities to limit the amount of wastewater generated on-site. For wastewater disposal, the winery will connect to an existing conventional septic system. The existing system was sized to accommodate 1,450 gallons per day of combined process and domestic wastewater. Because additional leach lines were added during construction, the system has the capacity to accommodate 1,617 gallons per day. Existing structures on the parcel currently only contribute 620 gallons per day to the system. As the proposed additional 775 gallons per day from the winery does not exceed the capacity of the existing system, no improvements will be made. The septic reserve area for the winery can be accommodated by existing test pits adjacent to the existing conventional septic system.

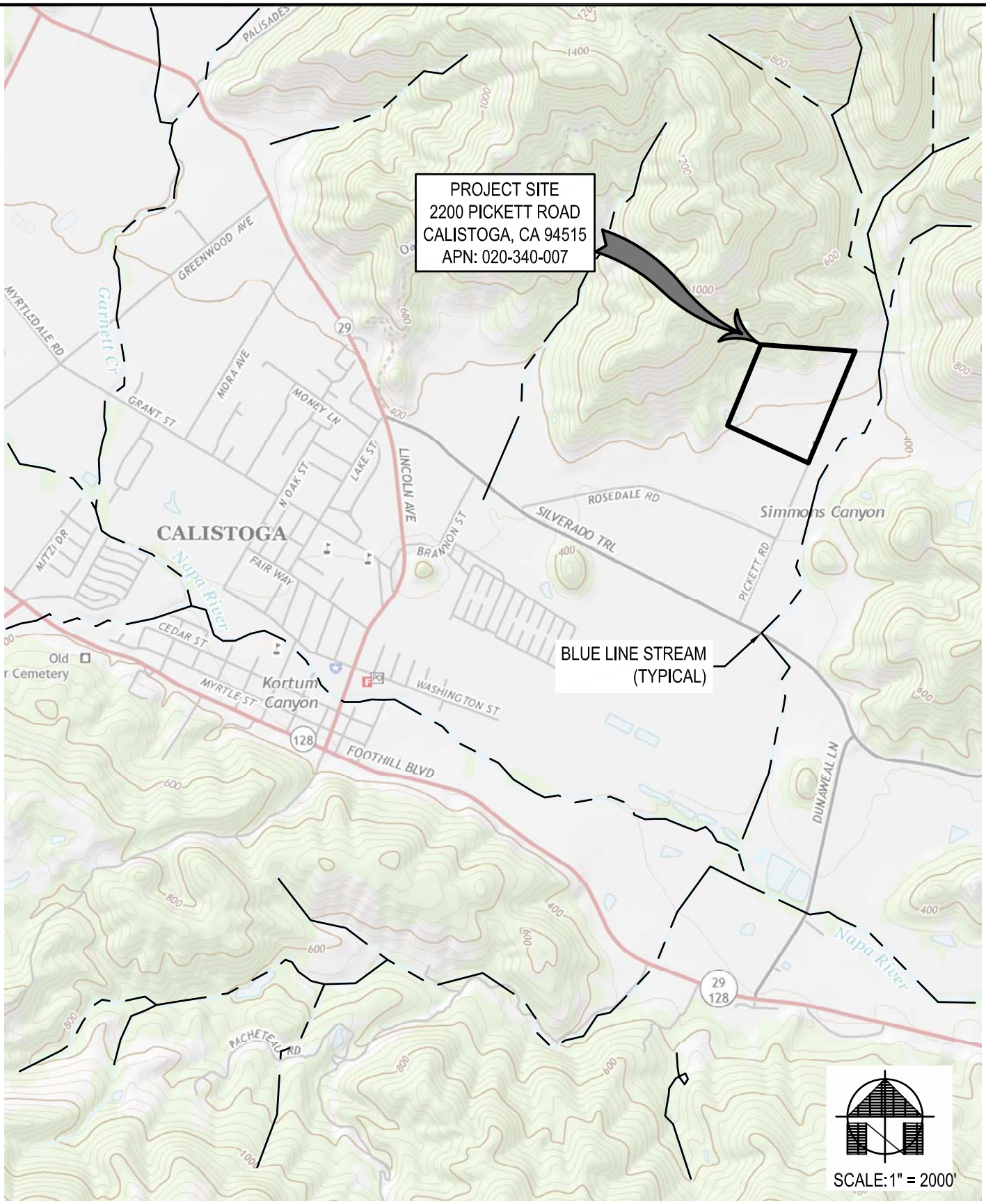
As a secondary option, the Kenefick Ranch Winery would like to consider the use of treated process wastewater for vineyard irrigation. Several additional pieces of equipment would be required for this system and can be seen in the site map in Appendix 3. If this option is pursued, the domestic wastewater from the winery will be connected to the existing conventional septic system.

With the treatment options outlined in this report, the wastewater treatment systems at the Kenefick Ranch Winery are capable of treating and dispersing the wastewater as estimated by the proposed marketing plan.

APPENDIX

1 Vicinity Map
2 Overall Site Map
3 WWTS Options Exhibits
4 Existing Conventional System: Site Evaluation, Plans, and As-Built Drawings
5 Wastewater Generation & Water Balance Calculations
6 Site Soil Information

APPENDIX 1:
VICINITY MAP



MAP FROM USGS 7.5 MIN SERIES MAP NAME: CALISTOGA

0 2000'
Scale in feet

VICINITY MAP

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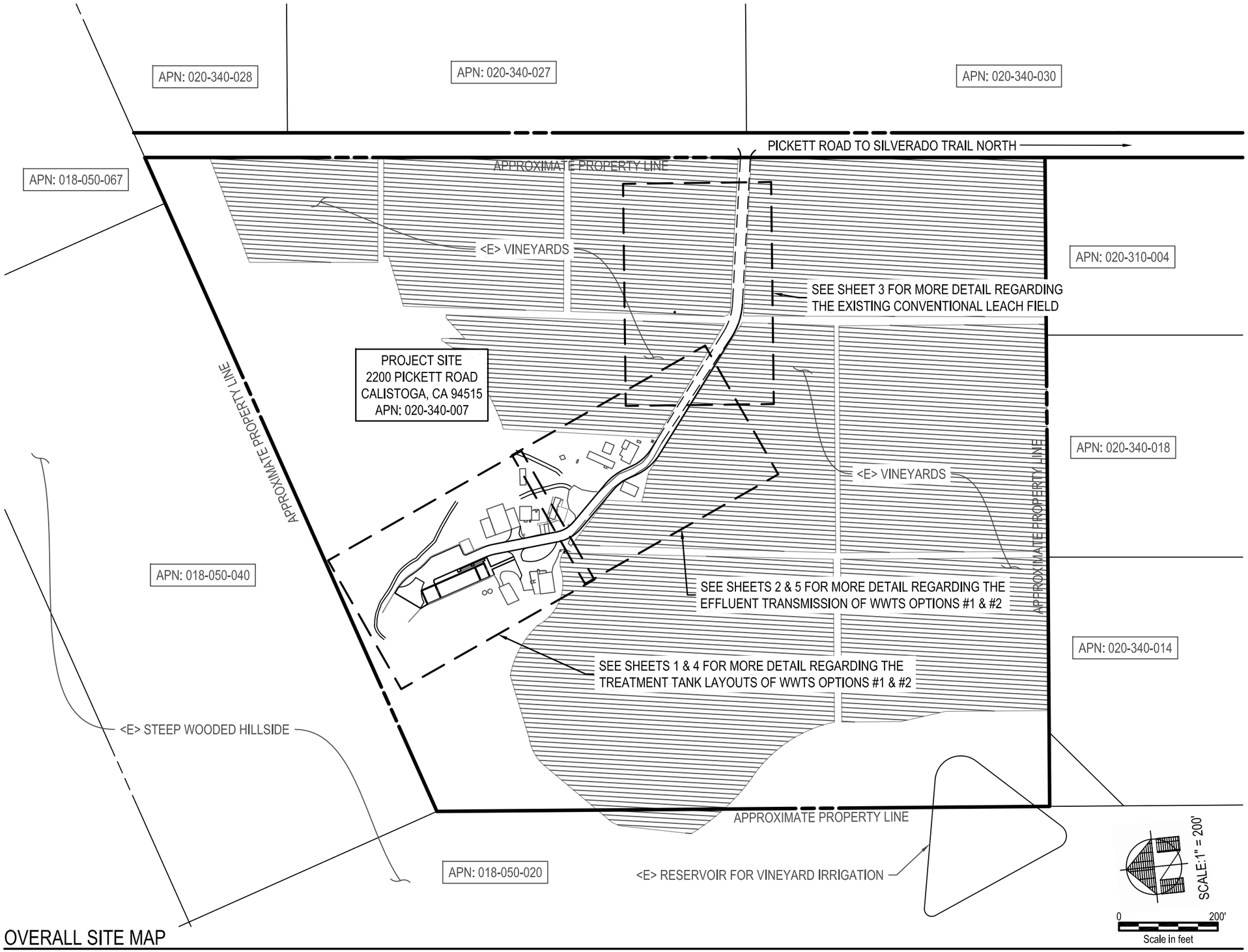
APPENDIX 2:
OVERALL SITE MAP



OVERALL SITE MAP

OVERALL SITE MAP
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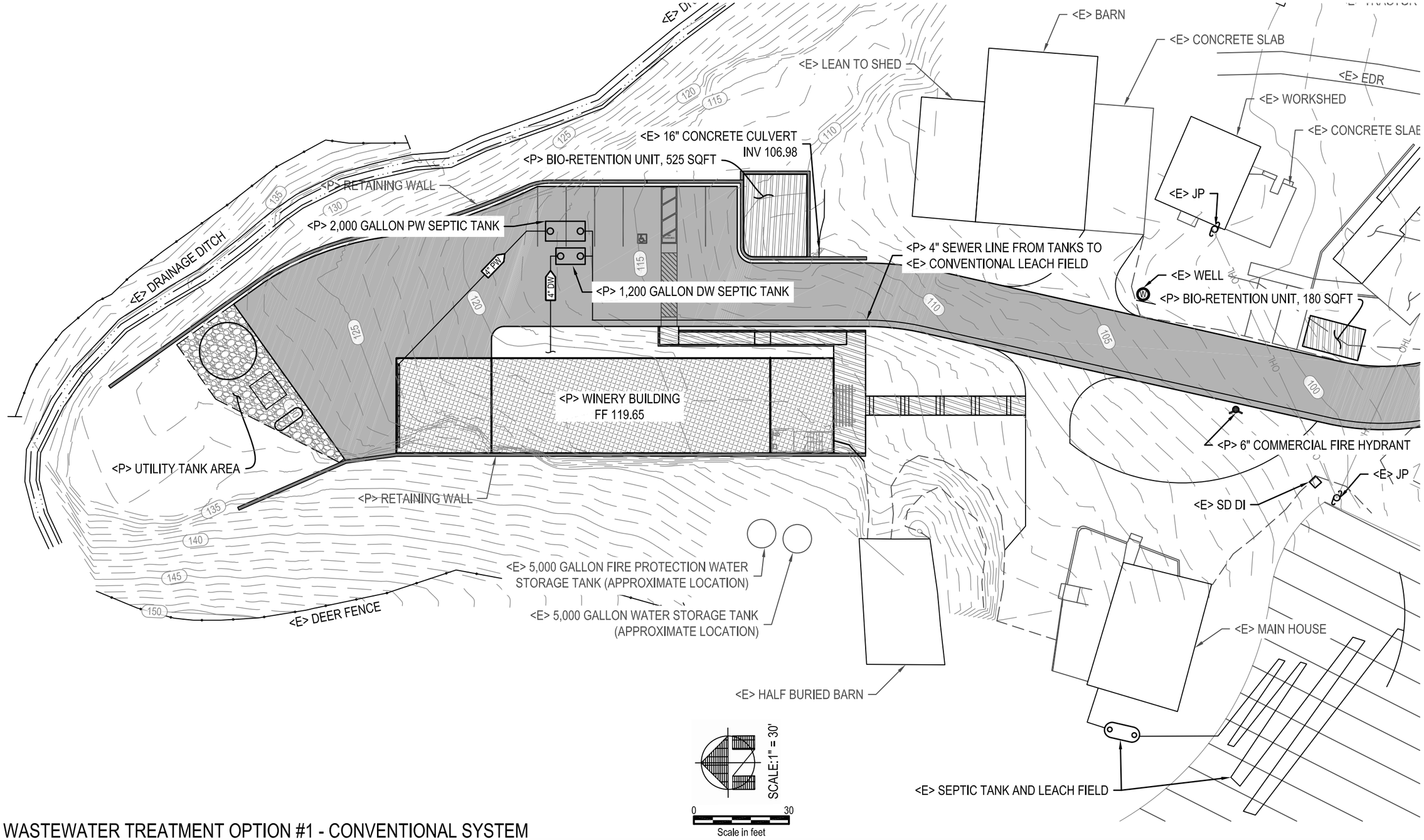
APPENDIX 3:
WWTS OPTIONS EXHIBITS



WASTEWATER TREATMENT OPTION #1 - CONVENTIONAL SYSTEM

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<E> CHICKEN COOP
<E> EDR
OHL
<E> STORAGE BUILDING
APPROXIMATE LOCATION OF <E> SEPTIC TANK
APPROXIMATE LOCATION OF <E> SEPTIC TANK
APPROXIMATE LOCATION OF <E> SEPTIC LINE
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ETE SLAB
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<E> WORKSHED
<E> CONCRETE SLAB
<E> 300 GALLON PROPANE TANK
<E> 2 BEDROOM FARMWORKER TRAILER
<E> SD DI
<E> 2 BEDROOM FARMWORKER HOUSE
<P> 4" SEWER LINE FROM TANKS TO <E> CONVENTIONAL LEACH FIELD
<E> VINEYARD OFFICE AND PORCH
<E> WORKSHED
:NTION UNIT, 180 SQFT
<E> FH
100
<P> 4" SEWER LINE FROM TANKS TO <E> CONVENTIONAL LEACH FIELD
<E> VINEYARD
> 6" COMMERCIAL FIRE HYDRANT
<E> JP
DI
SCALE:1" = 30'
0
30
Scale in feet

WASTEWATER TREATMENT SYSTEM OPTION #1 - CONVENTIONAL SYSTEM

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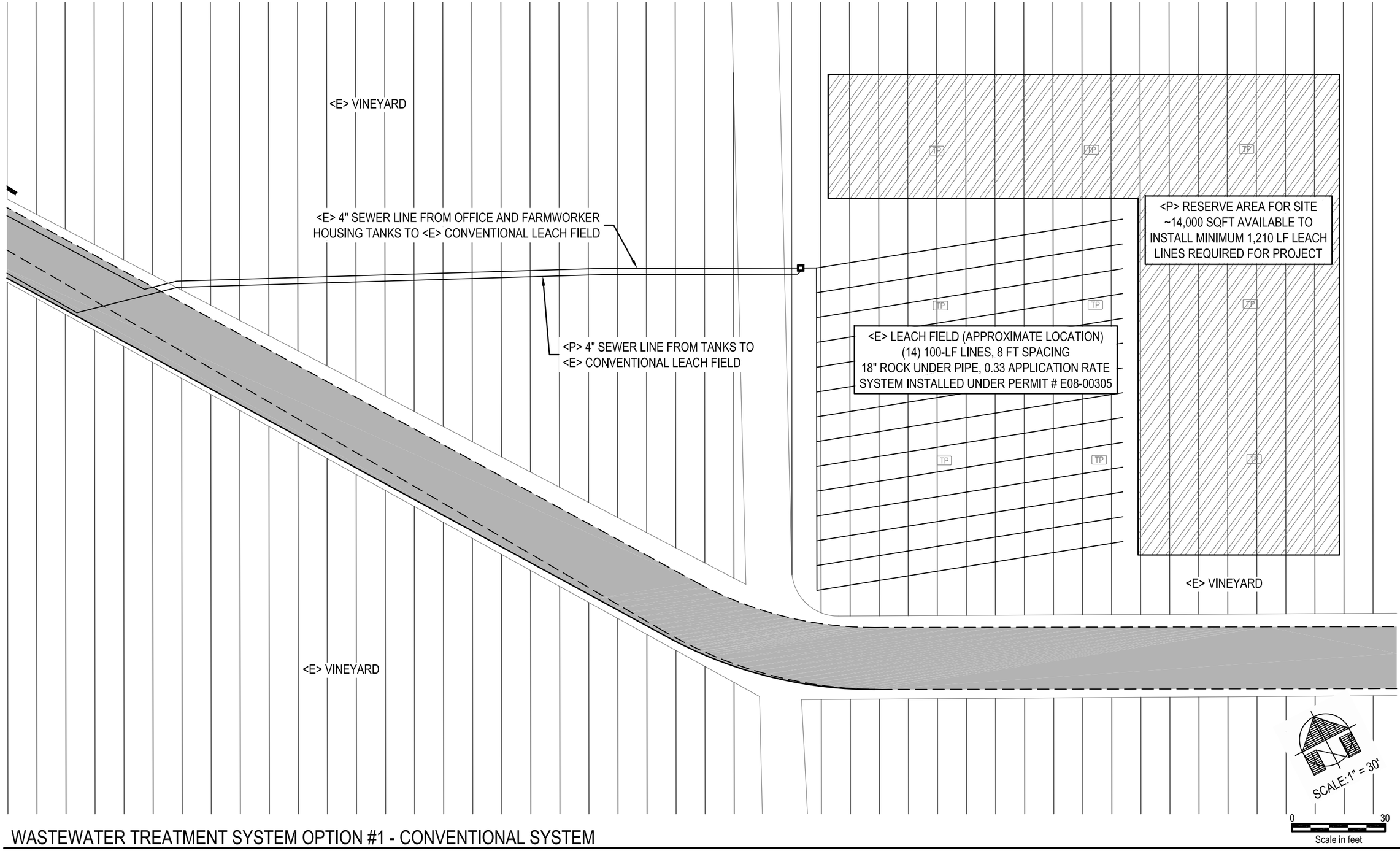

WASTEWATER TREATMENT SYSTEM OPTION #1 - CONVENTIONAL SYSTEM

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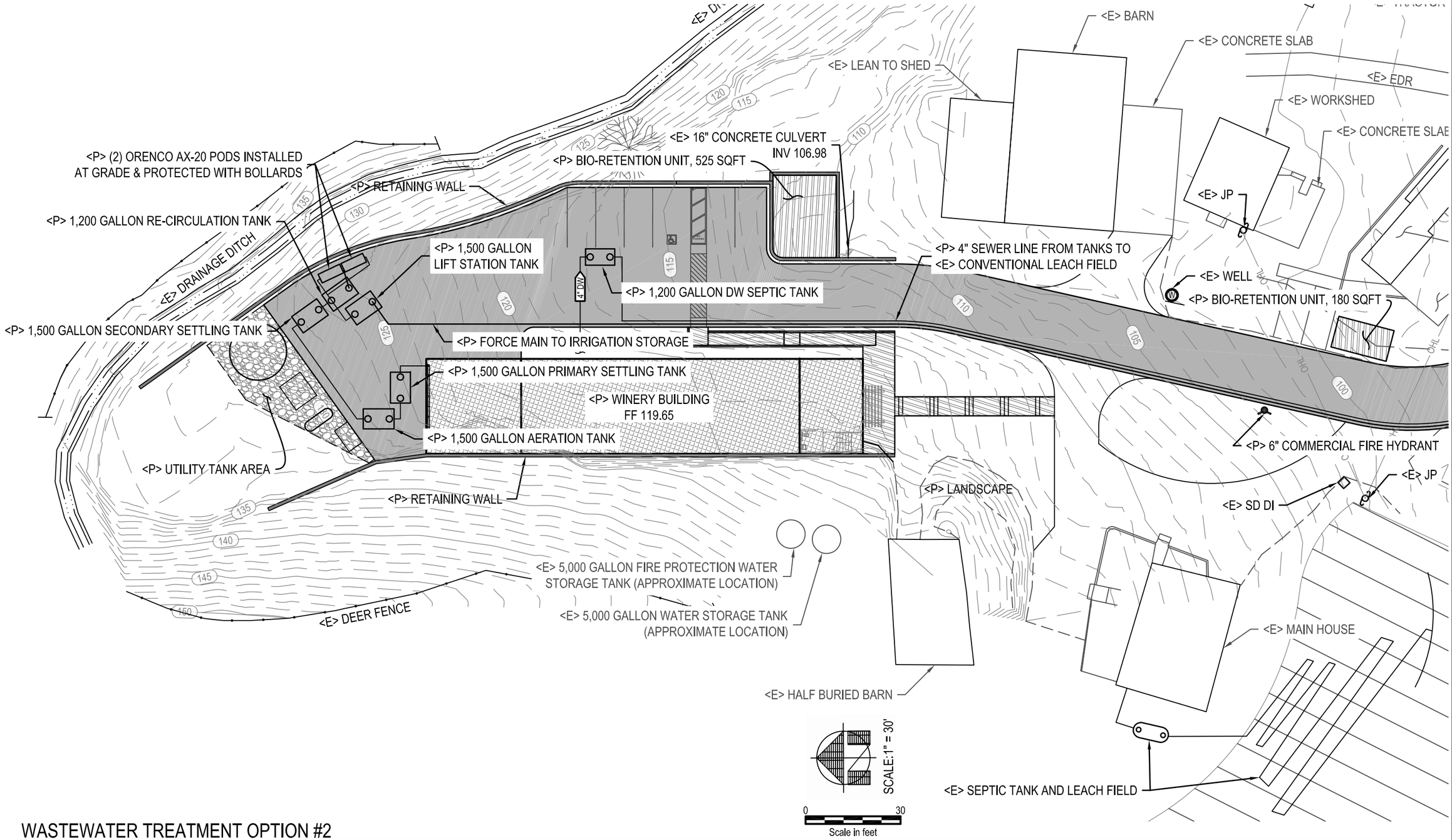

WASTEWATER TREATMENT OPTION #2

SANITARY SEWER - CONNECT TO EXISTING CONVENTIONAL SYSTEM
PROCESS WASTE - PROPOSED VINEYARD IRRIGATION SYSTEM

WWTS OPTIONS
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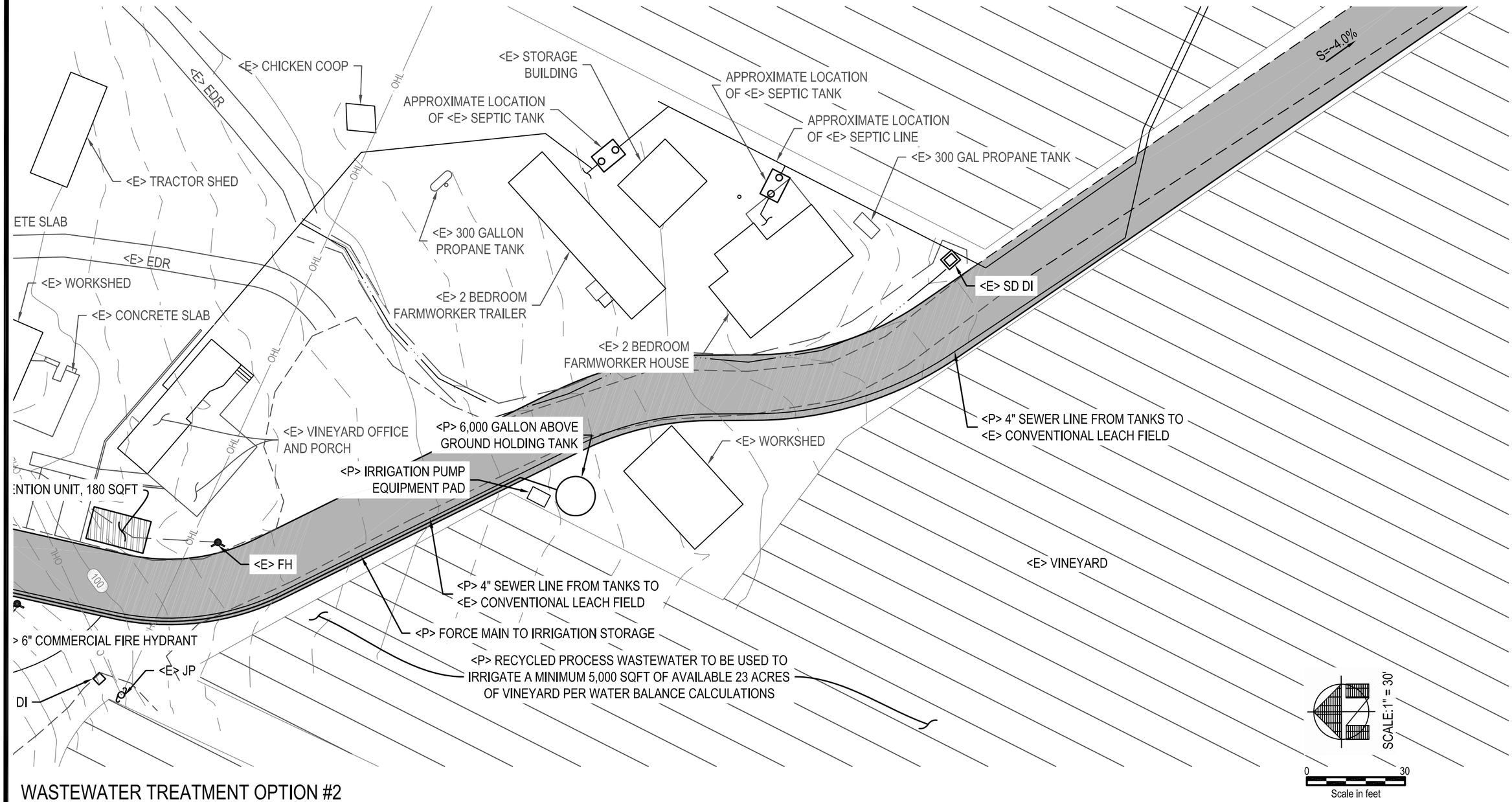

WASTEWATER TREATMENT OPTION #2

SANITARY SEWER - CONNECT TO EXISTING CONVENTIONAL SYSTEM
PROCESS WASTE - PROPOSED VINEYARD IRRIGATION SYSTEM

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APPENDIX 4:
EXISTING CONVENTIONAL SYSTEM: SITE EVALUATION, PLANS, AND "AS-BUILT" DRAWINGS

STEVEN LEDERER
Director of Environmental Management

COUNTY of NAPA

ENVIRONMENTAL MANAGEMENT
1195Third Street, Suite 101, Napa CA 94559
Phone: 707/253-4471 Fax: 707/253-4545
www.co.napa.ca.us

SEWAGE PERMIT B08-01060

059

Application Type:	EM Permits-Sewage System-New Install Conventional		
Permit Number:	E08-00305	**Applied Date:**	06/12/2008
Parcel Number:	020-340-007-000	**Issued Date:**	06/16/2008
		Expiration Date:	6/16/2010

Site Address:	2198 PICKETT ROAD CALISTOGA		
Owner:	KENEFICK THOMAS P M/M ETAL	**Phone:**	
Address:	2100 WEBSTER ST SUITE 110, SAN FRANCISCO, CA, 94115-2373		
Applicant:	Blakeley Construction Inc	**Phone:**	
Business Name:			

Type of Project: New Install Conventional

	Bedrooms			Commercial UP#:	
	Existing	**Proposed**	**GPD**		**GPD**
Residence			300	**Sanitary Waste**	
Second Dwelling			300	**Process Waste**	
Guest House					

Water Supply: Well

Distance from closest water source to any part of sewage system:

Specifications

Designer:	Doug Sterk	**Drainline:**	1100	**Sump Type:**	
Engineered Plan Date:		**Trench Depth (in):**	36	**A/V Alarm:**	
Conventional Plan Date:	06/16/2008	**Rock Under Pipe (in):**	18	**Remote Alarm:**	
Septic Tank:	1200g concrete each	**Chamber Manu:**		**Elec Self Cert:**	
Sewer Line:	4" SCH 40 ABS	**Model Number:**			
Length (ft):	60	**DOC Backfill (in):**	12		
		DOC Fill (in):			

TO PERMITTEE:

Any work performed or operations conducted under the auspices of this permit constitutes acceptance of all conditions, inspections and comments contained in this permit, and the incorporation of all requirements as set forth in the permit application.

Staff Signature: Melinda Merry Date: 10/10/08

STEVEN LEDERER
Director of Environmental Management

COUNTY of NAPA

ENVIRONMENTAL MANAGEMENT
1195Third Street, Suite 101, Napa CA 94559
Phone: 707/253-4471 Fax: 707/253-4545
www.co.napa.ca.us

Sewage Permit
CONDITIONS/INSPECTIONS/COMMENTS

Application Type: New Install Conventional

Permit Number:	E08-00305	**Applied Date:**	06/12/2008
Parcel Number:	020-340-007-000	**Issued Date:**	06/16/2008
Applicant:	Blakeley Construction Inc		
Owner:	KENEFICK THOMAS P M/M ETAL		

Conditions:

Code	Condition
CODE VIOLATION	MANUFACTURED HOME & ELEC & PLUMBING/GAS
EM-11	The applicant shall comply with the Department of Public Works "Conditions of Approval-National Polution Discharge Elimination System Requirements", a copy of which was provided at the time of permit issuance. Failure to comply with the NPDES requirements will result in a stop-work order.
EM-5	✓An as-built drawing must be submitted prior to final. 7/7/08
Winery	This system is voluntarily oversized by the owner with the intent for use by a future winery. However,this permit does not guarantee an approval of use permit or any other permits having to do with this desired future winery. This permit is only for tanks, sewer lines, leachlines, etc. that are to serve for the two dwellings mentioned on the permit application.

Inspections: Inspected By: Date: 06/16/2008

Inspection

Leach Lines 6/20/08 MM
Sewer Line 4/27/09
Septic Tank Installation 6/26/08
D-Box 6/20/08 MM
Environmental Management Final MM 7/9/09

Sewer line for B08-01054 ok
sewer line for B08-01066 - still need
then can final this permit

OK MM 10/19/09

Comments:

Date	Comment
	Call 253-4135 at least 24 hours in advance during normal business hours to schedule inspection requests. Inspections are taken on a first-come-first-served basis so if you need a specific date and time be sure to call well in advance
	Environmental Management"s inspection must be obtained prior to covering any portion of the system.
06/16/2008	Any deviation from these permit specifications without prior approval from the Department of Environmental Management will be cause for stopping work until the changes are fully justified and approved.
	If a claim is to be submitted for a refund, per County Code, a 25% processing fee will be retained. Such claims must be made within one year of the date on the receipt.

Napa County Department of
Environmental Management
1195 Third Street, Room 101
Napa, CA 94559

9 June 2008

Re: Kenefick Ranch Septic System Layout, 2198 Pickett Rd., Calistoga, CA
APN 020-340-007

The attached layout is provided to show the system layout for (2) 2-bedroom houses. In addition, enough leach line is shown to provide septic treatment and disposal for a potential future 10,000-case winery. It is understood that to use the system on approved Use Permit issued by the County of Napa must first be procured for the winery. The proposed home system is voluntarily being oversized with the knowledge that a future use permit might not be obtained and that the construction of the system does not guarantee the use permit will be issued.

Sincerely,

Thomas P Kenefick

Tom Kenefick
Kenefick Ranch

STEVEN LEDERER
Director of Environmental Management

COUNTY of NAPA

ENVIRONMENTAL MANAGEMENT
1195Third Street, Suite 101, Napa CA 94559
Phone: 707/253-4471 Fax: 707/253-4545
www.co.napa.ca.us

RECEIPT

THIS IS NOT A PERMIT

Application Type: EM Permits-Sewage System-New Install Conventional

Permit Number:	E08-00305	**Parcel Number:**	020-340-007-000
Situs Address:	2198 PICKETT ROAD CALISTOGA	**Applied Date:**	06/12/2008
Applicant:	Blakeley Construction Inc	**Phone:**	
Owner:	KENEFICK THOMAS P M/M ETAL	**Phone:**	

DEPOSIT/PAYMENTLIST:

Receipt No.	Payor	Method	Date	Reference No.	Comments	Cashier	Payment Amount
69050	Blakeley Construction Inc	Check	06/12/2008	20477		RHICKS	$515.00

FEES:

Fee	Invoice Number	Account	Fee Amount	Payment	Balance Due
Sewage System New Install Conventional	52935	46081100-1000-40500	$515.00	$515.00	$0.00
		Total:	$515.00	$515.00	$0.00

Date Printed: **06/12/2008**

STEVEN LEDERER
Director of Environmental Management

COUNTY *of* NAPA

ENVIRONMENTAL MANAGEMENT
1195Third Street, Suite 101, Napa CA 94559
Phone: 707/253-4471 Fax: 707/253-4545
www.co.napa.ca.us

APPLICATION
THIS IS NOT A PERMIT

Application Type:	EM Permits-Sewage System-New Install Conventional		
Permit Number:	E08-00305	**Parcel Number:**	020-340-007-000
Situs Address:	2198 PICKETT ROAD CALISTOGA	**Applied Date:**	06/12/2008
Owner:	KENEFICK THOMAS P M/M ETAL	**Phone:**	
Applicant:	Blakeley Construction Inc	**Phone:**	

Worker's Compensation Coverage:
( ) A Certificate of current Worker's Comp Insurance Coverage is on file with this office (or filed with this application)
( ) I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the Worker's Compensation laws of California.

By executing this application, the undersigned agrees to comply with all conditions, inspections and comments of the issued permit and all federal, state and county code requirements applicable to this permit. Furthermore, I understand that the Department of Environmental Management in no way guarantees trouble-free operation of the system, and that future repair may be necessary.

Owner or Authorized Agent Signature: Tyson Blakeley Date: 6-12-08

MR KRIEFICK
WOULD LIKE TO PUT
IN ENOUGH EXTRA
LEECH LINE FOR A
HOUSE TO BE 3 BEDROOMS
DUE TO SIZE
BEDROOM
300' TO THE SYSTEM

CONVENTIONAL SEWAGE DISPOSAL SYSTEM CONSTRUCTION APPLICATION

PROPERTY OWNER INFORMATION

Name: TOM KARPICK

Address: 2198 PICKETT RD.

APN: 020-340-007

Phone #: 942-6457

SEWAGE CONTRACTOR INFORMATION

Company Name: BUCKLEY CONSTRUCTION

Contact person: DICK BUCKLEY

Address: 310 FRANZ VALLEY SCHOOL RD.

Phone #: 707-942-4383
707-975-0587 Cell

PROPOSED USE (circle one): (Residential) Commercial

TYPE OF PERMIT (circle one): (New Construction) WINERY Addition (Repair) 2-2 BDR HOUSES

Tank Only Sewer line

DESIGN FLOW: 850 (WINERY) GAL/DAY
2 X 300 (2 - 2 BDR HOUSES)

SITE EVALUATION TEST DATA: (PLEASE ATTACH)

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SEWER LINE:
SIZE: 4" INCHES
MATERIAL: ABS

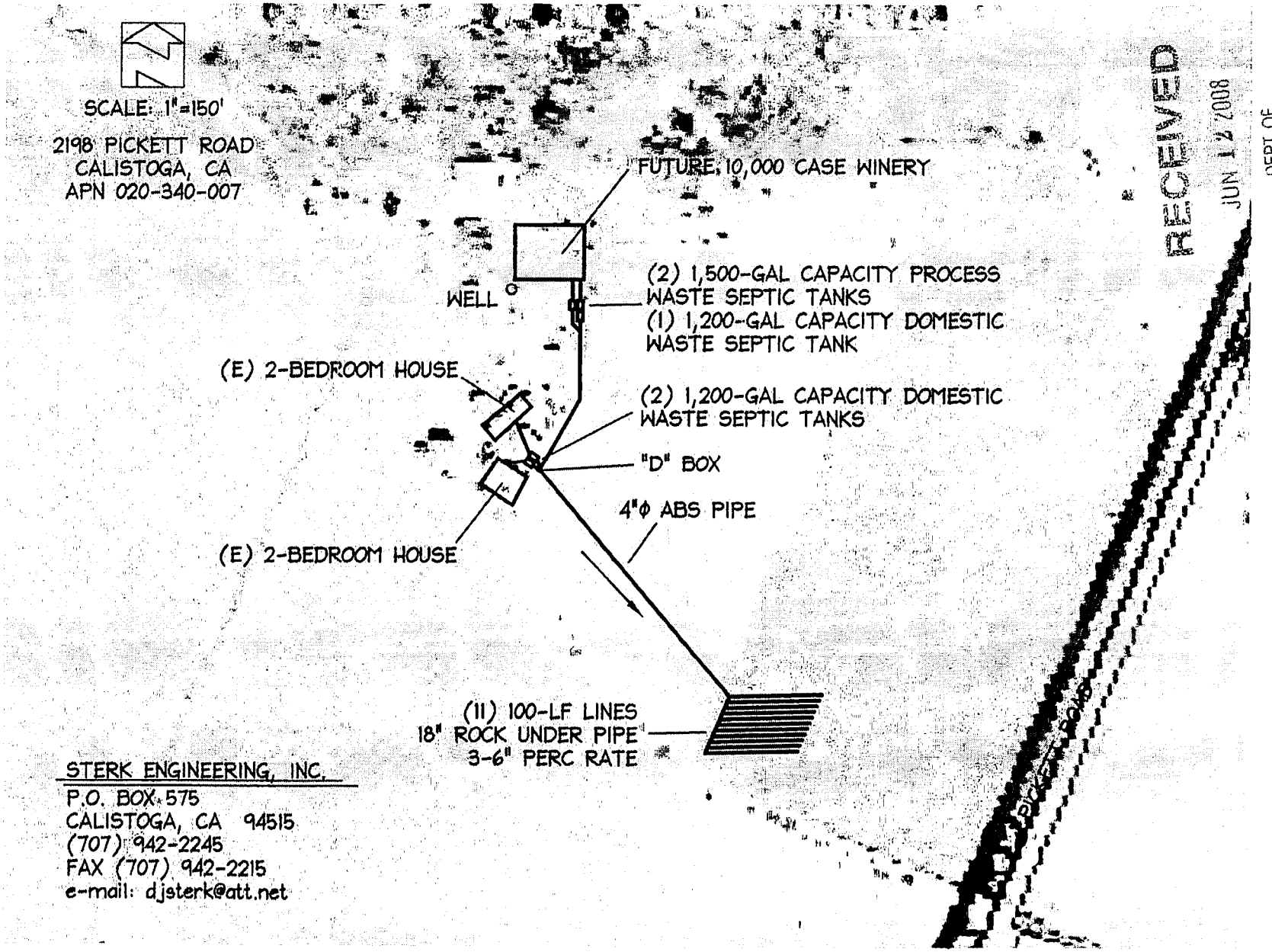
SEPTIC TANK:
WINERY: 2 - 1500 gal & 1 - 1250 gal
HOUSES: 1 - 1200 gal (EACH)
SIZE: _____ GALLONS
MATERIAL (circle one): (Concrete) Fiberglass Polyethylene other: _____
MANUFACTURER: SOLVAGE

SUMP TANK: YES (NO)
SIZE: _____ GALLONS
MATERIAL: (circle one) Concrete Fiberglass Polyethylene other: _____
MANUFACTURER: _____

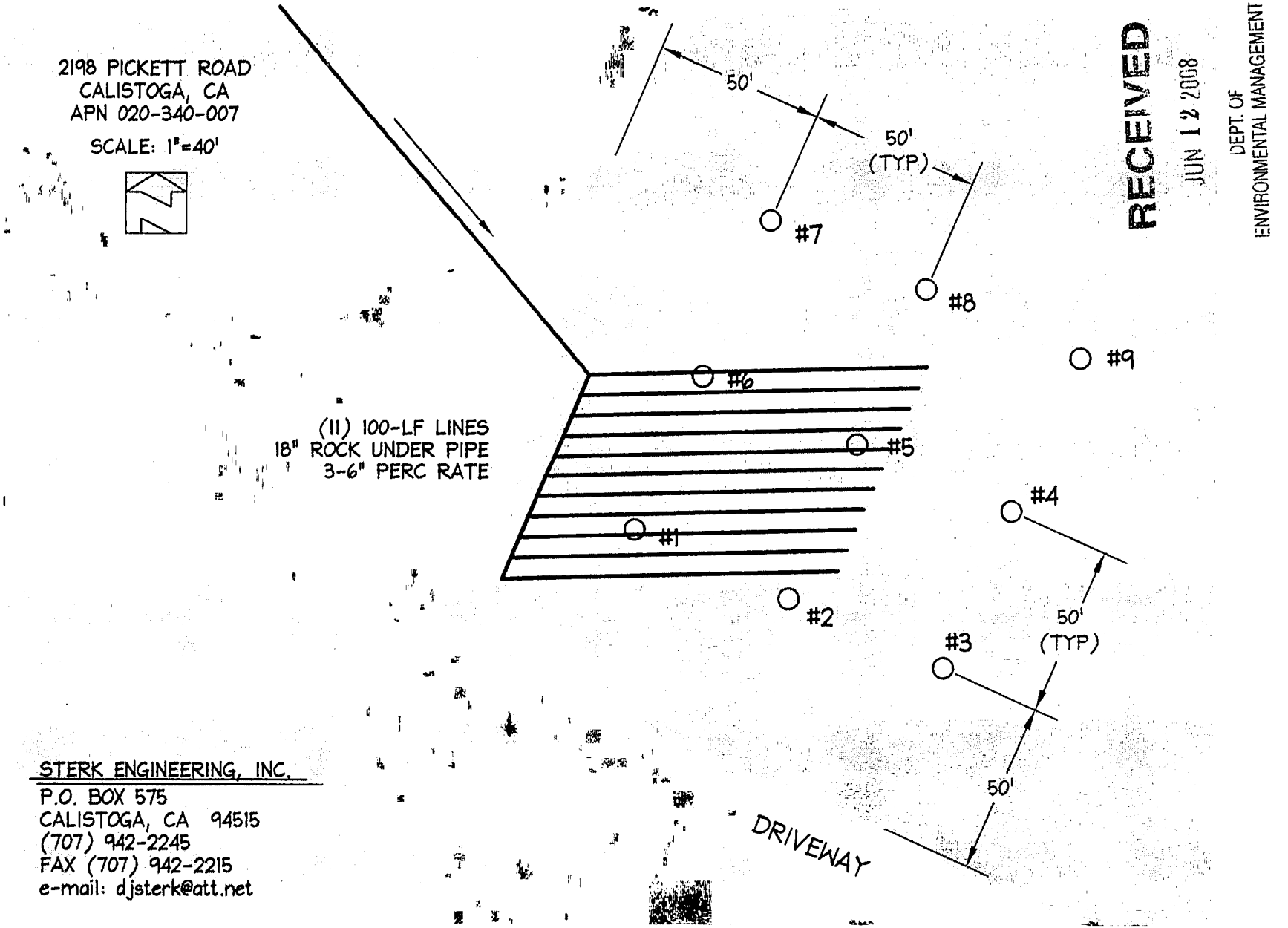
LEACHFIELD SPECIFICATIONS:
TYPE OF DISPOSAL FIELD: (GRAVEL/PIPE) CHAMBER
TRENCH DEPTH: 18 INCHES (GRAVEL UNDER PIPE - 12" DIRT COVER)
TRENCH WIDTH: 18 INCHES
TOTAL LENGTH OF LEACHLINE: 1100 FEET
OF LEACHLINES: 11
DISTRIBUTION BOX: (YES) NO

DISTANCE FROM SEWAGE DISPOSAL SYSTEM TO NEAREST WELL: _____FEET

A MAP OF THE PROPOSED SEWAGE DISPOSAL SYSTEM SHALL BE ATTACHED TO THIS APPLICATION.



STERK ENGINEERING, INC.
P.O. BOX 575
CALISTOGA, CA 94515
(707) 942-2245
FAX (707) 942-2215
e-mail: djsterk@att.net



STERK ENGINEERING, INC.
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CALISTOGA, CA 94515
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FAX (707) 942-2215
e-mail: djsterk@att.net

Napa County Department of Environmental Management

SITE EVALUATION REPORT

Please attach an 8.5" x 11" plot map showing the locations of all test pits triangulated from permanent landmarks or known property corners. The map must be drawn to scale and include a North arrow, surrounding geographic and topographic features, direction and % slope, distance to drainages, water bodies, potential areas for flooding, unstable landforms, existing or proposed roads, structures, utilities, domestic water supplies, wells, ponds, existing wastewater treatment systems and facilities.

Permit #: E08-00043

APN: 020-340-007

(County Use Only)
Reviewed by: Date:

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner TOM KENEFICK	☐ New Construction ■ Addition ☐ Remodel ■ Relocation ☐ Other:
Property Owner Mailing Address 2200 PICKETT ROAD	■ Residential - # of Bedrooms: 3 Design Flow : 450 gpd
City State Zip CALISTOGA, CA 94515	☐ Commercial – Type: Sanitary Waste: gpd Process Waste: gpd
Site Address/Location 2198 PICKETT ROAD CALISTOGA, CA 94515	☐ Other: Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:

Company Name STERK ENGINEERING, INC.	Evaluator's Name DOUGLAS J. STERK, P.E.	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist)
Mailing Address: P.O. BOX 575		Telephone Number (707) 942-2245
City State Zip CALISTOGA, CA 94515		Date Evaluation Conducted 21 AUGUST 2007

Primary Area	**Expansion Area**
Acceptable Soil Depth: 72 in. Test pit #'s: 1 – 7, 9 (66" - #8)	Acceptable Soil Depth: 66 in. Test pit #'s: 1 - 9
Soil Application Rate (gal. /sq. ft. /day): 0.33	Soil Application Rate (gal. /sq. ft. /day): 0.33
System Type(s) Recommended: STANDARD	System Type(s) Recommended: STANDARD
Slope: 1 %. Distance to nearest water source: > 100' ft.	Slope: 1 %. Distance to nearest water source: > 100' + ft.
Hydrometer test performed? No ■ Yes ☐ (attach results)	Hydrometer test performed? No ■ Yes ☐ (attach results)
Bulk Density test performed? No ■ Yes ☐ (attach results)	Bulk Density test performed? No ■ Yes ☐ (attach results)
Percolation test performed? No ■ Yes ☐ (attach results)	Percolation test performed? No ■ Yes ☐ (attach results)
Groundwater Monitoring Performed? No ■ Yes ☐ (attach results)	Groundwater Monitoring Performed? No ■ Yes ☐ (attach results)

Site constraints/Recommendations:

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JUN 12 2008

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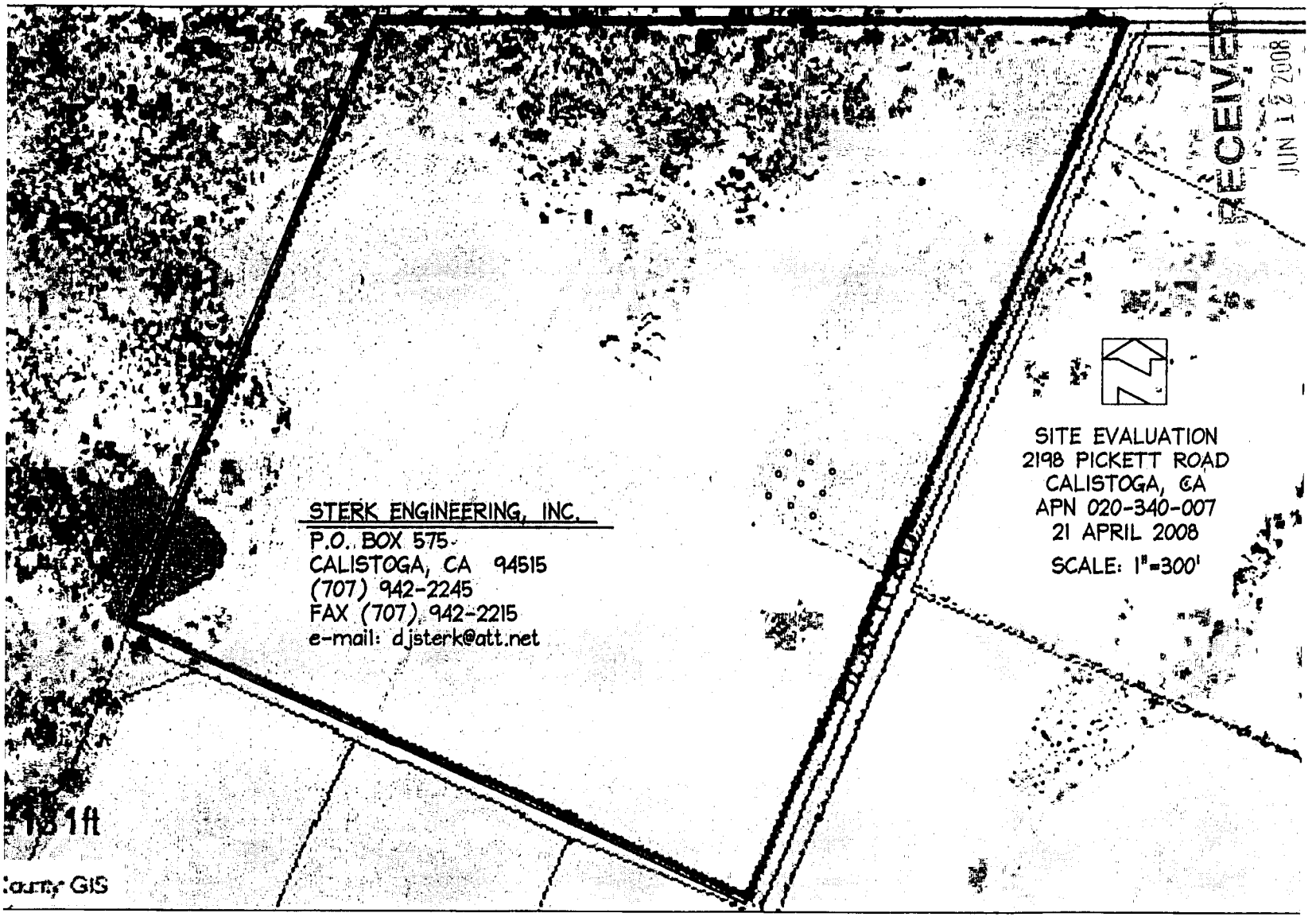
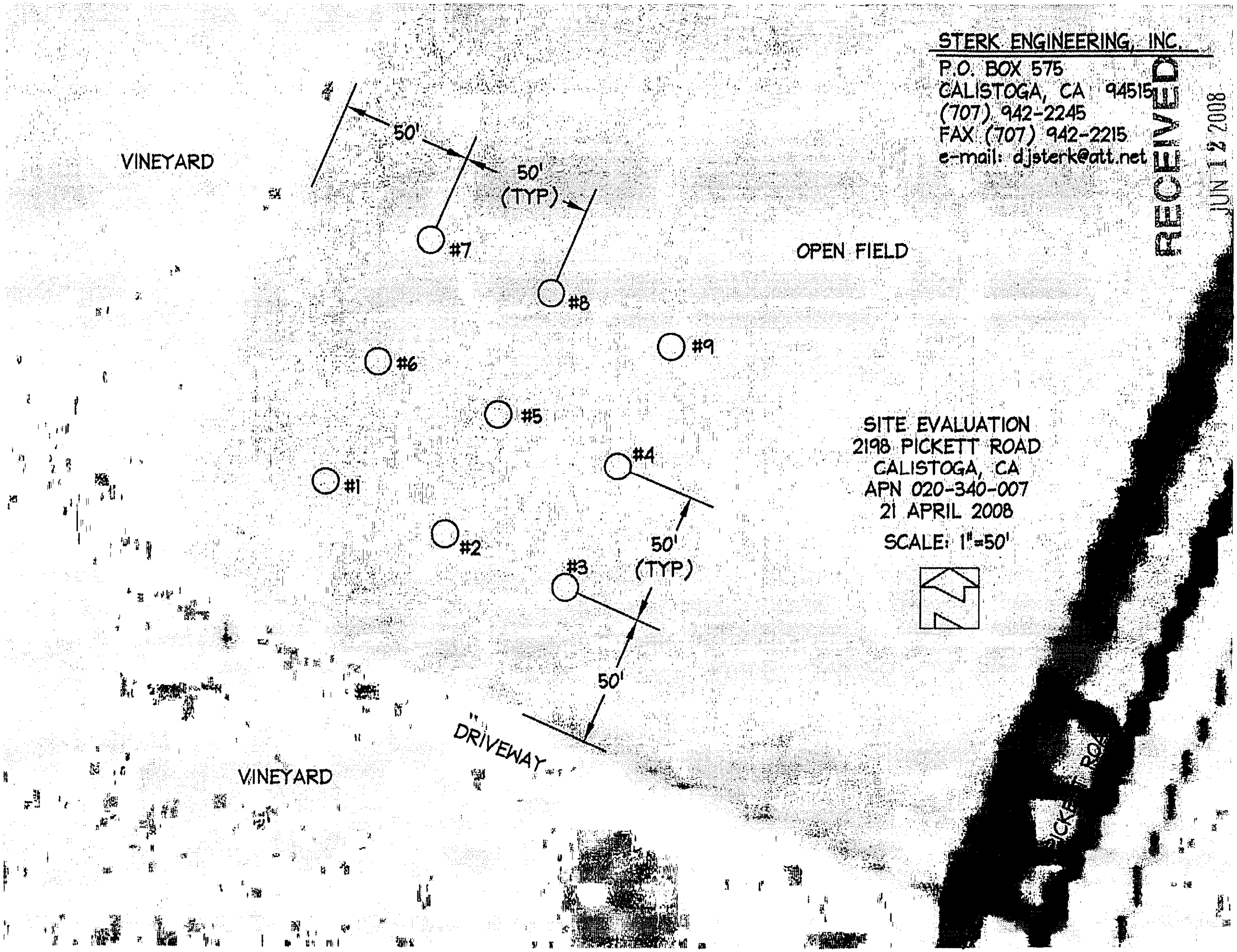
ENVIRONMENTAL MANAGEMENT





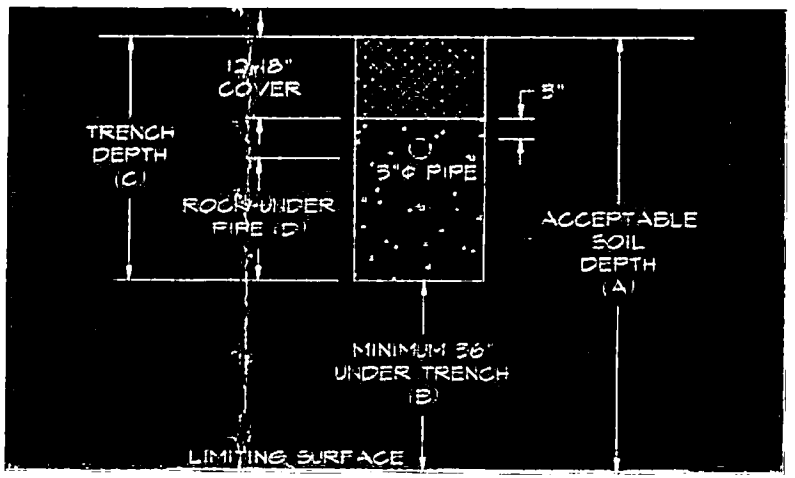
perc (in/hr)	sf sw/ 150 gal/day	bedrooms	depth under trench to limiting surface level: 12" rock under pipe	18" rock under pipe	24" rock under pipe	30" rock under pipe	36" rock under pipe
SF SIDEWALL / FT →			3	4	5	6	7
1"-3"	600	1	200.00	150.00	120.00	100.00	85.71
		2	400.00	300.00	240.00	200.00	171.43
		3 - 5	600.00	450.00	360.00	300.00	257.14
	(450+100) →	6	733.33	550.00	440.00	366.67	314.29
	(450+200) →	7	866.67	650.00	520.00	433.33	371.43
	845 gallons →		1,126.67	845.00	676.00	563.33	482.86
	1230 →		1,640.00	1,230.00	984.00	820.00	702.86
3"-6"	450	1	150.00	112.50	90.00	75.00	64.29
		2	300.00	225.00	180.00	150.00	128.57
		3 - 5	450.00	337.50	270.00	225.00	192.86
	850 →		850.00	637.50	510.00	425.00	364.29
6"-12"	300	1	100.00	75.00	60.00	50.00	42.86
		2	200.00	150.00	120.00	100.00	85.71
		3 - 5	300.00	225.00	180.00	150.00	128.57
	(450+100) →	6	366.67	275.00	220.00	183.33	157.14
	(450+200) →	7	433.33	325.00	260.00	216.67	185.71

"Y"

length of leach field lines (total)

FORMULA:

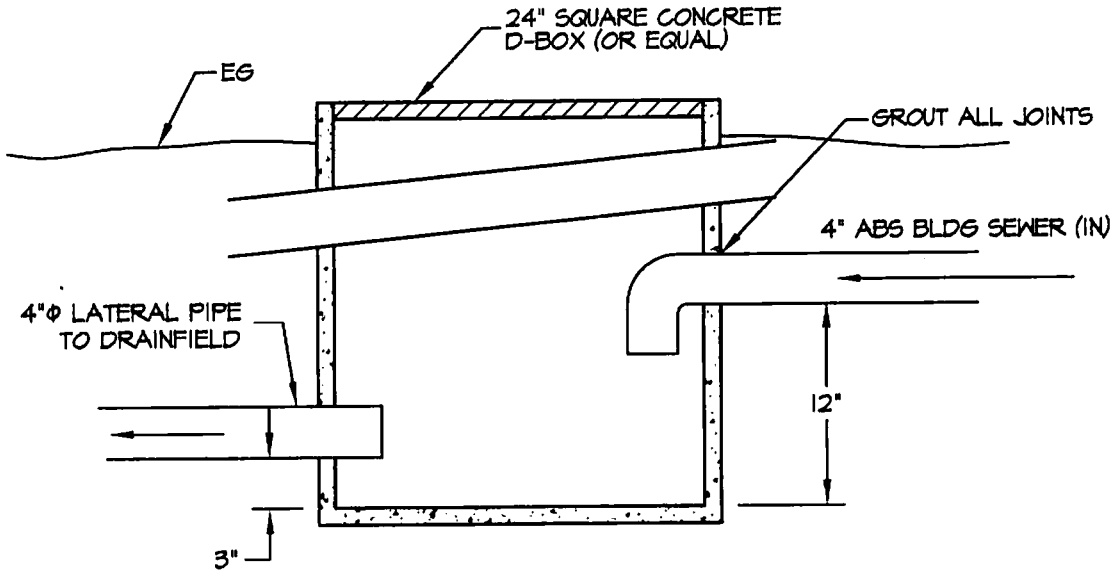
LENGTH = (SF SIDEWALL/150 GAL EFFL) X (# BDRMS) X (150 GAL EFFL/BDRM) X ("X" FT FIELD/"Y" SF SIDEWALL/FT)



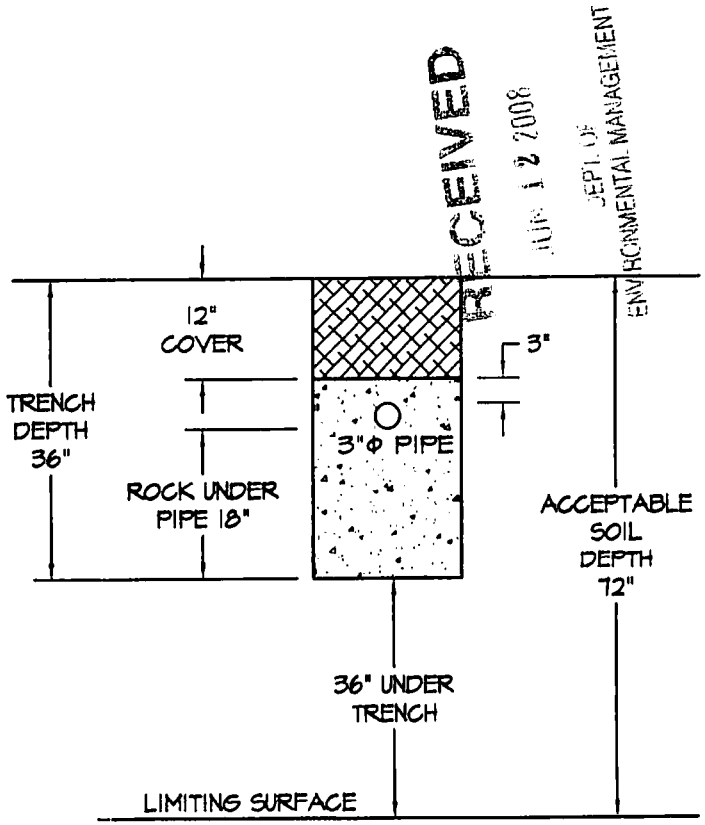
trench depth (C) = A - B

rock under pipe (D) = C - (12" to 18") - 3" - 3"

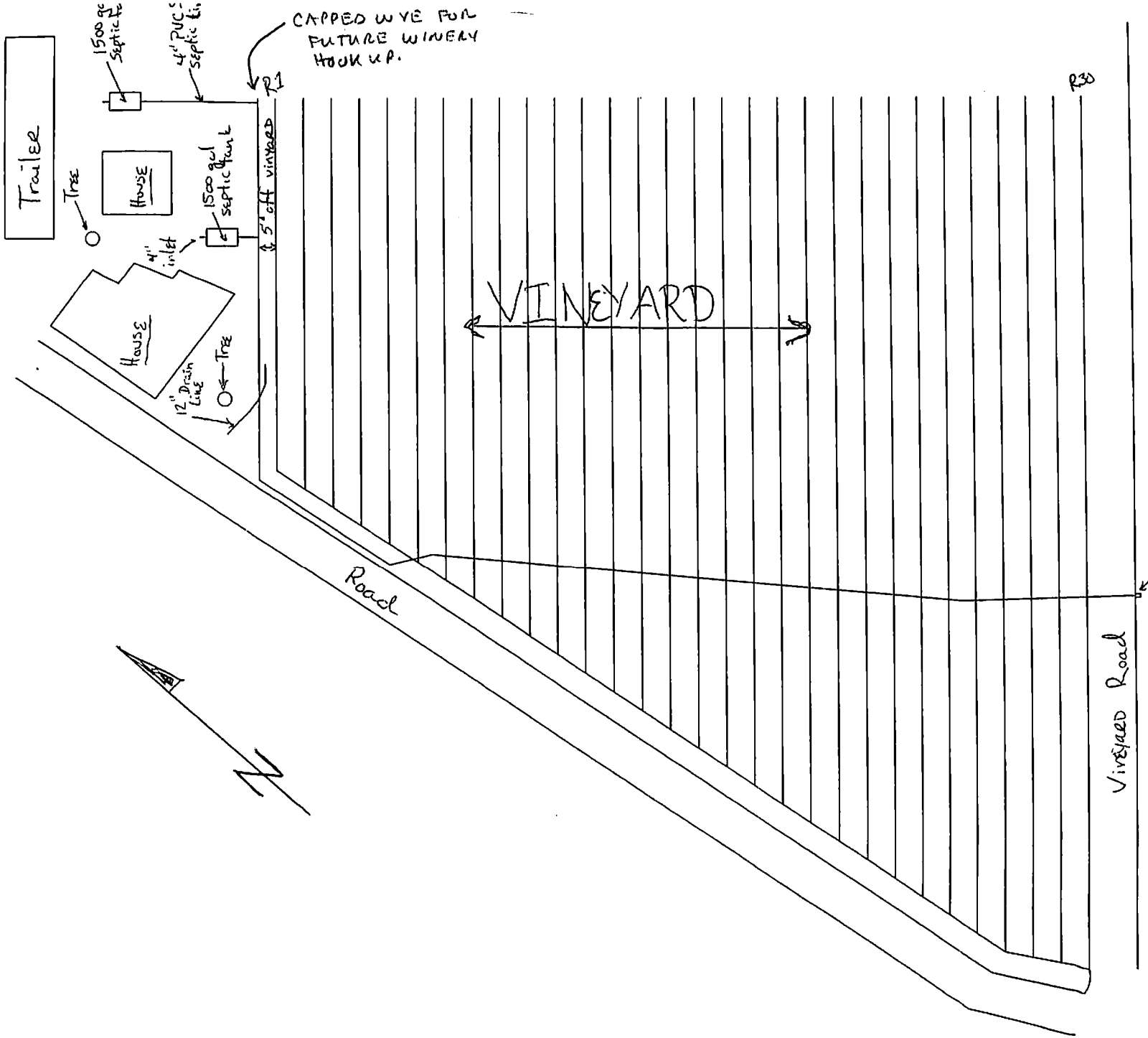
3	EQUIV BDRMS FOR 3-5 RANGE
10,000	cases
12	bottles/case
0.75	liters/bottle
0.2642	gallons/liter
23,778	gallons wine
1.5	gallons effluent/wine
45	crush period
792.60	gallons/day
3	full-time employees
15	gpd/employee
45	gallons/day
837.60	total gallons/day
850	use
225.00	2-bdrm house
225.00	2-bdrm house
637.50	10k winery
1,087.50	lf of leach line
1,100	use



"D" BOX DETAIL



TRENCH DETAIL



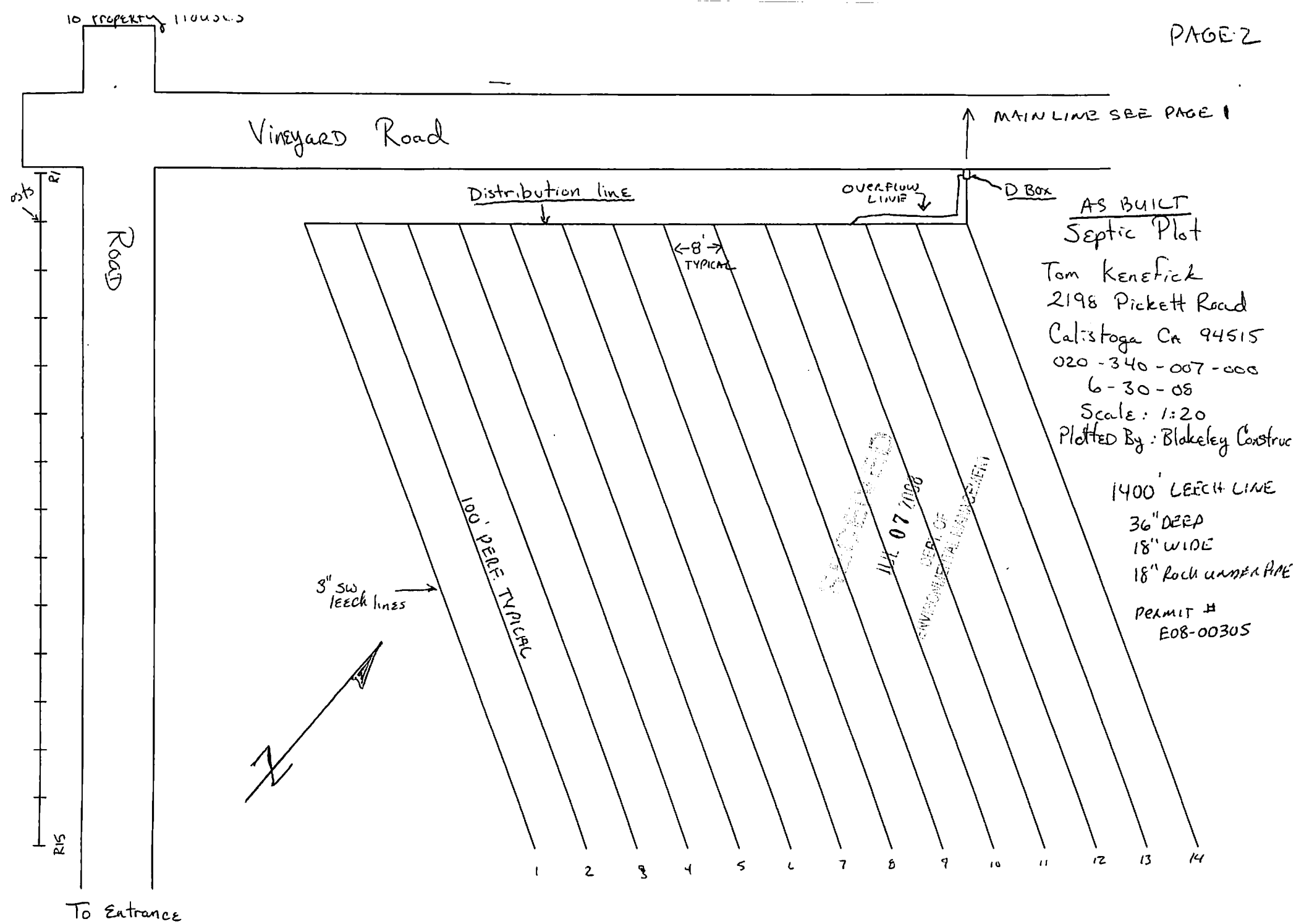
LEECH LINES
SEE PAGE 2

PERMIT # E08-00305

AS BUILT

Septic Plot

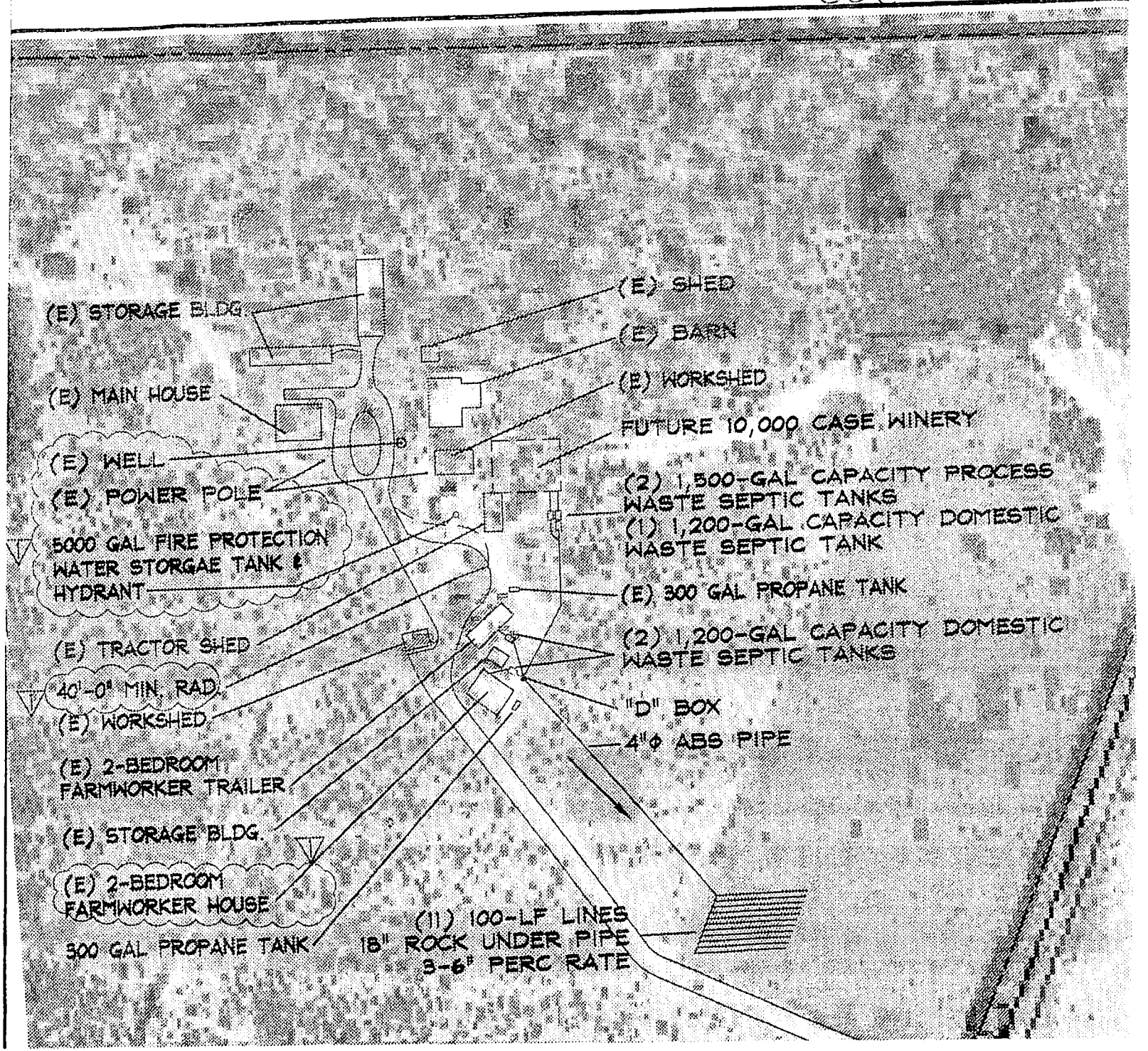
Tom Kenefick
2198 Pickett Road
Calistoga CA 94515
020-340-007-000
6-30-08
Scale 1"=40'

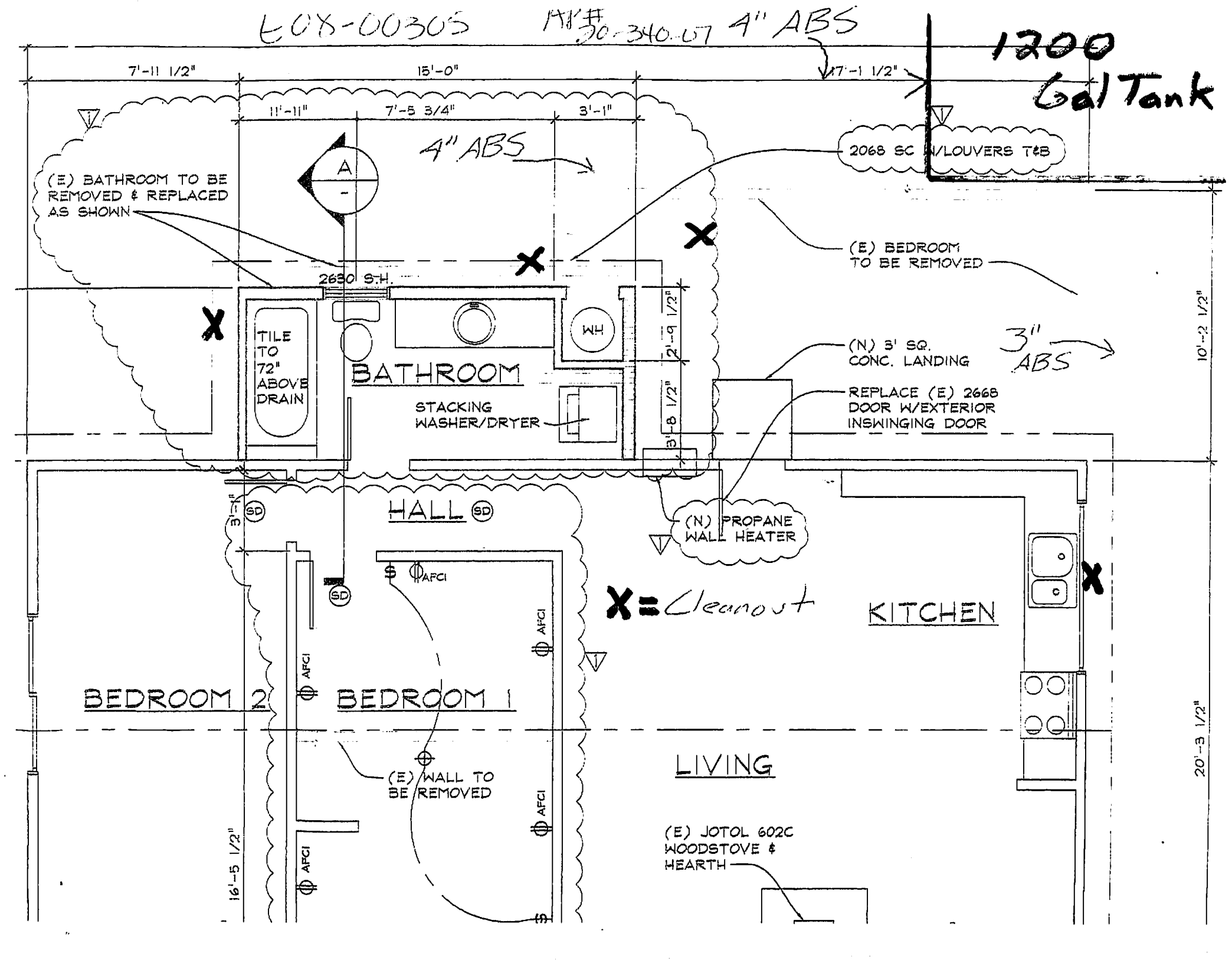

To property houses
Vineyard Road
MAIN LINE SEE PAGE 1
Road
R1
R15
To Entrance
Distribution line
OVERFLOW LINIE
D BOX
←8'→ TYPICAL
100' PERF. TYPICAL
3" SW leech lines
1 2 3 4 5 6 7 8 9 10 11 12 13 14
AS BUILT
Septic Plot
Tom Kenefick
2198 Pickett Road
Calistoga Ca 94515
020-340-007-000
6-30-08
Scale: 1:20
Platted By: Blakeley Construc
1400' LEECH LINE
36" DEEP
18" WIDE
18" Rock underNAE
PERMIT #
E08-00305
RECEIVED
JUL 07 2008
ENVIRONMENTAL HEALTH

20.340-07

As-built

EDS-00305




EOX-00305
AP# 30-340-07
4" ABS
1200 Gal Tank
7'-11 1/2"
15'-0"
17'-1 1/2"
11'-11"
7'-5 3/4"
3'-1"
4" ABS
A
(E) BATHROOM TO BE REMOVED & REPLACED AS SHOWN
2068 SC W/LOUVERS T&B
(E) BEDROOM TO BE REMOVED
2630 S.H.
TILE TO 72" ABOVE DRAIN
WH
BATHROOM
STACKING WASHER/DRYER
2'-9 1/2"
3'-8 1/2"
(N) 3' SQ. CONC. LANDING
3" ABS
REPLACE (E) 2668 DOOR W/EXTERIOR INSWINGING DOOR
10'-2 1/2"
3'-1"
SD
HALL
(N) PROPANE WALL HEATER
AFCI
X = Cleanout
KITCHEN
BEDROOM 2
BEDROOM 1
(E) WALL TO BE REMOVED
LIVING
(E) JOTOL 602C WOODSTOVE & HEARTH
16'-5 1/2"
20'-3 1/2"

Test Pit # 1

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36	G	0	L	S - SB	SH	VFRB	SS	C – F	F – F	NONE
36-60	G	25 **	SCL	S - SB	H	FRB	SS	C – M	F – F	NONE
60-72		40 **	SL	S – SB	S	VFRB	NS	C – M	----------	NONE

Test Pit # 2

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-33	G	0	L	S - SB	SH	VFRB	SS	C – F	F – F	NONE
33-52	G	25 **	SCL	S - SB	H	FRB	SS	C – M	C - M	NONE
52-72		40 **	SL	S – SB	S	VFRB	NS	C – M	----------	NONE

Test Pit # 3

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36	G	0	L	S - SB	SH	VFRB	SS	C – F	M – F	NONE
36-72		40 **	SL	S – SB	S	VFRB	NS	C – M	----------	NONE

Test Pit # 4

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-26	G	0	L	S - SB	SH	VFRB	SS	C – F	F – F	NONE
26-48	G	25 **	SCL	S - SB	H	FRB	SS	C – M	F – F	NONE
48-72		40 **	SL	S – SB	S	VFRB	NS	C – M	----------	NONE

Test Pit # 5

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-30	G	0	L	S - SB	SH	VFRB	SS	C – F	F – F	NONE
30-48	G	25 **	SCL	S - SB	H	FRB	SS	C – M	C – F	NONE
48-72		40 **	SL	S – SB	S	VFRB	NS	C – M	----------	NONE

Test Pit # 6

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-30	G	0	L	S - SB	SH	VFRB	SS	C – F	F – F	NONE
30-45	G	25 **	SCL	S - SB	H	FRB	SS	C – M	F – F	NONE
45-72		40 **	SL	S – SB	S	VFRB	NS	C – M	----------	NONE

Test Pit # 7

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-32	C	0	L	S - SB	SH	VFRB	SS	C – F	F – F	NONE
32-72		0	CL	S – SB (TIGHT)	H	FRB	SS	C – F	-------	NONE

Test Pit # 8

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36	G	0	L	S - SB	SH	VFRB	SS	C – F	F – F	NONE
36-48		0	CL	S – SB (TIGHT)	H	FRB	SS	C – F	-------	NONE
48-66		40 **	SL	S – SB	S	VFRB	NS	C – M	----------	NONE

Test Pit # 9

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36	G	0	L	S - SB	SH	VFRB	SS	C – F	F – F	NONE
36-54	G	25 **	SCL	S - SB	H	FRB	SS	C – M	F – F	NONE
54-72		40 **	SL	S – SB	S	VFRB	NS	C – M	-------	NONE

*** Some rocks softball size through layer*

DELTA CONSULTING & ENGINEERING
OF ST. HELENA

APPENDIX 5:
WASTEWATER GENERATION & WATER BALANCE CALCULATIONS

Project: Kenefick Winery
Surface Drip Irrigation Water Balance
Issue Date: 12/11/15
Revision: 0

DELTA CONSULTING & ENGINEERING
OF ST. HELENA

Process Wastewater Treatment System: Surface Drip Irrigation Area Calculations

Overall System Operation

These calculations are intended to estimate the area required for the optional process wastewater surface drip irrigation system at Kenefick Winery.

Process Wastewater

Winery Production (WP) =	8,333	cases/year
	20,000	gallons (2.4 gallons/case)

*Estimated Peak Process Wastewater Flows: Napa County Method**

Number of Crush Days=	45	
Process Wastewater (Harvest Period) =	667	gpd
Estimated theoretical total PEAK PW generated during Harvest period=	30,000	gallons PW generated during harvest

**Napa County Enviromental Management Method*

1104 Adams Street, Suite 203
St. Helena, California 94574
707-963-8456 + fax 963-8528

Project: Kenefick Winery
Surface Drip Irrigation Water Balance
Issue Date: 12/11/15
Revision: 0

DELTA CONSULTING & ENGINEERING
OF ST. HELENA

Historical Local Annual Average Precipitation, Evaporation Rates, and Temperatures

	Information Source	Location
Rainfall	Western Regional Climate Center	Calistoga, CA
Pan Evaporation	Western Regional Climate Center	Lake Berryessa, CA
Temperatures	California Department of Water Resources	Calistoga, CA

	Precipitation				Evaporation		Average Temperatures		
Month	Avg Rainfall (in)	10-Year Rainfall[a] (in)	Monthly Percentage	Calculated Rain Days	PAN Evaporation (in)	Lake Evaporation[b] (In)	High (ºF)	Low (ºF)	Month
Jan	7.88	11.03	20.8%	10	1.53	1.18	59	35.4	Jan
Feb	6.55	9.17	17.3%	10	2.15	1.66	62.9	38.2	Feb
Mar	5.10	7.14	13.5%	15	3.79	2.92	66.5	40	Mar
Apr	2.37	3.32	6.3%	30	5.82	4.48	71.5	41.6	Apr
May	1.00	1.40	2.6%	30	8.90	6.85	78.7	46.3	May
Jun	0.25	0.35	0.7%	30	11.00	8.47	86.5	50.4	Jun
Jul	0.05	0.07	0.1%	30	13.22	10.18	91.7	52.7	Jul
Aug	0.10	0.14	0.3%	30	12.06	9.29	91	52.5	Aug
Sep	0.38	0.53	1.0%	30	8.67	6.68	87.3	50.7	Sep
Oct	2.14	3.00	5.7%	30	5.72	4.40	79.5	45.9	Oct
Nov	4.60	6.44	12.2%	15	2.48	1.91	66	39.4	Nov
Dec	7.44	10.42	19.7%	10	1.66	1.28	59.2	35.2	Dec
	37.86	53.00	100.0%		77.00	59.29	91.7	35.2	<---Max/Min Temp (ºF)
							Jul	Dec	<---Max/Min Month

Notes:
[a]10-Year Rainfall Is the Month Average Rainfall multiplied by 1.4
[b]PAN Evaporation Rates Adjusted By A Factor Of 0.77 To Determine Lake Evaporation

Standard daily pan evaporation is measured using the four-foot diameter Class A evaporation pan. The pan water level reading is adjusted when precipitation is measure to obtain the actual evaporation. Most Class A pans are installed above ground, allowing effects such as radiation on the side walls and heat exchnges with the pan material. These effects tend to increase the evaporation totals. The amounts can then be adjusted by multiplying the totals b 0.70 or 0.80 to more closely estimate the evaporation from naturally existing urfaces such as a shallow lake, wet soil or other moist natural surfaces.

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Project: Kenefick Winery
Surface Drip Irrigation Water Balance
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Landscape and Plant Water Demand

Source and General Planting Information

Evapotranspiration Rate (ET_0) from[1]:	California Irrigation Management Information System
Station Location:	Oakville, CA, Station 77

Vineyard with Cover Crop:	Yes		
Landscape Planting Water Requirements	High (H)	70 - 90 % Etc	80%

General Water Demand

		Crop Coefficient, Kc				
Month	Reference Et_o[1] (in/mo)	Landscape Et_L (in/mo)	Vines (no cover crop)[2] (in/mo)	Vines w/ Cover Crop[3] (in/mo)	Vineyard Et_c[4] (in/mo)	Total Et Uptake (in/mo)
Jan	1.28	1.02	0.06	0.09	0.12	1.14
Feb	1.96	1.57	0.06	0.09	0.18	1.74
Mar	5.25	4.20	0.10	0.15	0.79	4.99
Apr	4.75	3.80	0.20	0.30	1.43	5.23
May	6.14	4.91	0.80	1.20	7.37	12.28
Jun	6.84	5.47	0.80	1.20	8.21	13.68
Jul	7.05	5.64	0.80	1.20	8.46	14.10
Aug	6.31	5.05	0.80	1.20	7.57	6.25
Sep	4.88	3.90	0.40	0.60	2.93	4.50
Oct	3.43	2.74	0.20	0.30	1.03	3.04
Nov	1.75	1.40	0.06	0.09	0.16	1.56
Dec	1.28	1.02	0.06	0.09	0.12	1.11
Total	50.92				38.34	69.62

[1] Reference ET_0 from California Irrigation Management Information System

[2] Crop Coefficients (Kc) for vineyards Table 5-2, Irrigation and Reclaimed Municipal Wastewater-A Guidance Manual, 84-1 wr, SWRCB

[3] 50% increase in vineyard uptake due to cover crop per reference note 2.

[4] Etc=Et*Kc (Column carries forward to Soil Water Balance)

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Soil Properties

Site Evaluation Conclusions

Performed By:	Sterk Engineering	Rate Limiting Soil Type:	(SL) Sandy Loam
Site Evaluation Date:	8/21/2007	Structure-Grade:	(M) Moderate
Test Pits Evaluated:	9	Structure-Shape:	(SB) Subangular Blocky

Application Rate Determined from Field Analysis:	0.330	gal/ft^2/day
	64.000	min/in
	0.94	in/hr

U.S.D.A. Soil Survey

USDA, NRCS Report Name:	Custom Soil Resource Report for Kenefick Vineyards	
Report Date:	September 14, 2015	
Site Coordinates:	Latitude	Longitude
	38.589814	-122.55312

Site Soil Mapping Unit:	124	Cortina Very Gravelly Loam, 0% - 5% slopes

General Soil Information [1]:

Depth to Restrictive Layer:	>80"	
Typical Profile:	0-11"	Very Gravelly Loam
	11"-60"	Stratified Very Gravelly Loamy Sand to Very Gravelly Sandy Loam

Physical Soil Properties [1]

Component Breakdown

Depth (in)	Sand (%)	Silt (%)	Clay (%)
0-11	44	41	5-15-25
11-60	79	17	0-5-10

Saturated Hydraulic Conductivity (micro m/s)

Depth (in)	Low	High	Average	Rating (µm/s)	Rating (in/hr)
0-11	14.00	42.00	28.0	14	2.0
11-60	42.00	141.00	91.5		29.68 gal/ft2*day
	-	-	-		

Moist Bulk Density (g/cc)

Depth (in)	Low	High	Average
0-11	1.45	1.55	1.5
11-60	1.55	1.65	1.6
	-	-	-

Available Water Capacity (in/in)

Depth (in)	Low	High	Average
0-11	0.09	0.13	0.11
11-60	0.06	0.09	0.08
	-	-	-

Infiltration Rate for Design

	Reduction[2] (%)	in/hr	Available Percolation (in/mo)	Applied Percolation (in/mo)	gal/ft2/day
Site Evaluation Rate:	0.04	0.94	675.0	27.0	0.56
NRCS Rate:	0.04	2.0	1,428.3	57.1	1.19

Restrictive Infiltration Rate:	27.0	in/mo

[1] United Stated Department of Agriculture & Natural Resource Conservation Service, Web Soil Survey data for the subject location.

[2] 0.04 to 0.10 adjustment factor to account for the resting period between applications, Crites & Tchobanoglous, page 670

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Surface Drip Irrigation Disposal

Land Application Irrigation Data: Drip System Layout

Dispersal Field Sizing		
Minimum Primary Drip Dispersal Area Required:	1188	ft²
Primary Land Surface Area Required with 8 ft Drip Line Spacing:	4754	ft²
200% Reserve Area Required:	9,508	ft²

Provided Drip Line Information			
Drip Lateral Length (ft)	Lateral Spacing (ft)	Emmitter Spacing (ft)	# Laterals
400	8	4	8

(3,500 ft of drip line required @4' emitter spacing)

Primary Drip Dispersal Area Provided:	2501	ft²	(Total Emitters x Emitter Drip Area)
Primary Land Surface Area Provided:	25,600	ft²	

Good, PrimaryDispersal Field Size Exceeds Minimum Size

Emmitter& Dispersal Flow Information

Total # Emmitters	Emitter Flowrate (gph)	Drip Radius (ft)	Drip Area (ft²)	Field Flow Rate (gph)	Field Flow Rate (gpm)
796	1.0	1	3.14	796	13.27

Check Lateral Spacing:	Spacing Ok
Check Emmitter Spacing:	Spacing Ok

Irrigation Information Based on Drip System

Tank Storage Volume:	10,000 gallons
Distribution System?	Process Only

	NON-GROWING SEASON [1]				GROWING SEASON [1]					NON-GROWING SEASON [1]		
	1-Jan	1-Feb	1-Mar	1-Apr	1-May	1-Jun	1-Jul	1-Aug	1-Sep	1-Oct	1-Nov	1-Dec
Estimated # Available Application Days[1]	10	10	15	30	30	30	30	30	30	30	15	10
Total WW Generated (gallons)	8,400	8,400	9,800	9,800	9,800	8,400	8,400	16,800	21,000	21,000	9,800	8,400
WW Applied/Cycle:	840	840	653	327	327	280	280	560	700	700	653	840
Irrigation Time per Cycle (hrs):	1.1	1.1	0.8	0.4	0.4	0.4	0.4	0.7	0.9	0.9	0.8	1.1
Irrigation Time per Cycle (min):	63	63	49	25	25	21	21	42	53	53	49	63
Volume per Emmitter per Cycle (gal):	1.06	1.06	0.82	0.41	0.41	0.35	0.35	0.70	0.88	0.88	0.82	1.06
Inches Applied per Month (in/mo):	5.39	5.39	6.29	6.29	6.29	5.39	5.39	10.78	13.47	13.47	6.29	5.39
Available Storage[2] (days):	37.0	33.3	31.3	30.3	31.3	35.7	37.0	18.5	14.3	14.7	30.3	37.0
Storage Met:	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok

Notes:

[1] Application days is a function of the particular month's percentage of annual rainfall.
Non-Growing Season assumes rain events which prohibit effluent application 2 days prior to, during, and 2 days after a rain event;
Growing season: assumes no or minimal rain events, all irrigation water to be applied to ground

[2] Available Storage assumes tank is empty at beginning of month. Tank(s) shall provide the number of days storage shown. If the sum of Available Application Days and Available Storage Days is greater than the number of days in the month, adequate storage is provided.

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Soil Water Balance

Site Specific Water Balance								
Month	Vegetation ET_v[1], ET (in/mo)	Precipitation Rate[2], Pr (in/mo)	Net ET (ET_v-Pr) (in/mo)	Percolation Rate[3], P (in/mo)	Available Loading Rate[4] [L_w] (in/mo)	Applied Loading Rate[5] (in/mo)	Net[6] (in/mo)	Check
Jan	1.14	7.88	(6.74)	27.00	20.26	5.39	14.87	Good, Uptake Exceeds Inflow
Feb	1.74	6.55	(4.81)	27.00	22.19	5.39	16.81	Good, Uptake Exceeds Inflow
Mar	4.99	5.10	(0.11)	27.00	26.89	6.29	20.60	Good, Uptake Exceeds Inflow
Apr	5.23	2.37	2.86	27.00	29.86	6.29	23.57	Good, Uptake Exceeds Inflow
May	12.28	1.00	11.28	27.00	38.28	6.29	31.99	Good, Uptake Exceeds Inflow
Jun	13.68	0.25	13.43	27.00	40.43	5.39	35.04	Good, Uptake Exceeds Inflow
Jul	14.10	0.05	14.05	27.00	41.05	5.39	35.66	Good, Uptake Exceeds Inflow
Aug	6.25	0.10	6.15	27.00	33.15	10.78	22.37	Good, Uptake Exceeds Inflow
Sep	4.50	0.38	4.12	27.00	31.12	13.47	17.65	Good, Uptake Exceeds Inflow
Oct	3.04	2.14	0.90	27.00	27.90	13.47	14.43	Good, Uptake Exceeds Inflow
Nov	1.56	4.60	(3.04)	27.00	23.96	6.29	17.67	Good, Uptake Exceeds Inflow
Dec	1.11	7.44	(6.33)	27.00	20.67	5.39	15.29	Good, Uptake Exceeds Inflow
Totals (in/yr)--->	69.62	37.86	31.76	324.00	355.76	89.81	265.95	Ok

[1]From Crop Uptake table

[2]From Precip & Evap table

[3]From Soil Info table

[2]From Precip & Evap table

[4]Sum of Net ET and the soil Percolation Rate

[5] Treated WW applied per month converted to inches

[6]Net distribution to ground (positive=additional ww may be applied, negative=capacity is exceeded)

Hydraulic Loading Rate

$$L_w = ET + P + \mathrm{Pr}$$

where :

L_w = *wastewater hydraulic loading rate, in / mo*

ET = *evapotranspiration rate, in / mo*

Pr = *precipitation rate, in / mo*

P = *soil percolation rate, in / mo*

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APPENDIX 6:
SITE SOIL INFORMATION

United States Department of Agriculture

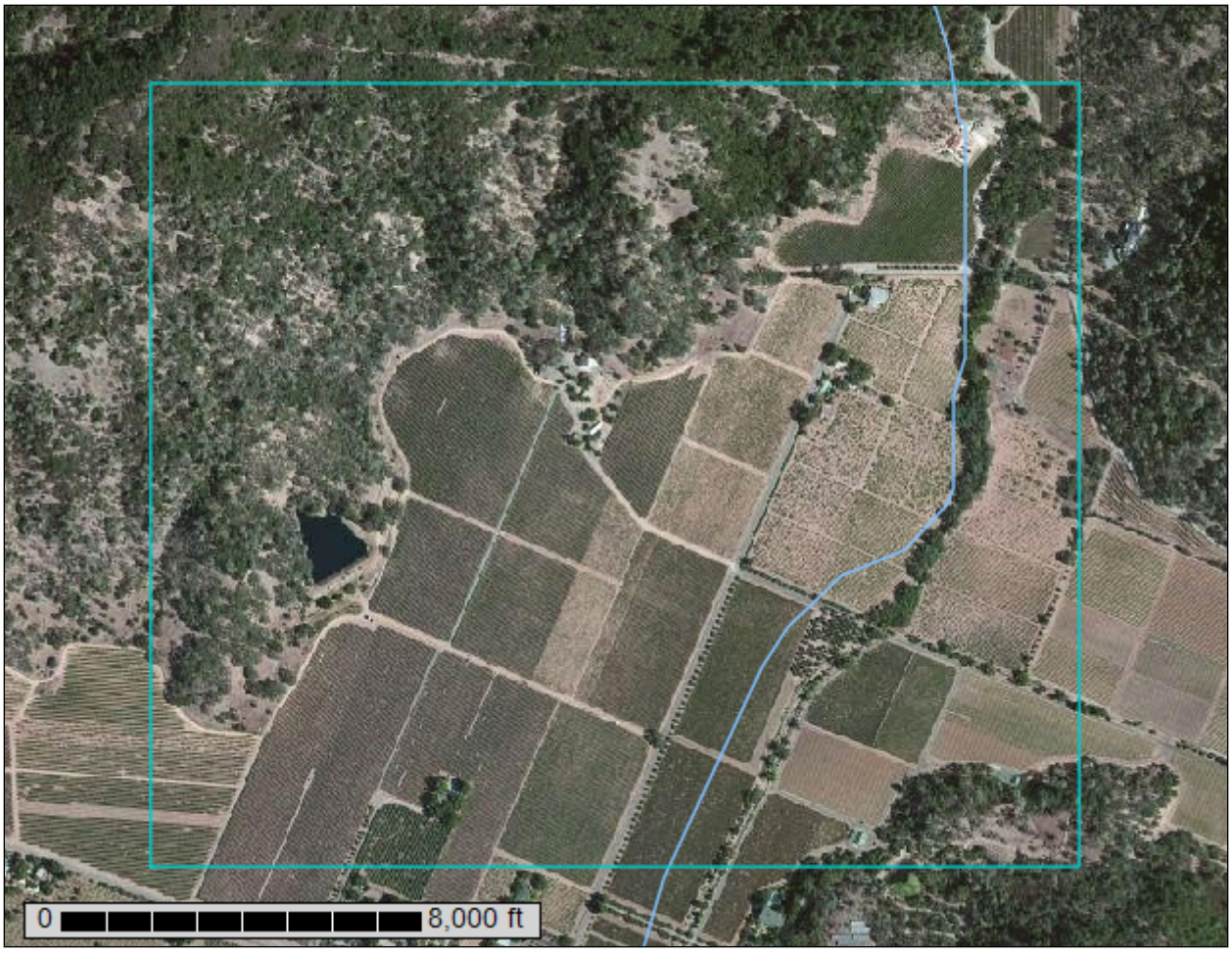
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Napa County, California

Kenefick Winery



September 14, 2015

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

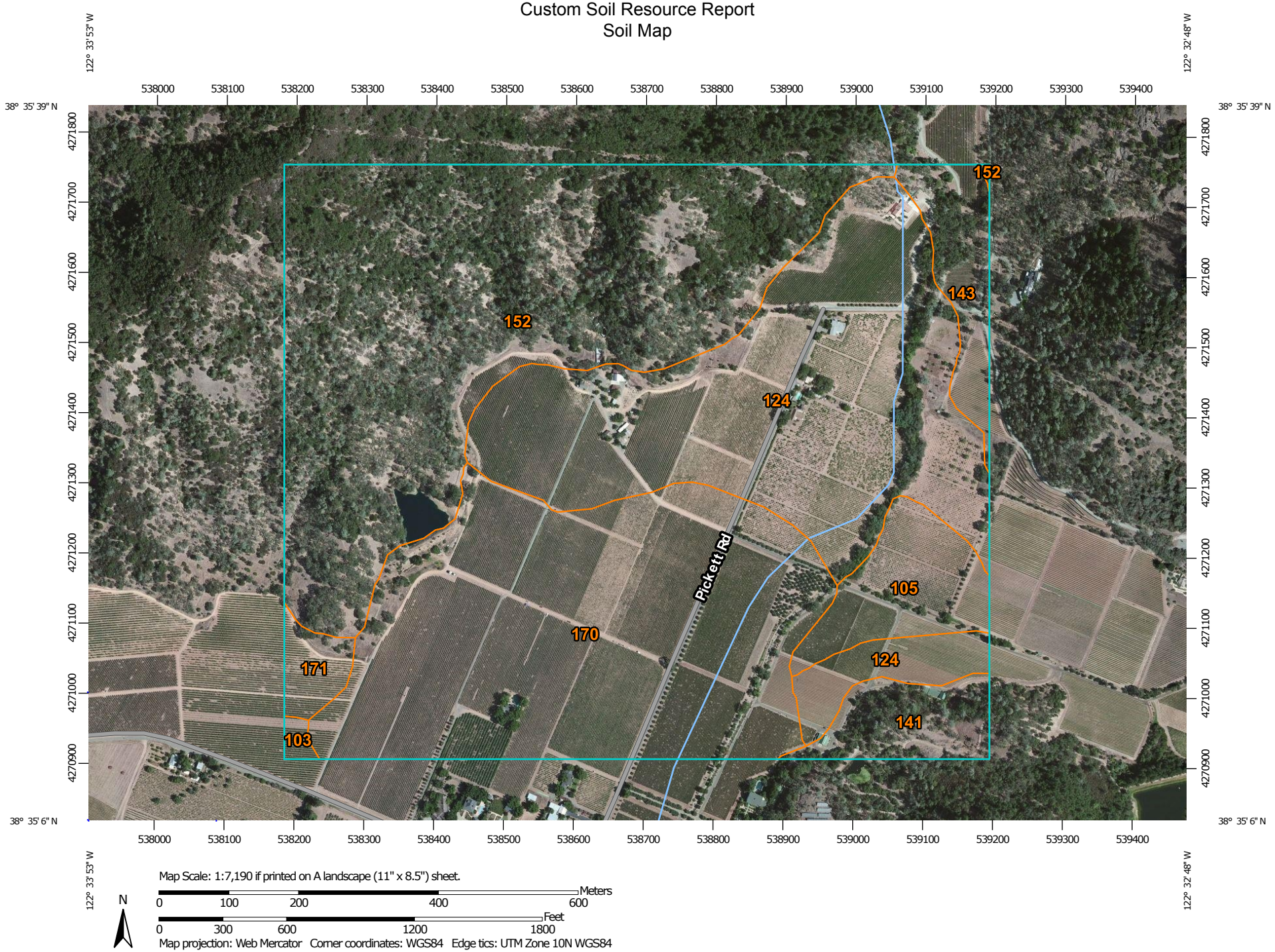
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
Survey Area Data: Version 7, Sep 25, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 14, 2011—Aug 15, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Napa County, California (CA055)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
103	Bale loam, 0 to 2 percent slopes	0.6	0.3%
105	Bale clay loam, 2 to 5 percent slopes	8.9	4.2%
124	Cortina very gravelly loam, 0 to 5 percent slopes	56.4	26.6%
141	Forward-Kidd complex, 50 to 75 percent slopes	6.4	3.0%
143	Guenoc-Rock outcrop complex, 5 to 30 percent slopes	6.7	3.2%
152	Hambright rock-Outcrop complex, 30 to 75 percent slopes	72.2	34.0%
170	Pleasanton loam, 0 to 2 percent slopes	58.4	27.5%
171	Pleasanton loam, 2 to 5 percent slopes	2.7	1.3%
Totals for Area of Interest		**212.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified

by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Napa County, California

103—Bale loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdk3
Elevation: 20 to 400 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 220 to 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Bale and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bale

Setting

Landform: Flood plains, alluvial fans
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from rhyolite and/or alluvium derived from igneous rock

Typical profile

H1 - 0 to 24 inches: loam
H2 - 24 to 60 inches: stratified gravelly sandy loam to loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B

Minor Components

Clear lake

Percent of map unit: 3 percent
Landform: Alluvial fans

105—Bale clay loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: hdk5
Elevation: 20 to 400 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 220 to 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Bale and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bale

Setting

Landform: Flood plains, terraces
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from rhyolite and/or alluvium derived from igneous rock

Typical profile

H1 - 0 to 24 inches: clay loam
H2 - 24 to 60 inches: stratified gravelly sandy loam to loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B

124—Cortina very gravelly loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hdks
Elevation: 30 to 2,400 feet
Mean annual precipitation: 30 to 35 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 230 to 260 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cortina and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cortina

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: very gravelly loam
H2 - 11 to 60 inches: stratified very gravelly loamy sand to very gravelly sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A

Minor Components

Riverwash

Percent of map unit: 5 percent
Landform: Drainageways

141—Forward-Kidd complex, 50 to 75 percent slopes

Map Unit Setting

National map unit symbol: hdlb
Elevation: 400 to 4,500 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 54 to 55 degrees F
Frost-free period: 200 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Forward and similar soils: 60 percent
Kidd and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Forward

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from rhyolite

Typical profile

H1 - 0 to 4 inches: gravelly loam
H2 - 4 to 35 inches: loam, gravelly loam
H2 - 4 to 35 inches: weathered bedrock
H3 - 35 to 59 inches:

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B

Description of Kidd

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from rhyolite

Typical profile

H1 - 0 to 14 inches: loam
H2 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 50 to 75 percent
Depth to restrictive feature: 14 to 18 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D

143—Guenoc-Rock outcrop complex, 5 to 30 percent slopes

Map Unit Setting

National map unit symbol: hdld
Elevation: 400 to 3,000 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 230 days
Farmland classification: Not prime farmland

Map Unit Composition

Guenoc and similar soils: 60 percent
Rock outcrop: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Guenoc

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from basic igneous rock

Typical profile

H1 - 0 to 12 inches: loam
H2 - 12 to 30 inches: clay loam
H3 - 30 to 40 inches: unweathered bedrock

Properties and qualities

Slope: 5 to 30 percent
Depth to restrictive feature: 25 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: LOAMY UPLAND (R015XD126CA)

Description of Rock Outcrop

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Free face
Down-slope shape: Linear
Across-slope shape: Linear

Properties and qualities

Slope: 5 to 30 percent
Depth to restrictive feature: About 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

152—Hambright rock-Outcrop complex, 30 to 75 percent slopes

Map Unit Setting

National map unit symbol: hdlp
Elevation: 200 to 3,000 feet
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Hambright and similar soils: 50 percent
Rock outcrop: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hambright

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from basic volcanic rock

Typical profile

H1 - 0 to 12 inches: very stony loam
H2 - 12 to 22 inches: unweathered bedrock

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: VERY SHALLOW ROCKY (R015XD127CA)

Description of Rock Outcrop

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Free face
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from igneous, metamorphic and sedimentary rock

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: About 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

170—Pleasanton loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdm8
Elevation: 2,400 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Pleasanton and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pleasanton

Setting

Landform: Alluvial fans, flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 11 inches: loam
H2 - 11 to 66 inches: loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups
Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: C

171—Pleasanton loam, 2 to 5 percent slopes

Map Unit Setting
National map unit symbol: hdm9
Elevation: 2,400 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Pleasanton and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pleasanton

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile
H1 - 0 to 11 inches: loam
H2 - 11 to 66 inches: loam

Properties and qualities
Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Saturated Hydraulic Conductivity (Ksat), Standard Classes (Kenefick Winery)

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits. The classes are:

Very low: 0.00 to 0.01

Low: 0.01 to 0.1

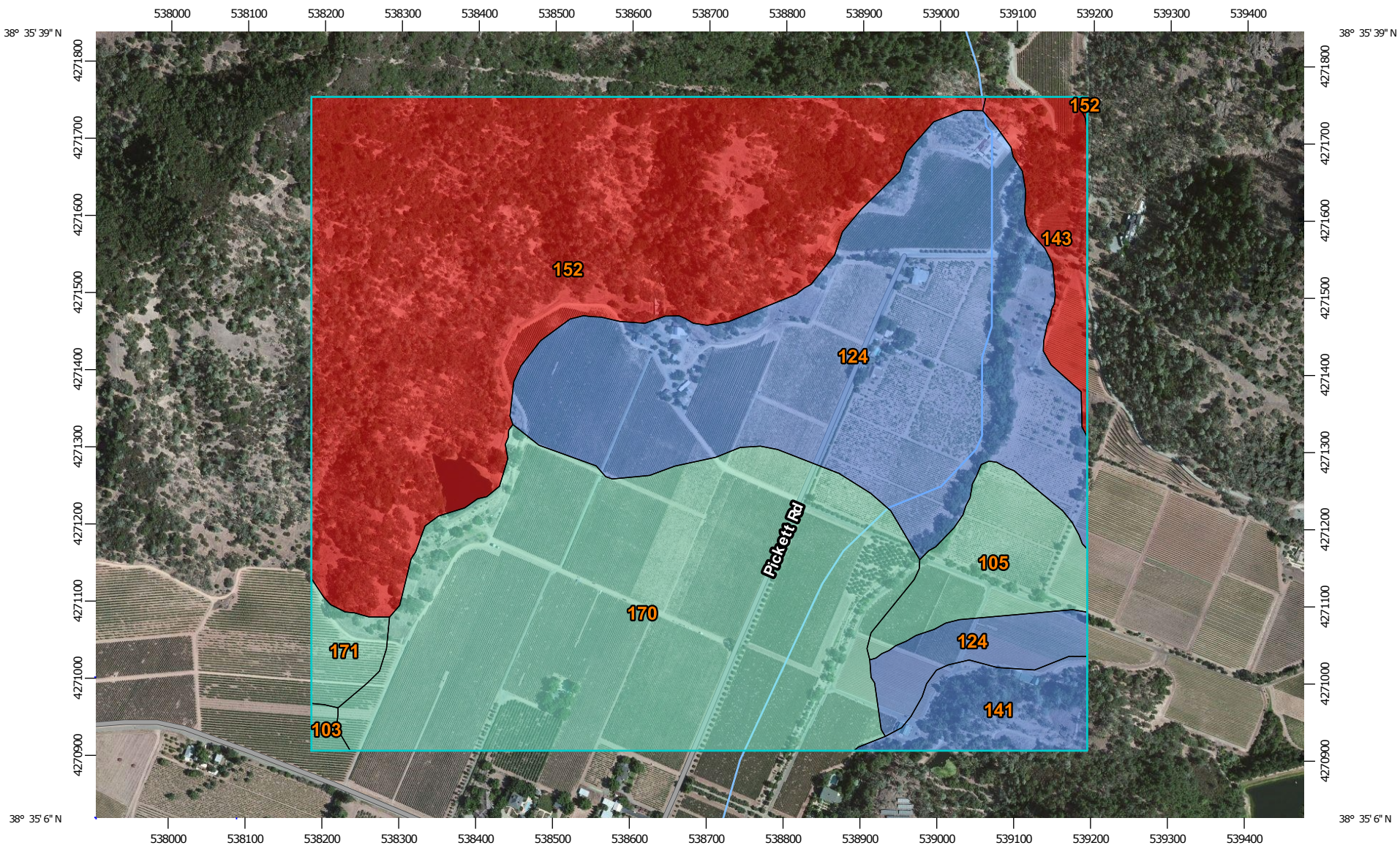
Moderately low: 0.1 to 1.0

Moderately high: 1 to 10

High: 10 to 100

Very high: 100 to 705

Custom Soil Resource Report
Map—Saturated Hydraulic Conductivity (Ksat), Standard Classes (Kenefick Winery)



Map Scale: 1:7,190 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Very Low (0.0 - 0.01)
- Low (0.01 - 0.1)
- Moderately Low (0.1 - 1)
- Moderately High (1 - 10)
- High (10 - 100)
- Very High (100 - 705)
- Not rated or not available

Soil Rating Lines
- Very Low (0.0 - 0.01)
- Low (0.01 - 0.1)
- Moderately Low (0.1 - 1)
- Moderately High (1 - 10)
- High (10 - 100)
- Very High (100 - 705)
- Not rated or not available

Soil Rating Points
- Very Low (0.0 - 0.01)
- Low (0.01 - 0.1)
- Moderately Low (0.1 - 1)
- Moderately High (1 - 10)
- High (10 - 100)
- Very High (100 - 705)
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
Survey Area Data: Version 7, Sep 25, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 14, 2011—Aug 15, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Saturated Hydraulic Conductivity (Ksat), Standard Classes (Kenefick Winery)

Saturated Hydraulic Conductivity (Ksat), Standard Classes— Summary by Map Unit — Napa County, California (CA055)				
Map unit symbol	**Map unit name**	**Rating (micrometers per second)**	**Acres in AOI**	**Percent of AOI**
103	Bale loam, 0 to 2 percent slopes	9.0000	0.6	0.3%
105	Bale clay loam, 2 to 5 percent slopes	9.0000	8.9	4.2%
124	Cortina very gravelly loam, 0 to 5 percent slopes	28.0000	56.4	26.6%
141	Forward-Kidd complex, 50 to 75 percent slopes	28.0000	6.4	3.0%
143	Guenoc-Rock outcrop complex, 5 to 30 percent slopes	0.0000	6.7	3.2%
152	Hambright rock-Outcrop complex, 30 to 75 percent slopes	0.0000	72.2	34.0%
170	Pleasanton loam, 0 to 2 percent slopes	9.0000	58.4	27.5%
171	Pleasanton loam, 2 to 5 percent slopes	9.0000	2.7	1.3%
Totals for Area of Interest			**212.3**	**100.0%**

Rating Options—Saturated Hydraulic Conductivity (Ksat), Standard Classes (Kenefick Winery)

Units of Measure: micrometers per second

Aggregation Method: Minimum or Maximum

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Minimum or Maximum" returns either the lowest or highest attribute value among all components of the map unit, depending on the corresponding "tie-break" rule. In this case, the "tie-break" rule indicates whether the lowest or highest value among all components should be returned. For this aggregation method, percent composition ties cannot occur. The result may correspond to a map unit component of very minor extent. This aggregation method is appropriate for either numeric attributes or attributes with a ranked or logically ordered domain.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Slowest

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Interpret Nulls as Zero: No

This option indicates if a null value for a component should be converted to zero before aggregation occurs. This will be done only if a map unit has at least one component where this value is not null.

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

For an attribute of a soil horizon, a depth qualification must be specified. In most cases it is probably most appropriate to specify a fixed depth range, either in centimeters or inches. The Bottom Depth must be greater than the Top Depth, and the Top Depth can be greater than zero. The choice of "inches" or "centimeters" only applies to the depth of soil to be evaluated. It has no influence on the units of measure the data are presented in.

When "Surface Layer" is specified as the depth qualifier, only the surface layer or horizon is considered when deriving a value for a component, but keep in mind that the thickness of the surface layer varies from component to component.

When "All Layers" is specified as the depth qualifier, all layers recorded for a component are considered when deriving the value for that component.

Whenever more than one layer or horizon is considered when deriving a value for a component, and the attribute being aggregated is a numeric attribute, a weighted average value is returned, where the weighting factor is the layer or horizon thickness.

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties (Kenefick Winery)

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-

swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the

Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Physical Soil Properties–Napa County, California														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
103—Bale loam, 0 to 2 percent slopes														
Bale	0-24	-41-	-37-	16-22- 27	1.40-1.45-1.50	4.00-9.00-14.00	0.13-0.15-0.16	0.0- 1.5- 2.9	1.0- 2.0-3.0	.24	.24	5	6	48
	24-60	-67-	-20-	10-13- 16	1.40-1.45-1.50	4.00-9.00-14.00	0.08-0.10-0.11	0.0- 1.5- 2.9	0.5- 0.8-1.0	.17	.24			
Clear lake	—	—	—	—	—	—	—	—	—					
105—Bale clay loam, 2 to 5 percent slopes														
Bale	0-24	-35-	-34-	27-31- 35	1.30-1.38-1.45	4.00-9.00-14.00	0.14-0.15-0.16	3.0- 4.5- 5.9	1.0- 2.0-3.0	.20	.20	5	6	48
	24-60	-67-	-15-	10-18- 26	1.40-1.45-1.50	4.00-9.00-14.00	0.08-0.10-0.11	0.0- 1.5- 2.9	0.5- 0.8-1.0	.15	.20			
124—Cortina very gravelly loam, 0 to 5 percent slopes														
Cortina	0-11	-44-	-41-	5-15- 25	1.45-1.50-1.55	14.00-28.00-42.00	0.09-0.11-0.13	0.0- 1.5- 2.9	0.5- 0.8-1.0	.15	.37	2	7	38
	11-60	-79-	-17-	0- 5- 10	1.55-1.60-1.65	42.00-92.00-141.00	0.06-0.08-0.09	0.0- 1.5- 2.9	0.1- 0.3-0.5	.05	.24			
Riverwash	—	—	—	—	—	—	—	—	—					

Physical Soil Properties–Napa County, California														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
141—Forward-Kidd complex, 50 to 75 percent slopes														
Forward	0-4	-43-	-43-	10-14- 18	0.85-0.88-0.90	14.00-28.00-42.00	0.06-0.09-0.12	0.0- 1.5- 2.9	2.0- 3.0-4.0	.17	.37	3	6	48
	4-35	-43-	-43-	10-14- 18	0.85-0.88-0.90	14.00-28.00-42.00	0.09-0.13-0.16	0.0- 1.5- 2.9	0.0- 0.0-0.0	.32	.55			
	35-59	—	—	—	—	0.00-0.21-0.42	-0.00-0.00	—	—					
Kidd	0-14	-43-	-43-	10-14- 18	0.85-0.90-0.95	14.00-28.00-42.00	0.10-0.15-0.19	0.0- 1.5- 2.9	1.0- 2.0-3.0	.28	.49	2	6	48
	14-18	—	—	—	—	0.07-70.00-141.00	—	—	—					
143—Guenoc-Rock outcrop complex, 5 to 30 percent slopes														
Guenoc	0-12	-39-	-37-	20-24- 27	1.40-1.45-1.50	4.00-9.00-14.00	0.16-0.17-0.18	0.0- 1.5- 2.9	0.5- 1.3-2.0	.37	.37	2	6	48
	12-30	-22-	-39-	35-39- 45	1.40-1.48-1.55	1.40-2.70-4.00	0.14-0.15-0.16	3.0- 4.5- 5.9	0.5- 0.8-1.0	.10	.28			
	30-40	—	—	—	—	0.07-70.00-141.00	-0.00-0.00	—	—					
Rock outcrop	0-10	—	—	—	—	0.00-0.00-0.00	—	—	—					

Physical Soil Properties–Napa County, California														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
152—Hambright rock-Outcrop complex, 30 to 75 percent slopes														
Hambright	0-12	-39-	-37-	20-24- 27	1.40-1.45-1.50	4.00-9.00-14.00	0.08-0.09-0.10	1.2- 1.9- 2.7	2.0- 5.0-8.0	.10	.28	1	8	0
	12-22	—	—	—	—	0.07-70.00-141.00	-0.00-0.00	—	—					
Rock outcrop	0-10	—	—	—	—	0.00-0.00-0.00	—	—	—					
170—Pleasanton loam, 0 to 2 percent slopes														
Pleasanton	0-11	-43-	-39-	12-19- 25	1.40-1.45-1.50	4.00-9.00-14.00	0.13-0.14-0.15	0.0- 1.5- 2.9	1.0- 1.5-2.0	.24	.37	5	6	48
	11-66	-35-	-40-	25-25- 35	1.40-1.48-1.55	1.40-2.70-4.00	0.13-0.14-0.15	3.0- 4.5- 5.9	0.5- 0.8-1.0	.24	.37			
171—Pleasanton loam, 2 to 5 percent slopes														
Pleasanton	0-11	-43-	-39-	12-19- 25	1.40-1.45-1.50	4.00-9.00-14.00	0.13-0.14-0.15	0.0- 1.5- 2.9	1.0- 1.5-2.0	.24	.37	5	6	48
	11-66	-35-	-40-	25-25- 35	1.40-1.48-1.55	1.40-2.70-4.00	0.13-0.14-0.15	3.0- 4.5- 5.9	0.5- 0.8-1.0	.24	.37			

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