MEMORANDUM

COUNTY OF SAN MATEO
PLANNING AND BUILDING DEPARTMENT

DATE: December 1, 2020

TO: Agricultural Advisory Committee

FROM: Angela Chavez, Project Planner

SUBJECT: PLN2019-00429 (Vida Verde)

Consideration of this item took place at the November 9, 2020 Agricultural Advisory Committee (AAC) meeting at which, the AAC continued the item to the December 14, 2020 meeting. The continuation was to allow those members who expressed interest in attending a site visit to the proposed project property time to do so. The continuation was also to allow for Staff to provide clarity regarding the project's compliance with the requirements pertaining to the provision of water.

The applicant, as part of the permit application, has supplied a Water Supply Plan which details the water service plan for the property (included as an attachment to this Memorandum). While water wells located within the County of San Mateo are generally regulated by the County's Environmental Health Division in this case the water system will be regulated by the California Water Board's Division of Drinking Water. This review responsibility differs from standard projects because the water service qualifies as a Transient Non-Community Water System which is defined as a public water system that does not regularly serve at least 25 of the same persons over six months of the year, such as a camp ground or highway rest stop. Therefore, the standard application of the County's Well Ordinance is not applicable for this project which includes the requirement that a well produce 2.5 gallons per minute in association with residential development. The applicant has consulted with and is in the beginning stages of this application process with the Division of Drinking Water. There will be no issuance of building permits until confirmation of approval is received from the Division of Drinking Water.

Since the previous meeting, staff has received requests to provide reports and documents that were submitted as part of the overall permit application. These documents have been subsequently provided. In an effort to ensure that all members have access to the same information those documents have been included as attachments to this memorandum. These include Applicant's Density Analysis Rationale (Attachment A), Water Supply Plan (Attachment B), Wastewater Facilities Plan (Attachment C), and Hydrology Report (Attachment D).

COUNTY OF SAN MATEO - PLANNING AND BUILDING DEPARTMENT

ATTACHMENT A

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ATTORNEY WORK PRODUCT
ATTORNEY-CLIENT PRIVILEGE

PLN2019-00428

To:	Sandy Sommer, Vida Verde
From:	Kristina Lawson Robia S. Crisp
Date:	March 27, 2017 File No.: P0487.031
Subject:	Vida Verde; Classification of Proposed Use and Density Issues

Introduction and Summary

The proposed Vida Verde nature and science camp is an overnight educational camp operated by a non-profit organization for low-income, public elementary school students in grades four to six (the "Project"). The proposed camp will allow student campers to tend to a working farm comprised of one acre of organic row crops, a 10-tree fruit orchard, and an animal pasture with goats, chickens and a llama, and to experience coastal recreation opportunities through the exploration of the outdoors, wilderness, and ocean.

The proposed camp facilities would include the existing single family home with alterations, a new barn to include housing to accommodate nine permanent staff members and temporary yurts to accommodate up to 38 guests, including students and chaperones. The site is approximately 23.08 acres and contains approximately 4.6 acres of prime soils.

As discussed in detail below, while the County zoning regulations do not appear to specifically contemplate the proposed use, it is best characterized as a Public Recreation use. Taken as a whole, assuming the Project is best characterized as a Public Recreation use, it requires less than the one density credit assigned to the site.

Discussion

1. The Proposed Use is Best Classified as a Public Recreation Use.

Based on the proposed function and use of the existing and proposed facilities, the Project, taken as a whole, most likely constitutes a "Public Recreation" use under the County's zoning ordinance. Within the Planned Agricultural District, uses permitted subject to the

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issuance of a Planned Agricultural Permit include single-family residences, farm labor housing, public recreation uses, and uses ancillary to agriculture.[1] (SMCC 6353.A.)

The "Public Recreation" land use classification is defined in the PAD zoning district regulations to mean, "Lands and facilities serving primarily a recreation function which are operated by public agencies or other non-profit organizations." Examples of Public Recreation facilities "include, but are not limited to, public beaches, parks, recreation areas, natural preserves, wild areas and trails." (SMCC 6351.H.) Further, the general provisions of the Zoning Regulations define in Section 6102.68.3, "Public Facilities" to include "facilities and grounds owned or operated by park and recreation districts, schools, fire departments, churches, municipal institutions, and community organizations including clubs, lodges and similar uses."

The San Mateo County Local Coastal Program similarly states the following with regard to the definition of Public Recreation Facilities:

> Define public recreation facilities as lands and facilities serving primarily a recreation function which are operated by public agencies or other non-profit organizations. Public recreation facilities include, but are not limited to, public beaches, parks, recreation areas, natural preserves, wild areas and trails.

(LCP Policy 11.3, p. 11.1.)

Here, the lands and facilities proposed for use will serve primarily a recreation and function with educational and agricultural components, and will be operated by Vida Verde, a non-profit organization. The Project's facilities are akin to recreation areas and grounds operated by community organizations including clubs and lodges, which are among the examples of Public recreation facilities described in the zoning regulations.

It may be noted that County land use classifications also include uses for Schools and Commercial Recreation, neither of which are appropriate for the proposed use, and neither of which, in any event, are permitted or conditionally permitted on Prime Agricultural Lands in the PAD zone.

First, while the County zoning ordinance does not define "Schools" it defines "Elementary and Secondary Schools" as "Public or private educational facilities and associated

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[1] "Agriculture" is defined to mean "[a]ctivities including, but not limited to, the cultivation of food, fiber, or flowers, and the grazing, growing or pasturing of livestock" and "uses ancillary to agriculture" are defined to mean "[a]gricultural grading equipment supplies, agricultural rental supplies, topsoil stockpiling, and other similar uses determined to be appropriate by the Planning Director. (SMCC 6351D and E.)

ground used for academic instruction below the collegiate level." (See SMCC 6163.3, 6263.2, 6290.1, 6373, 6801) "Trade and Vocational Schools" are defined to mean, "Public or private educational facilities and associated grounds offering specialized trade or commercial instruction, but not academic education, above the secondary level." (*Id.*) The proposed use is not a school that provides academic instruction but rather supplements the students' regular public schools and provides a non-academic, educational and recreational opportunity at the elementary level.

Second, PAD Regulations define "Commercial Recreation" to mean, Country inns, commercial or other stables for more than five (5) confined animals, riding academies, campgrounds, rod and gun clubs, private beaches, food/gasoline/telephone services, hostels, and other similar uses determined to be appropriate by the Planning Commission. (SMCC 6351.) While the proposed use is comprised of activities that may be considered similar to a campground use, by definition, a "commercial" use is a use that is intended to make a profit. Here, the property is owned, and the program is operated, by a non-profit and as such, is not a commercial use.

In sum, the proposed use is best classified as a Public Recreation use.

2. Density Credits

(a) Calculation of Density Credits. While we have not conducted a detailed density analysis, it is fairly clear based on the density criteria set forth in the code, that there is less than one density credit accumulated on the parcel. Based on Section 6356 of the County Zoning Regulations, assuming the parcel is a legal parcel, it accumulates one density credit.

Section 6356 of the code governs the maximum density of development within the PAD zoning district. Specifically, this section states that in the Planned Agricultural District, for purposes of determining the maximum total number of density credits accumulated on any parcel, the total parcel shall be compared against specified criteria in the order listed in Section 6356. Once considered under a criterion, a segment of the parcel shall not be considered under subsequent criteria. When the applicable criteria have been determined for each of the areas, any portion of the parcel which has not yet been assigned a maximum density accumulation shall be assigned a density of one density credit per 40 acres. The sum of densities accrued under all applicable categories shall constitute the maximum density of development permissible under this section. Section 6356 provides, "All legal parcels shall accumulate at least one density credit."

In other words, based on the characteristics of the land, a parcel starts with a certain number of density credits. The more density credits a parcel has, the more intensive the

development allowed, and as development occurs, these credits are used and subtracted from the total available until the property is built out.

The criteria for the initial calculation of density credits, to be applied in the order listed, are as follows:

A. Prime Agricultural Lands. One density credit per 160 acres for that portion of a parcel which is prime agricultural land as defined in Section 6351 (i.e., the number of acres of Prime Agricultural Land divided by 160).

B. Lands With Landslide Susceptibility. One density credit per 160 acres for that portion of a parcel which lies within any of the three least stable categories (Categories V, VI and L) as shown on the U.S. Geological Survey Map MF 360, "Landslide Susceptibility in San Mateo County" or its current replacement (i.e., the number of acres of land susceptible to landslides divided by 160).

C. Land With Slope 50% or Greater. One density credit per 160 acres for that portion of a parcel which has a slope 50% or greater (i.e., the number of acres of land with a slope 50% or greater divided by 160).

D. Remote Lands. One density credit per 160 acres for that portion of a parcel over 1/2 mile from a public road that was an existing, all-weather through public road before the County Local Coastal Program was initially certified in November 1980 (i.e., the number of acres of remote land divided by 160).

E. Land With Slope 30% But Less Than 50%. One density credit per 80 acres for that portion of a parcel which has a slope 30% but less than 50% (i.e., the number of acres of land with a slope 30%, but less than 50% divided by 80).

F. Land Within Rift Zones or Active Faults. One density credit per 80 acres for that portion of a parcel which is located within the rift zone or zone of fractured rock of an active fault as defined by the U.S. Geological Survey and mapped on USGS Map MF 355, "Active faults, probably active faults, and associated fracture zones in San Mateo County," or its current replacement (i.e., the number of acres of land within rift zones or active faults divided by 80).

G. Lands Within Flood Hazard Areas. One density credit per 60 acres for that portion of a parcel falling within a 100-year floodplain as most recently defined by the Federal Emergency Management Agency, the U.S. Geological Survey, or

the U.S. Army Corps of Engineers (i.e., the number of acres of land within the 100-year floodplain divided by 60).

H. Land With Slope 15% But Less Than 30%. One density credit per 60 acres for that portion of a parcel with a slope in excess of 15% but less than 30% (i.e., the number of acres of land with a slope 15%, but less than 30% divided by 60).

I. Land Within Agricultural Preserves or Exclusive Agricultural Districts. One density credit per 60 acres for that portion of a parcel within agricultural preserves or the exclusive Agricultural Districts as defined in the Resource Conservation Area Density Matrix policy on March 25, 1986 (i.e., the number of acres of land within Agricultural Preserves or Exclusive Agricultural Districts divided by 60).

J. All Other Lands. One density credit per 40 acres for that portion or portions of a parcel not within the above areas (i.e., the number of acres of all other land divided by 40). If the same portion of a parcel is covered by two or more of the subsections A. and J., the density credit for that portion shall be calculated solely on the basis of the subsection which permits the least density credit.

For the Project site, under the first criteria, 4.6 acres of prime soils divided by 160 results in .02875 density credits. Even if the remaining 18.48 acres did not fall within any of the areas listed in the following criteria, 18.48 acres divided by 40 per the last criteria, results in only 0.462 density credits for a total of .49 density credits. Given that the site also contains steep slopes and is located within a designated flood hazard area, it is likely that a detailed density calculation would result in far less than one density credit. Pursuant to Section 6356, as a legal parcel, the site would accumulate one density credit.

(b) Density Required for a Public Recreation Use. If the proposed use is classified as a Public Recreation Use, less than one density credit is required. "For new or expanded visitor-serving, commercial recreation and public recreation uses, one density credit shall be required for the first 945 gallons, or fraction thereof, of average daily water use during the two months of highest water use in a year. One additional density credit shall be required for each 630 gallons, or fraction thereof, of average daily water use during the two months of highest water use in a year." [2] (SMCC 6356.)

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[2] As explained by the court in *San Mateo County Coastal Landowners' Association v. County of San Mateo* (1995) 38 Cal.App.4th 523, the County chose 315 gallons per day as the basic measure for residential uses because that was the estimate of residential water use for a single family home in the Town of Pescadero. This amount was doubled for priority recreational uses at the suggestion of the Coastal Commission in 1980. When the original LCP was

For the purpose of calculating density credits, however, the meaning of public recreation use incorporates a requirement that the use enhances public opportunities for coastal recreation. Specifically, Section 6356 states, "visitor-serving, commercial recreation, and public recreation uses" shall be only those lands and facilities listed in LCP Policies 11.1, 11.2 and 11.3, "and only if those lands and facilities specifically enhance public opportunities for coastal recreation." (SMCC 6356.) Therefore, in order to take advantage of Section 6356 for public recreation uses, the lands and facilities must specifically enhance public opportunities for coastal recreation.

Given that the students benefitting from the recreation opportunities offered by the Project will be public elementary school students, under a broad interpretation of the policies, the proposed use enhances public opportunities for coastal recreation.

Based on the two months of highest water use projected for the proposed project, (October, December, January, March and May are each projected to require 22,320 gallons for 31 days), it is our understanding that the project will require 720 gallons per day for the two months of highest use. For purposes of calculating the density credit requirement, 0.76 density credit will be required, i.e., 720 divided by 945=0.76, for a Public Recreation Use.

forwarded to the Coastal Commission, the Commission staff suggested that the County should do more to encourage development of recreational and visitor serving facilities on the coast in recognition of Coastal Act policy contained in Public Resources Code Section 30222. Section 30222 states that the use of private lands suitable for visitor-serving commercial recreational facilities designed to enhance public opportunities for coastal recreation shall have priority over private residential, general industrial, or general commercial development, but not over agriculture or coastal-dependent industry.

COUNTY OF SAN MATEO - PLANNING AND BUILDING DEPARTMENT

ATTACHMENT B

Water Supply Plan

For

Vida Verde

San Gregorio, California

Project #1600028

Prepared By

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Norman N. Hantzsche, P.E.

Revised - October 2019

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INTRODUCTION AND PROJECT DESCRIPTION

This report presents the water supply plan for the proposed Vida Verde educational farm and camp in San Gregorio, San Mateo County. This report is provided for planning review by County of San Mateo Environmental Health and to establish the feasibility of the proposed water supply. Design drawings and permit application for the proposed water facilities will be completed and submitted following planning approvals.

Vida Verde operates an overnight wilderness and farm camp program serving low-income school districts and families in the S.F. Bay Area that would otherwise not be able to afford this experience for their 4th to 6th grade students. Students experience working in the farm grounds, caring for farm animals, milking the goats and making goat cheese, experiencing the outdoors and wilderness at nearby County parks and enjoying the oceanfront, some for the first time. Located at the 'Hidden Creek' site, 3540 La Honda Road (State Hwy. 84), San Gregorio, Vida Verde is planning to turn this developed residential/agricultural property into its camp and working farm.

Existing development at the project site includes a 3-bedroom residence, barn, several storage buildings, large farming ground, and a livestock/poultry corral. Existing utilities include an onsite water well and storage tank, septic tank and gravity drainfield for the residence, PG&E electrical service, and propane tank. A long paved driveway winds down the hillside from the entrance off Highway 84, leading to the farm and also to a bridge crossing that provides access to three (3) neighboring properties located on the south side of San Gregorio Creek.

Vida Verde is proposing to develop facilities for 2-night/3-day camping accommodations for up to a maximum of 30 guests (4^{th} - 6^{th} grade students), including two or three parent/teacher chaperones. Camping accommodations would be in removable teepees/yurts and the existing barn will be replaced for student meeting, cooking and eating, with farm worker sleeping quarters (2 bedroom/1 bathroom) and office on the second level, plus restrooms for the guests, staff and farm workers. There will also be a new standalone guest restroom near the camp area.

In addition to an new water system, other site infrastructure improvements will include: (a) a new septic system to accommodate all proposed uses and designed to comply with recently adopted San Mateo County Onsite Wastewater Treatment System Standards; (b) driveway and parking improvements; (c) agricultural equipment storage facilities; (d) new accessible paths; (e) ground-mounted photovoltaic array; and (f) biodiesel fuel storage for camp shuttle vehicles and tractor.

Water supply needs for the project include the following:

- **New Well and Domestic Water System**. The existing water well will be formally abandoned and replaced with a newly installed well, treatment and storage facilities, compliant with State Drinking Water Standards and requirements for transient non-community water systems.

- **Fire Protection Water Supply.** A new fire hydrant, barn sprinkler system, and fire water supply storage and distribution system will be provided in accordance with County Fire Marshall requirements.

- **Agricultural Irrigation Water Supply.** Agricultural irrigation water is currently obtained through a permitted/allocated pumped diversion from San Gregorio Creek. No changes to this water supply are included in the proposed project.

DOMESTIC WATER SYSTEM – GENERAL REQUIREMENTS

The domestic water system for the project will be regulated by the State Water Resources Control Board, Division of Drinking Water (DDW) as a "public water system", which is defined as a system that "… provides water for human consumption to 15 or more connections or regularly serves 25 or more people daily for at least 60 days out of the year".

The system will be further classified as a **transient non-community** water system, based on providing water to a mix of onsite residents, day workers and guests.

Vida Verde will be the owner and operator of the water system and will be responsible for ensuring that the drinking water is safe and reliable for those who use the system. The following are some of the key legal obligations:

- Ensure an adequate quantity of water must always be available.

- Water quality must meet all health standards of the California Health and Safety Code (CHSC).

- Owner to issue an annual Consumer Confidence Report to their system users.

- Water must be delivered under proper pressure (at least 20 pounds per square inch).

- System must be properly operated, maintained and protected from damage and contamination.

- System cannot be connected to another, unapproved system or source.

- System must operate under a valid water supply permit. Any changes or additions to source or treatment require the system to apply for and receive an amended permit.

- Owner must pay all required water system regulatory fees.

- Owner must submit an annual report to the Division of Drinking Water as required.

- Must meet Technical, Managerial and Financial requirements as specified in Section 116540 of the CHSC.

As a new public water system, the owner will be required to prepare and submit a technical report in accordance with DDW guidelines, which (per Senate Bill 1263) includes evaluation and documentation of efforts to seek consolidation with an existing public water system for any system within a 3-mile radius of the project site. There are a few small public water systems within 3 miles of Vida Verde that will require investigation as to the potential for any cooperation or consolidation of activities, such as operation and maintenance. Contacts will be made and documented in the Engineering Report submitted to the DDW. Regardless of the outcome of consolidation discussions, there is little chance the source of water supply for the project facilities will change from the proposed use of an onsite well.

ESTIMATED WATER DEMAND

Water demand for the Vida Verde facility will include domestic water supply for the onsite resident population, weekly 2-night/3-day student/guest camping stays for up to 30 people (students and chaperones), plus other occasional visitors. The domestic water demand will typically fluctuate from weekday to weekend and also vary between the school year (main camping periods) and the rest of the year. In the future, camp outings may also be offered during summer months, making water demand more uniform throughout the year.

Per Title 22, Division 4, Chapter 16 - California Water Works Standards, estimates for Maximum Day Demand (MDD) and Peak Hour Demand (PHD) are described below.

Maximum Day Demand (MDD). "Maximum day demand (MDD)" is the amount of water utilized by consumers during the highest day of use (midnight to midnight), excluding fire flow. For Vida Verde, MDD is estimated based on projected maximum occupancy (during camping stays), using projected maximum rates of wastewater generation plus a 25-percent addition to account for consumption and system losses. The water demand estimates by building/activity and overall total for the system are presented in **Table 1**. As indicated, the estimated MDD is 2,064 gallons per day (gpd), which equates to a supply (pumping rate) of approximately 1.45 gallons per minute (gpm).

Table 1
Vida Verde - Estimated Maximum Day Water Demand (MDD)

Building/Activity	Units	Unit Wastewater Flow (gpd)	# of Units	Maximum Daily Wastewater Flow[1] (gpd)	Maximum Day Water Demand[2] (gpd)
Main Residence	Bedrooms	150	3	450	563
Barn Residence	Bedrooms	150	3[3]	450	563
Overnight Camping	Student	25	27	675	844
	Adult	25	3	75	94
Total Daily Flow				**1,650**	**2,064**

[1] Per "Wastewater Facilities Plan for Vida Verde, December 2018"
[2] Based on maximum daily wastewater flow x 1.25
[3] Note: (2) bedrooms proposed, but sizing based on minimum of (3) bedrooms per standard San Mateo County requirements for residential use.

Peak Hour Demand (PHD). "Peak hour demand (PHD)" is the amount of water utilized by consumers during the highest hour of use during the maximum day, excluding fire flow. Per California Water Works Standards, for the proposed Vida Verde system (<1,000 connections) the PHD can be estimated as equal to 1.5 times the average hourly water use during periods of maximum day demand. Assuming (conservatively) the projected MDD of 2,064 gpd occurs over approximately 12 hours time (e.g., 7 am to 7 pm), the average hourly water demand would be 172 gallons per hour. Using a 1.5 multiplier, the PHD would be about 260 gallons per hour. This equates to a short-term flow rate of approximately 4.3 gpm.

WATER SOURCE

Existing Well. The Vida Verde property is currently served by a shallow domestic supply well located approximately 40 feet east of the residence. This well is within the 100-yr floodplain of San Gregorio Creek and construction details for the well (e.g., installation date, well completion log, screened interval, well seal, casing) are lacking. According to a local well driller, the well was tested for yield in 2001 and 2008 in connection with property transfers and showed yields of 3.5 and 3.8 gpm, respectively. Water level during pumping was between 41 and 42 feet below ground surface. Testing of the well in 2017 showed poor mineral quality (TDS >1,000 mg/L). Due to its location within the floodplain, unknown construction details, and poor mineral quality, the existing well is planned to be capped or formally abandoned and replaced by a new well recently installed farther north of the residence as described below.

New Water Well Installation. A new water supply well was installed on June 4th and 5th, 2019 on the alluvial terrace portion of the site, approximately 150 feet north of the residence as shown in **Figure 1.** The location is outside the 100-yr floodplain boundary and was selected based on information from the geotechnical test borings completed in September 2017. The well was installed by Earth Flow Drilling Company under drilling permit issued by San Mateo County Division of Environmental Health, and Coastal Development Permit PLN2018-000457 approved by San Mateo County Planning Commission. Background hydrogeologic information is contained in the "Water Well Application for Vida Verde, San Gregorio, California" (Questa Engineering, November 19, 2018). Construction details are contained in the "Well Completion Report" (Form DWR 188, submitted 6/23/2019), a copy of which is provided in **Attachment A**.

The completed well is 40-feet deep with an 8-inch diameter PVC casing (blank from 0 to 22 feet, screened from 22 to 40 feet) and a 20-ft annular seal. Alluvial deposits were encountered from 0 to 32 feet, with shale-silty clay below. First water was encountered within loose sand gravelly alluvial deposits at a depth of 25 feet from ground surface. A well yield of 3 gpm was estimated by the driller at the time of well installation (air lift method).

Per State requirements, the standard minimum depth of annular seal for public water wells is 50 feet, which was deemed infeasible for this site due to the hydrogeology. The selection of a 20-ft annular seal was selected in order to access the best available supply of groundwater having the most suitable water quality. Because of the shorter depth of seal, it is expected that the water well will be considered to be "under the influence of surface water", thus requiring treatment prior distribution for domestic use.

Well Capacity. Production capacity of the new water well was determined to be 2.5 gpm, sufficient for the estimated domestic water supply needs of the project. Water well testing included the following:

- **5-hr Pumping Test (County standard)**. On June 12, 2019, a few days following well completion, a 5-hr pumping test was conducted in accordance with San Mateo County standards by Simms Plumbing & Water Equipment. The test was run with the pump set at a depth of 38 feet. The static water level was measured at a depth of 20 feet at the start of the test. At a pumping rate averaging 2.4 gpm, the water level stabilized at 32'-3" (12.25 feet of drawdown) about an hour into the test, and remained at that level through the end of the 5-hr pumping period. This initial testing indicated a specific capacity of 0.2 feet per foot of drawdown. See **Attachment B** for the pump test report

- **6-day Pumping/Well Development**. To further develop the well, the pump was reset at a depth of 28 feet, and the well was pumped continuously over a 6-day period, from July 30th to August 5th. The pump was set to operate at a discharge rate of approximately 5 gpm, and controlled with an on-off float switch. The discharge was run through an accumulating flow meter. For the 6-day period the well produced 10,770 gpm, an overall average of 1.24 gpm. No water well readings were taken during this pumping period.

- **8-hr Pumping Test (State standard)**. To formally establish the well capacity, on August 20, 2019 an 8-hr pumping test was conducted by Simms in accordance with State requirements for public system supply wells in alluvium (Title 22, Chapter 16. California Water Works Standards. §64554). The test was run with the pump set at a depth of 28 feet. The static water level was measured at a depth of 20'-8" at the start of the test. At a constant pumping rate of 2.5 gpm, the water level stabilized at 27'7" (6.9 feet of drawdown) about 45 minutes into the test, and remained at that level through the end of the 8-hr pumping period. Following pumping, the rising water level in the well was measured every 15 minutes, showing approximately 95% recovery (within 5 inches of the initial static level) at the end of 2 hours of recovery. The completed 8-hr test confirmed a minimum well capacity of 2.5 gpm, with a specific capacity of 0.36 gpm per foot of drawdown. See **Attachment B** for the pump test report.

The indicated well yield of 2.5 gpm from the 8-hr test is more than sufficient to meet the projected Maximum Day Demand of approximately 1.45 gpm. Projected Peak Hourly Demand of 4.3 gpm would be supplied from short-term water storage capacity provided as part of the water treatment and distribution system.

The well will be fitted with a submersible well pump matched to the well capacity and required head to deliver water to the proposed water treatment system, which will be located on the north hillside (approximately 80 to 100 feet of lift). The new well will also be the source of water for filling the Fire Supply Water Storage Tank, as required.

Water Quality. Water samples were obtained from the new well: (a) on June 12, 2019 during the initial 5-hr pumping test; and (b) on August 27, 2019 following the 8-hr pumping test (after well development). The water samples were taken for laboratory analysis to Soil Control Lab in

Watsonville. Testing was completed for the standard suite of drinking water parameters, including general mineral, inorganics and general physical. Bacteriological testing of the well water on June 12th showed absence of Total Coliform and E Coli. The results for key drinking water parameters are listed in **Table 2** along with the applicable drinking water limits per Title 22, California Code of Regulations. See **Attachment C** for laboratory reports with all results.

Table 2
Vida Verde – New Well Water Quality Results

Parameter	Units	Results by Sampling Date		MCL[1]	
		June 12, 2019	August 20, 2019	Primary	Secondary[2]
General Mineral					
Nitrate as N	mg/L	ND	ND	10	
pH	pH units	7.4	7.8		6.5-8.5
Specific Conductance	uS/cm	1,300	850		1,600 900
Total Dissolved Solids	mg/L	860	560		1,000 500
Chloride	mg/L	190	65		500 250
Sulfate as SO_4	mg/L	110	140		500 250
Fluoride	mg/L	0.34	0.26	2	
Iron	mg/L	**8.2**	0.280		0.300
Manganese	mg/L	**0.330**	**0.220**		0.05
Copper	mg/L	ND	ND		1.0
Zinc	mg/L	ND	0.071		5.0
Inorganics					
Nitrite as N	mg/L	ND	ND	1.0	
Arsenic	mg/L	0.002	ND	0.010	
Barium	mg/L	ND	ND	1.0	
Boron	mg/L	0.79	0.34	-	-
Cadmium	mg/L	ND	0.0012	0.005	
Chromium	mg/L	0.038	ND	0.050	
Cyanide (total)	mg/L	ND	ND	0.15	
Lead	mg/L	ND	ND	0.015	
Mercury	mg/L	ND	ND	0.002	
Selenium	mg/L	ND	ND	0.050	
Silver	mg/L	ND	ND		0.100
MBAS (surfactants)	mg/L	ND	ND		0.005
Aluminum	mg/L	**5.7**	ND	1.0	0.2
Antimony	mg/L	ND	ND	0.006	
Berylium	mg/L	ND	ND	0.004	
Nickel	mg/L	0.024	ND	0.1	
Thallium	mg/L	ND	ND	0.002	
General Physical					
Color	Color Units	13	8		15
Odor	Threshold	ND	ND		3
Turbidity	NTU	**100**	2		5

[1]MCL: Maximum Contaminant Level, per Title 22, California Code of Regulations; Primary standards are for constituents that may pose a health risk when present in drinking water.

[2] Secondary standards are for constituents related to consumer acceptance and non-health threatening factors such as aesthetics, taste, odor, etc; where two values are shown, the lower one is recommended and the higher is the upper limit; Secondary standards are enforceable only for community water systems; they are used as guidelines for non-community water systems.

The water quality testing of the new well on June 12th (shortly after well completion) showed unusually high readings for several constituents (iron, aluminum, turbidity), indicating possible residual effects from the drilling operation. Following the 6-day period of continuous pumping/well development, repeat sampling and testing on August 20th showed a drop in all of these constituents to levels within the respective standards. The August 20th testing shows the well water to be in compliance with all Primary drinking water standards as well as all Secondary consumer acceptance guidelines, with the exception of manganese.

Manganese, is an essential nutrient and a naturally occurring mineral leached from geologic formations. The Secondary limit for manganese is based on its tendency to cause discoloration of water and black staining. Manganese in water is commonly removed by oxidation/filtration or ion exchange processes. A decision on what if any manganese removal process will be employed for the Vida Verde water system will be based on further monitoring of the well water for manganese concentrations and effects, and pilot testing of different treatment methods.

WATER TREATMENT, STORAGE AND DISTRIBUTION

Based on the fact that the new well draws from a relatively shallow terrace aquifer necessitating a limited 20-ft deep annular seal, it is assumed that the well will be deemed "under the influence of surface water" and, as such, subject to compliance with surface water treatment standards. At a minimum this will include filtration and disinfection. The need for other water treatment processes for Secondary consumer acceptance constituents (e.g., iron or manganese removal) will be determined based on further water quality testing and evaluation. It is also noted that although the new well is located relatively close to San Gregorio Creek, water quality testing (e.g., mineral constituents) shows clear evidence of groundwater, rather than surface water, being the source of supply.

A preliminary site plan-layout of water treatment, storage and distribution facilities is shown in **Figure 1**. A schematic diagram of the proposed water system is provided in **Figure 2**, with key features summarized as follows:

Water Treatment System. The water treatment system will be located in a level to gently sloping area on the north hillside, near the property entrance off of La Honda Road. The treatment facilities will be installed on a gravel-surfaced pad covering an area of approximately 1,500 square feet, entailing a small amount of grading and excavation. The treatment system will include the following:

- **Feed Tank** and pump system to meter water into the filtration system based on water demand as indicated by water level conditions in the Treated Water Distribution Reservoir.

- **Slow Sand Filter**, dual redundant units, will be used for water filtration, designed for a loading rate of ≤ 0.10 gpm/ft^2 per State drinking water standards. The filters will be operated alternately.

- **Chlorine Contact Chamber** following sand filtration to meet disinfection requirements; contact chamber design will include an 8 to 12-inch diameter pipe (or equal) to ensure plug flow conditions.

- **Backwash system** for the slow sand filters will include a pump and sump for collection of backwash water and solids; backwash water will be utilized for onsite irrigation. The backwash sump will also be plumbed to take water drained from the Feed Tank and storage tanks.

- **Water System Monitoring** will include: (a) continuous turbidity monitoring ahead of the chlorine contact chamber; (b) chlorine monitoring following chlorination and at the outlet of the Treated Water Distribution Reservoir; and (c) local and remote monitoring of equipment and water levels at various points in the system.

- **Maintenance Access.** A 6-ft wide grass-surfaced trail will be installed and maintained for access to the water treatment site with small farm vehicles, for system maintenance.

Treated Water Storage. Disinfected filtered water will be collected and stored in a 5,000-gallon Treated Water Distribution Reservoir (e.g., 10-ft dia. by 6-ft high poly tank). This will provide minimum storage capacity for 2.5 days of Maximum Day Demand (MDD). In normal operation, the water tank will remain full and will trigger flow from the well pump and through the treatment system in response to water use and drainage from the tank. The water tank will be located at an elevation to provide minimum water pressure of 20 psi to the residence, barn and guest restroom.

Water Distribution System. The water distribution system will consist of 2-inch diameter pipe extending from the Distribution Reservoir to the development area, generally following the paved driveway and circular gravel driveway, with service laterals to the residence, barn and guest restroom.

FIRE WATER SUPPLY

A new fire water supply storage and distribution system will be provided in accordance with County Fire Marshall requirements. Based on preliminary input, this is planned to include:

- 7,500-gallon storage tank at water treatment site, with booster pump to meet fire flow requirements (sizing to be determined);

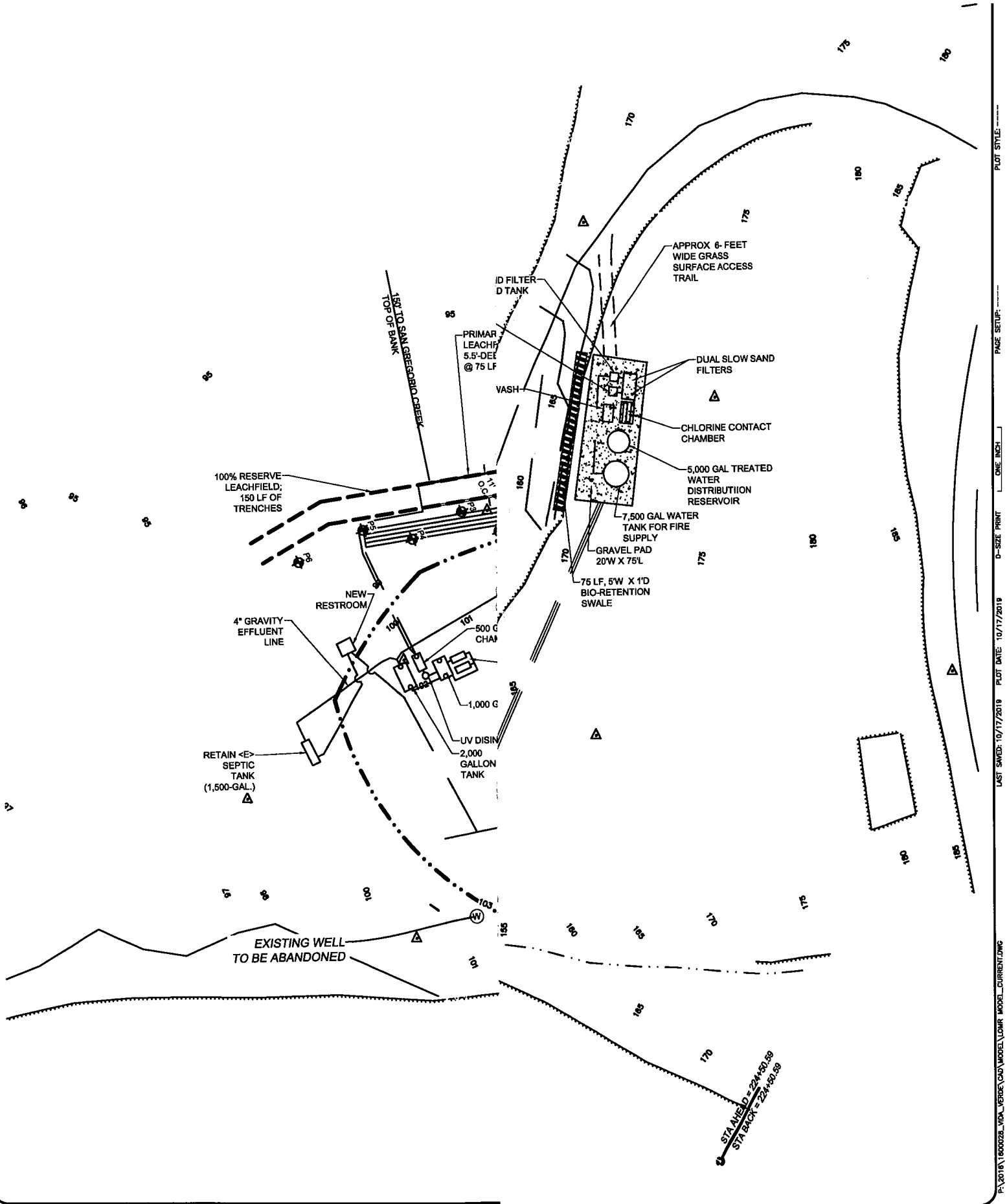
- 4-inch diameter fire distribution system, C-900 pipe or equal.

- Fire hydrant and paved turn-out at circular driveway entrance to building area.

- Barn sprinkler system.

OPERATION AND MAINTENANCE

The water system will be operated and monitored under the terms of State Water System Permit issued by the State Water Resources Control Board, DDW. Day-to-day operations will be managed by onsite maintenance staff at Vida Verde under the supervision of the farm manager. A certified water treatment operator will be retained for routine inspection, monitoring and reporting of system operating conditions in accordance with the DDW permit. Depending on the results of the public water system consolidation evaluation, O&M activities may be provided in a cooperative arrangement with another existing public water system in the project area.



VIDA VERDE

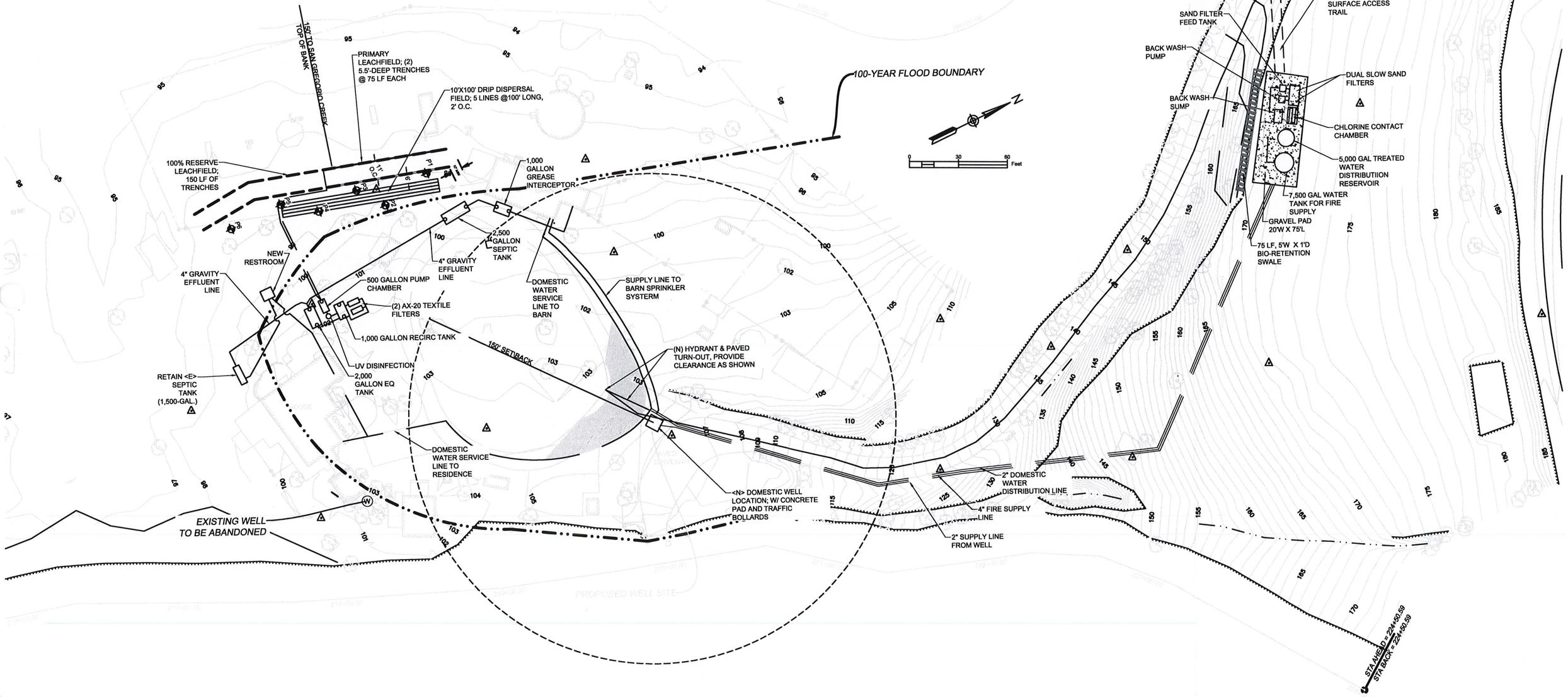
VIDA VERDE NATURE EDUCATIONAL
3540 LA HONDA ROAD

SED WATER AND WASTEWATER FACILITIES

VIDA VERDE NATURE EDUCATION

SAN GREGORIO, CA

Size	Project
D	1600028
Scale:	1:30
Date:	10/17/2019
Sheet:	FIGURE 1



VIDA VERDE

VIDA VERDE NATURE EDUCATIONAL
3540 LA HONDA ROAD

QUESTA ENGINEERING CORP.
Civil Environmental & Water Resources
(510) 236-6114
FAX (510) 236-2423
questa@questaec.com
P.O. Box 70356 1220 Brickyard Cove Road Point Richmond, CA 94807

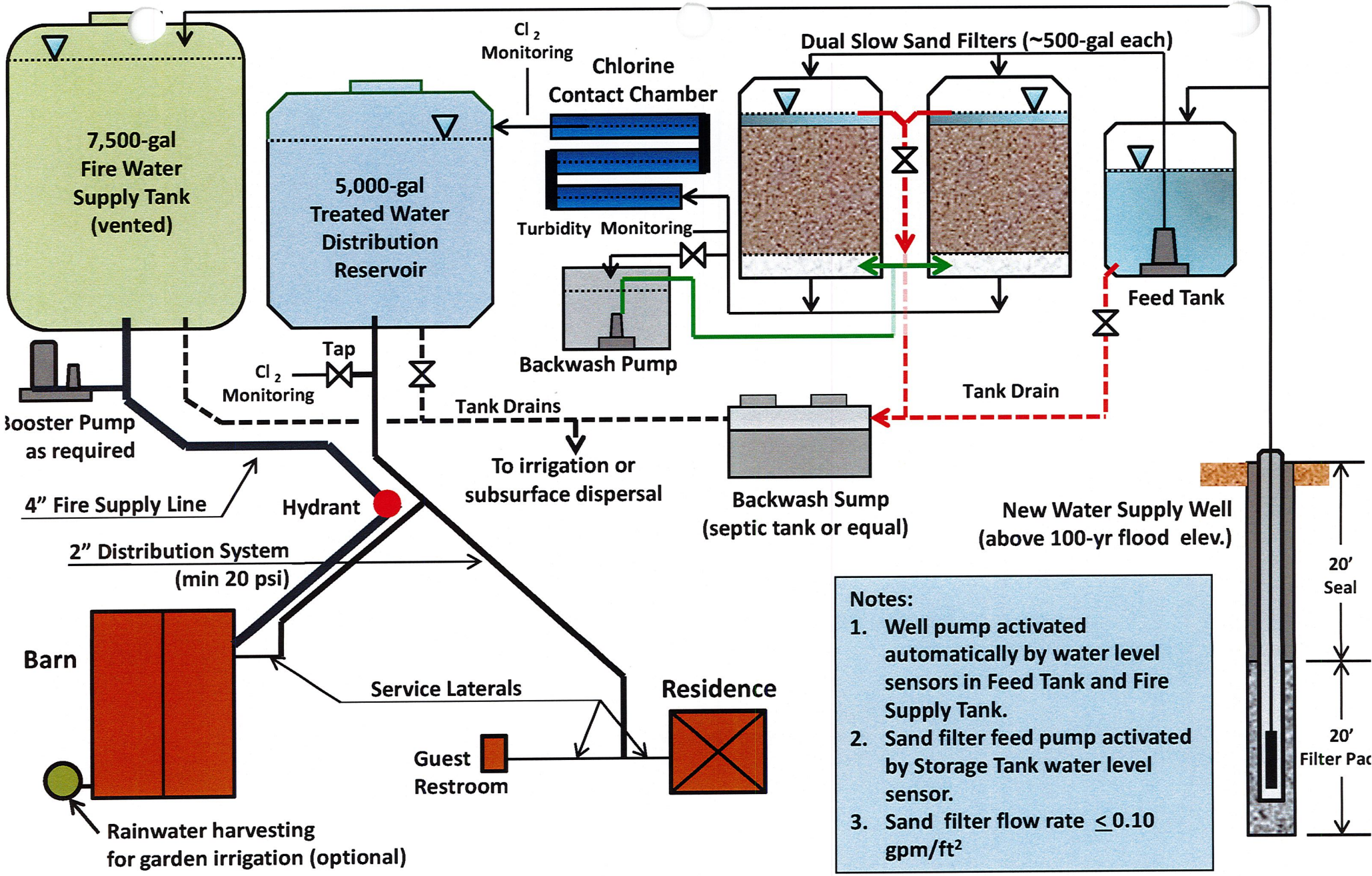
Sht:	Rev:	Date:	By:	Description:	App'd:

Design: NH
Drawn: FP
Checked: NH
Appr'd: NH

PROPOSED WATER AND WASTEWATER FACILITIES
VIDA VERDE NATURE EDUCATION

SAN GREGORIO, CA

Size: D | Project: 1600028
Scale: 1:30
Date: 10/17/2019
Sheet: FIGURE 1



Vida Verde - Water System Schematic

Figure 2

ATTACHMENT A

Well Completion Report

State of California

Well Completion Report

Form DWR 188 Submitted 6/23/2019

WCR2019-008641

C 's Well Number 2683 | Date Work Began 06/04/2019 | Date Work Ended 06/05/2019

Local Permit Agency San Mateo County Division of Environmental Health

Secondary Permit Agency | Permit Number 19-0963 | Permit Date 05/29/2019

Well Owner (must remain confidential pursuant to Water Code 13752)

Name VIDA VERDE NATURE EDUCATION,

Mailing Address 3540 La Honda

City La Honda State CA Zip 94062

Planned Use and Activity

Activity New Well

Planned Use Water Supply Domestic

Well Location

Address 3240 La Honda RD

City La Honda Zip 94020 County San Mateo

	Deg.	Min.	Sec.		
Latitude	37	19	14.6675	N	
Longitude	-122	20	36.0455	W	

Dec. Lat. 37.320741 Dec. Long. -122.343346

Vertical Datum Horizontal Datum WGS84

Location Accuracy Location Determination Method

APN

Township 07 S

Range 05 W

Section 13

Baseline Meridian Mount Diablo

Ground Surface Elevation 100

Elevation Accuracy Unknown

Elevation Determination Method Digital Aerial Photo

Borehole Information

C ntation Vertical Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite

Total Depth of Boring 43 Feet

Total Depth of Completed Well 40 Feet

Water Level and Yield of Completed Well

Depth to first water 25 (Feet below surface)

Depth to Static Water Level (Feet) Date Measured 06/05/2019

Estimated Yield* 3 (GPM) Test Type Air Lift

Test Length 2 (Hours) Total Drawdown (feet)

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

Geologic Log - Free Form

Depth from Surface Feet to Feet		Description
0	3	Firm sandy top soil
3	18	Firm brown silty clay
18	32	Semi loose gravel and sand
32	43	Firm gray/brown shale or silty clay

Casings

Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	22	Blank	PVC	OD: 8.625 in. | SDR: 21 | Thickness: 0.410 in.	0.41	8.625			
1	22	40	Screen	PVC	OD: 8.625 in. | SDR: 21 | Thickness: 0.410 in.	0.41	8.625	Milled Slots	0.032	

Annular Material

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	20	Cement	10.3 Sack Mix		
20	40	Filter Pack	8 x 16		

Other Observations:

Borehole Specifications

Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	43	15

Certification Statement

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

Name: EARTH FLOW DRILLING COMPANY (Person, Firm or Corporation)

2600 SMITH GRADE (Address) | SANTA CRUZ (City) | CA (State) | 95060 (Zip)

Signed: *electronic signature received* (C-57 Licensed Water Well Contractor) | 06/23/2019 (Date Signed) | 800269 (C-57 License Number)

DWR Use Only

CSG #	State Well Number	Site Code	Local Well Number

N — Latitude Deg/Min/Sec

W — Longitude Deg/Min/Sec

TRS:

APN:

ATTACHMENT B

Pumping Test Reports

SIMMS PLUMBING & WATER EQUIPMENT, INC.
P.O. BOX 738
PESCADERO, CA 94060
(650) 879-1823

WELL REPORT INFORMATION

OWNERS NAME	VIDA VERDE
ADDRESS	3540 LA HONDA RD
TEST DATE	JUNE 12, 2019
WELL DEPTH	42'-0
STANDING WATER LEVEL	20'-0
STABILIZED WATER LEVEL	32'-3
PUMP SETTING	38'-0
TIME TEST BEGAN	9:45 AM

TIME	DRAWDOWN	G.P.M.
9:45	20'-0	12.7
10:00	31'-1	3.0
10:15	31'-8	2.6
10:30	32'-0	2.6
10:45	32'-5	2.6
11:00	32'-3	2.5
11:15	32'-4	2.5
11:30	32'-6	2.4
11:45	32'-7	2.5
12:00	31'-5	2.1
12:15	32'-1	2.5
12:30	32'-5	2.5
12:45	32'-2	2.3
1:00	32'-2	2.3
1:15	32'-3	2.3
1:30	32'-3	2.3
1:45	32'-3	2.3
2:00	32'-2	2.5
2:15	32'-2	2.5
2:30	32'-3	2.3
2:45	32'-3	2.5

SIMMS PLUMBING & WATER EQUIPMENT, INC.
P.O. BOX 738
PESCADERO, CA 94060
(650) 879-1823

WELL REPORT INFORMATION

OWNERS NAME	VIDA VERDE
ADDRESS	3540 LA HONDA RD
TEST DATE	AUGUST 20, 2019
WELL DEPTH	42'-0
STANDING WATER LEVEL	20'-8
STABILIZED WATER LEVEL	27'-7
PUMP SETTING	28'-0
TIME TEST BEGAN	7:30 AM

TIME	DRAWDOWN	G.P.M.
7:30	20'-8	4.0
7:45	26'-7	2.6
8:00	27'-2	2.6
8:15	27'-7	2.5
8:30	27'-7	2.5
8:45	27'-7	2.5
9:00	27'-7	2.5
9:15	27'-7	2.5
9:30	27'-7	2.5
9:45	27'-7	2.5
10:00	27'-7	2.5
10:15	27'-7	2.5
10:30	27'-7	2.5
10:45	27'-7	2.5
11:00	27'-7	2.5
11:15	27'-7	2.5
11:30	27'-7	2.5
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12:45	27'-7	2.5
1:00	27'-7	2.5
1:15	27'-7	2.5
1:30	27'-7	2.5
1:45	27'-7	2.5
2:00	27'-7	2.5
2:15	27'-7	2.5
2:30	27'-7	2.5
2:45	27'-7	2.5
3:00	27'-7	2.5
3:15	27'-7	2.5
3:30	27'-7	2.5

RECOVERY PERIOD

3:30	27'-7
3:45	22'-6
4:00	22'-1
4:15	21'-8
4:30	21'-6
4:45	21'-5
5:00	21'-3
5:15	21'-2
5:20	21'-2
5:25	21'-1
5:30	21'-1

WATER LEVEL DROPPED 6'-9 DURING THE PUMP TEST. WELL RECOVERED 95% OF WATER LEVEL WITHIN THE 2 HOUR RECOVERY PERIOD FOLLOWING THE COMPLETION OFTHE PUMP TEST

ATTACHMENT C

Well Water Laboratory Reports

ANALYTICAL CHEMISTS
and
BACTERIOLOGISTS
Approved by State of California

SOIL CONTROL LAB

42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

TEL: 831-724-5422
FAX: 831-724-3188

Simms Plumbing & Water Equip, Inc.
P.O. Box 9
Pescadero, CA 94060
Attn: Sherry Olsen

Work Order #: 9060488
Reporting Date: June 14, 2019

Bacteriological Examination of Water for Coliform Organisms

Date Received: Water sample(s) received June 13, 2019
Project # / Name: None / 3540 La Honda Rd
Water System #/Name: NA
Sampling Type: Routine Sampling Period: June 2019
Sampler's Name: Mike McDermott / Simms Plumbing
Matrix: Drinking Water

Sample Identification	Sampling Date	Sampling Time	Residual Chlorine (mg/L)	Total Coliforms	E. coli
3540 La Honda Rd	06/12/19	11:00	0	Absent	Absent

Date/Time Analyzed: 06/13/19 17:00
Method of Analysis: SM 9223 B

CA ELAP Certificate #1494 (This identifies our Laboratory to the Health Department)

Mike Galloway

ANALYTICAL CHEMISTS
and
BACTERIOLOGISTS
Approved by State of California

SOIL CONTROL LAB

42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

TEL: 831-724-5422
FAX: 831-724-3188

Simms Plumbing & Water Equip, Inc.
P.O. Box 9
Pescadero, CA 94060
Attn: Sherry Olsen

Work Order #: 9060488
Reporting Date: July 11, 2019

Date Received: June 13, 2019
Project # / Name: None / 3540 La Honda Rd
Water System #: NA
Sample Identification: 3540 La Honda Rd, sampled 6/12/2019 11:00:00AM
Sampler Name / Co.: Mike McDermott / Simms Plumbing
Matrix: Drinking Water
Laboratory #: 9060488-01

	Results	Units	RL	State Drinking Water Limits [1]	Analysis Method	Date Analyzed	Flags
General Mineral							
Nitrate as N	ND	mg/L	0.10	10	EPA 300.0	06/14/19	
pH	7.4	pH Units	0.1	-	SM4500-H+ B	06/13/19	
Specific Conductance (EC)	1300	uS/cm	1.0	1600	SM2510B	06/13/19	
Hydroxide as OH	ND	mg/L	2.0	-	SM 2320B	06/13/19	
Carbonate as CO3	ND	mg/L	2.0	-	SM 2320B	06/13/19	
Bicarbonate as HCO3	360	mg/L	2.0	-	SM 2320B	06/13/19	
Total Alkalinity as CaCO3	290	mg/L	2.0	-	SM 2320B	06/13/19	
Hardness	350	mg/L	5.0	-	SM 2340 B	06/19/19	
Total Dissolved Solids	860	mg/L	10	1000	SM2540C	06/14/19	
Chloride	190	mg/L	1.0	500	EPA 300.0	06/14/19	
Sulfate as SO4	110	mg/L	1.0	500	EPA 300.0	06/14/19	
Fluoride	0.34	mg/L	0.10	2	EPA 300.0	06/14/19	
Calcium	85	mg/L	0.50	-	EPA 200.7	06/19/19	
Magnesium	34	mg/L	0.50	-	EPA 200.7	06/19/19	
Potassium	4.3	mg/L	0.50	-	EPA 200.7	06/19/19	
Sodium	160	mg/L	0.50	-	EPA 200.7	06/19/19	
* Iron	8200	ug/L	50	300	EPA 200.7	06/19/19	
* Manganese	330	ug/L	20	50	EPA 200.7	06/19/19	
Copper	ND	ug/L	50	1000	EPA 200.7	06/19/19	
Zinc	ND	ug/L	50	5000	EPA 200.7	06/19/19	
Inorganics							
Nitrate+Nitrite as N	ND	mg/L	0.10	10	EPA 300.0	06/14/19	
Arsenic	2.0	ug/L	2.0	10	EPA 200.8	06/20/19	
Barium	ND	ug/L	100	1000	EPA 200.7	06/19/19	

RL - are levels down to which we can quantify with reliability, a result below this level is reported as "ND" for Not Detected.
State Drinking Water Limits[1] - as listed by California Administrative Code, Title 22.
* - a * in the left hand margin of the report means that particular constituent is above the California Drinking Water Limits.

Mike Galloway

ANALYTICAL CHEMISTS
and
BACTERIOLOGISTS
Approved by State of California

SOIL CONTROL LAB

42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

TEL: 831-724-5422
FAX: 831-724-3188

Simms Plumbing & Water Equip, Inc.
P.O. Box 9
Pescadero, CA 94060
Attn: Sherry Olsen

Work Order #: 9060488
Reporting Date: July 11, 2019

Date Received: June 13, 2019
Project # / Name: None / 3540 La Honda Rd
Water System #: NA
Sample Identification: 3540 La Honda Rd, sampled 6/12/2019 11:00:00AM
Sampler Name / Co.: Mike McDermott / Simms Plumbing
Matrix: Drinking Water
Laboratory #: 9060488-01

	Results	Units	RL	State Drinking Water Limits	Analysis Method	Date Analyzed	Flags
Inorganics							
Boron	790	ug/L	100	-	EPA 200.7	06/19/19	
Cadmium	ND	ug/L	1.0	5	EPA 200.8	06/20/19	
Chromium	38	ug/L	1.0	50	EPA 200.8	06/20/19	
Cyanide (total)	ND	ug/L	100	200	SM 4500-CN F	06/25/19	
Lead	ND	ug/L	5.0	15	EPA 200.8	06/20/19	
Mercury	ND	ug/L	1.0	2	EPA 245.1	06/21/19	
Selenium	ND	ug/L	5.0	50	EPA 200.8	06/20/19	
Silver	ND	ug/L	10	100	EPA 200.8	06/20/19	
MBAS (Surfactants)	ND	mg/L	0.025	0.5	SM5540C	06/14/19	
* Aluminum	5700	ug/L	50	1000	EPA 200.7	06/19/19	
Antimony	ND	ug/L	6.0	6	EPA 200.8	06/20/19	
Beryllium	ND	ug/L	1.0	4	EPA 200.7	06/19/19	
Nickel	24	ug/L	10	100	EPA 200.7	06/19/19	
Thallium	ND	ug/L	1.0	2	EPA 200.8	06/20/19	
Nitrite as N	ND	mg/L	0.10	1	EPA 300.0	06/14/19	
General Physical							
Color	13	Color Units	3.0	-	SM 2120B	06/13/19	
Threshold Odor No.	ND	T.O.N.	1.0	-	SM 2150B	06/13/19	
Turbidity	100	NTU	0.10	-	SM 2130B	06/13/19	

- are levels down to which we can quantify with reliability, a result below this level is reported as "ND" for Not Detected.
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Mike Galloway

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95076
USA

TEL: 831-724-5422
FAX: 831-724-3188

Simms Plumbing & Water Equip, Inc.
P.O. Box 9
Pescadero, CA 94060
Attn: Sherry Olsen

Work Order #: 9080802
Reporting Date: September 11, 2019

Date Received: August 27, 2019
Project # / Name: None / 3540 La Honda Rd.
Water System #: NA
Sample Identification: 3540 La Honda Rd., sampled 8/26/2019 3:00:00PM
Sampler Name / Co.: Matt Simms / Simms Plumbing
Matrix: Drinking Water
Laboratory #: 9080802-01

	Results	Units	RL	State Drinking Water Limits [1]	Analysis Method	Date Analyzed	Flags
General Mineral							
Nitrate as N	ND	mg/L	0.10	10	EPA 300.0	08/28/19	
pH	7.8	pH Units	0.1	-	SM4500-H+ B	08/27/19	
Specific Conductance (EC)	850	uS/cm	1.0	1600	SM2510B	08/27/19	
Hydroxide as OH	ND	mg/L	2.0	-	SM 2320B	08/27/19	
Carbonate as CO3	ND	mg/L	2.0	-	SM 2320B	08/27/19	
Bicarbonate as HCO3	290	mg/L	2.0	-	SM 2320B	08/27/19	
Total Alkalinity as CaCO3	240	mg/L	2.0	-	SM 2320B	08/27/19	
Hardness	300	mg/L	5.0	-	SM 2340 B	08/30/19	
Total Dissolved Solids	560	mg/L	9.9	1000	SM2540C	08/30/19	
Chloride	65	mg/L	1.0	500	EPA 300.0	08/28/19	
Sulfate as SO4	140	mg/L	1.0	500	EPA 300.0	08/28/19	
Fluoride	0.26	mg/L	0.10	2	EPA 300.0	08/28/19	
Calcium	70	mg/L	0.50	-	EPA 200.7	08/30/19	
Magnesium	31	mg/L	0.50	-	EPA 200.7	08/30/19	
Potassium	2.2	mg/L	0.50	-	EPA 200.7	08/30/19	
Sodium	67	mg/L	0.50	-	EPA 200.7	08/30/19	
Iron	280	ug/L	50	300	EPA 200.7	08/30/19	
* Manganese	220	ug/L	20	50	EPA 200.7	08/30/19	
Copper	ND	ug/L	50	1000	EPA 200.7	08/30/19	
Zinc	71	ug/L	50	5000	EPA 200.7	08/30/19	
Inorganics							
Nitrate+Nitrite as N	ND	mg/L	0.10	10	EPA 300.0	08/28/19	
Arsenic	ND	ug/L	2.0	10	EPA 200.8	09/05/19	
Barium	ND	ug/L	100	1000	EPA 200.7	08/30/19	

RL - are levels down to which we can quantify with reliability, a result below this level is reported as "ND" for Not Detected.
State Drinking Water Limits[1] - as listed by California Administrative Code, Title 22.
* - a * in the left hand margin of the report means that particular constituent is above the California Drinking Water Limits.

Mike Galloway

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SOIL CONTROL LAB

42 HANGAR WAY
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TEL: 831-724-5422
FAX: 831-724-3188

Simms Plumbing & Water Equip, Inc.
P.O. Box 9
Pescadero, CA 94060
Attn: Sherry Olsen

Work Order #: 9080802
Reporting Date: September 11, 2019

Date Received: August 27, 2019
Project # / Name: None / 3540 La Honda Rd.
Water System #: NA
Sample Identification: 3540 La Honda Rd., sampled 8/26/2019 3:00:00PM
Sampler Name / Co.: Matt Simms / Simms Plumbing
Matrix: Drinking Water
Laboratory #: 9080802-01

	Results	Units	RL	State Drinking Water Limits [1]	Analysis Method	Date Analyzed	Flags
Inorganics							
Boron	340	ug/L	100	-	EPA 200.7	08/30/19	
Cadmium	ND	ug/L	1.0	5	EPA 200.8	09/05/19	
[illegible]omium	1.2	ug/L	1.0	50	EPA 200.8	09/05/19	
Cyanide (total)	ND	ug/L	100	200	SM 4500-CN F	09/05/19	
Lead	ND	ug/L	5.0	15	EPA 200.8	09/05/19	
Mercury	ND	ug/L	1.0	2	EPA 245.1	08/28/19	
Selenium	ND	ug/L	5.0	50	EPA 200.8	09/05/19	
Silver	ND	ug/L	10	100	EPA 200.8	09/05/19	QR-04
MBAS (Surfactants)	ND	mg/L	0.025	0.5	SM5540C	08/28/19	
Aluminum	ND	ug/L	50	1000	EPA 200.7	08/30/19	
Antimony	ND	ug/L	6.0	6	EPA 200.8	09/05/19	
Beryllium	ND	ug/L	1.0	4	EPA 200.7	08/30/19	
Nickel	ND	ug/L	10	100	EPA 200.7	08/30/19	
Thallium	ND	ug/L	1.0	2	EPA 200.8	09/05/19	
Nitrite as N	ND	mg/L	0.10	1	EPA 300.0	08/28/19	
General Physical							
Color	8.0	Color Units	3.0	-	SM 2120B	08/27/19	
Threshold Odor No.	ND	T.O.N.	1.0	-	SM 2150B	08/27/19	
Turbidity	2.0	NTU	0.10	-	SM 2130B	08/27/19	

[illegible] - are levels down to which we can quantify with reliability, a result below this level is reported as "ND" for Not Detected.
State Drinking Water Limits[1] - as listed by California Administrative Code, Title 22.
* - a * in the left hand margin of the report means that particular constituent is above the California Drinking Water Limits.

Mike Galloway

COUNTY OF SAN MATEO - PLANNING AND BUILDING DEPARTMENT

ATTACHMENT C

PLN2019-00429

Wastewater Facilities Plan

For

Vida Verde

San Gregorio, California

Project #1600028

5C

Prepared By

Questa Engineering Corporation
1220 Brickyard Cove Road, Suite 206
Richmond, California 94807

Norman N. Hantzsche, P.E.

Revised - December 2018 and
October 17, 2019

TABLE OF CONTENTS

ATTACHMENTS:

INTRODUCTION AND PROJECT DESCRIPTION

This report presents the plans for an onsite wastewater treatment and dispersal system for the proposed Vida Verde educational farm camp in San Gregorio, San Mateo County. This report is provided for planning review by County of San Mateo Environmental Health and to establish the feasibility of the proposed wastewater plan. Design drawings and permit application for the proposed wastewater facilities will be completed and submitted following planning approvals.

Vida Verde operates an overnight wilderness and farm camp program serving low-income school districts and families in the S.F. Bay Area that would otherwise not be able to afford this experience for their 4th to 6th grade students. Students experience working in the farm grounds, caring for farm animals, milking the goats and making goat cheese, experiencing the outdoors and wilderness at nearby County parks and enjoying the oceanfront, some for the first time. Located at the 'Hidden Creek' site, 3540 La Honda Road (State Hwy. 84), San Gregorio, Vida Verde is planning to turn a developed residential/agricultural property into its camp and working farm.

Existing development at the project site includes a 3-bedroom residence/office, barn, several storage buildings, large farming ground, and a livestock/poultry corral. Existing utilities include an onsite water well and storage tank, septic tank and gravity drainfield for the residence, PG&E electrical service, and propane tank. A long paved driveway winds down the hillside from the entrance off Highway 84, leading to the farm and also to a bridge crossing that provides access to three (3) neighboring properties located on the south side of San Gregorio Creek.

Proposed major facilities and activities of the Vida Verde camp and farm include:

- **Existing Residence Improvements.** Improvements to the existing residence to serve as caretaker residence and Vida Verde program office.

- **Overnight Camping.** Overnight camping accommodations for up to maximum of 30 guests (students) including two or three parent/teacher chaperones; camping would be for 2 nights/3 days per week during the school year. Camping accommodations would be in removable teepees/yurts located in a screened enclosure area on the south side of the site. No showers provided for overnight campers. A small standalone restroom will be built between the camping area and Barn as a convenience for campers.

- **New 'Barn' Facility.** Remodeling and expansion of the existing barn for student meeting, cooking and eating, with farm staff sleeping rooms (2 bedrooms) on the second level, plus restrooms for the guests, staff and farm workers.

- **New Well and Domestic Water System.** The existing water well will be formally abandoned and replaced with a new well, treatment and storage facilities, compliant with County and State standards applicable to "State Small Water Systems", which are those

that serve water to 5 to 14 service connections and fewer than 25 people daily for at least 60 days out of a year.

- **New Septic System**. A new septic system (combining the flows for the entire facility) will be installed to accommodate all proposed uses, and will be designed to comply with recently adopted San Mateo County Onsite Wastewater Treatment System Standards, including supplemental treatment and subsurface dispersal system as required for installations within 600 feet of water body formally listed as impaired (San Gregorio Creek, impaired for pathogens).

- **Other Site Infrastructure**. Other site infrastructure improvements will include: (a) new fire hydrant, barn sprinkler system, and fire water supply storage and distribution system; (b) driveway and parking improvements; (c) agricultural equipment storage facilities; (d) new accessible paths; (e) ground-mounted photovoltaic array; and (f) biodiesel fuel storage for camp shuttle vehicles and tractor.

ESTIMATED WASTEWATER FLOWS

Wastewater flows at the Vida Verde facility will include sewage wastes from the onsite resident population, day workers and office staff, plus that from the periodic 2-night/3-day student/guest camping stays. The flows will typically fluctuate from weekday to weekend and also vary between the school year (main camping periods) and the rest of the year. In the future, similar 2-night/3-day camp outings may also be offered during summer months. The regular and predictable fluctuations in waste-generating activities makes the facility suitable for use of flow equalization facilities, as provided for in San Mateo County onsite wastewater requirements (Onsite Systems Manual, Section 3).

Peak Daily Flows. The proposed project will convert the uses of the property to recreation-education uses, with a mix of permanent residents, day workers and guest stays. As such, the wastewater system will fall under the category of a "Multiunit Residences and Non-residential Facilities" for system sizing and design (per San Mateo County Onsite Systems Manual, Section 3.C). Estimated peak daily wastewater flows for camping and non-camping days are presented in **Table 1**, based on projected occupancy and unit wastewater flows as follows:

- **Onsite Residents and Staff.** Since there will be accommodations for permanent residents in the existing residence/office and in the barn, wastewater sizing based on bedroom count provides the most reasonable and safe estimate for design. A unit flow of 150 gallons per day (gpd) per bedroom is the standard criterion for sizing residential wastewater systems, with a minimum allowance for 3 bedrooms per residence. This assumes occupancy of 2 persons per bedroom, which equates to an allowance for 12 total residents for the two buildings at Vida Verde. Since realistically there would be no more than 6 to 8 permanent residents, the design flow allowance of 450 gpd each for the residence/office and the barn (900 gpd total) is very conservative, by a factor of 1.5 to 2. This leaves roughly 300 to 450 gpd for office and day workers, which is more than ample for the maximum daily staff of up to 8 people. The standard allowance for employee/day workers is 15 gpd per person, equaling 120 gpd for 8 workers.

- **Campers.** The unit flows of 25 gpd per overnight camping and 10 gpd per camp day use, are is based on guidelines published by US EPA (2002, Onsite Wastewater Treatment Systems Design Manual) and also reflected in adopted standards for neighboring Santa Clara County for overnight campers without showers. (Note: San Mateo County does not have established sewage flow rates for non-residential uses.)

Table 1
Vida Verde - Estimated Daily Wastewater Flows for Maximum Occupancy
Non-Camping Days, Day-Use Camping, and Overnight Camping

Building/Activity	Units	Unit Flow (gpd)	Non-Camping Days		Day Use Camping		Overnight Camping	
			Number of Units	Total Daily Flow (gpd)	Number of Units	Total Daily Flow, gpd	Number of Units	Total Daily Flow, gpd
Main Residence	Bedrooms	150	3	450	3	450	3	450
Barn Residence	Bedrooms	150	3	450	3[1]	450	3	450
Day Use Camping	Student	10	0	0	27	270	0	0
	Adult	10	0	0	3	30	0	0
Overnight Camping	Student	25	0	0	0	0	27	675
	Adult	25	0	0	0	0	3	75
Total Daily Flow				**900**		**1,170**		**1,650**

[1] Note: (2) bedrooms proposed, but sizing based on min (3) bedrooms per San Mateo County requirements for residential use.

Peak Week Design Flow. Flow equalization will be incorporated to store surge wastewater flows during camp outings and meter the flows through the treatment and dispersal systems at a relatively even rate over the subsequent days of the week before the next camping group arrives. This will allow the supplemental treatment system and dispersal field to be designed and operated most effectively based on the weekly average wastewater flow for peak usage periods. Under full occupancy, weekly average flow for treatment and dispersal system design is estimated to be:

- 4 days at 900 gpd = 3,600 gallons
- 1 days at 1,170 gpd = 1,170 gallons
- 2 days at 1,650 gpd = 3,300 gallons

Total weekly flow = 8,070 gallons

Peak Week Design Flow = 1,153 gpd, round to **1,200 gpd**

Flow equalization capacity must be provided to allow the treatment and dispersal field to receive up to 1,200 gpd, requiring detention of 450 gpd (1,650-1,200) during overnight stays, and no additional flow during day-use camping (1,170 < 1,200). This equates to a total weekly surge storage capacity of roughly 900 gallons for the typical 2-night/3-day student camp outings during maximum occupancy.

Average Daily Flow (Annual). Average annual flow is estimated to be about 50 to 75 percent of peak weekly flow, due to the combination of occupancy and unit wastewater generation rates normally being less than the assumed maximum design values. This would equate to an average year-round daily wastewater flow in the range of about 600 to 900 gpd. To be conservative, we recommend the design be for **1,000 gpd average daily flow**.

SITE CONDITIONS

The project site is located about 3 miles inland from the Pacific Ocean and accessed off of La Honda Road. The property extends from La Honda Road down a moderate to steeply sloping hillside to a gently sloping alluvial terrace situated in the oxbow of San Gregorio Creek. The building and farming activities and proposed onsite wastewater facilities are all located in the alluvial terrace.

Soils and Groundwater. Soils comprising the alluvial terrace are mapped by the USDA (Soil Survey of San Mateo Area, 1961) as Corralitos sandy loam, gently sloping, 2% to 5%. The soils are characterized as very deep, rapidly permeable with slow runoff and slight erosion hazard.

Soil profile investigation and groundwater level determinations (wet weather) were conducted for the prior property owner in the area proposed for a new onsite wastewater system on May 15, 2014. This work was a follow-up to percolation testing in the fall of 2013 (discussed below). The area investigated was immediately south of the existing barn along the east and southern edge of the vegetable garden (see **Figure 1**). This consisted of two backhoe test pits with soils and groundwater conditions observed and reported by County Environmental Health staff as follows:

Test Hole # 1

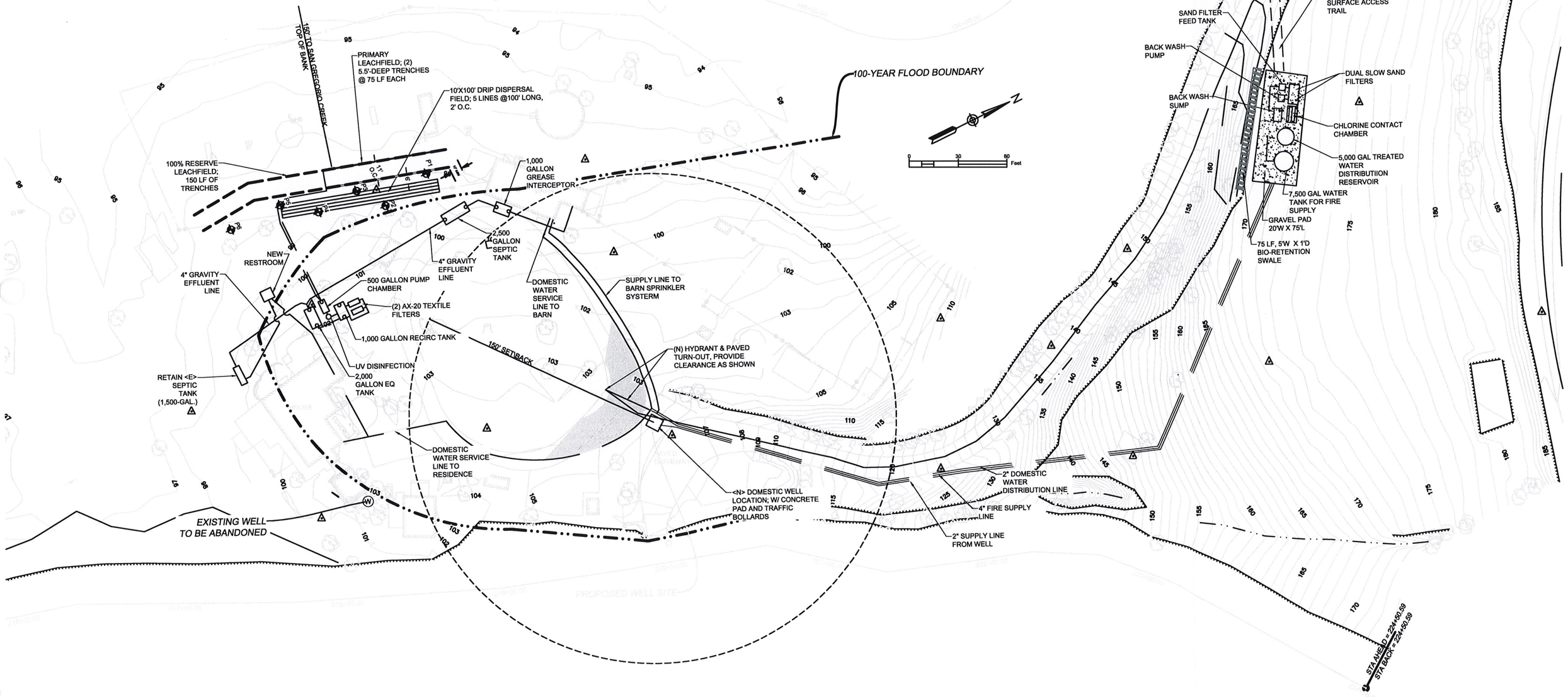
- 1' – 5' tan to brown sandy silt soil
- 5' – 11.5' brown sandy silt with some sand and clay soils
- No groundwater encountered to 11.5'below ground surface (bgs)

Test Hole # 2

- 1' – 11' tan to brown sandy silt with lots of cobbles
- Groundwater observed at bottom of test pit at 11.0' bgs

Percolation Tests. Six (6) percolation tests were conducted in October 2013 by Langley Hill Quarry in the proposed wastewater dispersal area (see **Figure 1**). Test results are listed in **Table 2**, showing consistently good "A" rates between 6 and 9 minutes per inch (7 to 9 inches per hour. All tests were completed in accordance with San Mateo County percolation testing procedures at a standard depth of 4 to 5 feet bgs. Percolation test data are on file with San Mateo County Environmental Health, and a copy attached to this report for reference (**Attachment A**).

The soil log on the percolation test field sheet described soils as consisting of "sandy loam topsoils to sandy clay soil to some areas with sandy gravelly soil". Groundwater was observed at a depth of 15 to 16 feet bgs.



VIDA VERDE

VIDA VERDE NATURE EDUCATIONAL
3540 LA HONDA ROAD

QUESTA ENGINEERING CORP.
Civil Environmental & Water Resources
(510) 236-6114
FAX (510) 236-2423
questa@questaec.com
P.O. Box 70356 1220 Brickyard Cove Road Point Richmond, CA 94807

Sht:	Rev:	Date:	By:	Description:	App'd:

Design: NH
Drawn: FP
Checked: NH
Appr'd: NH

PROPOSED WATER AND WASTEWATER FACILITIES

VIDA VERDE NATURE EDUCATION

SAN GREGORIO, CA

Size: D | Project: 1600028
Scale: 1:30
Date: 10/17/2019
Sheet: FIGURE 1

Table 2. Percolation Test Results
October 29, 2013

Test #	Depth (feet)	Percolation Rate	
		Inches per Hour	Minutes per Inch
P-1	4 to 5	6.875	8.7
P-2	4 to 5	9.5	6.3
P-3	4 to 5	8.25	7.3
P-4	4 to 5	8.0	7.5
P-5	4 to 5	8.0	7.5
P-6	4 to 5	8.375	7.2
Average Rate		**8.2**	**7.4**

Setbacks. The proposed area for the new wastewater treatment and dispersal facilities is located where it will be able to maintain minimum setbacks from key site features as follows:

- San Gregorio Creek (top of bank): 130 to 150 feet
- New water supply well (public): 180 feet
- Existing water supply well (to be abandoned): 140 feet

The existing septic tank for the residence, which is planned to remain in service, is located 110 feet from San Gregorio Creek (top of bank) and 100 feet from the existing domestic well to be abandoned. However, the septic tank is located within (at the edge of) the 100-yr flood plain boundary of San Gregorio Creek and will require water tightness testing and possible improvements (e.g., watertight access riser) to eliminate potential floodwater infiltration. The existing leachfield for the residence building will be disconnected and abandoned, with the septic tank effluent redirected to the new advanced wastewater system for the property.

The new septic tanks, treatment units and pumping facilities will all be located outside the limits of the 100-year floodplain. The new leachfield and reserve area, while being located 130 to 150 feet from the top of bank of San Gregorio Creek, will be within the 100-year floodplain and subject to inundation during an extreme flood event. Mitigation for this condition would include cessation of discharge to the leachfield during the period of flooding, which can be controlled by either manual or automatic shut-off of the pump in the flow equalization tank.

Proximity to Impaired Water Body. San Gregorio Creek is listed under Section 303d of the Clean Water Act as an impaired water body for pathogens. As such, onsite wastewater systems located within 600 feet of the creek require compliance with supplemental wastewater treatment standards specified in the State Onsite Wastewater Treatment Systems Policy and adopted into San Mateo County Onsite Wastewater Treatment Systems Ordinance and technical manual in 2016 . The standards require onsite wastewater systems be designed to include supplemental treatment (beyond conventional septic tank treatment), and dispersal system requirements as follows:

- Effluent Quality:
  - ✓ Total Suspended Solids (TSS): $\leq$30 mg/L, 30-day average

- ✓ Fecal Coliform: ≤200 MPN/100 ml
- Dispersal System:
  - ✓ 3-ft minimum separation to groundwater
  - ✓ 12-inch minimum soil cover

Onsite Wastewater Suitability. The area tested and proposed for the new onsite wastewater system is excellently suited for subsurface wastewater dispersal using either conventional gravity trenches or pressure distribution trenches, up to 8-feet deep. Because of the need to include supplemental treatment due to proximity to San Gregorio Creek, subsurface drip dispersal would also be a viable and dispersal method and advantageous in gaining some amount of irrigation benefit from the treated water. The proposed area is above the 100-yr floodplain, more than 100 feet from San Gregorio Creek, and more than 150 feet from the proposed location of the new water supply well for the project.

PROPOSED WASTEWATER FACILITIES

All sanitary and kitchen wastewater from the residence/office and the remodeled barn will be collected in a single system providing secondary treatment and dispersal to a combination drip dispersal system and conventional leaching trenches in and garden area south of the barn, as diagrammed schematically in **Figure 2**. Layout of the proposed wastewater facilities are shown on **Figure 1**and described below.

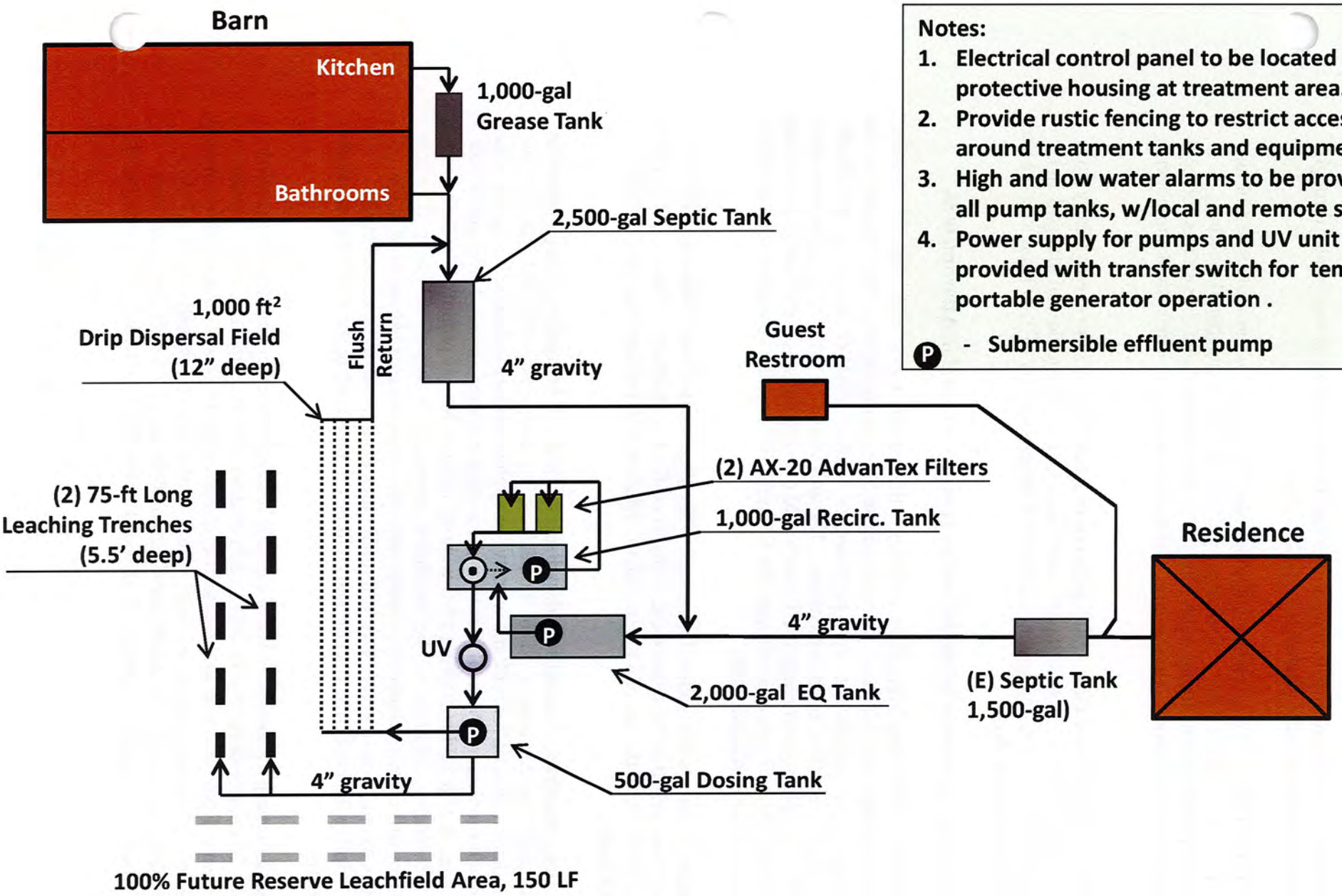
Septic Tanks.

- The septic tank serving the existing residence/office (1,500-gal) will be inspected, upgraded with risers and effluent filter and remain in service, providing a minimum 2-days hydraulic retention time. The sanitary drain from the new standalone restroom will be connected to the existing septic tank. The existing leachfield for the residence/office building will be disconnected, with the flow from the existing septic tank redirected to the new advanced wastewater system for the property.

- A new 2,500-gallon septic tank (with effluent filter) will be installed to collect all wastewater flow from the barn, providing minimum of 2-days hydraulic retention time for estimated peak flows of 1,200 gpd from this building.

Grease Interceptor. A new 1,000-gallon grease interceptor will be installed to receive wastewater flow from the kitchen sinks and dishwasher, estimated to be on the order of 400 to 600 gpd on peak camping days (twice a week), and less than 100 gpd on other days.

Flow Equalization. Septic tank effluent from the residence and barn systems will collect by gravity to a 2,000-gallon flow equalization (EQ) tank located in an open area between the barn and residence. The EQ tank will be operated to maintain a minimum standing volume of approximately 1,000 gallons, with 1,000 gallons surge capacity for storage and regulation of flow rate to the secondary treatment system. A pump system with timed-dosing will be provided to meter flows into the treatment system at a maximum daily rate of approximately 1,200 gpd or less. In times of extreme flooding or other emergencies, the EQ pump can be



Vida Verde - Wastewater System Schematic

Figure 2

disabled, manually or automatically, to temporarily halt the processing of wastewater through treatment system and subsequent discharge to the leachfield.

AdvanTex Textile Filter. The secondary (supplemental) treatment system will consist of an AdvanTex textile filter, which is an NSF 40 approved treatment unit capable of meeting minimum effluent requirements for use with subsurface drip dispersal and for systems adjacent to pathogen impaired water bodies (in this case, San Gregorio Creek). The system components will include:

- Recirculation/blend tank: 1,000-gallon (min.) capacity, equal to average daily flow
- AdvanTex Pods: (2) AX-20 pods, each rated for an average flow of 500 gpd and peak flow of 1,000 gpd, giving a combined design capacity of 1,000 gpd average and 2,000 gpd peak flow.

Manufacturer/design information for the AdvanTex system is provided in **Attachment B**.

UV Disinfection. Following AdvanTex treatment, the treated water will flow (by gravity) through a UV disinfection unit prior to collection in the dosing tank for distribution to the dispersal system. The disinfection unit proposed is Orenco AXUV, which is specifically designed to follow AdvanTex treatment systems. The unit would be installed in a below-ground vault/manhole. Compliance sampling of effluent would occur at the point of inflow to the dosing tank, immediately following passage through the UV unit. Technical information on the AXUV equipment is provided in **Appendix B**.

Effluent Dosing Tank. A 500-gallon dosing tank will collect treated water following the UV unit, and from there dosed to the either the drip dispersal field or leaching trenches. Discharge to the drip field will be with the use of a pump system. Discharge to the leaching trenches will be by gravity discharge.

Subsurface Drip Dispersal. A subsurface drip dispersal field will be installed along the eastern edge of the vegetable garden area, sized for the peak weekly design flow of 1,200 gpd. For the observed percolation rates of 7.4 MPI, the wastewater application rate would be 1.2 gpd/ft^2 (San Mateo County Onsite Systems Manual, Section 4.E) requiring approximately 1,000 square feet of drip field area. A drip field measuring 10-ft wide by 100-feet long is proposed, with five (5) drip lines at 2-ft spacing; driplines will be installed to provide 12 inches of soil cover. The drip dispersal system will include a controller, valves and other appurtenances as required in the Onsite Systems Manual and in accordance with guidelines from the dripline manufacturer (Geoflow). Dripline flushing (when performed) will be directed back to the 2,500-gallon septic tank (at the barn).

Conventional Leaching Trenches. A 100% capacity leaching trench system will be installed adjacent to the drip dispersal field to be operated in tandem with the drip field, and to provide a gravity emergency dispersal option in the case of extended pump or power outage. The proposed trenches will be 5.5-feet deep, 18-inches wide, with 8 ft^2 of effective sidewall area (4 ft below pipe), per lineal foot of trench. For the observed percolation rate of 7.4 MPI, the wastewater loading rate would be 1.0 gpd/ft^2, requiring a total of 150 lineal feet of trench. Two trenches of

75 feet long are proposed, with 11-ft spacing between trenches (two times the 5.5-ft trench depth). The leaching trenches will maintain a 5.5-ft vertical separation to wet weather groundwater level (11.0 feet bgs).

100% Future/Reserve Leaching Trenches (not installed). Per San Mateo County requirements, an additional 100% area for conventional leaching trenches (150 lineal feet) has been designated and will be reserved for future use if needed.

OPERATION AND MAINTENANCE

The proposed wastewater facilities will be operated and monitored under the terms of an Operating Permit to be issued by San Mateo County Environmental Health. Day-to-day operations will be managed by onsite maintenance staff at Vida Verde under the supervision of the farm manager. Additionally, a qualified professional or other qualified onsite wastewater maintenance provider will be retained for periodic inspection, monitoring and reporting of system operating conditions in accordance with Section 5.B of the Onsite Systems Manual and specific terms of the Operating Permit.

ATTACHMENT A

Soils, Groundwater and Percolation Data

Langley Hill Quarry

SR 0011030

Ph: 650-851-0126 • Septic Systems Installed & Repaired • Lic. No. A702033

SMC Certified Installer No. 01

SMC Soil Percolation Tester No. 007 = WATER Added

Observed in Field By: _____ Date: 10-29-13

1/2 HOUR INTERVALS	READINGS	HOLE #1	HOLE #2	HOLE #3	HOLE #4	HOLE #5	HOLE #6
8:30	FINISH	11 5/16"	11 5/16"	11 10/16"	11 5/16"	11 7/16"	11 3/16"
1 8:00	START	4" =	4" =	4" =	4" =	4" =	4" =
	= DIFF. =	7 5/16"	7 5/16"	7 10/16"	7 5/16"	7 7/16"	7 3/16"
9:00	FINISH	11 4/16"	10 13/16"	11"	10 5/16"	10 5/16"	11"
2 8:30	START	6" =	6" =	6" =	6" =	6" =	6" =
	DIFF.	5 4/16"	4 13/16"	5"	4 5/16"	4 5/16"	5"
9:30	FINISH	10 5/16"	11 13/16"	10 4/16"	11 5/16"	11 9/16"	10 13/16"
3 9:00	START	6" =	10 13/16"	6" =	10 5/16"	10 5/16"	6" =
	DIFF.	4 5/16"	1"	4 4/16"	1"	4 4/16"	4 13/16"
10:00	FINISH	11 8/16"	11 7/16"	11 5/16"	10"	10 1/16"	11 14/16"
4 9:30	START	10 5/16"	6" =	10 2/16"	6" =	6" =	10 12/16"
	DIFF.	1 3/16"	5 7/16"	1 4/16"	4"	4 1/16"	1 2/16"
10:30	FINISH	10 2/16"	11 5/16"	10 5/16"	10 4/16"	10 4/16"	10 12/16"
5 10:00	START	6" =	6" =	6" =	6" =	6" =	6" =
	= DIFF. =	4 2/16"	5 5/16"	4 5/16"	4 2/16"	4 1/16"	4 12/16"
11:00	FINISH	9 15/16"	11 3/16"	10 1/16"	10"	10"	10 4/16"
6 10:30	START	6" =	6" =	6" =	6" =	6" =	6" =
	= DIFF. =	3 3/16"	5 3/16"	4 1/16"	4"	4"	4 6/16"
11:30	FINISH	9 10/16"	10 15/16"	10 1/16"	10"	10 1/16"	10 6/16"
7 11:00	START	6" =	6" =	6" =	6" =	6" =	6" =
	= DIFF. =	3 10/16"	4 8/16"	4 1/16"	4"	4 1/16"	4 6/16"
12:00	FINISH	9 7/16"	10 12/16"	10 2/16"	10"	10"	10 3/16"
8 11:30	START	6" =	6" =	6" =	6" =	6" =	6" =
	= DIFF. =	3 7/16"	4 12/16"	4 2/16"	4"	4"	4 3/16"
	FINISH						
9	START						
	DIFF.		overall "A" perc rate				
	FINISH						
10	START						
	DIFF.						

APPLICANTS NAME: **LANGLEY HILL QUARRY** PHONE: **650-851-0126**

OWNERS NAME: KATZENSTEIN - David APN: 081-320-060

ADDRESS: 3540 LA Honda Rd SMC

SIZE OF PARCEL: _____ WATER SOURCE: WELL SUBDIVISION: _____

WET WEATHER TESTING REQUIRED? ✓ YES ___ NO DEPTH TO GROUND WATER: 16' AT 15'6" WATER SEEN

SOIL LOG: SANDY LOAM TOP SOIL TO SANDY CLAY SOIL TO SOME AREA'S WITH SANDY GRAVEL SOIL

ENVIRONMENTAL HEALTH

LAND USE FIELD & DATA REPORT

2000 Alameda de las Pulgas, Suite 100, San Mateo, CA 94403
Phone (650) 372-6200 Fax (650) 627-8244 www.smchealth.org/landuse

APN # 081-320-060 SR # 0011029	Date 10/28/13
Site Address 3540 La Honda Rd.	Owner
City La Honda Zip	Contractor LHQ

Presoak/Site

(6) holes deep. 4'-5' days ok to pour water and proceed with presoaking.

Site = Slope relatively flat, maintain 100' setbacks from creek, 50' from property lines. 100' setbacks from water wells.

Deep hole = 16', encountered H2O @ 15'6".

Soil profile = grayish sandy/creek gravel soil.

Note: Deep hole in #2 pere-hole.

* Wet-weather Test required

COUNTY STAFF

RECEIVED BY

ENVIRONMENTAL HEALTH
SAN MATEO COUNTY

LandUse Program
Service Request Form

REPORT#: 9618 (LUSR)

Assigned to: LOW
Date Assigned: 6/19/13

SERVICE REQUEST ID: SR0011030
RELATED FACILITY ID:

PE: 4220 SEPTIC SYSTEM PERCOLATION TEST

FACILITY NAME/SITE LOCATION:
KATZENSTEIN, DAVID
3540 LA HONDA RD LA HONDA

APN#: 081320060

PROPERTY OWNER:
KATZENSTEIN, DAVID
3540 LA HONDA RD
LA HONDA
6508687250

CONTRACTOR(REQUESTOR) INFORMATION:

KINNARE, ROBERT
3540 LA HONDA RD
LA HONDA

Phone: 650-747-9245

COMMENTS:
APPLICATION # 13-503 APPLIED FOR SITE EXAM AND PERC TEST
3 PLOT MAPS SUBMITTED

Notes:

ENVIRONMENTAL HEALTH
SAN MATEO COUNTY

LandUse Program
Service Request Form

REPORT#: 9618 (LUSR)

Assigned to: LOW
Date Assigned: 6/19/13

SERVICE REQUEST ID: SR0011029
RELATED FACILITY ID:

PE: 4218 SEPTIC SYSTEM SITE INVESTIGATION

FACILITY NAME/SITE LOCATION: APN#: 081320060
KATZENSTEIN, DAVID
3540 LA HONDA RD LA HONDA

PROPERTY OWNER:
KATZENSTEIN, DAVID
3540 LA HONDA RD
LA HONDA
6508687250

CONTRACTOR(REQUESTOR) INFORMATION:

KINNARE, ROBERT
3540 LA HONDA RD
LA HONDA

Phone: 650-747-9245

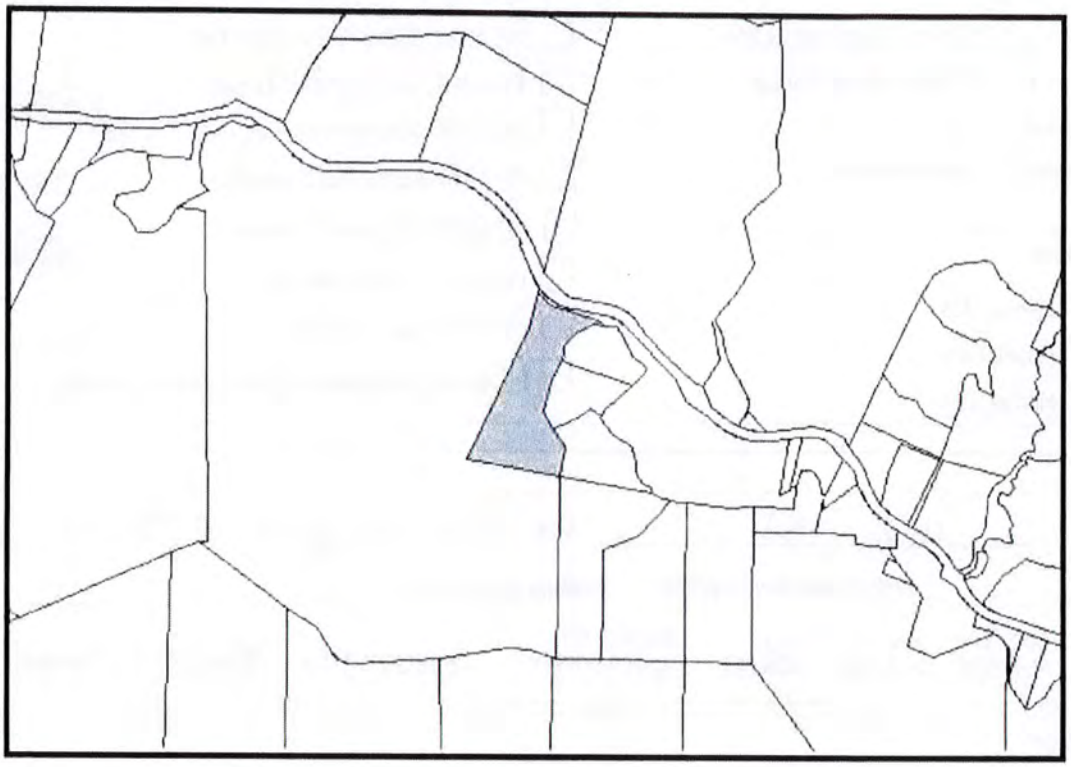
COMMENTS:
APPLICATION # 13-503 APPLIED FOR SITE EXAM AND PERC TEST
3 PLOT MAPS SUBMITTED

Notes:

6/19/13 Intake review completed. File to Pamela for site exam. DD

SELECTED PROPERTY

Situs: 3540 La Honda Rd , La Honda
Owner: Katzenstein David, 43 Pearce Mitchell Pl, Stanford, CA, 94305-
APN: 081320060



Property Owner Summary

APN:	081320060
Parcel ID:	255679
Situs:	3540 La Honda Rd
City:	La Honda
Owner:	Katzenstein David

Jurisdictions

Supervisorial:	3
Congressional:	18
Assembly:	24
Senatorial:	13
Election Precinct:	3360
City Name:	UNINCORPORATED
Zip Code:	94074
Mitigation Fee Area:	RURAL AREA SOUTH
Zoning:	PAD/CD

Tax Rate Area# 087029

GENERAL TAX RATE
COUNTY DEBT SERVICES
COUNTY FIRE PROTECTION STRUCTU
CABRILLO UNIFIED BOND
SM JR COLLEGE BD 2002
SM JR COLL BOND 2001 SER C
SAN MATEO COMM COLL 2005 SER B
BAY AREA AIR QUALITY MANAGEMEN
RESOURCE CONSERVATION DISTRICT
GENERAL COUNTY TAX
FREE LIBRARY
CABRILLO UNIFIED GEN PUR
SM JR COLLEGE GEN PUR
SM JR COLL BOND SER 2005 B
SM JR COLL BOND 2006 SER A
SM JR COLL BOND REF 2012
COUNTY HARBOR DISTRICT
COUNTY EDUCATION TAX

Print

Amt 2610.

INDIVIDUAL SEWAGE DISPOSAL SYSTEM PERMIT

13-503

COUNTY ENVIRONMENTAL HEALTH SERVICES DIVISION
2ADA DE LAS PULGAS, SUITE 100, SAN MATEO, CA 94403
372-6200 FAX (650) 627-8244 WWW.SMCHEALTH.ORG

CK NO 1151A
DATE 6-17-13

ENVIRONMENTAL HEALTH STAFF AT LEAST 2 WORKING DAYS IN ADVANCE

NEW CONSTRUCTION: (check one or more)

- [x] PE 4218 Site Exam
- [x] PE 4220 Perc Test
- [ ] PE 4219 Repair/Alteration
- [ ] PE 4214 Tank Replacement in same location
- [ ] PE 4299 Other: _____

Installation Permit: (check one)

- [ ] PE 4221 <2500 feet^2 House Size
- [ ] PE 4223 <3500 feet^2 House Size
- [ ] PE 4224 >3501 feet^2 House Size

Fees must be submitted with application (see land use fee guide)

- [ ] PE 4211 Tank Destruction
- [ ] PE 4225 Permit Appeal
- [ ] PE 4260 Filing Fee / Water Test
- [ ] PE 4216 Wet Weather Testing
- [ ] PE 4208 Alternative / Pres Dose Annual
- [ ] PE 4213 Alternative Systems
- [ ] PE 4212 Exception / Variance
- [ ] PE 4217 Permit Extension: _____
- [ ] PE 4210 Re-submittal: _____
- [ ] PE 4209 Certification of Perc Tester or Installer

SAN MATEO COUNTY ENVIRONMENTAL HEALTH
JUN 17 2013
RECEIVED

SITE INFORMATION

SITE ADDRESS: 3540 La Honda Rd City: San Gregorio Zip: 94074

APN: 081-320-060 (9 digit number required) Building Application #: _____

NUMBER OF BEDROOMS: _____ ADDITION TO HOUSE: [ ] YES [x] NO SOURCE OF WATER SUPPLY: [ ] PUBLIC WATER [x] WELL [ ] SPRING

PROPERTY OWNER INFORMATION

PROPERTY OWNER: David Katzenstein

Mailing Address: 43 Pearce Mitchell City: Stanford Zip: 94305

Phone: 650-868-7250 Email: DAVIDKK@STANFORD.EDU

CONTRACTOR INFORMATION (MUST BE CERTIFIED SEPTIC CONTRACTOR)

CONTRACTOR: Robert Kinnare Contractor License No. _____

Mailing Address: 3540 La Honda Rd. City: San Gregorio Zip: 94074

Phone: 650-747-9245 E-Mail: bobby.kinnare@gmail.com

San Mateo County Certified Percolation Tester OR Certified Installer: [ ] YES [ ] NO passed written percolation exam

Contractor Signature: _____ Date: June 7, 2013

Property Owner/ Agent Signature: _____ Date: June 7, 2013

(Attach a letter from the property owner providing authorization if signed by an agent)

*3 surveyed Plot Plans with Topography, must graphically indicate slopes greater than or equal to 50%. Submit plans to scale 1" = 20' preferred (not required for permit extension or tank abandonment/destruction)
*Method of Abandonment/Destruction on separate sheet (required for tank abandonment/destruction only)
*Property Owner / Agent's Signature (Attach a letter from the Property Owner providing authorization if signed by an Agent.)
*Contractor's Information and Signature

APPLICATION WILL BE VOID AFTER 1 YEAR FROM DATE OF SUBMITTAL
PERMITS ARE NONTRANSFERABLE AND MUST BE POSTED ON-SITE IN A CONSPICUOUS PLACE

GROUND-WATER LEVEL DETERMINATION

PROPOSED SEPTIC DISPOSAL SYSTEM

VIDA VERDE, 3540 LA HONDA ROAD

SAN GREGORIO, CALIFORNIA

GEOCONSULTANTS, INC.

Hydrogeology ▪ Ground-Water Exploration & Development ▪ Ground-Water Resources Management ▪

GEOCONSULTANTS, INC.
Hydrogeology • Ground-Water Exploration & Development • Ground-Water Resources Management •
1450 Koll Circle, Suite 114, San Jose, California 95112-4612
Phone: (408) 453-2541 Fax: (408) 453-2543
www.geo-consultants.com

Project G1703-01
May 29, 2014

Mr. Robert Kinnare
3540 La Honda Road
San Gregorio, CA 94070

RE: GROUND-WATER LEVEL DETERMINATION
PROPOSED SEPTIC DISPOSAL SYSTEM
VIDA VERDE, 3540 LA HONDA ROAD
SAN GREGORIO, CALIFORNIA

Dear Mr. Kinnare:

In accordance with Work Agreement No. 995, and as authorized by you, this letter presents the results of our evaluation of the potential impact of any ground-water occurrence on the proposed septic disposal system for expanded facilities at the subject site (Figure 1). This evaluation was made to fulfill a requirement of the San Mateo County Environmental Health Department that specifies that in certain areas of concern, either a "wet weather" winter determination be made of depth to ground water, or a report by a hydrogeologist concerning the highest anticipated ground-water level in the area be submitted in lieu of this determination. This past winter, the "wet weather" determination could not be made due to lack of rainfall, so alternatively, this hydrogeologic report has been prepared.

Our scope of work for this project involved the following tasks:

1. A review of available published and unpublished data on soil and ground-water conditions in the vicinity of the site was completed.

2. Septic system disposal conditions were reviewed with consultant Steve R. Hartsell, R.E.H.S.

3. Subsurface soil and hydrogeologic conditions in the proposed drainfield area and vicinity were evaluated by two exploratory test pits excavated on May 15, 2014. This activity was witnessed by an inspector from the San Mateo Environmental Health Department.

4. Information from the above tasks was evaluated, and this letter report prepared on our findings.

HYDROGEOLOGIC CONDITIONS

Surface

The project site is in the greater drainage area of San Gregorio Creek, and is located in an upland terrace area just east of the creek channel at an average elevation of about 60 feet (Hartsell, 2013). The region containing the site is underlain by geologic units consisting of older alluvial fan and stream terrace deposits generally composed of an unconsolidated mixture of silt, sand, and gravel, overlying mudstone bedrock of the Purisima Formation (Brabb and others, 1998).

Soils mapped in the proposed drainfield area include "Corralitos sandy loam, gently sloping" (Soil Conservation Service, 1961). On a regional basis the near-surface materials consist of "massive sand or sandy loam", grading downward to stratified sand and gravel, with some clay.

Subsurface

Subsurface soil and hydrogeologic conditions in the vicinity of the proposed drainfield were evaluated on May 15, 2014 by two exploratory test pits excavated by a backhoe at the locations shown on the Site Plan, Figure 1. The test pit logs are included in the Appendix to this report. The depth of exploration was 11.5 and 11 feet for test pits TP-1 and TP-2, respectively.

Test pit TP-1 was located immediately adjacent to the central portion of the proposed drainfield area. Sandy silt, exhibiting increasing sand content with depth was exposed from the surface to a depth of 9 feet. This unit was underlain by caving silty sand with occasional gravel and cobbles, and was in turn underlain at a depth of 11 feet by silty clay to the maximum depth explored of 11.5 feet. All soil units were dry to damp and no ground water was found.

Test pit TP-2 was excavated off the south end of the proposed drainfield area, at an elevation 2.4 feet lower than TP-1 as determined by hand level and stadia rod measurement. Fill, as noted on the log was exposed from the surface to a depth of 4 feet. From 4 feet to a depth of 11 feet, sandy gravel containing

large cobbles was noted. Ground water entered the test pit at 11 feet, the total depth explored.

CONCLUSIONS

There is no evidence such as "mottling" in the soil units that were exposed in test pit TP-1 that free ground water had ever been present within the depth interval explored of 11 feet. Outside of the proposed drainfield area, ground water was found in TP-2 at a depth of 11 feet, but this test pit is 2.4 feet lower in elevation than TP-1 as previously noted. We understand that the minimum separation required between the bottom of the septic drainfield chambers and the highest anticipated ground-water level is 8 feet. We conclude that with no indications of ground water having ever been present at a depth as shallow as 11 feet in TP-1 in the proposed drainfield area, that ground water should not be a factor in determining the feasibility of a drainfield at the proposed location.

LIMITATIONS

Geoconsultants, Inc. has provided its findings, recommendations, specifications, and professional advice after preparing such information in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the field of hydrogeology. This acknowledgment is in lieu of all warranties either express or implied.

Geoconsultants, Inc. does not guarantee nor warrant that a satisfactory septic disposal system can be developed at the subject site, or warrant or guarantee approval of the project by regulatory authorities.

It has been a pleasure performing this service for you. If you should have any questions regarding the data or conclusions, please do not hesitate to call.

PROFESSIONAL GEOLOGIST
JEREMY C. WIRE
CERTIFIED HYDROGEOLOGIST
No. 93
STATE OF CALIFORNIA

Sincerely,

GEOCONSULTANTS, INC.

Jeremy C. Wire
Hydrogeologist, HG-93

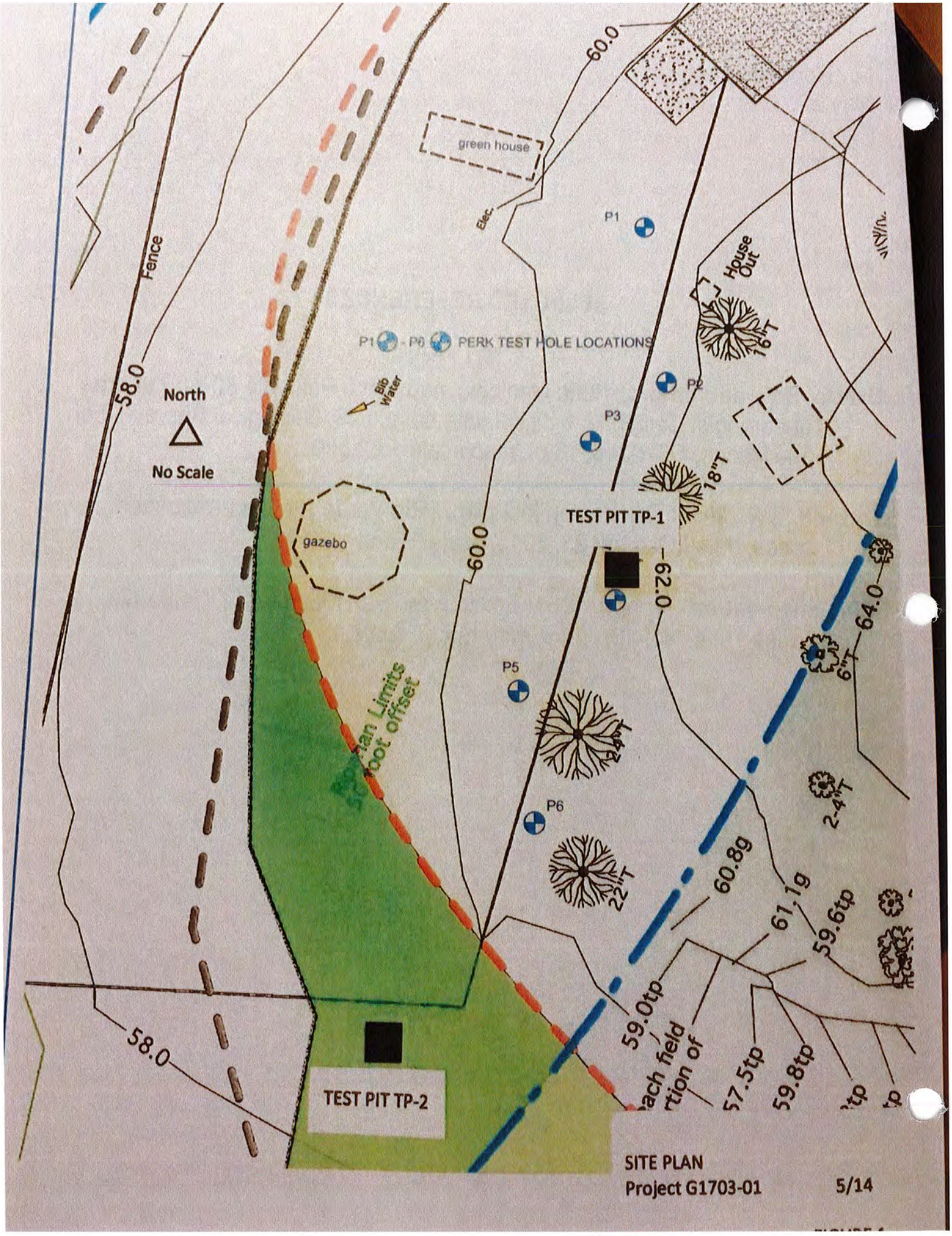
Copies: Addressee (2)
Stan Low, R.E.H.S. (1)
Steve R. Hartsell, R.E.H.S. (1)

SELECTED REFERENCES

Brabb, E.E., and others, 1998: Geologic map of the Palo Alto 30 x 60 degree quadrangle, California; a digital data base, U.S. Geological Survey Open File Report, OFR-348, 16 p., map scale 1:62,500. .

Hartsell, S.R., 2013: Percolation test plan, Vida Verde site plan--restricted zones, dated October 23, 2013, scale 1 inch = 20 feet.

Soil Conservation Service, 1961: Soil survey, San Mateo area, California; Series 1954, No. 13, 111 p. with maps, scale 1:15,800.


60.0
green house
Elec.
P1
House Out
16"T
Fence
58.0
P1 - P6 PERK TEST HOLE LOCATIONS
North
No Scale
Bio Water
P2
P3
18"T
TEST PIT TP-1
gazebo
60.0
62.0
64.0
6"T
P5
Reduction Limits 30 foot offset
24"T
2-4"T
P6
22"T
60.8g
61.1g
59.6tp
59.0tp
57.5tp
59.8tp
58.0
TEST PIT TP-2
SITE PLAN
Project G1703-01
5/14

TEST PIT LOG

TP-1

Depth (feet)	Description
0 - 4.5	Silt, sandy, grading to silty sand, dry, brown (ML-SM)
4.5 - 9	Silt, sandy, with increasing amount of sand with depth, dry to damp (ML-SM)
9 - 11	Sand, silty, with occasional gravel and cobbles, damp, brown (SM-GM)
11 - 11.5	Clay, silty, damp, dark brown (CL)

Total depth of excavation, 11.5 feet

May 25, 2014

GPS coordinates: N37°19.222', W122°20.639'

TEST PIT LOG

TP-2

Depth (feet)	Description
0 - 4	Fill, primarily rock, loose gravel, and bricks
4 - 11	Gravel, sandy, with large cobbles, increasing amount of sand with depth, damp (GW)

*Free ground water found at 11 feet

Total depth of excavation, 11 feet

May 25, 2014

GPS Coordinates: N37°19.210', W122°20.639'

ATTACHMENT B

Manufacturer Information
AdvanTex AX-20

Commercial Treatment Systems

Design Considerations for AdvanTex® Treatment Systems

Table of Contents ..... Page

Equations and Parameters Frequently Used In This Design Criteria

For recommendations regarding minimum hydraulic retention times, primary tankage, and configurations, see Table A, page 22.

Determining mass load in AdvanTex® systems *(For complete information on how to use these equations, see page 23.)*

Mass Load (lbs/day)	Mass Load (kg/day)
Concentration (mg/L) × (8.34 x 10^{-6}) × Flow (gpd)	Concentration (mg/L) × (0.001) × Flow (m^3/day)

Determining standard AdvanTex® stage sizing *(For complete information on how to use these equations, see pages 15-16.)*

	Design Avg (US Units)	Design Max. (US Units)	Design Avg (SI Units)	Design Max. (SI Units)
Based on Organic Loading Rate (OLR)	0.04 lbs BOD_5/ft^2•d	0.08 lbs BOD_5/ft^2•d	0.2 kg BOD_5/m^2•d	0.4 kg BOD_5/m^2•d
Based on Hydraulic Loading Rate (HLR)	25 gpd/ft^2	50 gpd/ft^2	1 m^3/m^2•d	2 m^3/m^2•d
Based on Total Nitrogen Loading Rate (TNLR)	0.014 lbs TN/ft^2•d	0.028 lbs TN/ft^2•d	0.07 kg TN/m^2•d	0.014 kg TN/m^2•d
Based on Ammonia Loading Rate (ALR)	0.01 lbs NH_3-N/ft^2•d	0.02 lbs NH_3-N/ft^2•d	0.05 kg NH_3-N/m^2•d	0.1 kg NH_3-N/m^2•d

Determining second stage AdvanTex sizing in two-stage systems *(For complete information on how to use these equations, see pages 16-17.)*

	Design Avg (US Units)	Design Max. (US Units)	Design Avg (SI Units)	Design Max. (SI Units)
Based on Organic Loading Rate (OLR)	0.02 lbs BOD_5/ft^2•d	0.04 lbs BOD_5/ft^2•d	0.1 kg BOD_5/m^2•d	0.2 kg BOD_5/m^2•d
Based on Hydraulic Loading Rate (HLR)	75 gpd/ft^2	125 gpd/ft^2	3 m^3/m^2•d	5 m^3/m^2•d
Based on Total Nitrogen Loading Rate (TNLR)	0.07 lbs TN/ft^2•d	0.014 lbs TN/ft^2•d	0.035 kg TN/m^2•d	0.07 kg TN/m^2•d
Based on Ammonia Loading Rate (ALR)	0.005 lbs NH_3-N/ft^2•d	0.01 lbs NH_3-N/ft^2•d	0.025 kg NH_3-N/m^2•d	0.05 kg NH_3-N/m^2•d

Determining anticipated treatment performance from standard AdvanTex systems *(For complete information on how to use these equations, see pages 25-25.)*

Based on BOD_5

$$BOD_{5e} = BOD_{5i} \times (1 - C_{BR})$$

where: BOD_{5e} = BOD_5 effluent from standard AdvanTex stage
BOD_{5i} = BOD_5 primary treated effluent value
C_{BR} = 0.90 coefficient

Based on TKN or NH_3-N

$$TKN_e = TKN_i \times (1 - C_{NR})$$

where: TKN_e = TKN effluent from standard AdvanTex stage
TKN_i = TKN primary treated effluent value
C_{NR} = 0.95 coefficient

Based on NO_3

$$NO_{3e} = (TKN_i - TKN_e) \times (1 - C_{DNR})$$

where: NO_{3e} = NO_3 effluent from standard AdvanTex stage
TKN_i = TKN primary treated effluent value
TKN_e = TKN effluent
C_{DNR} = 0.70 coefficient

Based on TN

$$TN_e = TKN_e + NO_{3e}$$

where: TN_e = TN effluent from standard AdvanTex stage
TKN_e = TKN effluent from standard AdvanTex stage
NO_{3e} = NO_3 effluent from standard AdvanTex stage

Determining anticipated treatment performance for total nitrogen from post-anoxic AdvanTex treatment stages

(For complete information on how to use these equations, see page 26.)

$$TN_{PAe} = TKN_e + NO_{3e} \times (1 - C_{DNR})$$

where: TN_{PAe} = TN effluent from post-anoxic stage
TKN_e = TKN effluent from standard Advantex stage
NO_{3e} = NO_3 effluent from standard AdvanTex stage
C_{DNR} = 0.70 coefficient

Orenco Systems® Inc., 814 Airway Ave., Sutherlin, OR 97479 USA • 800-348-9843 • 541-459-4449 • www.orenco.com

Introduction

Orenco's AdvanTex® Treatment Systems were developed for the long-term processing of domestic- and commercial-strength wastewater to advanced treatment levels. The heart of all AdvanTex systems is a multiple-pass, packed-bed, fixed-film media filter that reliably provides high-quality effluent in a wide range of applications. These systems have undergone numerous national and international testing protocols, as well as multiple third-party field verification programs. This manual provides design information and guidance for commercial applications using an AdvanTex Treatment System. For other applications, contact Orenco or your local Orenco Dealer for more information.

AdvanTex® Model Descriptions

Three AdvanTex models are typically used in commercial applications. Your choice of model depends on system sizing requirements and site characteristics. All three operate in the manner described in the Treatment Process Description, and all perform similarly. For exact dimensions and specific treatment configurations, see AdvanTex Treatment System drawings.

AdvanTex AX20

AX20 Specifications

Length	91 inches (2311 mm)
Width	40 inches (1016 mm)
Height	31 inches (787 mm)
Dry weight	400 lbs (181 kg)
Treatment surface area	20 ft² (1.9 m²), nominal
Installation footprint	25 ft² (1.9 m²), actual
Installation methods	Partial burial or bermed installation; 6 inches (150 mm) above grade, minimum; antifloatation flanges available for areas with high groundwater
Recirculation-blend tankage	External
Recirculation method	Recirculating splitter valve

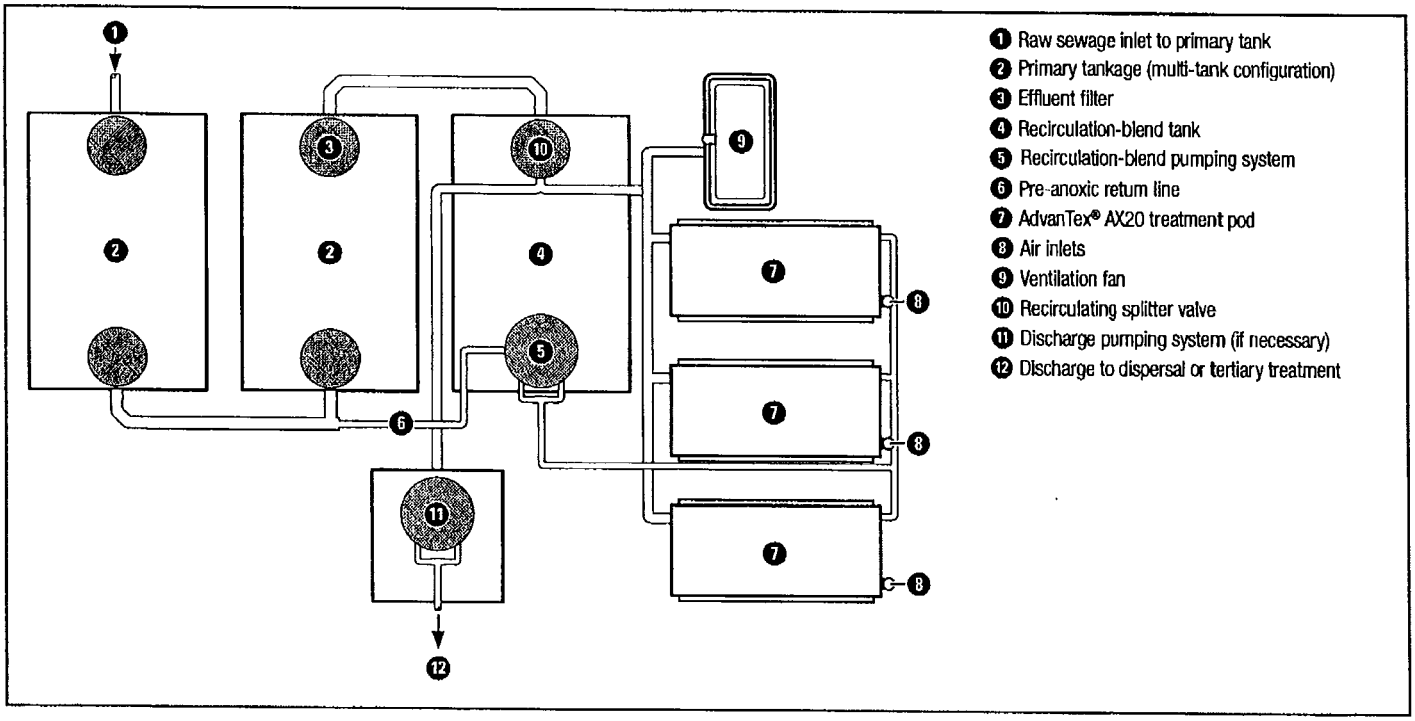


Figure 1. Example of an AdvanTex AX20 Commercial Treatment System

AdvanTex AX100

AX100 Specifications:

Length	191 inches (4851 mm)
Width	94 inches (2388 mm)
Height	42 inches (1067 mm)
Dry weight	1760 lbs (798 kg)
Treatment surface area	100 ft² (9.3 m²), nominal
Installation footprint	128 ft² (11.9 m²), actual
Installation methods	Partial burial or bermed installation; 6 inches (150 mm) above berm, minimum; 9 inches (230 mm) below natural grade, maximum
Recirculation-blend tankage	External
Recirculation method	Recirculating splitter valve

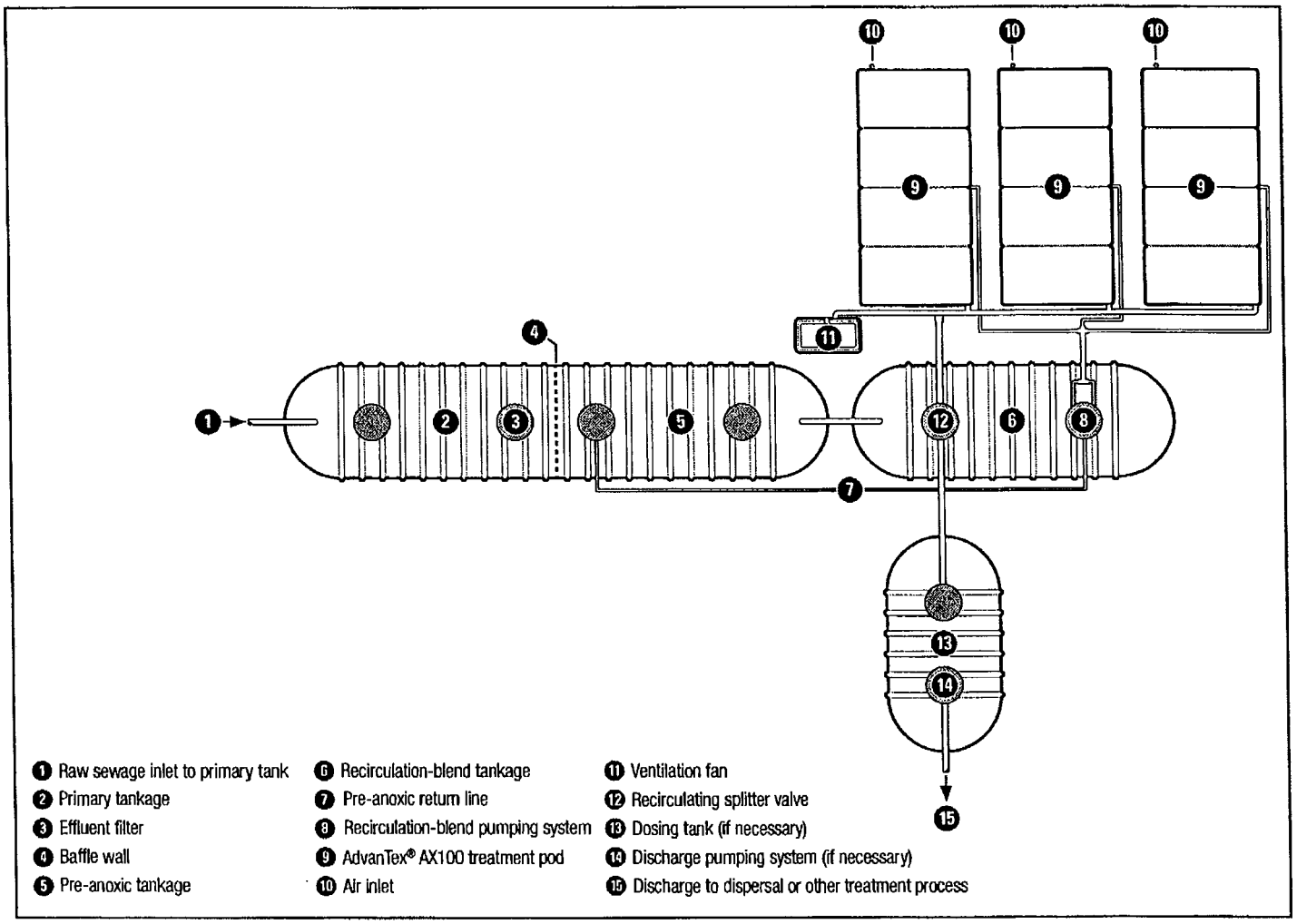


Figure 2. Example of an AdvanTex AX100 Commercial Treatment System

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AdvanTex AX-Max™

AX-Max Specifications:

Length	14-42 ft (4.2-12.8 m)
Width	90 inches (2286 mm)
Height	97 inches (2464 mm)
Dry weight	Variable, up to 12,000 lbs (5440 kg)
Treatment surface area	25-300 ft² (2.3-27.9 m²), nominal
Installation footprint	112-336 ft² (10.4-31.2 m²), actual
Installation methods	Partial burial or bermed installation, or free-standing installation; 24-36 inches (610-910 mm) above grade or berm for ease of maintenance; antifloatation available for areas with high groundwater
Recirculation-blend tankage	Included
Recirculation method	Tank baffle wall, recirc-return valve

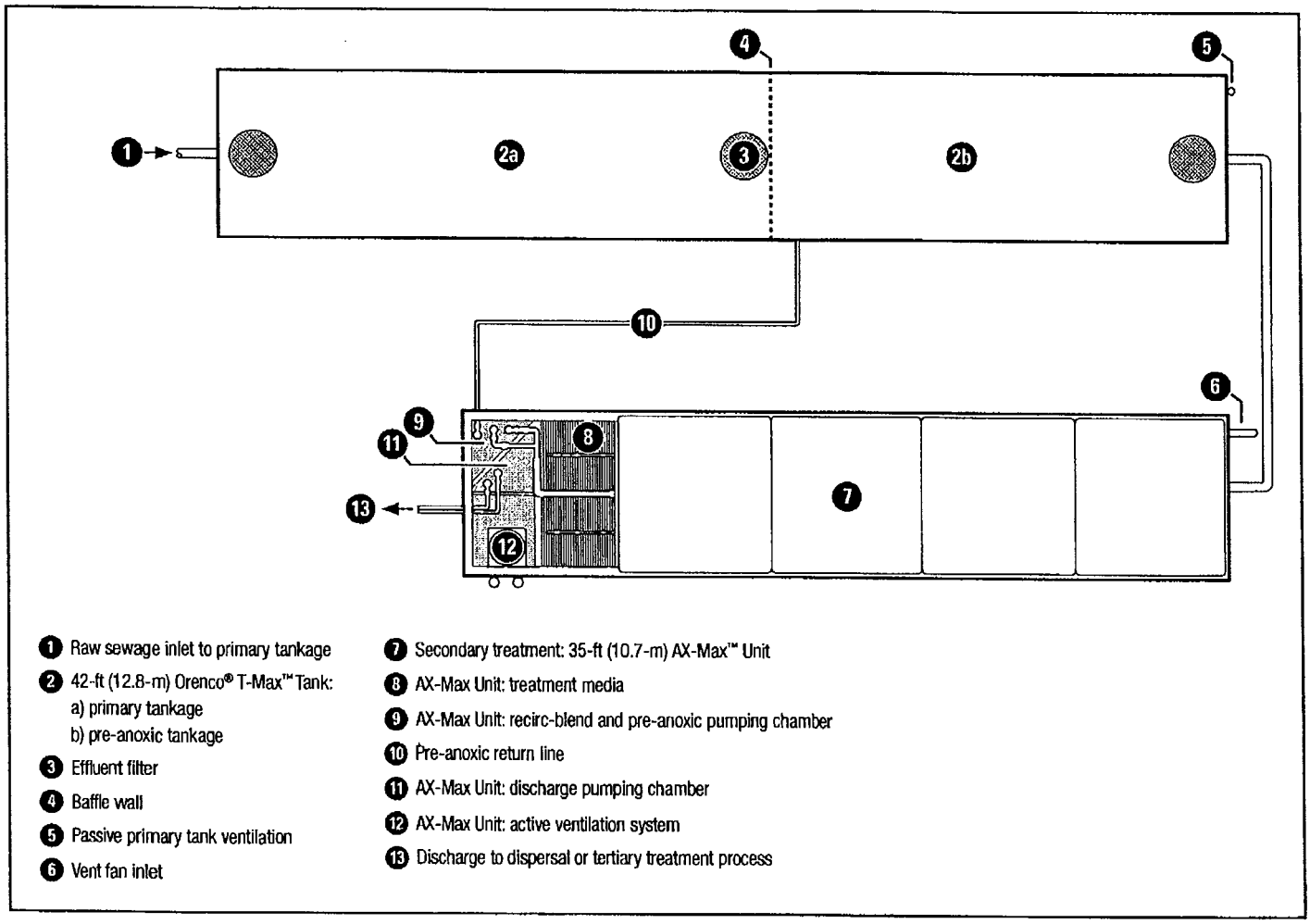


Figure 3. Example of an AdvanTex AX-Max Commercial Treatment System

Design Basis

To ensure that the system is designed properly for a given application, it is critical to first determine the design basis. The design basis for any treatment system consists of careful evaluation of several parameters that control the system's design and subsequent performance. Orenco's "*Engineered Project Questionnaire,*" NFO-ATX-ADM-2, is available to assist in identifying and characterizing these parameters. It can be downloaded from Orenco's Document Library at www.orenco.com, or you may contact Orenco or your local Orenco Dealer for a copy. This document provides a list of the typical design parameters necessary to determine the suitability of Orenco products to a given project and for forming the system's design basis.

Average Day and Maximum Day Flows

Flows may be defined or calculated differently by application and local regulation; however, as used in this document:

Design Average Flow **(Q_A)** is the average of the daily volume to be received for a continuous 12-month period expressed as a volume per day. For facilities having critical seasonal high hydraulic loading periods (e.g., recreational areas, campgrounds) the design average is based on the daily average flow during the seasonal period.

Design Maximum Day Flow **(Q_M)** is the largest volume of flow to be received during a continuous 24-hour period expressed as a volume per day. The Design Maximum Day Flow is highly dependent on the application and collection technology used. For Effluent Sewer (STEP), Grinder Sewer, and Vacuum Sewer, a typical value is two times the Design Average Flow ($2Q_A$).

For Conventional Gravity Sewer applications, a typical value for QM is four times the Design Average Flow ($4Q_A$) for new construction and can range to over ten times ($10Q_A\pm$) for existing systems. Make sure to carefully evaluate any existing flow information and regulatory requirements when establishing this design parameter.

Primary-Treated Effluent Wastewater Strength

Organic Constituents in Wastewater

The two primary organic constituents in wastewater used in determining applicability and sizing of AdvanTex Treatment Systems are biochemical oxygen demand (**BOD_5**) and total suspended solids (**TSS**). These constituents are typically quantified either in raw wastewater or after the primary treatment stage. In order to determine the waste load to the AdvanTex Treatment System, it is necessary to determine the constituent concentrations after primary treatment. These constituent concentrations are referred to as primary-treated effluent throughout this document, and all percent reduction estimates are calculated relative to these concentrations. If these constituents are provided as raw wastewater values, it is the responsibility of the designer to determine the appropriate primary treatment requirements to achieve the primary-treated effluent values used in the design. Industry experts typically estimate that appropriate primary treatment (see Appendix A for primary tank sizing recommendations) will provide 50% reduction of BOD_5 (down to a minimum of 150 mg/L) and 90% reduction of TSS (down to a minimum of 50 mg/L).

Nitrogen Constituents in Wastewater

The principal forms of nitrogen found in wastewater are Organic Nitrogen (**Organic-N**), Ammonia Nitrogen (**NH_3-N**), Ammonium Nitrogen (**NH_4-N**), Nitrite Nitrogen (**NO_2-N**), and Nitrate Nitrogen (**NO_3-N**). These are expressed either individually or as components of the following:

- **Total Kjeldahl Nitrogen (TKN)**, which is the sum of Organic-N + NH_3-N
- **Total Inorganic Nitrogen (TIN)**, which is the sum of NH_3-N + NO_2-N + NO_3-N
- **Total Nitrogen (TN)**, which is the sum of TKN + NO_2-N + NO_3-N

As with the organic constituent concentrations, the nitrogen constituent concentrations must be quantified after the primary treatment stage to determine waste load to the AdvanTex Treatment System and are listed as primary-treated effluent throughout this document. A thorough understanding of the nitrogen cycle and how it works within the wastewater system is important when designing a system to treat for these parameters. A brief description of the processes follows:

<u>Ammonification</u>

Nitrogen is usually introduced into the wastewater system as Organic-N and NH_4-N. Organic-N (including feces, urea, and other animal and vegetable matter) in wastewater is converted into NH_4-N by the process of ammonification. In ammonification, proteins, amino acids, and other nitrogen-containing compounds are biochemically degraded by heterotrophic bacteria. Ammonification typically occurs in primary tankage and transport lines, as well as in the secondary treatment process. Because of this, a raw wastewater ammonia measurement may be significantly lower than the true value. In these instances, TKN is a better measure of overall nitrogen content and should be used when determining waste load to the AdvanTex Treatment System.

Nitrification and Denitrification

Once primary treated effluent is introduced into the secondary treatment process, nitrogen removal occurs first by nitrification and then by denitrification. In the first step of nitrification, an ammonium-oxidizing autotrophic bacteria, (Nitrosomonas), converts ammonium to nitrite. In the second step of nitrification, a nitrite-oxidizing bacteria, (Nitrobacter), converts nitrite to nitrate. Both of these processes occur under aerobic conditions. Lastly, denitrification occurs when nitrate is converted to nitrogen gas by heterotrophic bacteria under anoxic conditions (DO < 0.5 mg/L).

Therefore, treatment for NH_3-N and TKN occurs through an aerobic process while treatment for NO_3-N, TIN, and TN occurs through a combination of aerobic and anoxic processes.

For more information about the nitrogen process in wastewater, see Metcalf & Eddy's "*Small and Decentralized Wastewater Management Systems,*" 4th Edition (1999). For information on pH and temperature effects on Nitrification and Denitrification, see *pH Effect on Nitrification* and *Temperature Effect on Nitrification and Denitrification* in the Design Considerations section on page 19.

Discharge Treatment Levels and Sampling Requirements

Discharge treatment levels and sampling requirements play a significant role in treatment facility design. Secondary treatment (effluent concentrations of BOD_5 and TSS of ≤ 30 mg/L based on a 30-day average) is a simple process typically requiring only a single-stage AdvanTex Treatment System. Additionally, advanced secondary treatment (BOD_5 and TSS of ≤ 10 mg/L based on a 30-day average) can typically be accomplished in the same manner. However many permits are now requiring some higher level of nitrogen treatment as well as providing values of "not to exceed" in place of "30-day average" or "30-day arithmetic mean." In these instances a safety factor of some kind is typically applied (or additional processes added) so that the discharge parameters are not exceeded even under maximum day flow conditions or maximum day primary-treated effluent concentrations.

Likelihood of System Expansion and Potential Permit Changes

Permits are typically limited in duration, and over the past two decades treated effluent discharge requirements have become stricter. In fact, many permit renewals are now asking for measurement of various constituents that were not part of the original treatment facility design. When designers are planning for future expansion, or for future modifications to permits, Orenco recommends using incremental engineering to plan for and provide space for potential future treatment upgrades. By understanding the various stages used in AdvanTex Treatment Systems, designers can lay out the treatment facility in a manner that allows for additional stages in the event that a planned build-out or future permit modification requires it. Please see sections titled *Treatment System Configurations* and *Process Stages* for more information.

Highly Variable or Seasonal Flow Considerations

Hundreds of AdvanTex systems are installed in parks, campgrounds, resorts, and lodges that experience highly variable flows (or complete shutdowns for long periods) due to seasonal use. AdvanTex systems are ideally suited for these applications. Shortly after the system is placed in service, a thin bacterial film develops in the upper portion of the textile media, and removal of BOD_5/TSS occurs the first day after being in service. Independent tests show that AdvanTex systems are capable of removing > 85% $cBOD_5$ and > 97% TSS within the first few days of operation. Many other technologies (especially suspended growth technologies) require weeks to treat to this level and struggle during periods of low loading.

The Operations & Maintenance (**O&M**) manual provided with each AdvanTex system can help guide the operator on appropriate O&M for systems with highly variable or seasonal flows, including the use of trending to automatically adjust recirculation ratios. For more information on determining which O&M method is best for a particular highly variable or seasonal flow application, contact Orenco.

Application Types

Applications can typically be classified into one of seven application types, each characterized by waste streams and usage characteristics. Table 1 lists each application type, examples, the criteria used to establish each type, and associated design notes.

It is important to note that the flow and constituent concentration ranges associated with each application type represent Orenco's observations from similarly classified applications. However, they do not represent actual flows and constituent concentrations of the applications at hand. The engineer is responsible for ensuring that wastewater in each project is properly characterized and, whenever possible, waste streams should be sampled and actual values used in the design.

Table 1. Application Types

Application Types	Examples	Characterization Criteria	Design Notes
Type 1: *Domestic Primary-Treated Effluent Quality (Blend of Black and Grey Water Waste)*	• Apartments • Condominiums • Mobile Home Parks • Municipal Systems • Planned Communities • Residential Subdivisions • Work Camps	• Waste streams are residential in nature • Contributions come from both black and grey water sources	• *Some "Type 1" applications have flow contributions that bias them toward another application type (e.g., communities serving primarily commercial core areas with minimal residential connections, or work camps with commercial kitchens serving meals for workers from other camps).* • *With appropriate primary treatment, primary-treated effluent typically ranges from:* – BOD_5 140-250 mg/L – TSS 40-140 mg/L – TKN 50-80 mg/L
Type 2: *Primarily Black Water Waste*	• Airport Facilities • Campgrounds • Fire Departments • Golf Courses • Manufacturing Facilities • Offices • Parks • Public Toilets/Rest Areas • RV Parks • Ski Resorts • Visitor Centers	• Waste streams are commercial in nature • Contributions come from primarily black water sources	• *Some "Type 2" applications have flow contributions that bias them toward another application type (e.g., facilities with restaurants or RV parks or campgrounds with flow contributions from dump stations exceeding 20% of the daily flow).* • *With appropriate primary treatment, primary-treated effluent typically ranges from:* – BOD_5 300-500 mg/L – TSS 80-250 mg/L – TKN 90-200 mg/L
Type 3: *Primarily Black Water Waste with Surge Flows*	• Churches • Schools	• Waste streams are commercial in nature and primarily from black water sources • Flows and primary treated effluent quality are heavily dependent on the facilities (e.g., schools with cafeterias and shower facilities vary significantly from those without)	• *Due to variations in daily waste volumes, flow equalization tankage should be strongly considered in order to optimize the treatment process.* • *With appropriate primary treatment, primary-treated effluent typically ranges from:* – BOD_5 300-500 mg/L – TSS 80-250 mg/L – TKN 90-150 mg/L
Type 4: *Primarily Black Water Waste with Pharmaceuticals or Toxic Inhibitors*	• Hospitals • Retirement Facilities • Veterinary Clinics	• Waste streams are commercial in nature and primarily from black water sources	• *Antiblotics and other pharmaceutical products in the waste stream may impair microorganism health in the primary tank and the AdvanTex unit.* • *The designer should note on the plan set that the wastewater treatment system can be negatively affected by the introduction of these substances and care should be taken to limit their discharge.* • *With appropriate primary treatment, primary-treated effluent typically ranges from:* – BOD_5 300-700 mg/L – TSS 100-350 mg/L – TKN 70-120 mg/L

Application Types	Examples	Characterization Criteria	Design Notes
Type 5: *Black Water with Restaurant Waste*	• Bars/Taverns • Casinos • Delis • Gas Stations • Hotels/Motels • Restaurants • Resorts • Shopping Centers • Strip Malls	• Waste streams are commercial in nature • Contributions range from primarily black water with some kitchen sources to primarily kitchen sources with some black water • Raw wastewater has significant grease and oil (G&O) contributions	• *Careful evaluation is required to properly size AdvanTex systems for "Type 5" applications. Waste strength varies significantly depending on the hours of business, menu, take-out vs. dine-In eating, dining seat turnover rate, catering and event hosting activities, etc.* • *Restaurant applications require a pre-anoxic return loop (see Process Stages section on page 12).* • *Restaurants and applications with greater than a 50% flow contribution from restaurants and BOD_5 values greater than 800 mg/L will require the use of pre-aeration and clarification (see Process Stages section on page 13).* • *Grease tanks must be sized to ensure that the maximum G&O contribution to the secondary treatment system does not exceed 25 mg/L. Recommended grease tank sizes are provided in Appendix A.* • *Kitchen dishwashing appliances used in conjunction with AdvanTex treatment must be high-temperature appliances.* • *For existing systems with low-temperature, chemical-type appliances, pre-aeration will be necessary.* • *With appropriate primary treatment, primary-treated effluent typically ranges from:* – BOD_5 300-1000+ mg/L – TSS 80-300 mg/L – TKN 90-200+ mg/L
Type 6: *Polishing Bioreactors*	• Organic Removal • Ammonia Removal	• Waste streams have typically been treated to secondary levels prior to polishing unit • These are sized based upon the organic and or ammonia removal loading rates provided in this document.	• *Polishing of lagoon or holding pond effluent requires removal of algae prior to introduction to the polishing bioreactor system.* • *Contact Orenco for support on all high-strength waste projects.*
Type 7: *High Strength Process Waste*	• Wineries • Breweries • Dairies • Food Processing Facilities • Slaughterhouses	• These are complex waste streams requiring careful evaluation	• *Chemical cleaning processes used in facilities that produce high-strength process waste must be addressed to ensure they are compatible with AdvanTex biological treatment processes.* • *All Type 7 applications require the use of a pre-anoxic return loop (see Process Stages).* • *All Type 7 applications will require the use of pre-aeration and clarification (see Process Stages).* • *Additional treatment processes, such as bioaugmentation (the addition of necessary nutrients required to speed up the rate of degradation of a contaminant), are often necessary in addition to the secondary treatment system.* • *Contact Orenco for support on all high-strength waste projects.*

Treatment System Configurations

This section shows the three most common treatment system configurations using an AdvanTex Treatment System. Determination of the appropriate configuration is based upon flow, primary treated effluent constituent concentrations, and discharge permit requirements.

Each configuration shows the applicable treatment stages utilized and where to find the information to properly size the systems.

For systems with restaurant waste contributions, adequate grease tankage or similar means are necessary to ensure that the maximum grease contribution to the secondary treatment system does not exceed 25 mg/L greases and oils. Levels above 25 mg/L will tend to clog the textile sheets prematurely, preventing adequate aeration and uniform delivery of wastewater constituents for effective biological breakdown.

The appropriate sizing equations are referenced in each figure. When multiple equations are referenced, each calculation should be performed and the largest resulting textile surface area must be used in the design. Please contact Orenco or the nearest Orenco Dealer for support regarding the appropriate configuration or sizing criteria.

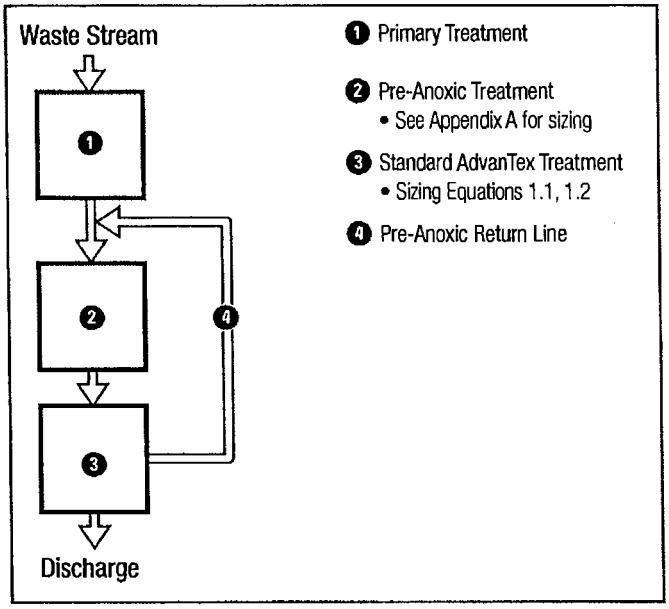


Figure 4. Treatment Diagram for Removal of Organics

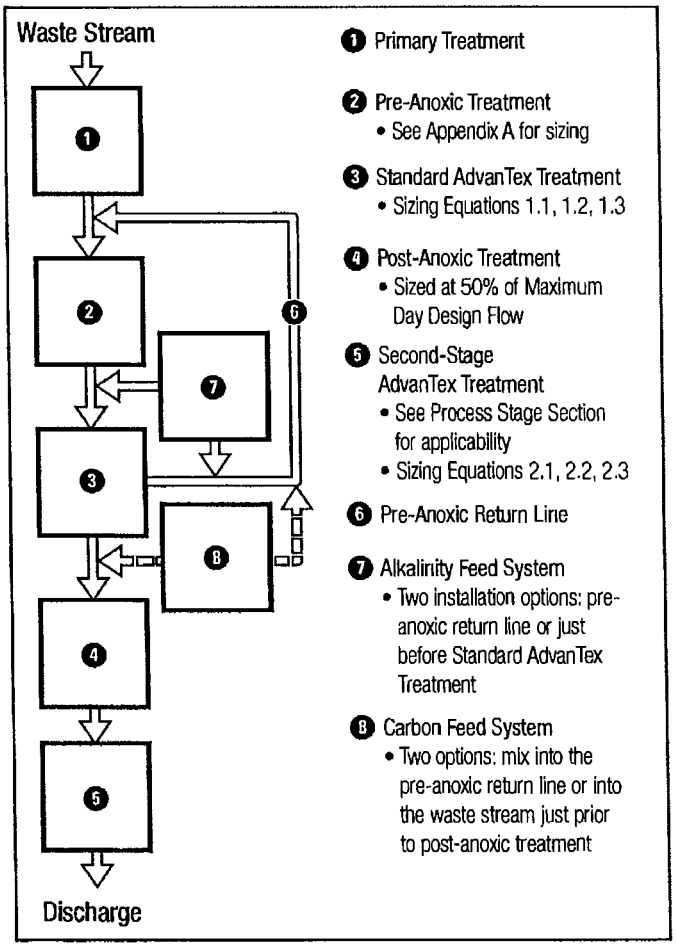


Figure 5. Treatment Diagram for Advanced Removal of Nitrogen

Standard AdvanTex Systems

Use for BOD_5/$cBOD_5$, TSS, and Nitrogen Discharge Limits

Organic removal is the simplest form of advanced treatment, typically requiring only primary and secondary treatment. When loaded at or below the applicable loading rates, standard AdvanTex Treatment Systems typically achieve treatment levels of < 10 mg/L BOD_5/$cBOD_5$ and TSS (based on 30-day average or 30-day arithmetic mean), and they typically provide reduction of total nitrogen (TN) > 60% and removal of ammonia (NH_3-N) of 95% (range 90-99%).

Figure 4 shows the typical configuration for discharge limits associated with these constituents. See the AdvanTex Unit Sizing section of this document for the sizing equation listed.

A pre-anoxic stage is recommended for all organic-only removal applications and it is required for systems with high-strength primary treated effluent (Application Types 5 & 7).

A two-stage AdvanTex system will be necessary for systems with discharge limits of NOT TO EXCEED 10 mg/L BOD_5/$cBOD_5$ or for discharge limits of ≤ 5 mg/L BOD_5/$cBOD_5$ based on a 30-day average or 30-day arithmetic mean.

AdvanTex Systems for the Advanced Removal of Nitrogen

Use for Systems with Permits Requiring Discharge Limits of 60-80% Removal of Total Nitrogen, Total Inorganic Nitrogen, or Nitrate Nitrogen

For wastewater systems with permit limits for TN, TIN, or NO_3-N requiring greater than 60% nitrogen reduction, pre-anoxic and post-anoxic treatment stages are needed, as well as the possible addition of both supplemental carbon and alkalinity. Figure 5 shows the typical configuration for systems with discharge limits.requiring this level of treatment.

The nitrification occurring in the AdvanTex treatment stage is heavily influenced by the alkalinity required to buffer the process (7.14 mg/L alkalinity per 1 mg/L of ammonia-N). pH levels of 7.5 to 8.5 are ideal for complete nitrification and should be buffered to remain above a pH of 7 for all applications. The use of the pre-anoxic stage benefits overall operation of the system, since denitrification in this stage will return as much as 50% of the alkalinity consumed during nitrification. Even so, a supplemental alkalinity feeder may be necessary immediately preceding the AdvanTex treatment stage, to ensure sufficient alkalinity for nitrification.

Carbon addition should be balanced to the wastewater flows to ensure carbon-to-nitrogen (C:N) ratios are appropriate. C:N ratios need to be greater than 4:1 and preferably in the 6:1 range to ensure that denitrification occurs. Carbon is added in the post-anoxic stage to maintain the proper carbon-to-nitrogen ratio. For applications requiring greater than 80% removal of nitrogen, carbon addition in the pre-anoxic stage is also recommended.

See *pH Effect on Nitrification* and *Temperature Effect on Nitrification and Denitrification* in the Design Considerations section on page 19.

For permits with stringent organic removal requirements, an AdvanTex polishing unit is used after the post-secondary anoxic stage to remove excess carbon ($cBOD_5$) prior to discharge.

For TN, TIN, and NO_3-N discharge requirements of < 10 mg/L, or for applications with primary treated effluent TN values of > 150 mg/L and greater than 80% nitrogen removal requirements, it will be necessary to integrate a denitrification upflow filter, moving bed bioreactor (**MBBR**), or other denitrification technology into the treatment process. Contact Orenco for support prior to designing a system to meet these requirements.

AdvanTex Systems for the Advanced Removal of Ammonia

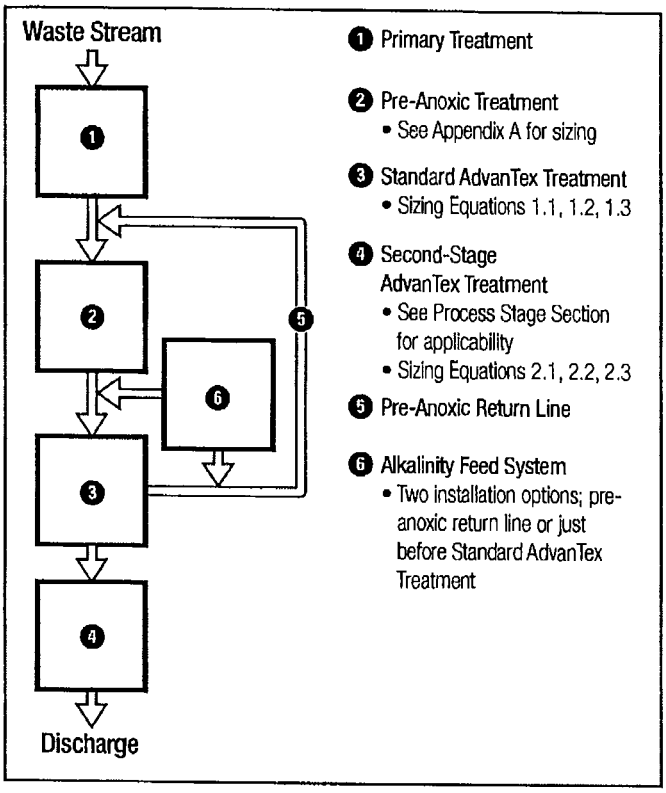


Figure 6. Treatment Diagram for Advanced Removal of Ammonia

Use for Systems with Permits Requiring Discharge Limits > 95% Removal of Ammonia or TKN

For wastewater systems requiring ammonia removal due to restrictive ammonia nitrogen (NH_3-N) or TKN discharge limits (>95% removal), a Second Stage AdvanTex system will be necessary following standard AdvanTex treatment. Figure 6 shows the typical configuration for discharge limits associated with this level of treatment.

The nitrification occurring in the AdvanTex system is heavily influenced by the alkalinity required to buffer the process (7.14 mg/L alkalinity per 1 mg/L of ammonia-N). pH levels of 7.5 to 8.5 are ideal for complete nitrification and should be buffered to remain above a pH of 7 for all applications. Immediately preceding the AdvanTex treatment stage, a supplemental alkalinity feeder may be necessary to ensure sufficient alkalinity for nitrification to break down ammonia.

Using a pre-anoxic stage helps buffer pH, as denitrification in this stage will return as much as 50% of the alkalinity consumed during nitrification. In addition, readily available BOD is consumed in the pre-anoxic denitrification stage, reducing the BOD load to the secondary treatment unit. Most application types provide adequate carbon in the incoming stream to achieve denitrification and subsequent alkalinity return, but in the design it is best to ensure that there is enough alkalinity added without relying on this occurrence. As operational data becomes available for the specific treatment system – demonstrating the return of alkalinity through denitrification – alkalinity feed rates can be adjusted downward.

See *pH Effect on Nitrification* and *Temperature Effect on Nitrification and Denitrification* in the Design Considerations section on page 19.

Process Stages – AdvanTex Treatment Systems

Primary Treatment Stage

Purpose and Description:

The primary treatment stage is designed to collect wastewater; segregate settleable and floatable solids (sludge and scum); accumulate, consolidate and store solids; digest organic matter; and discharge primary-treated effluent. Passive, energy-free primary tankage provides the most cost-efficient method of primary treatment available for nonindustrial sewage; BOD removal of >50% and TSS removal of > 90% (when using an effluent filter) are typically accomplished with passive primary treatment.

The primary treatment stage can be configured in several ways, including single- or multiple-compartment tanks, single tanks with meandering baffles (partitions), or multiple tanks in series. Some systems may utilize solids separation devices. Primary treatment includes effluent screening, and effluent may be discharged to the secondary treatment stage via gravity or pump.

Design Notes and Special Considerations:

The volume and configuration of primary tankage or inclusion of other primary treatment devices (e.g. solids separation) is dependent on the system, the application type, and the expected waste strength.

When using tankage for primary treatment, proper sizing ensures adequate volume for the development of the necessary microbial environments, appropriate sludge and scum storage, and surge volume. For recommendations on sizing of primary tankage, see Appendix A. The tank's structural soundness and watertightness are vital to the system's performance, and all tanks should be reviewed by the engineer and water-tested in the field after installation.

Pre-Anoxic Treatment Stage

Purpose and Description:

This process consists of recirculating a portion of the recirc-blend (or filtrate) from the AdvanTex secondary treatment system to an anoxic zone within the initial primary solids settling/collection chamber or, preferably, in a separate pre-anoxic tank. A pre-anoxic treatment stage tends to balance and lower concentrations by blending primary treated effluent with AX filtrate. It also provides an environment for denitrifying a portion of the nitrified filtrate.

The use of a pre-anoxic stage benefits all applications and is essential for those applications with high-strength waste (organic or nitrogen concentrations) and restrictive permit limits, as well as applications in which higher-quality effluent and enhanced overall removal performance are desired.

Design Notes and Special Considerations:

Orenco recommends the use of a pre-anoxic stage for all projects. For recommendations on sizing of pre-anoxic tankage (typically 1 day Q_M), see Appendix A. Pre-anoxic tankage volume is a component of the overall primary tankage. For an effluent sewer collection system (i.e. STEP Sytstem) the pre-anoxic tank is recommended to be sized at 50% of the values provided in Appendix A for gravity or onsite tankage options.

The Pre-anoxic return ratio ($\mathbf{R_{NOX}}$) is the ratio of flow of the pre-anoxic return loop in relation to the average day design flow.

For most applications, the R_{NOX} value is equal to 1± and therefore the return flow to the pre-anoxic stage ($\mathbf{Q_{RNOX}}$) is equal to the Average Day Design Flow ($\mathbf{Q_A}$).

Alkalinity is often added in this stage, because the pre-anoxic return line is a convenient place to add alkalinity while simplifying the overall system layout. The pre-anoxic return line can also be used to introduce supplemental carbon while still keeping the design simple. The establishment of denitrification in this stage reduces organic and nitrogen levels while returning about 50% of the alkalinity consumed during the first stage of secondary treatment (3.57 mg/L alkalinity per 1 mg/L NO_3-N denitrified).

Consider supplemental carbon addition in the pre-anoxic stage for ...

- Systems requiring significant total nitrogen reduction (> 80%)
- Systems with high nitrogen values in primary treated effluent (Application types 2, 3, & 5), resulting in low carbon-to-nitrogen (C:N) ratios (< 4:1)

Orenco offers liquid chemical feed units for adding alkalinity and supplemental carbon. There are advantages and disadvantages to various alkalinity sources and supplemental carbon products, so specific project conditions should be considered when making a selection.

Flow Equalization Stage

Purpose and Description:

Flow equalization (**EQ**) provides stability by leveling out peaks in flow and allowing consistent loading of the treatment system. EQ is strongly recommended for systems with variable flow patterns and restrictive discharge limits. EQ is especially important for systems that have highly variable flow patterns due to usage (e.g., resorts and churches) or collection method (e.g., conventional gravity collection).

The EQ stage consists of a tank or tanks fitted with a timed-dose-controlled pumping system. It follows the primary tank and pre-anoxic tank (if used) and is typically located before pre-aeration/clarification tankage (if used) or a recirculation-blend chamber.

Design Notes and Special Considerations:

EQ tank sizing recommendations vary for systems with significant fluctuations in flow. For support with EQ tank sizing, contact Orenco.

For schools and churches, Orenco typically recommends dividing the system's total weekly flow by six and using this value as the Design Average Flow, with one day allowed for recovery. Using this technique, an EQ tank equal to the Design Maximum Day Flow is generally adequate, but calculations should be performed to verify the tank sizing requirement.

By their nature, effluent sewer collection systems inherently provide a significant amount of flow equalization. When using this collection method, the addition of EQ tanks at the treatment site is only necessary for systems with extreme flow fluctuations (e.g., fairgrounds, racing venues, etc.) or highly restrictive permit requirements.

Pre-Aeration Treatment Stage

Purpose and Description:

Pre-aeration reduces organic waste strength prior to secondary treatment, with a target reduction of BOD_5 to less than 400 mg/L. It is used for applications with high strength waste streams (such as Type 7 applications and any application with a significant volume of restaurant waste, such as Type 5) to condition the waste stream prior to secondary treatment by raising dissolved oxygen levels.

An aeration tank, followed by a clarification tank, is situated between the primary treatment system (or pre-anoxic tank if used) and the secondary treatment system.

Design Notes and Special Considerations:

Pre-aeration units should be sized to provide the appropriate amount of oxygen to reduce organic waste strength or to reduce BOD_5 to less than 400 mg/L. For systems with extreme BOD_5 influent values, pre-aeration can be sized to accomplish approximately 50% reduction in BOD_5 values. For recommendations on sizing pre-aeration and clarification tanks, see Appendix A.

Pre-aeration is required for all Application Type 7 systems, as well as for systems that have greater than a 50% contribution of flow from restaurants (primarily Application Type 5 systems).

Standard AdvanTex Treatment Stage

Purpose and Description:

After primary or pre-anoxic treatment, effluent is transported to the recirculation-blend tank or chamber, where it is blended with AdvanTex filtrate. The blended wastewater is distributed over the AdvanTex textile media and percolates down through the media, where it is filtered, cleaned, and nitrified by the naturally occurring microorganisms populating the media. After treatment, a portion of the filtrate is returned to the recirculation-blend chamber while a portion is transported to the next treatment stage or to dispersal. Note that a portion of the recirc-blend (or filtrate) is often returned directly to the pre-anoxic treatment stage.

In the secondary treatment process, AdvanTex units filter and clean effluent from the primary treatment system. When loaded at or below the applicable loading rate, they typically achieve treatment levels of < 10 mg/L BOD_5/$cBOD_5$ and TSS (30-day average or 30-day arithmetic mean), with total nitrogen (TN) reduction typically > 60% and nitrification averages of 95% (range 90-99%).

For nitrogen loading rates and sizing requirements, refer to the *AdvanTex Unit Sizing* section of this document.

Post-Anoxic Treatment Stage

Purpose and Description:

The post-anoxic treatment stage provides additional denitrification after secondary treatment in wastewater systems that require significant (60-80%) reductions in TN, TIN, or NO_3-N. Nitrified AdvanTex filtrate from the secondary treatment stage is transported to an anoxic zone inside of the post-anoxic tank. During post-anoxic denitrification, BOD is consumed during the conversion of NO_3 to N_2 gas by facultative heterotrophic bacteria. The N_2 gas is then returned to the atmosphere.

Design Notes and Special Considerations:

Post-anoxic tanks are typically sized at 50% of the Maximum Day Design Flow. For denitrification to take place, oxygen levels must be depleted to the level that nitrate becomes the primary oxygen source for microorganisms. Requirements for effective denitrification include ...

- Dissolved oxygen levels < 0.5 mg/L (preferably < 0.2 mg/L)
- Carbon-to-nitrogen ratio of 4:1 to 8:1
- Sufficient residual alkalinity (100 mg/L ±) in the secondary treatment stage to ensure optimum pH in the post-anoxic stage
- Under these conditions, reduction of nitrate (NO_3) through conversion to nitrogen gas (N_2) should exceed 70%

A supplemental carbon feed unit is required for the post-anoxic stage to achieve the necessary carbon-to-nitrogen ratio for effective denitrification.

AdvanTex Treatment – Second Stage of Two-Stage Treatment

Purpose and Description:

A second stage of AdvanTex treatment can be used cost-effectively for enhanced nitrification or polishing:

- Nitrifying the waste stream for systems with very low ammonia (NH_3-N) or TKN discharge requirements – typically > 95% removal (nitrification)
- Removing any excess BOD_5 that is not consumed in the denitrification process following the post-anoxic stage on projects with restrictive BOD_5/$cBOD_5$ permit limits, typically 20 mg/L or less (polishing)
- Removing BOD_5 for systems with NOT TO EXCEED permit limits of < 10 mg/L BOD_5/$cBOD_5$ or 30-day average permit limits of ≤ 5 mg/L BOD_5/$cBOD_5$ (polishing)

The treatment mechanisms are the same as described under *Standard AdvanTex Treatment Stage* on page 13. For sizing requirements, refer to the AdvanTex Unit Sizing section of this document.

For information on the importance of pH and temperature on the nitrification process, see *pH Effect on Nitrification* and *Temperature Effect on Nitrification and Denitrification* in the Design Considerations section on page 19.

Disinfection Stage

Purpose and Description:

Secondary-treated effluent is usually clear and odorless, but it still contains pathogens at levels that can cause illness if ingested or released to the environment. Disinfection is required in many surface discharge or reuse systems. Disinfection can be achieved by any method that destroys pathogens; ultraviolet (UV) rays, chlorine (tablet or gas), and ozonation are the most common methods.

Due to the low turbidity of AdvanTex effluent and the fact that UV disinfection requires no chemicals and leaves no toxic residue, UV disinfection is the most common method used following AdvanTex systems.

Chlorination is also a common disinfection method that is utilized; however, handling issues and concerns about chemical residue make it less desirable than UV. Ozonation, another common method, is extremely effective and popular for re-use applications within facilities (e.g. toilet flushing), due to its ability to remove any residual color in the effluent stream. Ozonation is typically the least economical of the three methods in the lower flow applications common with decentralized systems.

Design Notes and Special Considerations:

UV disinfection lamps require cleaning and servicing on a regular basis (once a month to once a year, depending on effluent quality and UV system design).

Disinfection devices can be integrated into the treatment system and connected to the TCOM™ control system for monitoring and control.

Reuse applications, such as for toilet flushing and industrial processes, require a high level of effluent purity. Chlorination or ozonation are often used in these applications. In some circumstances, tertiary treatment may be required. This can include (in addition to chemical or ultraviolet disinfection) the use of fine mesh filter processes such as polishing filters; multi-media filtration; micro-, ultra-, or nano-filtration through membranes; reverse osmosis; or cloth/disc filters. Contact Orenco for more information.

Performance Requirements and Unit Sizing

Performance of Typical AdvanTex Systems

When loaded at or below the applicable loading rates, AdvanTex systems typically achieve <10 mg/L BOD_5 and TSS (30-day average or 30-day arithmetic mean). Total Nitrogen (TN) reduction typically exceeds 60%, with nitrification exceeding 95%, given liquid temperature levels greater than 50°F (10°C) and pH values between 7-9. The loading rates provided in AdvanTex Stage Sizing are based upon these minimum values for liquid temperature and pH. With additional components and configurations (see Treatment System Configurations), AdvanTex Treatment Systems can meet more stringent treatment levels.

Standard AdvanTex Stage Sizing

The primary criteria used to determine the amount of textile surface area necessary to meet treatment requirements are the daily flow volume (Average and Maximum Day), primary-treated effluent Organic Load, Organic Loading Rate (**OLR**), and Hydraulic Loading Rate (**HLR**). For facilities that require advanced nitrogen discharge levels (> 60% TN or > 95% NH3-N), the Ammonia Loading Rate (**ALR**) or Total Nitrogen Loading Rate (**TNLR**) should be used in conjunction with the organic and hydraulic loading rates to size the system. **The loading rate that corresponds to the largest textile surface area will control the design.** AdvanTex Treatment Systems must be sized so that the designed treatment area meets or exceeds that required by the controlling loading rate.

Standard AdvanTex Treatment Loading Rates – All Systems:

Organic Loading Rates (OLR)

- Design Average: 0.04 lbs $BOD_5/ft^2 \bullet d$ (0.2 kg $BOD_5/m^2 \bullet d$)
- Design Maximum Day: 0.08 lbs $BOD_5/ft^2 \bullet d$ (0.4 kg $BOD_5/m^2 \bullet d$)

The equation for determining OLR-based treatment area is as follows:

$$A_{OLR} = BOD_{5i} / OLR \qquad \textbf{Equation 1.1}$$

where: A_{OLR} = *Treatment area based on Organic Loading, ft² (m²)*
BOD_{5i} = *Primary treated effluent BOD_5 (organic) load, lbs/d (kg/d)*
OLR = *Organic loading rate, lbs/ft² • d (kg/m² • d)*

Hydraulic Loading Rates (HLR)

- Design Average: 25 gpd/ft² (1 $m^3/m^2 \bullet d$)
- Design Maximum Day: 50 gpd/ft² (2 $m^3/m^2 \bullet d$)

The equation for determining the HLR-based treatment area is as follows:

$$A_{HLR} = Q / HLR \qquad \textbf{Equation 1.2}$$

where: A_{HLR} = *Surface area based on Design Average Hydraulic Loading, ft² (m²)*
Q = *Influent hydraulic load, gpd (m^3/d)*
HLR = *Hydraulic loading rate, gpd/ft² • d ($m^3/m^2 \bullet d$)*

Systems with Total Nitrogen-Based Discharge Limits:

For systems requiring a greater than 60% removal rate for TN, TIN, or NO_3-N, the required textile area is determined by using the Total Nitrogen Loading Rate (TNLR) and the TN value (if available) or TKN value (if the TN value isn't available) in the primary treated effluent. (The value for TN and TKN should be the same after anaerobic primary treatment, but it will vary significantly if pre-aeration is used.)

Total Nitrogen Loading Rates (TNLR)

- Design average TNLR is 0.014 lbs $TN/ft^2 \bullet d$ (0.07 kg $TN/m^2 \bullet d$).

The equation for determining TNLR-based treatment size is as follows:

$$A_{TNLR} = (TKN_i \text{ or } TN_i) / TNLR \qquad \textbf{Equation 1.3}$$

where: A_{TNLR} = *Treatment area based on Total Nitrogen Loading, ft² (m²)*
TKN_i = *Primary treated effluent Total Kjeldahl Nitrogen load, lbs/d (kg/d)*
TN_i = *Primary treated effluent Total Nitrogen load, lbs/d (kg/d)*
$TNLR$ = *Total nitrogen loading rate, lbs/ft² • d (kg/m² • d)*

Systems with Ammonia-Based Discharge Limits:

For applications requiring ammonia or TKN removal greater than 95%, use both the ALR (see below) and the TNLR (Equation 1.3) and choose the greater of the two values. ALR for primary-treated effluent ammonia and TNLR accounts for any organic nitrogen that may be converted to ammonia through the primary or secondary treatment processes (see Ammonification).

Ammonia Loading Rates (ALR)

- Design average ALR is 0.01 lbs NH_3-N/ft² • d (0.05 kg NH_3-N/m² • d)

The equation for determining ALR-based treatment area is as follows:

$$A_{ALR} = NH_3\text{-}N_i / ALR \qquad \textbf{Equation 1.4}$$

where: AALR = Surface area based on NH3-N loading, ft² (m²)
NH3-Ni = Primary treated effluent Ammonia load, lbs/d (kg/d)
ALR = Stage 1 Ammonia loading rate, lbs/ft² • d (kg/m² • d)

Second Stage AdvanTex Sizing in Two-Stage Systems

For the calculation of Second Stage AdvanTex treatment area, use BOD_{5e} and TKN_e — the treated effluent values from the Standard AdvanTex Treatment system. Standard AdvanTex Stage treated effluent values for BOD_5 and TKN are typically based upon 95% nitrification and 70% denitrification through the Pre-Anoxic Stage and Standard AdvanTex Treatment Stage. See Appendix B for example calculation.

Second Stage Organic Loading Rates (OLR)

- Design Average: 0.02 lbs BOD_5/ft² • d (0.1 kg BOD_5/m² • d)
- Design Maximum Day: 0.04 lbs BOD_5/ft² • d (0.2 kg BOD_5/m² • d)

The equation for determining OLR-based treatment area is as follows:

$$A_{OLR} = BOD_{5e} / OLR \qquad \textbf{Equation 2.1}$$

where: A_{OLR} = Treatment area based on Organic Loading, ft² (m²)
BOD_{5e} = Secondary treated effluent BOD_5 (organic) load, lbs/d (kg/d)
OLR = Organic loading rate, lbs/ft² • d (kg/m² • d)

Second Stage Hydraulic Loading Rates (HLR)

- Design Average: 75 gpd/ft² (3 m³/m² • d)
- Design Maximum Day: 125 gpd/ft² (5 m³/m² • d)

The equation for determining HLR-based treatment area is as follows:

$$A_{HLR} = Q / HLR \qquad \textbf{Equation 2.2}$$

where: A_{HLR} = Surface area based on Design Average Hydraulic Loading, ft² (m²)
Q = Influent hydraulic load, gpd (m³/d)
HLR = Hydraulic loading rate, gpd/ft² • d (m³/m² • d)

Second Stage Total Nitrogen Loading Rates (TNLR)

- Design average TNLR is 0.007 lbs TN/ft² • d (0.035 kg TN/m² • d).

The equation for determining TNLR-based treatment size is as follows:

$$A_{TNLR} = TKN_e / TNLR \qquad \textbf{Equation 2.3}$$

where: A_{TNLR} = Treatment area based on Total Nitrogen Loading, ft² (m²)
TKN_e = Secondary treated effluent Total Kjeldahl Nitrogen, lbs/d (kg/d)
TNLR = Total nitrogen loading rate, lbs/ft² • d (kg/m² · d)

Second Stage Ammonia Loading Rates (ALR)

- Design average ALR is 0.005 lbs NH_3-N/ft² • d (0.025 kg NH_3-N/m² • d)

The equation for determining ALR-based treatment area is as follows:

$$A_{ALR} = TKN_e / ALR \qquad \text{Equation 2.4}$$

where: A_{ALR} = *Surface area based on NH_3-N loading, ft² (m²)*
TKN_e = *Secondary treated effluent Total Kjeldahl Nitrogen, lbs/d (kg/d)*
ALR = Ammonia loading rate, lbs/ft² • d (kg/m² • d)

Design Considerations

Recirculation-Blend Tank Sizing

AdvanTex AX20 and AX100 Treatment Systems require external recirculation-blend tankage. The following design considerations apply to recirculation-blend tankage for AX20 and AX100 systems:

- For standard AdvanTex Treatment Systems, recirculation-blend tankage should be sized to at least 75% of the design maximum day flow, or 100% average day design flow, whichever is greater.
- For Stage 2 AdvanTex Treatment Systems, recirculation-blend tankage should be sized to at least 25% of the design maximum day flow.

AdvanTex AX-Max units are configured with integral recirculation-blend capacity and do not require an external recirculation-blend tank.

Recirculation Pump Sizing

AX20 pods have five laterals and sixty-eight 1/8-inch (3-mm) diameter orifices in each pod. A residual pressure of 5 ft (1.5 m) is used to determine initial timed-dosing settings. Typically, residual pressure ranges from 3 to 6 ft (0.9 to 1.8 m). This may vary depending on system hydraulics or special treatment requirements. Table 3 provides sizing information for Orenco 4-inch (100-mm) submersible effluent pumps used in AdvanTex AX20 recirculation pumping assemblies with typical design configurations.

Table 3. Recirculation Pump Sizing, AX20

Number of Pods	Number and Operation of Pumps	Nominal Flow Rate	60 Hz Pump Selections	50 Hz Pump Selections
1	2 pumps, alternate dosing	30 gpm (1.9 L/sec)	½ hp (0.37 kW); PF3005	¾ hp (0.56 kW); PF3005
2	2 pumps, alternate dosing	50 gpm (3.2 L/sec)	½ hp (0.37 kW); PF5005	¾ hp (0.56 kW); PF5007
3	2 pumps, alternate dosing	75 gpm (4.7 L/sec)	1 hp (0.7 kW); PF7510	1 hp (0.7 kW); PF7510
4	2 pumps, 1 pump to 2 pods, alternate dosing	50 gpm (3.2 L/sec)	½ hp (0.37 kW); PF5005	¾ hp (0.56 kW); PF5007

AX100 pods have four laterals with two spin nozzles per lateral, for a total of eight spin nozzles. The pumping rate is about 50 gpm± per AX100 pod (minimum 6 gpm ± per nozzle at 3.0 psi, or 0.38 L/sec at 20.7 kPa). Adjusting pressure at the pod inlet can vary flow. Sufficient pump redundancy is required to ensure operational integrity with one or more inoperable pumps. Table 4 provides sizing information for Orenco 4-inch (100-mm) submersible effluent pumps used in AdvanTex AX100 recirculation pumping assemblies for typical design configurations.

Table 4. Recirculation Pump Sizing, AX100

Number of Pods	Number and Operation of Pumps	Nominal Flow Rate	60 Hz Pump Selections	50 Hz Pump Selections
1	2 pumps, alternate dosing	50 gpm (3.2 L/sec)	¾ hp (0.56 kW); PF5007	¾ hp (0.7 kW); PF5007
2	2 pumps, 1 pump per pod, alternate dosing	50 gpm (3.2 L/sec)	¾ hp (0.56 kW); PF5007	1 hp (0.7 kW); PF5010
3	2 pumps, simultaneous dosing	75 gpm (4.7 L/sec)	1 hp (0.7 kW); PF7510	1 hp (0.7 kW); PF7510
4	4 pumps, 1 pump per pod, alternate dosing	50 gpm (3.2 L/sec)	¾ hp (0.56 kW); PF5007	1 hp (0.7 kW); PF5010
5-6	4 pumps, 2 pumps per 2-3 pods, simultaneous or alternating dosing	75 gpm (4.7 L/sec)	1 hp (0.7 kW); PF7510	1 hp (0.7 kW); PF7510
7-9	6 pumps, 2 pumps per 2-3 pods, simultaneous or alternating dosing	75 gpm (4.7 L/sec)	1 hp (0.7 kW); PF7510	1 hp (0.7 kW); PF7510

AX-Max units are typically designed to accommodate a specific application, based on Design Average and Design Maximum Day flows, the application type's targeted treatment levels, and other factors. Because of this, AX-Max configurations vary and recirculation pumps for these units are determined on a project-by-project basis. Contact Orenco for more information.

AdvanTex TCOM™ Control System

The TCOM™ Control Panel is a telemetry-based panel — which can be connected to a landline, cellular service, Internet, or satellite service — that controls all sensors and pumping equipment. TCOM panels are an integral part of all commercial AdvanTex Treatment System equipment packages. Telemetry provides real-time operator monitoring and control of system components, as well as remote data collection of key operational parameters and events. Its communication function provides notice to system operators in the event of an alarm. Operators can call into the control unit, determine the cause of the alarm, and – often – address the situation without having to be physically present at the treatment facility.

The TCOM unit can be programmed to use trend data for adjusting timer settings automatically, based on established recirculation ratios, so frequent operator adjustment is not necessary for systems with flow variations. If additional equipment for pretreatment, tertiary treatment, or disinfection is required, the controls for each component can easily be incorporated into the TCOM control panel. This allows Orenco to contact the panel directly to assist the operator in system evaluation and troubleshooting or to manually override operations. TCOM control panels can also integrate into existing SCADA systems. Consult with Orenco early in the design process to discuss any integration needs.

Orenco's TCOM control panels are available with multiple enclosure types; however, for ease of operation, they should be protected from direct sunlight to protect the electronics and allow the operator access without direct exposure to the elements (rain, snow, etc.). This should be taken into account when determining location of the control unit. Shelters are recommended for panels whenever possible. Contact Orenco for a quote.

AdvanTex System Ventilation

Proper ventilation, achieved by active or passive ventilation, is critical for maintaining aerobic treatment processes in AdvanTex Treatment Systems.

Active Ventilation

Active ventilation is the preferred means of ventilating AdvanTex Systems and is required for the following systems:

- All systems with design maximum day flows > 10,000 gpd (37,854 L/day)
- All systems with average primary treated effluent waste strength > 200 mg/L BOD_5 and 100 mg/L TSS
- All systems with nitrogen discharge limits
- All AX-Max systems; *at least one* ventilation assembly is required per two connected units (AX-Max units are typically designed with a built-in active vent system and one vent system per unit is preferred)

Passive Ventilation

Passive ventilation is discouraged for commercial applications, but can be considered in AX20 or AX100 systems receiving primary-treated effluent of residential strength, with constituent concentrations of < 200 mg/L BOD_5 and < 100 mg/L TSS and with design maximum day flows < 10,000 gpd (37,854 L/day) for AX100 systems and 4,000 gpd (15,140 L/day) for AX20 systems. For proper function, it is critical for air movement to be greater than 5 cubic feet per minute (cfm) for every 100 ft^2 of treatment area (0.002 m^3/minute for every 9.3 m^2). It is also critical to ensure that there is a clear path for airflow through the system if the system relies on passive ventilation. If these conditions cannot be met, active ventilation should be used.

Although activated carbon media is included to adsorb and mitigate odors in AdvanTex passive ventilation systems, slight odors may occur during dosing events. Passively ventilated systems should be located in areas where this will not be perceived as a nuisance.

Anti-Buoyancy Features

AdvanTex AX20 pods come standard with anti-flotation flanges to help prevent the pod from floating out of the ground under saturated soil conditions. Always keep the top of the pod at least 6 inches (150 mm) above grade at all times. When buried to this level, pod spacing is 5 feet (1.5 m) between AX20 units. Contact Orenco for details.

AdvanTex AX100 Pods are designed for installation in areas that are free of water. AX100 pods can be bermed and free draining, but the bottom of each pod should be no more than 9 inches (230 mm) below the natural grade to protect it from floating in saturated conditions.

AX-Max units should be ordered with anti-buoyancy provisions if the unit will be partially buried. Spacing of the units varies, but at maximum bury of 6 feet (1.82 m) with high groundwater conditions, this spacing would be approximately 10 feet (3.04 m) between units. When the unit is set at natural grade and the material used for berming is free flowing, anti-buoyancy will not be necessary. Contact Orenco for details.

pH Effect on Nitrification

pH is extremely important for nitrification. (See Figure 7.) The effective reaction rate (RN) is 0.95 at a pH of 8±, dropping to 0.47 at a pH of 7, and dropping precipitously to 0.15 at a pH of 6. Nitrification effectively ceases at a pH of 5. The use of additional alkalinity to buffer the process is critical for all nitrogen removal configurations and the feed system should be sized to provide a minimum targeted residual of 80 mg/L, with a preferred residual target of 100 mg/L.

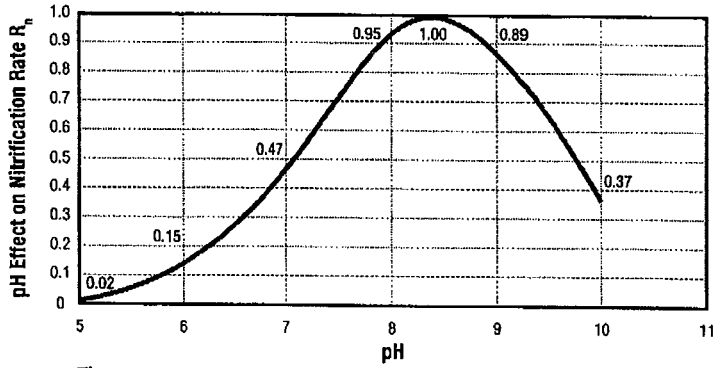


Figure 7. pH Effects on Nitrification

Cold Weather Considerations

The naturally occurring bacteria that populate the AdvanTex treatment media are active at temperatures above 44° F (6.7° C), with an optimal temperature range above 68° F (20° C). To ensure treatment in cold climates or areas with seasonal cold weather, it is recommended that the liquid temperature remain above 50° F (10° C). Temperature is especially important in the nitrification and denitrification process. If temperature values are expected to be below this threshold, contact Orenco for heating options and/or safety factors for design purposes.

Temperature Effect on Nitrification and Denitrification

Temperatures in the liquid stream and treatment media have an impact on both the nitrification and denitrification processes. As shown in Figure 8, the effect of temperature on nitrification and denitrification rates can be used to predict efficiency of the overall treatment process. Orenco bases performance on minimum temperature values of 50° F (10° C) during winter operation and 59° F (15° C) during summer operation. For actual liquid temperatures below these values, systems should be upsized to achieve treatment expectations described in this document.

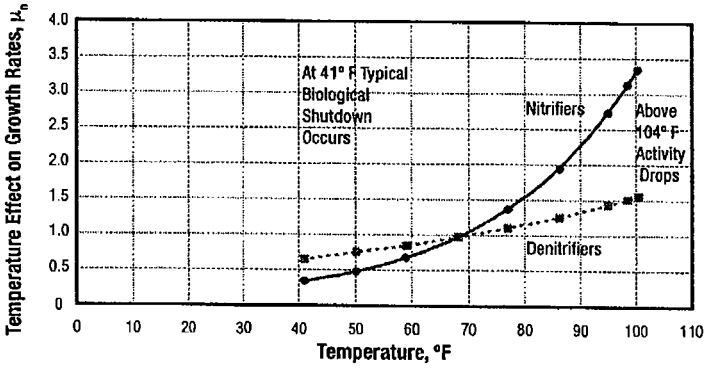


Figure 8. Temperature Effect on Nitrification and Denitrification

Following are cold weather considerations for AX20 pods, AX100 pods, and AX-Max units, as well as general cold weather considerations for all systems to prevent freezing and avoid damage due to frost heave:

AX20 and AX100 Pods

- Insulated foam-core lids with a minimum R-value of R-6 (RSI-1) are standard equipment to prevent heat loss through the top of AX20 and AX100 pods. If necessary, insulation board or spray-on insulation foam can be added during installation.
- The depth of the recirculation-blend tank can be increased — but the tank must still be accessible to operators for maintenance activities.
- Warm air ventilation is critical. High flows of cold air through the treatment unit can cause significant temperature drops.
- Orenco Fiberglass Shelters provide a climate-controlled environment — providing a temperature controlled air source for the treatment system, access to the control system, and equipment and storage for chemical feed equipment.

AX-Max Units

- Units are configurable for use in climates with extreme temperatures ranging from -60° F to 125° F (-51°C to 52° C).
- Units are constructed with 4-inch (100-mm) foam cells that provide an estimated insulation value of R-26 (RSI-5).
- Orenco Fiberglass Shelters provide a climate-controlled environment — providing a temperature controlled air source for the treatment system, access to the control system, and equipment and storage for chemical feed equipment.

General Cold Weather Considerations for All Systems

- Standard cold weather practices for AdvanTex systems include allowing all lines to drain back to tankage and insulating access lids on primary and recirculation-blend tankage.
- In extreme climates with long periods of subfreezing weather, a warm air source into the treatment pods or units or immersion heaters may be necessary to keep treatment temperatures above 50° F (10° C).
- In areas where snow typically accumulates each winter, air vents must be extended to ensure they are above peak snow levels.
- In areas where frost heave is a concern, backfilling access riser excavations with pea gravel is recommended.

Several times per year Orenco provides training on general wastewater concepts, design, and operation and maintenance at our facility in Sutherlin, Oregon, as well as throughout the United States and abroad. If you are interested in attending a training session, contact Orenco or your local Orenco Dealer.

Orenco staff is prepared to support the designer throughout the project cycle, from the initial evaluation of technologies, to the preliminary design, to a thorough and timely design review — all without cost. Orenco can also assist with the approval process and the evaluation of operational and life cycle costs.

Orenco® UV and AXUV Disinfection Units

Applications

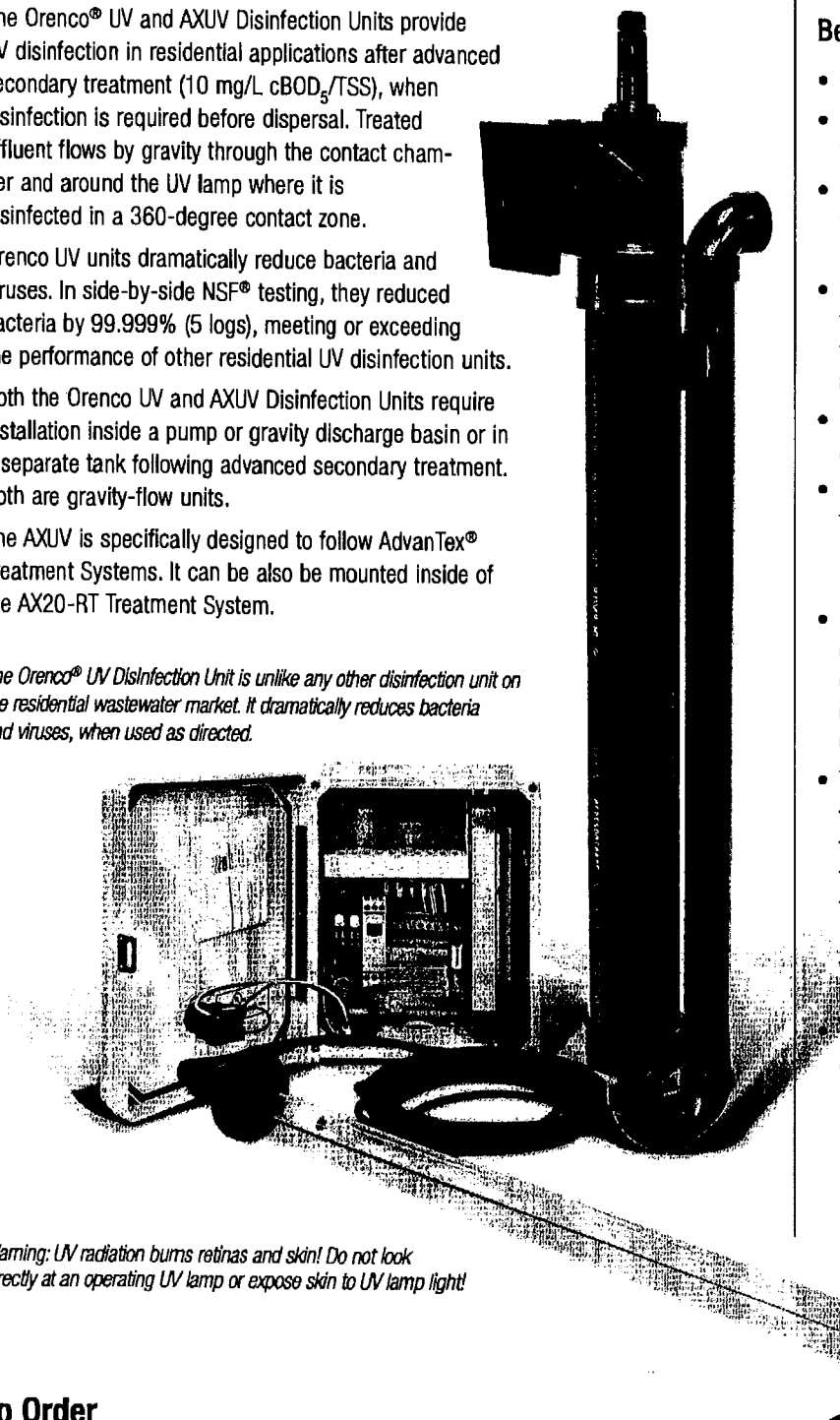
The Orenco® UV and AXUV Disinfection Units provide UV disinfection in residential applications after advanced secondary treatment (10 mg/L $cBOD_5$/TSS), when disinfection is required before dispersal. Treated effluent flows by gravity through the contact chamber and around the UV lamp where it is disinfected in a 360-degree contact zone.

Orenco UV units dramatically reduce bacteria and viruses. In side-by-side NSF® testing, they reduced bacteria by 99.999% (5 logs), meeting or exceeding the performance of other residential UV disinfection units.

Both the Orenco UV and AXUV Disinfection Units require installation inside a pump or gravity discharge basin or in a separate tank following advanced secondary treatment. Both are gravity-flow units.

The AXUV is specifically designed to follow AdvanTex® Treatment Systems. It can be also be mounted inside of the AX20-RT Treatment System.

The Orenco® UV Disinfection Unit is unlike any other disinfection unit on the residential wastewater market. It dramatically reduces bacteria and viruses, when used as directed.



Warning: UV radiation burns retinas and skin! Do not look directly at an operating UV lamp or expose skin to UV lamp light!

Standard Features & Benefits

Better Product

- UL-recognized
- NSF® equivalency tested
- Fecal coliform reduction of 99.999% (5 logs)
- Flow path designed to maximize contact time between effluent and lamp
- Unit comes fully-assembled
- Components designed to work together; no piecemeal disinfection units and wiring
- Quick-disconnect coupling makes unit easy to remove for inspection and cleaning
- Teflon® sleeve ...
  - protects lamp
  - reduces breakage
  - minimizes buildup
  - minimizes service intervals
  - makes cleaning easy
- Yearly service interval and lamp replacement

Better Controls

- Power ballast and lamp current sensor housed in control panel (not a tank or wet well) to minimize corrosion and failure due to environmental exposure
- Panel prevents discharge of non-disinfected effluent due to lamp failure or control panel failure[1]
- Audible and visible alarm activated if lamp fails[2]
- E-mail alert sent if lamp fails[3]
- For more information, call Orenco at 800-348-9843 or 541-459-4449

[1] *AXUV only*

[2] *AXUV or UVIB panel only*

[3] *AXUV with VCOM® panel only*

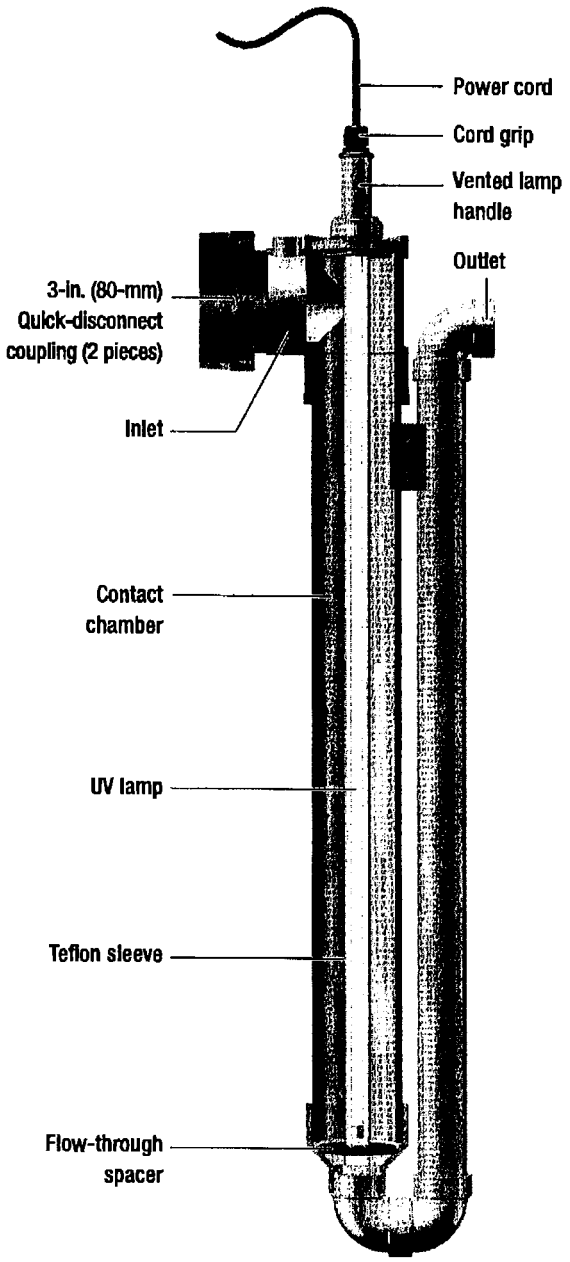
To Order

Call your nearest Orenco Systems®, Inc. Distributor. For nearest Distributor, call Orenco at 800-348-9843, or visit www.orenco.com and click on "Where to Buy."

Orenco®
Orenco Systems®, Incorporated

Orenco Systems® Inc., 814 Airway Ave., Sutherlin, OR 97479 USA
800-348-9843 • 541-459-4449 • www.orenco.com

UV Disinfection Unit Components



UL-recognized

Performance

Typical contact chamber UV dose (65% transmittance, 20% lamp degradation)	276,000 µW·s/cm² at 1 gpm (0.06 L/sec) 55,000 µW·s/cm² at 5 gpm (0.32 L/sec) 28,000 µW·s/cm² at 10 gpm (0.63 L/sec)
Minimum target dose	30,000-38,000 µW·s/cm²
Lamp	31 in. (787 mm), 92 VAC, 50 or 60 Hz, 425 mA, 38 W; 254 nm UVC intensity at 1m is 125 µW/cm²
Power cord length	600V, 18/2 UL Type TC, 25 ft (7.62 m) std
Cord plug	UL listed four-pin connector, lamp-holder, electric discharge, 1000 V or less
Ballast	120 VAC, 50 or 60 Hz, located in UL listed Orenco® control panel
Circuit breaker	10 A, OFF/ON switch; Single-pole 120 V*, DIN rail mounting with thermal magnetic tripping characteristics
Audible alarm*	95 dB at 24 in. (610 mm), warble-tone sound
Visual alarm*	⅞-in. (22-mm) diameter red lens, "Push-to-silence," UL Type 4X rated, 1 W LED light, 120 V

** Standard on VeriComm, MVP, and UVIB panels. Not available with UVIBSUB panels.*

Model Codes for Ordering

UV - 125/31 - ☐ - ☐

- UV: Orenco UV disinfection unit
- 125: Lamp output at 1 meter: 125 = 125 µW/cm²
- 31: Lamp length: 31 = 31 in. (787 mm)
- ☐ (Control panel options): UVIB = panel with audible and visible alarms; UVIBSUB = sub-panel for use with separate control panel
- ☐ (Power cord length): Blank = 25 ft (7.62 m); 50 = 50 ft (15.2 m)

AXUV - 125/31 - ☐

- AXUV: AdvanTex™ UV disinfection unit
- 125: Lamp output at 1 meter: 125 = 125 µW/cm²
- 31: Lamp length: 31 = 31 in. (787 mm)
- ☐ (Power cord length): Blank = 25 ft (7.62 m); 50 = 50 ft (15.2 m)

Orenco Systems® Inc., 814 Airway Ave., Sutherlin, OR 97479 USA
800-348-9843 • 541-459-4449 • www.orenco.com

COUNTY OF SAN MATEO - PLANNING AND BUILDING DEPARTMENT

ATTACHMENT D

Hydrology Report for
Vida Verde
San Gregorio, California

Project #1600028

Prepared By

Questa Engineering Corporation
1220 Brickyard Cove Road, Suite 206
Richmond, California 94807

Norman N. Hantzsche, P.E.

Revised - December 2018

TABLE OF CONTENTS

ATTACHMENTS:

INTRODUCTION

This report describes the hydrological conditions of the Vida Verde project site in San Mateo County and presents an evaluation of the impacts and proposed drainage measures to accommodate the proposed development.

Vida Verde operates an overnight wilderness and farm camp program serving low-income school districts and families in the S.F. Bay Area that would otherwise not be able to afford this experience for their 4th to 6th grade students. Students experience working in the farm grounds, caring for farm animals, milking the goats and making goat cheese, experiencing the outdoors and wilderness at nearby County parks and enjoying the oceanfront, some for the first time. Located at the 'Hidden Creek' site, 3540 La Honda Road (State Hwy. 84), San Gregorio, Vida Verde is planning to turn a developed residential/agricultural property into its camp and working farm.

Existing development at the project site includes a 3-bedroom residence, barn, several storage buildings, large farming ground, and a livestock/poultry corral. Existing utilities include an onsite water well and storage tank, septic tank and gravity drainfield for the residence, PG&E electrical service, and propane tank. Entrance to the site is via a long paved driveway that winds down the hillside from the entrance off Highway 84, leading to the farm and also to a bridge crossing that provides access to three (3) neighboring properties located on the south side of San Gregorio Creek.

Development of the site for camping and outdoor education activities will include (a) improvements to the existing residence/office, (b) remodeling and expansion of the existing barn for student meeting, cooking and eating, with farm worker sleeping rooms plus restrooms for the guests, staff and farm workers; (c) tent camping accommodations; and (d) various infrastructure improvements, including a new septic system, a new well and water system, driveway and parking improvements; agricultural equipment storage facilities; new accessible paths, ground-mounted photovoltaic array and biodiesel fuel storage for camp shuttle vehicles and tractor.

HYDROLOGICAL SETTING

The project site is located adjacent to San Gregorio Creek, a year-round coastal stream originating in the Santa Cruz Mountains with a watershed area of approximately 61 square miles (39,000 acres). San Gregorio Creek and its tributaries include approximately 45 miles of blue line streams that drain generally to the southwest through steep canyons and redwood-Douglas fir and tanoak forests, then through rolling grasslands, coastal shrub, and agricultural areas before emptying into a coastal lagoon at the Pacific Ocean.

The 23-acre project site is situated within an oxbow of San Gregorio Creek, which cuts through the south side of the property. About 80% of the property borders the north side of the creek, and about 20 percent is on the south side. The property extends from La Honda Road down a

moderately sloping hillside (5 to 11 percent) to a gently (2 to 5 percent) sloping alluvial terrace where the buildings and farming activities are located. The portion of the property on the south side of the creek is mostly naturally vegetated hilly terrain with no existing or proposed development.

Climate

The San Gregorio Creek watershed generally experiences a Mediterranean climate, moderated by the Pacific Ocean marine layer that influences conditions along the north-central California coast. The project vicinity receives average annual precipitation of about 30 inches, with 80 percent occurring in the months of November through March. **Table 1** lists monthly average precipitation and reference evapotranspiration rates for Pescadero, the nearest representative weather station.

Table 1.
Average Precipitation and Evapotranspiration for Project Area

Month	Average Precipitation[1] (inches)	Reference Evapotranspiration[2] (inches)
Jan	5.66	0.93
Feb	5.08	1.40
Mar	4.25	2.48
Apr	2.27	3.30
May	0.86	4.03
Jun	0.33	4.50
Jul	0.11	4.65
Aug	0.18	4.03
Sep	0.41	3.30
Oct	1.55	2.48
Nov	3.49	1.20
Dec	5.24	0.62
Total	**29.43**	**32.92**

[1] Ave monthly precip for, determined from NOAA, Western Regional Climate Cntr for Pescadero
[2] Reference ETo obtained from DWR/CIMIS for Zone 1, Coastal Plains Heavy Fog Belt

Soil Conditions

- **Alluvial Terrace.** Soils comprising the alluvial terrace are mapped by the USDA (Soil Survey of San Mateo Area, 1961) as Corralitos sandy loam, gently sloping, 2 to 5%. The soils are characterized as very deep, rapidly permeable with slow runoff and slight erosion hazard.

- **North Hillside.** The hillside north area from La Honda Road down to the alluvial terrace are mapped as Tunitas clay loam, moderately sloping, 5 to 11%. The soils are characterized as moderately deep to deep, with moderately slow permeability, slow runoff and slight to moderate erosion hazards.

- **South of Creek.** The small (undeveloped) portion of the property lying south of San Gregorio Creek consists of a mix of alluvial terrace deposits (Corralitos soils) and moderately to steeply sloping hills comprised of Dublin clay (7 to 16%) and Gazos loam ($\geq$ 40%). Dublin clays are deep, slowly permeable soils, with slow runoff and moderate erosion hazards. Gazos soils are shallow (< 2-ft deep), moderately permeable, excessively drained, with high runoff rates and high erosion hazards.

Development and Impervious Surfaces

Existing buildings on the property consists of a 3-bedroom residence/office, barn, greenhouse, and several small sheds and out-buildings associated with agricultural operations. A paved asphalt driveway winds down the hillside from the entrance off Highway 84, leading to the farm and also to a bridge crossing that provides access to three (3) neighboring properties located on the south side of San Gregorio Creek. The paved driveway is about 850 feet long with approximately 12,000 square feet of impervious surface. Other driveway and parking areas on the site are either dirt or gravel-surfaced.

Site Drainage

There are no existing drainage facilities on the property. Direct rainfall and roof runoff from various buildings is readily absorbed in the very permeable alluvial soils. In the hillside area, the convex topography, surface soils, grassland, brush and tree cover combine to absorb most of the rainfall except during heavy and extended storm periods, when excess water runs off mainly as sheet flow. Most of this runoff eventually collects and percolates in the alluvial portions of the site or drains through riparian areas into San Gregorio Creek. The paved driveway is out-sloped over most of its length, dispersing runoff as sheet flow to adjacent vegetated areas, riparian areas of San Gregorio Creek and some to the lower alluvial terrace. There are no existing ditches, culverts or other drainage structures on the project site.

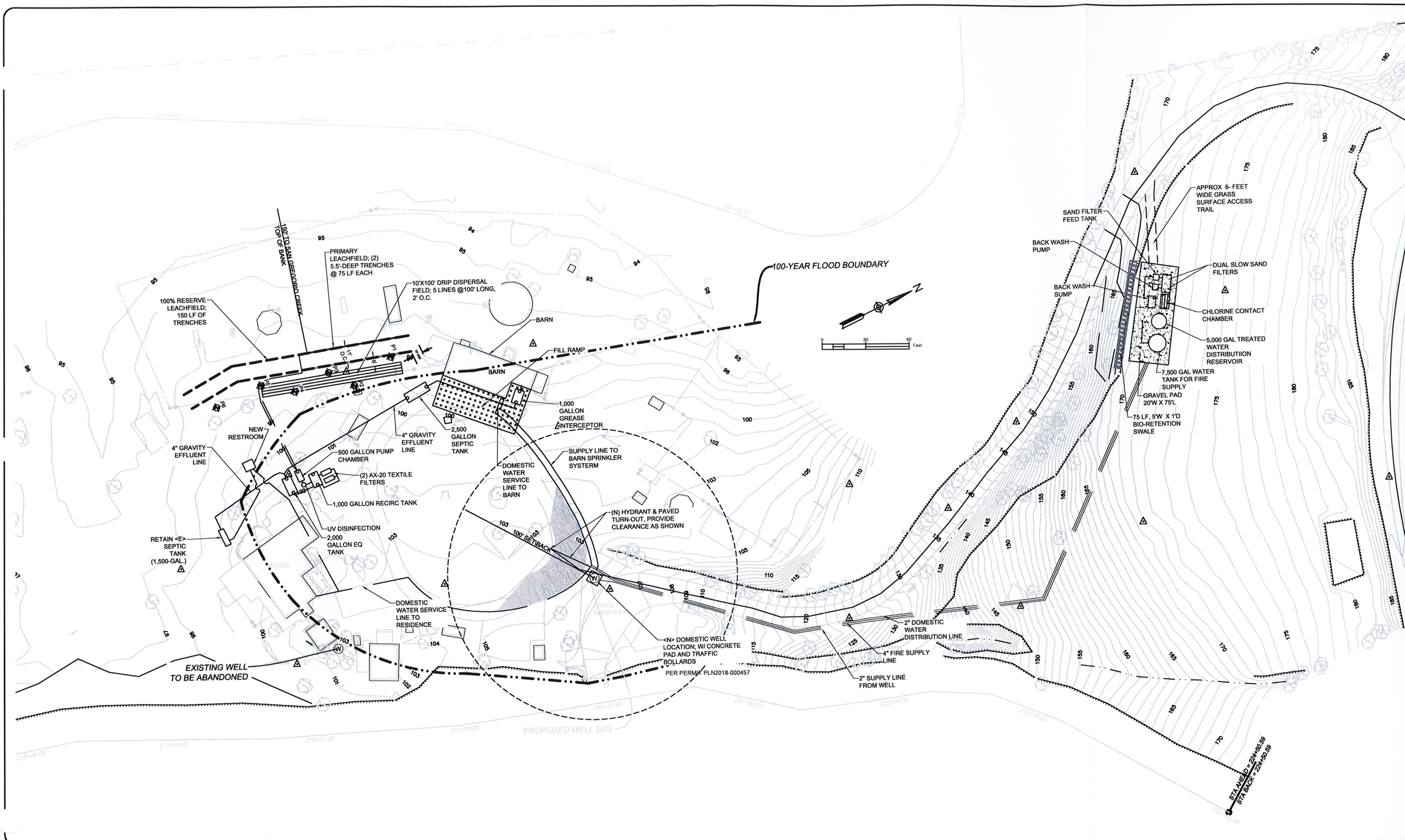
Floodplain Mapping

Portions of the site lie within the 100-yr floodplain of San Gregorio Creek. Detailed floodplain analysis and mapping was completed for the project site as presented in "*Floodplain Study for Vida Verde Nature Education, San Gregorio, California*" (Questa Engineering Corporation, 2018). **Figure 1** shows the limits of the 100-yr floodplain as determined in this recent study and relationship to existing site features and proposed improvements.

Groundwater

Groundwater on the site occurs mainly within the alluvial deposits beneath the alluvial terrace portion of the site. Smaller amounts of groundwater also likely occur in the sandstone and siltstone bedrock which underlies the project site, but have not been documented.

The alluvial groundwater is recharged by direct rainfall-recharge (percolation) and lateral infiltration from San Gregorio Creek. Estimates of groundwater recharge from onsite rainfall percolation were developed using an annual water balance analysis, provided in **Attachment A**.



VIDA VERDE

VIDA VERDE NATURE EDUCATIONAL
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Sht:	Rev:	Date:	By:	Description:	App'd:

Design: NH
Drawn: FP/MF
Checked: NH
Appr'd: NH

PROPOSED IMPROVEMENTS & FLOODPLAIN
VIDA VERDE NATURE EDUCATION
SAN GREGORIO, CA

Size: D | Project: 1600028
Scale: 1:30
Date: 12/21/2018
Sheet: FIGURE 1

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Considering a contributing recharge area of approximately 5 acres encompassing only the main alluvial terrace portion of the site, average annual groundwater recharge is estimated to be approximately 7 acre-ft per year (roughly 2.27 million gallons).

Depth to groundwater measurements have been taken at various locations and different times of the year in connection with subsurface exploration work and water well testing. **Table 2** summarizes the depth to groundwater observations and saturated thickness of the alluvial aquifer, where data were available.

Table 2.
Depth to Groundwater Observations
Vida Verde Project Site

Groundwater Observation Point	Location	Distance from San Gregorio Creek[1] (feet)	Date	Depth to Groundwater (feet, bgs[2])	Saturated Thickness (feet)[3]
Existing Water Well	E side of residence	40	2008	41.2	Unknown
Septic system test pit	South of barn	150	Oct 2013	15.0	Unknown
Septic system test pit	South of barn	150	May 2014	11.5	Unknown
Septic system test pit	South of barn	130	May 2014	11.0	Unknown
Geotech Boring #1	NE side bridge approach	30	Sep 2017	29.0	11.0
Geotech Boring #2	N side animal enclosure	200	Sep 2017	16.5	3.5
Geotech Boring #3	NE of barn	200	Sep 2017	17.0	13.0
Geotech Boring #4	E of barn	120	Sep 2017	17.5	12.0
Geotech Boring #5	SW side bridge approach	50	Sep 2017	28.0	7.0

[1] from top of bank
[2] bgs: below ground surface
[3] above bedrock

PROPOSED DEVELOPMENT AND DRAINAGE CHANGES

Proposed building and site development work for the project will include the following major items, some of which could affect landscape and drainage:

1. Barn replacement, perimeter foundation and adjacent grading and fill ramp
2. Internal modifications to the existing caretaker residence
3. New tent camping pads (at existing grade)
4. New onsite wastewater treatment system
5. New domestic supply well (separate permit application: PLN2018-000457)
6. New water treatment system and storage tanks on north hillside
7. New walking paths, gravel or decomposed granite
8. Resurfacing and widening existing gravel driveway and parking areas

9. Expansion of existing paved areas to include widening of the access driveway (two locations), parking spaces and fire hydrant access area; adding approximately 1,600 ft^2 paved surface.
10. Trenching and backfilling for underground site utilities (piping, electrical, etc...)

Minor and Unconnected Development Areas. Of the above items, all work except that associated with the new water treatment system and storage tanks (item 6), would involve relatively small building activities, grading or landscape changes where runoff and drainage is isolated and/or unconnected with other site development. In these cases drainage from building changes, tent structures, buried pipes and tanks, walking pathways, driveway and parking changes will continue to be shed (by sheet flow) and readily absorbed into the adjacent permeable alluvial soils. No fill will be placed within the 100-yr floodplain, and no changes in site hydrology will occur as a result of these development activities; no drainage improvements or mitigation measures will be required for these items.

Water Treatment and Storage Site. The proposed water treatment system and storage tanks will be located on a gently sloping (8% grade) area of the north hillside and will require a small amount of grading and drainage to accommodate the facilities (see **Figure 1**). Access to the site will be via a grassy trail (6- ft wide, 40-ft long) along the contours. The graded area for the water treatment/storage facilities is estimated to encompass approximately 2,000 ft^2 – approximately 1,500 ft^2 gravel surface, with 500 ft^2 of impervious area (tanks and concrete pads)

The development of this hillside treatment and tank site will result in a very minor increase in the rate and volume of runoff locally. To mitigate this, a bio-retention swale will be installed across the hillside immediately down-slope of the graded pad to collect, store and infiltrate excess runoff. **Attachment B** provides hydrology calculations documenting the estimation of the increased runoff and design basis for the bio-retention swale; results are summarized in **Table 3**. Based on 10-yr storm event, a bio-retention swale 75-ft long, by 5-ft wide, by 1-ft deep will fully attenuate the increased rate and volume of runoff from the water treatment and storage tank site.

Table 3.
Runoff Impact and Mitigation Summary
Water Treatment & Storage Area

	10-yr Storm Peak Flow, Q (cfs)	**10-min Runoff Vol. at Peak Flow (ft^3)**	**1-hr Runoff Vol. at Peak Flow (ft^3)**
Pre-development	0.05	31.34	188.06
Post-development	0.10	59.33	355.96
Net Increase	0.05	27.98	167.90
Bio-retention Storage + Infiltration	-	(-227.50)	(-240.00)
Mitigated Condition	-	(-168.17)	115.96
		No Discharge	Net Reduction

ATTACHMENT A

Water Balance - Recharge Analysis

ATTACHMENT A

Onsite Water Balance Recharge Analysis - Vida Verde*

ETo Climate Zone 1 - Deep Well Drained Alluvial Terrace - Corralitos Sandy Loam Soils

Month	Average Rainfall (in/month)	Average Runoff Rate (%)	Available Precip. (in/month)	Reference ETo (in/month)	Adjusted ET (in/month)	Net Rainfall Recharge (in/month)	Net Onsite Rainfall Recharge Vida Verde Alluvial Groundwater		
							ac-ft/ac-yr	Total for 5-acre Area ac-ft/yr	Total Gals/yr
Jan	5.66	0.15	4.81	0.93	0.56	4.25	0.35	1.77	577,435
Feb	5.08	0.15	4.32	1.40	0.84	3.48	0.29	1.45	472,212
Mar	4.25	0.10	3.83	2.48	1.49	2.34	0.19	0.97	317,297
Apr	2.27	0.05	2.16	3.30	1.98	0.18	0.01	0.07	23,964
May	0.86	0.00	0.86	4.03	2.42	0.00	0.00	0.00	0
Jun	0.33	0.00	0.33	4.50	2.70	0.00	0.00	0.00	0
Jul	0.11	0.00	0.11	4.65	2.79	0.00	0.00	0.00	0
Aug	0.18	0.00	0.18	4.03	2.42	0.00	0.00	0.00	0
Sep	0.41	0.00	0.41	3.30	1.98	0.00	0.00	0.00	0
Oct	1.55	0.05	1.47	2.48	1.49	0.00	0.00	0.00	0
Nov	3.49	0.10	3.14	1.20	0.72	2.42	0.20	1.01	328,702
Dec	5.24	0.15	4.45	0.62	0.37	4.08	0.34	1.70	554,218
Total	**29.43**		**26.07**	**32.92**	**19.75**	**16.75**	1.4	**7.0**	**2,273,829**

Notes:

* Based on methodology & assumptionsfor water balance-cumulative impact analysis Pescadero area, San Mateo County OWTS LAMP, 2016

1. Ave monthly precip for, determined from NOAA, Western Regional Climate Center for Pescadero
2. "Available Precip" equal to ave monthly precip minus estimated runoff volume;
3. Reference ETo obtained from DWR/CIMIS for Zone 1, Coastal Plains Heavy Fog Belt
4. Potential ET adjusted with 0.6 Landscape Coefficient multiplier
5. Alluvial terrace area: 5 acres

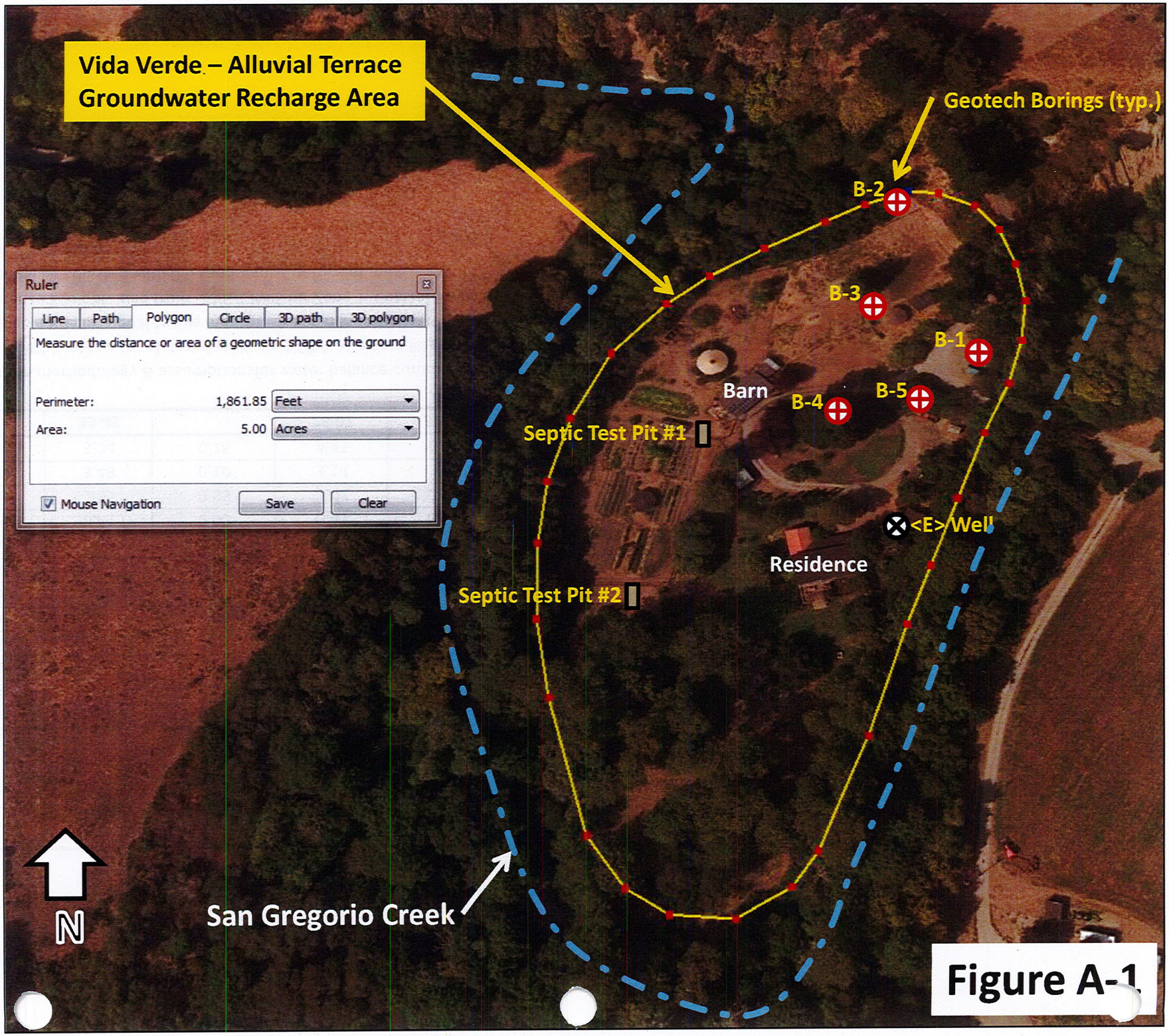

Vida Verde – Alluvial Terrace Groundwater Recharge Area
Geotech Borings (typ.)
B-2
B-3
B-1
B-4
B-5
Barn
Septic Test Pit #1
Septic Test Pit #2
<E> Well
Residence
San Gregorio Creek
N
Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the distance or area of a geometric shape on the ground
Perimeter:
1,861.85
Feet
Area:
5.00
Acres
Mouse Navigation
Save
Clear

Figure A-1

ATTACHMENT B

Runoff – Retention Calculations

ATTACHMENT B

Vida Verde

Hydrology/Drainage-Retention Analysis for Water Treatment/Storage Site

Area (A):

Gravel Pad: + 20' x 75' = 1,500 sq ft

Acres:	**0.03**

C Value:

Pre-development C (parks & Cemetery): **0.3**

Post-development C:

500 sq ft impermeable @ 0.85	425
1000 sq ft grass/gravel surface @ 0.50	500
	925
Composite C:	**0.62**

Time of Concentration: 0-10 min

Rainfall Intensity (I), 10-yr: **2.45** in/hr

Intensity Factor (F): **1.2**

Peak Runoff per Rational Method : Q=*C*I*A*F

	10-yr Q, cfs	10-min Vol (cu ft)	Hourly Vol (cu ft)
Pre-development	0.03	18.22	109.34
Post-development	0.06	37.46	224.75
Net Discharge Increase	0.03	19.24	115.41
Bioswale Storage Volume (below)		225.00	225.00
Infiltration Volume (below)		2.50	15.00
Mitigated Condition		**-190.04**	**-15.25**
		No Discharge	**Net Reduction**

Bioswale Retention - Storage and Infiltration Capacity

Trench Dimensions: 5 ft wide, 1 ft deep, 2:1 sidewalls

Trench Vol per lf: = 3 cu ft per lf

Trench length and vol: 75 lf; 225 cu ft

Infiltration Area: 2 sq ft per lf

Infltration Rate: 0.6 in/hr vertical, 1.2 in/hr horizontal @2:1 H:V = 0.10 ft/hr per sq ft

Time to Drain: 225 cu ft (0.2 cu ft/hr*75 ft) = 15 hrs

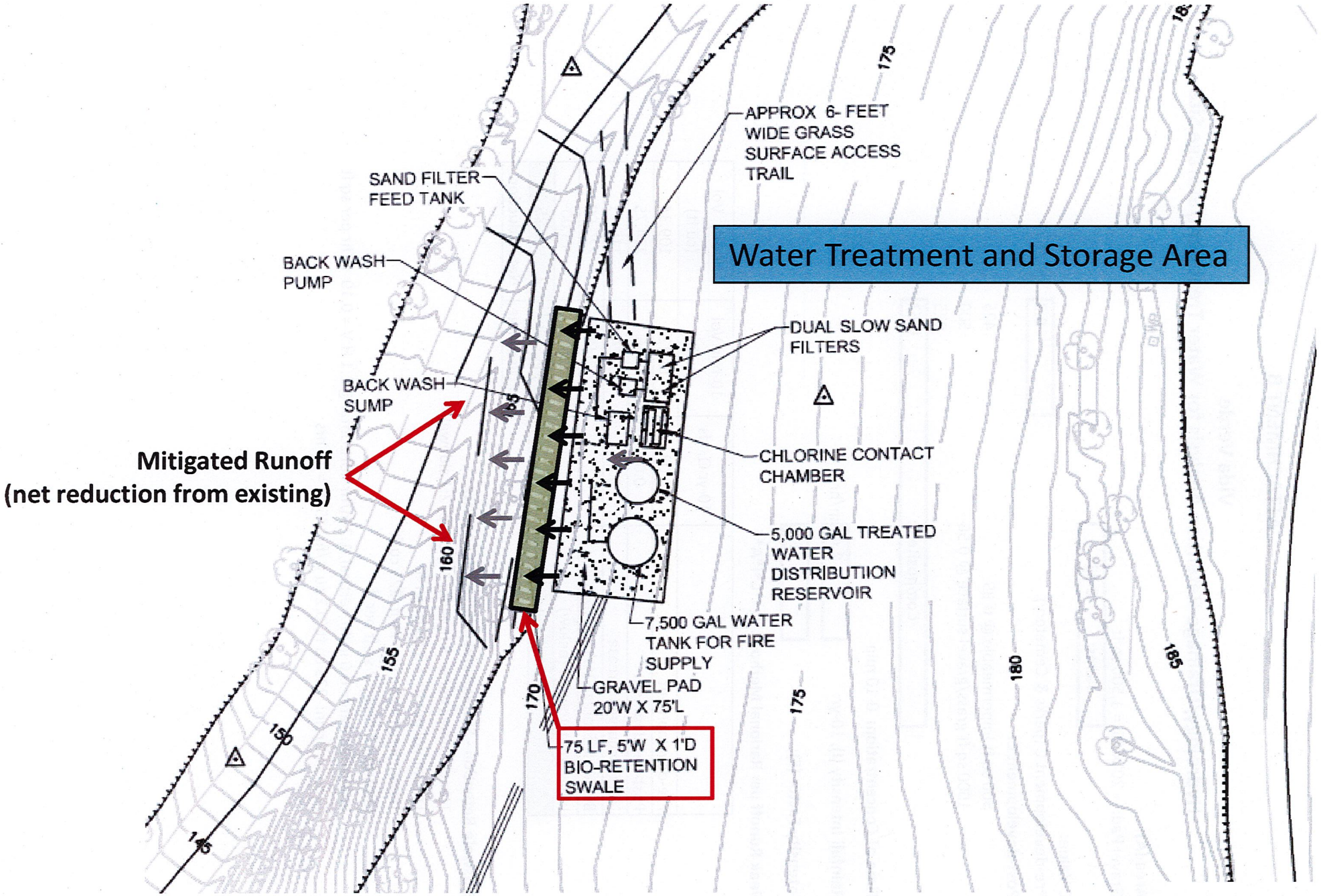

Water Treatment and Storage Area
APPROX 6- FEET WIDE GRASS SURFACE ACCESS TRAIL
SAND FILTER FEED TANK
BACK WASH PUMP
BACK WASH SUMP
DUAL SLOW SAND FILTERS
CHLORINE CONTACT CHAMBER
5,000 GAL TREATED WATER DISTRIBUTIION RESERVOIR
7,500 GAL WATER TANK FOR FIRE SUPPLY
GRAVEL PAD 20'W X 75'L
75 LF, 5'W X 1'D BIO-RETENTION SWALE
Mitigated Runoff
(net reduction from existing)
175
160
155
170
180
185

Figure B-1

QUESTA ENGINEERING CORP.
Civil, Environmental & Water Resources

December 21, 2018

Sandy Sommer ASLA, AICP
Vida Verde Capital Projects Manager
3540 La Honda Road,
San Gregorio, CA 94074

Subject: C3/C6 Stormwater Best Management Practices (BMPs) – Vida Verde

Dear Sandy:

This memorandum has been prepared to accompany the C3/C6 Development Review Checklist and project planning submittal package for the Vida Verde Nature Education facility in San Gregorio. Provided are listing and description of BMP measures incorporated in the design and to be provided as part of construction documents and project implementation, as applicable.

Erosion Control

1. Point of Contact for Erosion Control: Norman Hantzsche, PE; Questa Engineering; (510) 236-6114, ext. 214

2. Contractor(s) shall store, handle, and dispose of construction materials and wastes properly.

3. Contractor(s) shall be responsible for controlling and preventing runoff of all potential pollutants, including drill cuttings, chemicals, concrete, petroleum products, wash water or sediments,

4. Contractor(s) equipment access shall be via the existing paved entrance and established vehicle access roads.

5. Contractor(s) shall avoid tracking dirt or other materials off-site and shall clean off-site paved areas using dry sweeping methods at completion of work.

6. Contractor(s) shall provide and store necessary erosion control materials onsite for deployment as required.

7. Contractor(s) shall follow and implement all other erosion control measures as detailed in the project construction plans and consistent with San Mateo County Stormwater Control guidelines and requirements for development projects.

Low Impact Site Design Measures

1. The project site and current and planned operations (nature/education farm) are a model of low impact development.

2. All runoff from buildings and vehicle areas is directed into adjacent very permeable alluvial soils, gardens and vegetated areas over a majority of the site.

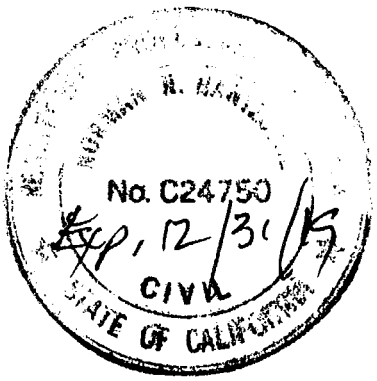
Box 70356, 1220 Brickyard Cove Rd. Suite 206 Pt. Richmond, CA 94807 T: 510/236.6114 F: 510/236.2423 E: Questa@QuestaEC.com

3. Cisterns for rainwater harvesting will be incorporated for farm and garden irrigation, as well as an educational tool.

4. Walkways and trails within the project will be constructed with permeable surface treatment, such as gravels and decomposed granite.

5. Except for the existing paved entrance driveway which serves multiple properties, vehicle parking and access driveway within the project area are gravel surfaced and will continue to be maintained as such.

Norman N. Hantzsche, PE
Principal/Managing Engineer



SAN MATEO COUNTYWIDE
Water Pollution
Prevention Program

COUNTY OF SAN MATEO
Planning & Building Department
455 County Center, 2nd Floor
Redwood City, CA 94063
BLD: 650-599-7311/PLN: 650-363-1825
http://planning.smcgov.org/

C.3 and C.6 Development Review Checklist

Municipal Regional Stormwater Permit (MRP)
Stormwater Controls for Development Projects

Applicants: This form should be filled out by the Project Civil Engineer, if one is associated with the project.
Office Use: Planners, scan and upload to Accela Case and provide hard copy to EC Team; Building Techs, forward to DPW

Project Information

I.A Enter Project Data *(For "C.3 Regulated Projects," data will be reported in the municipality's stormwater Annual Report.)*

Project Name: Vida Verde Nature Education Case Number:

Project Address & Cross St.: 3540 La Honda Road (Hwy 84)

Project APN: 081-320-060 Project Watershed: San Gregorio

Applicant Name: Vida Verde Nature Education **I.A.4** Slope on Site: 2-8 %

Applicant Phone: (650) 747-9288 Applicant Email Address: shawn@vveducation.org

Development type: (check all that apply)

- ☐ Single Family Residential: A stand-alone home that is not part of a larger project.
- ☐ Single Family Residential: Two or more lot residential development.[1] # of units: _____
- ☐ Multi-Family Residential # of units: _____
- ☐ Commercial
- ☐ Industrial, Manufacturing
- ☐ Mixed-Use # of units: _____
- ☐ Streets, Roads[2], etc.
- ☐ 'Redevelopment' as defined by MRP: creating, adding and/or replacing exterior existing impervious surface on a site where past development has occurred.

I.A.1

- ☐ **'Special land use categories'** as defined by MRP: (1) auto service facilities[3], (2) retail gasoline outlets, (3) restaurants, (4) uncovered parking area (stand-alone or part of a larger project)
- ☐ Institutions: schools, libraries, jails, etc.
- ☒ Parks and trails, camp grounds, other recreational
- ☒ Agricultural, wineries
- ☐ Kennels, Ranches
- ☐ Other, Please specify_____

Project Description[4]: (Also note any past or future phases of the project.)

Existing working farm to be converted to provide camping facilities for up to 30 students w/adults, reconstruct barn w/kitchen, worker sleeping quarters, and other supporting utilities.

I.A.2 Total Area of Site: 23 acres

I.A.3 Total Area of land disturbed during construction (include clearing, grading, excavating and stockpile area): 0.5 acres.

I.A.5 Certification:

Name of person completing the form: Norman Hantzsche Title: Project Engineer

Phone number: (610) 236-6114, ext. 214 Email address: nhantzsche@questaec.com

☑ By checking this box, I certify that the information provided on this form is correct and acknowledge that, should the project exceed the amount of new and/or replaced impervious surface provided in this form, the as-built project may be subject to additional improvements. Initials: NH Date: 12/21/18

I have attached the following: ☐ Preliminary Calculations ☐ Final Calculations ☒ A copy of site plan showing areas

[1] Common Plans of Development (subdivisions or contiguous, commonly owned lots, for the construction of two or more homes developed within 1 year of each other) are not considered single family projects by the MRP.

[2] Roadway projects creating 10,000 sq.ft. or more of contiguous impervious surface are subject to C.3 requirements if the roadway is new or being widened with additional traffic lanes.

[3] See Standard Industrial Classification (SIC) codes here

[4] Project description examples: 5-story office building, industrial warehouse, residential with five 4-story buildings for 200 condominiums, etc.

I.B Is the project a "C.3 Regulated Project" per MRP Provision C.3.b?

I.B.1 Enter the amount of impervious surface[5] Retained, Replaced and/or Created by the project:

Table I.B.1 Impervious[5] and Pervious Surfaces

Type of Impervious[5] Surface	I.B.1.a Pre-Project Impervious[5] Surface (sq.ft.)	I.B.1.b Existing Impervious[5] Surface to be Retained[6] (sq.ft.)	I.B.1.c Existing Impervious[5] Surface to be Replaced[6] (sq.ft.)	I.B.1.d New Impervious[5] Surface to be Created[6] (sq.ft.)	I.B.1.e Post-Project Impervious[5] Surface (sq.ft.) (=b+c+d)
Roof area(s)	5660	5660	1350	4470	11480
Impervious[5] sidewalks, patios, paths, driveways, streets	12000	12000	0	2500	14500
Impervious[5] uncovered parking[7]	0	0	0	0	0
Totals of Impervious Surfaces:	17660	17660	1350	6970	25980
I.B.1.f - Total Impervious[5] Surface Replaced and Created *(sum of totals for columns I.B.1.c and I.B.1.d)*:				8320	

Type of Pervious Surface	Pre-Project Pervious Surface (sq.ft.)				Post-project Pervious Surface (sq.ft.)
Landscaping	383000				369860
Pervious Paving	4000			**I.B.1.e.1:**	9000
Green Roof					
Totals of Pervious Surfaces:	387000				378860
Total Site Area (Total Impervious[5]+Total Pervious=**I.A.2**)	404660				404840

I.B.2 Please review and attach additional worksheets as required below using the Total Impervious Surface (IS) Replaced and Created in cell I.B.1.f from Table I.B.1 above and other factors:

	Check all that apply:	Check One Yes	Check One No	Attach Worksheet
I.B.2.a	Does this project involve any earthwork? If YES, then Check Yes, and Complete Worksheet A. If NO, then go to I.B.2.b	☑	☐	A
I.B.2.b	Is **I.B.1.f** greater than or equal to 2,500 sq.ft? If YES, then the Project is subject to Provision C.3.i. - complete Worksheets B, C & go to I.B.2.c. If NO, then Stop here - go to I.A.5 and complete Certification.	☑	☐	B, C
I.B.2.c	Is the total Existing IS to be Replaced (column **I.B.1.c**) 50 percent or more of the total Pre-Project IS (column **I.B.1.a**)? If YES, site design, source control and treatment requirements apply to the whole site. Continue to I.B.2.d If NO, these requirements apply only to the impervious surface created and/or replaced. Continue to I.B.2.d	☐	☑	
I.B.2.d	Is this project a Special Land Use Category (**I.A.1**) and is **I.B.1.f** greater than or equal to 5,000 sq.ft? If YES, project is a Regulated Project. Fill out Worksheet D. Go to I.B.2.f. If NO, go to I.B.2.e	☐	☑	D
I.B.2.e	Is **I.B.1.f** greater than or equal to 10,000 sq.ft? If YES, project is a C.3 Regulated Project - complete Worksheet D. Then continue to I.B.2.f. If NO, then skip to I.B.2.g.	☐	☑	D
I.B.2.f	Is **I.B.1.f** greater than or equal to 43,560 sq.ft? If YES, project may be subject to Hydromodification Management requirements - complete Worksheet E then continue to I.B.2.g. If NO, then go to I.B.2.g.	☐	☑	E
I.B.2.g	Is **I.A.3** greater than or equal to 1 acre? If YES, check box, obtain coverage under the CA Const. General Permit & submit Notice of Intent to municipality - go to I.B.2.h. If NO, then go to I.B.2.h. For more information see: www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml	☐	☑	
I.B.2.h	Is this a Special Project or does it have the potential to be a Special Project? See Worksheet F to determine if a Special Project. If YES, attach completed Worksheet F - then continue to I.B.2.i. If NO, go to I.B.2.i.	☐	☑	F
I.B.2.i	Is project a ***Construction Stormwater Regulated Site (SWRS)***? 1) Sites that disturb 1 acre or more of land; 2) where the project requires a Grading Permit; 3) Sites with a) Residential new construction or a 50% or greater remodel, or b) Commercial/ Industrial construction of a new building or additions of 3,000 sq. ft. or greater, and with one or both of the following: (1) Sites where development will occur on a slope greater than or equal to 5:1 (20%), and/or (2) Sites where development will occur within 100 feet of a creek, wetland, or coastline; 4) Any public or private project involving work within a waterway; and 5) Sites within the ASBS watershed that involve soil disturbance. *If NO, then go to I.B.2.j*	☐	☑	G
I.B.2.j	For Municipal Staff Use Only: Are you using Alternative Certification for the project review? If YES, then fill out section G-1 on Worksheet G. Fill out other sections of Worksheet G as appropriate. See cell **I.B.1.e.1** above - Is the project installing 3,000 square feet or more of pervious paving? If YES, then fill out section G-3 on Worksheet G. Add to Municipal Inspection Lists (C.3.h)	☐ ☐	☐ ☐	G

[5] Per the MRP, pavement that meets the following definition of pervious pavement is NOT an impervious surface. Pervious pavement is defined as pavement that stores and infiltrates rainfall at a rate equal to immediately surrounding unpaved, landscaped areas, or that stores and infiltrates the rainfall runoff volume described in Provision C.3.

[6] "Retained" means to leave existing impervious surfaces in place, unchanged; "Replaced" means to install new impervious surface where existing impervious surface is removed anywhere on the same property; and "Created" means the amount of new impervious surface being proposed which exceeds the total existing amount of impervious surface at the property.

[7] Uncovered parking includes the top level of a parking structure.

Worksheet A

C6 – Construction Stormwater BMPs

Include the following Construction BMPs on the Erosion Control Plan:
(Applies to all projects with earthwork)

Yes	Plan Sheet	Best Management Practice (BMP) Notes
☑	BMP Memo	Erosion Control Point of Contact. *(Provide an Erosion Control Point of Contact including name, title/qualification, email, and phone number. The EC Point of Contact will be the County's main point of contact if Erosion Control or Tree Protection corrections are required).*
☑	BMP Memo	Perform clearing and earth-moving activities only during dry weather. Measures to ensure adequate erosion and sediment control shall be installed prior to earth-moving activities and construction.
☑	BMP Memo	Measures to ensure adequate erosion and sediment control are required year-round. Stabilize all denuded areas and maintain erosion control measures continuously between October 1 and April 30.
☑	BMP Memo	Store, handle, and dispose of construction materials and wastes properly, so as to prevent their contact with stormwater.
☑	BMP Memo	Control and prevent the discharge of all potential pollutants, including pavement cutting wastes, paints, concrete, petroleum products, chemicals, wash water or sediments, and non-stormwater discharges to storm drains and watercourses.
☐	N/A	Use sediment controls or filtration to remove sediment when dewatering site and obtain Regional Water Quality Control Board (RWQCB) permit(s) as necessary.
☐	BMP Memo	Avoid cleaning, fueling, or maintaining vehicles on-site, except in a designated area where wash water is contained and treated.
☐	N/A	Limit and time applications of pesticides and fertilizers to prevent polluted runoff.
☑	BMP Memo	Limit construction access routes to stabilized, designated access points.
☑	BMP Memo	Avoid tracking dirt or other materials off-site; clean off-site paved areas and sidewalks using dry sweeping methods.
☑	BMP Memo	Train and provide instruction to all employees and subcontractors regarding the Watershed Protection Maintenance Standards and Construction Best Management Practices.
☐	N/A	Placement of erosion materials at these locations are required on weekends and during rain events: *(List locations)*
☑	BMP Memo	The areas delineated on the plans for parking, grubbing, storage, etc., shall not be enlarged or "run over."
☑	BMP Memo	Construction sites are required to have erosion control materials on-site during the "off-season."
☐	N/A	Dust control is required year-round.
☑	BMP Memo	Erosion control materials shall be stored on-site.
☑	BMP Memo	Use of plastic sheeting between October 1 and April 30 is not acceptable, unless for use on stockpiles where the stockpile is also protected with fiber rolls containing the base of the stockpile.
☑	BMP Memo	Tree protection shall be in place before any demolition, grading, excavating or grubbing is started.

Worksheet B

C3 - Source Controls

Select appropriate source controls and identify the detail/plan sheet where these elements are shown.

Yes	Detail/Plan Sheet No., or "N/A"	Features that require source control measures	Source Control Measures (Refer to Local Source Control List for detailed requirements)
☐	N/A	Storm Drain (street/road projects)	Mark on-site inlets with the words "No Dumping! Flows to Bay" or equivalent.
☑		Floor Drains (non-residential)	Plumb interior floor drains to sanitary sewer[8] [or prohibit].
☐	N/A	Parking garage (non-single-family residential)	Plumb interior parking garage floor drains to sanitary sewer.[8]
☑		Landscaping (all project types)	▪ Retain existing vegetation as practicable. ▪ Select diverse species appropriate to the site. Include plants that are pest- and/or disease-resistant, drought-tolerant, and/or attract beneficial insects. ▪ Minimize use of pesticides and quick-release fertilizers. ▪ Use efficient irrigation system; design to minimize runoff.
☐	N/A	Pool/Spa/Fountain (all project types)	Provide connection to the sanitary sewer to facilitate draining.[8]
☑	C.2	Food Service Equipment (non-residential)	Provide sink or other area for equipment cleaning, which is: ▪ Connected to a grease interceptor prior to sanitary sewer discharge.[8] ▪ Large enough for the largest mat or piece of equipment to be cleaned. ▪ Indoors or in an outdoor roofed area designed to prevent stormwater run-on and run-off, and signed to require equipment washing in this area.
☐	N/A	Refuse Areas (non-single-family residential)	▪ Provide a roofed and enclosed area for dumpsters, recycling containers, etc., designed to prevent stormwater run-on and runoff. ▪ Connect any drains in or beneath dumpsters, compactors, and tallow bin areas serving food service facilities to the sanitary sewer.[8]
☐	N/A	Outdoor Process Activities [9] (non-residential)	Perform process activities either indoors or in roofed outdoor area, designed to prevent stormwater run-on and runoff, and to drain to the sanitary sewer.[8]
☐	N/A	Outdoor Equipment/ Materials Storage (non-residential)	▪ Cover the area or design to avoid pollutant contact with stormwater runoff. ▪ Locate area only on paved and contained areas. ▪ Roof storage areas that will contain non-hazardous liquids, drain to sanitary sewer[8], and contain by berms or similar.
☐	N/A	Vehicle/ Equipment Cleaning (non-single-family residential)	▪ Roofed, pave and berm wash area to prevent stormwater run-on and runoff, plumb to the sanitary sewer[8], and sign as a designated wash area. ▪ Commercial car wash facilities shall discharge to the sanitary sewer.[8]
☐	N/A	Vehicle/ Equipment Repair and Maintenance (non-single-family residential)	▪ Designate repair/maintenance area indoors, or an outdoors area designed to prevent stormwater run-on and runoff and provide secondary containment. Do not install drains in the secondary containment areas. ▪ No floor drains unless pretreated prior to discharge to the sanitary sewer.[8] ▪ Connect containers or sinks used for parts cleaning to the sanitary sewer.[8]
☐	N/A	Fuel Dispensing Areas (non-residential)	▪ Fueling areas shall have impermeable surface that is a) minimally graded to prevent ponding and b) separated from the rest of the site by a grade break. ▪ Canopy shall extend at least 10 ft. in each direction from each pump and drain away from fueling area.
☐	N/A	Loading Docks (non-residential)	▪ Cover and/or grade to minimize run-on to and runoff from the loading area. ▪ Position downspouts to direct stormwater away from the loading area. ▪ Drain water from loading dock areas to the sanitary sewer.[8] ▪ Install door skirts between the trailers and the building.
☑		Fire Sprinklers (all project types)	Design for discharge of fire sprinkler test water to landscape or sanitary sewer.[8]
☐	N/A	Miscellaneous Drain or Wash Water (all project types)	▪ Drain condensate of air conditioning units to landscaping. Large air conditioning units may connect to the sanitary sewer.[8] ▪ Roof drains from equipment drain to landscaped area where practicable. ▪ Drain boiler drain lines, roof top equipment, all wash water to sanitary sewer.[8]
☐	N/A	Architectural Copper Rinse Water (all project types)	▪ Drain rinse water to landscaping, discharge to sanitary sewer[8], or collect and dispose properly offsite. See flyer "Requirements for Architectural Copper."

[8] Any connection to the sanitary sewer system is subject to sanitary district approval.
[9] Businesses that may have outdoor process activities/equipment include machine shops, auto repair, industries with pretreatment facilities.

Worksheet C

Low Impact Development – Site Design Measures

Select Appropriate Site Design Measures *(Required for C.3 Regulated Projects; all other projects are encouraged to implement site design measures, which may be required at municipality discretion.) Projects that create and/or replace 2,500 – 10,000 sq.ft. of impervious surface, and stand-alone single family homes that create/replace 2,500 sq.ft. or more of impervious surface, must include* ***one of Site Design Measures a through f*** *(Provision C.3.i requirements).*[10] *Larger projects must also include applicable Site Design Measures g through i. Consult with municipal staff about requirements for your project.*

Select appropriate site design measures and Identify the Plan Sheet where these elements are shown.

Yes	Plan Sheet Number	
☑	BMP Memo	a. Direct roof runoff into cisterns or rain barrels and use rainwater for irrigation or other non-potable use.
☑	BMP Memo	b. Direct roof runoff onto vegetated areas.
☑	BMP Memo	c. Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas.
☑	BMP Memo	d. Direct runoff from driveways and/or uncovered parking lots onto vegetated areas.
☑	A1.1	e. Construct sidewalks, walkways, and/or patios with pervious or permeable surfaces. Use the specifications in the C3 Technical Guidance (Version 4.1) downloadable at www.flowstobay.org/newdevelopment.
☐		f. Construct bike lanes, driveways, and/or uncovered parking lots with pervious surfaces. Use the specifications in the C3 Technical Guidance (Version 4.1) downloadable at www.flowstobay.org/newdevelopment.
☑	A1.1	g. Limit disturbance of natural water bodies and drainage systems; minimize compaction of highly permeable soils; protect slopes and channels; and minimize impacts from stormwater and urban runoff on the biological integrity of natural drainage systems and water bodies.
☑	A1.1	h. Conserve natural areas, including existing trees, other vegetation and soils.
☑	A1.1	i. Minimize impervious surfaces.

Regulated Projects can also consider the following site design measures to reduce treatment system sizing:

Yes	Plan Sheet Number	
☐		j. Self-treating area (see Section 4.2 of the C.3 Technical Guidance)
☐		k. Self-retaining area (see Section 4.3 of the C.3 Technical Guidance)
☐		l. Plant or preserve interceptor trees (Section 4.1, C.3 Technical Guidance)

[10] See MRP Provision C.3.a.i.(6) for non-C.3 Regulated Projects, C.3.c.i.(2)(a) for Regulated Projects, C.3.i for projects that create/replace 2,500 to 10,000 sq.ft. of impervious surface and stand-alone single family homes that create/replace 2,500 sq.ft. or more of impervious surface.

Worksheet D

C3 Regulated Project - Stormwater Treatment Measures

Check all applicable boxes and indicate the treatment measure(s) included in the project.

Yes	
☐ Attach Worksheet F and Calculations	Is the project a **Special Project?**[11] If yes, consult with municipal staff about the need to evaluate the feasibility and infeasibility of 100% LID treatment. Indicate the type of non-LID treatment to be used, the hydraulic sizing method[12], and percentage of the amount of runoff specified in Provision C.3.d that is treated: Non-LID Treatment Measures: — Hydraulic sizing method[12] — % of C.3.d amount of runoff treated ☐ Media filter ☐2.a ☐2.b ☐2.c ____% ☐ Tree well filter ☐2.a ☐2.b ☐2.c ____%
☐	Is the project using infiltration systems? The MRP no longer requires the use or analysis of the feasibility of infiltration, but infiltration systems are encouraged and may be beneficial depending on the project. Indicate the infiltration measures to be used, and hydraulic sizing method: Infiltration Measures: — Hydraulic sizing method[12] ☐ Bioinfiltration[13] ☐1.a ☐1.b ☐2.c ☐3 ☐ Infiltration trench ☐1.a ☐1.b ☐ Other (specify):
☐	Is the project harvesting and using rainwater? The MRP no longer requires the use or analysis of the feasibility of rainwater harvesting, but it rainwater harvesting and use is encouraged and may be beneficial depending on the project." Rainwater Harvesting/Use Measures: — Hydraulic sizing method[12] ☐ Rainwater Harvesting for indoor non-potable water use ☐1.a ☐1.b ☐ Rainwater Harvesting for landscape irrigation use ☐1.a ☐1.b
☐	Is the project installing biotreatment measures? Indicate the biotreatment measures to be used, and the hydraulic sizing method: Biotreatment Measures: — Hydraulic sizing method[12] ☐ Bioretention area ☐2.c ☐3 ☐ Flow-through planter ☐2.c ☐3 ☐ Other (specify): _____

A copy of the long term Operations and Maintenance (O&M) Agreement and Plan for this project will be required. Please contact the NPDES Representative of the applicable municipality for an agreement template and consult the C.3 Technical Guidance at www.flowstobay.org for maintenance plan templates for specific facility types.

[11] Special Projects are smart growth, high density, or transit-oriented developments with the criteria defined in Provision C.3.e.ii.(2), (3) or (4) (see Worksheet F).

[12] Indicate which of the following Provision C.3.d.i hydraulic sizing methods were used. Volume based approaches: 1(a) Urban Runoff Quality Management approach, or 1(b) 80% capture approach (recommended volume-based approach). Flow-based approaches: 2(a) 10% of 50-year peak flow approach, 2(b) 2 times the 85th percentile rainfall intensity approach, or 2(c) 0.2-Inch-per-hour intensity approach (recommended flow-based approach – also known as the 4% rule). Combination flow and volume-based approach: 3.

[13] See Section 6.1 of the C.3 Technical Guidance for conditions in which bioretention areas provide bioinfiltration.

Worksheet E

Hydromodification Management

E-1 Is the project a Hydromodification Management[14] (HM) Project?

E-1.1 Is the total impervious area increased over the pre-project condition?

- ☐ Yes. Continue to E-1.2
- ☐ No. The project is NOT required to incorporate HM Measures.
  Go to Item E-1.4 and check "No."

E-1.2 Is the site located in an HM Control Area per the HM Control Areas map (Appendix H of the C.3 Technical Guidance)?

- ☐ Yes. Continue to E-1.3
- ☐ No. Attach map, indicating project location. The project is NOT required to incorporate HM Measures.
  Skip to Item E-1.4 and check "No."

E-1.3 Has an engineer or qualified environmental professional determined that runoff from the project flows only through a hardened channel or enclosed pipe along its entire length before emptying into a waterway in the exempt area?

- ☐ Yes. Attach map of facility. Go to Item E-1.4 and check "No."
- ☐ No. Attach map, indicating project location. The project is required to incorporate HM Measures.
  Skip to Item E-1.4 and check "Yes."

E-1.4 Is the project a Hydromodification Management Project?

- ☐ Yes. The project is subject to HM requirements in Provision C.3.g of the Municipal Regional Stormwater Permit.
- ☐ No. The project is EXEMPT from HM requirements.

- ➢ If the project is subject to the HM requirements, incorporate in the project flow duration control measures designed such that post-project discharge rates and durations match pre-project discharge rates and durations.
- ➢ The Bay Area Hydrology Model (BAHM) has been developed to help size flow duration controls. See www.bayareahydrologymodel.org. Guidance is provided in Chapter 7 of the C.3 Technical Guidance.

E-2 Incorporate HM Controls (if required)

Are the applicable items provided with the Plans?

Yes	No	NA	
☐	☐	☐	Site plans with pre- and post-project impervious surface areas, surface flow directions of entire site, locations of flow duration controls and site design measures per HM site design requirement
☐	☐	☐	Soils report or other site-specific document showing soil type(s) on site
☐	☐	☐	If project uses the Bay Area Hydrology Model (BAHM), a list of model inputs and outputs.
☐	☐	☐	If project uses custom modeling, a summary of the modeling calculations with corresponding graph showing curve matching (existing, post-project, and post-project with HM controls curves), goodness of fit, and (allowable) low flow rate.
☐	☐	☐	If project uses the Impracticability Provision, a listing of all applicable costs and a brief description of the alternative HM project (name, location, date of start up, and entity responsible for maintenance).
☐	☐	☐	If the project uses alternatives to the default BAHM approach or settings, a written description and rationale.

[14] Hydromodification is the change in a site's runoff hydrograph, including increases in flows and durations that results when land is developed (made more impervious). The effects of hydromodification include, but are not limited to, increased bed and bank erosion of receiving streams, loss of habitat, increased sediment transport and/or deposition, and increased flooding. Hydromodification control measures are designed to reduce these effects.

Worksheet F
Special Projects

Complete this worksheet for projects that appear to meet the definition of "Special Project", per Provision C.3.e.ii of the Municipal Regional Stormwater Permit (MRP). The form assists in determining whether a project meets Special Project criteria, and the percentage of low impact development (LID) treatment reduction credit. Special Projects that implement less than 100% LID treatment must provide a narrative discussion of the feasibility or infeasibility of 100% LID treatment. See Appendix J of the C.3 Technical Guidance Handbook (download at www.flowstobay.org) for more information.

F.1 "Special Project" Determination *(Check the boxes to determine if the project meets any of the following categories.)*

Special Project Category "A"

Does the project have ALL of the following characteristics?

- ☐ Located in a municipality's designated central business district, downtown core area or downtown core zoning district, neighborhood business district or comparable pedestrian-oriented commercial district, or historic preservation site and/or district[15];
- ☐ Creates and/or replaces 0.5 acres or less of impervious surface;
- ☐ Includes no surface parking, except for incidental parking for emergency vehicle access, ADA access, and passenger or freight loading zones;
- ☐ Has at least 85% coverage of the entire site by permanent structures. The remaining 15% portion of the site may be used for safety access, parking structure entrances, trash and recycling service, utility access, pedestrian connections, public uses, landscaping and stormwater treatment.

☐ No (continue) ☐ Yes – Complete Section F.2 below

Special Project Category "B"

Does the project have ALL of the following characteristics?

- ☐ Located in a municipality's designated central business district, downtown core area or downtown core zoning district, neighborhood business district or comparable pedestrian-oriented commercial district, or historic preservation site and/or district[20];
- ☐ Creates and/or replaces more than 0.5 acres of impervious area and less than 2.0 acres;
- ☐ Includes no surface parking, except for incidental parking for emergency access, ADA access, and passenger or freight loading zones;
- ☐ Has at least 85% coverage of the entire site by permanent structures. The remaining 15% portion of the site may be used for safety access, parking structure entrances, trash and recycling service, utility access, pedestrian connections, public uses, landscaping and stormwater treatment;
- ☐ Minimum density of either 50 dwelling units per acre (for residential projects) or a Floor Area Ratio (FAR) of 2:1 (for commercial projects) - mixed use projects may use either criterion. **Note Change on 7/1/16[16]**

☐ No (continue) ☐ Yes – Complete Section F-2 below

Special Project Category "C"

Does the project have ALL of the following characteristics?

- ☐ At least 50% of the project area is within 1/2 mile of an existing or planned transit hub[17] or 100% within a planned Priority Development Area[18];
- ☐ The project is characterized as a non-auto-related use[19]; and
- ☐ Minimum density of either 25 dwelling units per acre (for residential projects) or a Floor Area Ratio (FAR) of 2:1 (for commercial projects) - mixed use projects may use either criterion. **Note Change on 7/1/16[16]**

☐ No (continue) ☐ Yes – Complete Section F-2 below

---

[15] And built as part of a municipality's stated objective to preserve/enhance a pedestrian-oriented type of urban design.

[16] **Effective 7/1/16**, the MRP establishes definitions for "Gross Density"(GD) & FAR. GD is defined as, "the total number of residential units divided by the acreage of the entire site area, including land occupied by public right-of-ways, recreational, civic, commercial and other non-residential uses." FAR is defined as," the Ratio of the total floor area on all floors of all buildings at a project site (except structures, floors, or floor areas dedicated to parking) to the total project site area.

[17] "Transit hub" is defined as a rail, light rail, or commuter rail station, ferry terminal, or bus transfer station served by three or more bus routes. (A bus stop with no supporting services does not qualify.)

[18] A "planned Priority Development Area" is an infill development area formally designated by the Association of Bay Area Government's / Metropolitan Transportation Commission's FOCUS regional planning program.

[19] Category C specifically excludes stand-alone surface parking lots; car dealerships; auto and truck rental facilities with onsite surface storage; fast-food restaurants, banks or pharmacies with drive-through lanes; gas stations; car washes; auto repair and service facilities; or other auto-related project unrelated to the concept of transit oriented development.

F.2 LID Treatment Reduction Credit Calculation

(If more than one category applies, choose only one of the applicable categories and fill out the table for that category.)

Category	Impervious Area Created/Replaced (sq. ft.)	Site Coverage (%)	Project Density[16] or FAR[16]	Density/Criteria	Allowable Credit (%)	Applied Credit (%)
A			N.A.	N.A.	100%	
B				Res ≥ 50 DU/ac or FAR ≥ 2:1	50%	
				Res ≥ 75 DU/ac or FAR ≥ 3:1	75%	
				Res ≥ 100 DU/ac or FAR ≥ 4:1	100%	
C				**Location credit (select one)[20]:**		
				Within ¼ mile of transit hub	50%	
				Within ½ mile of transit hub	25%	
				Within a planned PDA	25%	
				Density credit (select one):		
				Res ≥ 30 DU/ac or FAR ≥ 2:1	10%	
				Res ≥ 60 DU/ac or FAR ≥ 4:1	20%	
				Res ≥ 100 DU/ac or FAR ≥ 6:1	30%	
				Parking credit (select one):		
				≤ 10% at-grade surface parking[21]	10%	
				No surface parking	20%	
				TOTAL TOD CREDIT =		

F.3 Narrative Discussion of the Feasibility/Infeasibility of 100% LID Treatment:

If project will implement less than 100% LID, prepare a discussion of the feasibility or infeasibility of 100% LID treatment, as described in Appendix K of the C.3 Technical Guidance.

F.4 Select Certified Non-LID Treatment Measures:

If the project will include non-LID treatment measures, select a treatment measure certified for "Basic" General Use Level Designation (GULD) by the Washington State Department of Ecology's Technical Assessment Protocol – Ecology (TAPE). Guidance is provided in Appendix K of the C.3 Technical Guidance (download at www.flowstobay.org).[22]

[20] To qualify for the location credit, at least 50% of the project's site must be located within the ¼ mile or ½ mile radius of an existing or planned transit hub, as defined on page 1, footnote 2. A planned transit hub is a station on the MTC's Regional Transit Expansion Program list, per MTC's Resolution 3434 (revised April 2006), which is a regional priority funding plan for future transit stations in the San Francisco Bay Area. To qualify for the PDA location credit, 100% of the project site must be located within a PDA, as defined on page 1, footnote 3.

[21] The at-grade surface parking must be treated with LID treatment measures.

[22] TAPE certification is used in order to satisfy Special Project's reporting requirements in the MRP.

Worksheet G
(For municipal staff use only)

G-1 **Alternative Certification:** Were the treatment and/or HM control sizing and design reviewed by a qualified third-party professional that is not a member of the project team or agency staff?

☐ Yes ☐ No Name of Reviewer_____

G-2 **High Priority Site:** High Priority Sites can include those located in or within 100 feet of a sensitive habitat, an Area of Special Biological Significance (ASBS), a body of water, or **starting 7/1/16** on "hillside projects" disturbing >=5,000 sq.ft. of land and with steep slopes (of >=15% - see cell **I.A.4** - or as identified by municipal criteria or map). These sites are subject to monthly inspections from Oct 1 to April 30. See MRP Provision C.6.e.ii.(2).

☐ Yes ☐ No If yes, then add site to Staff's Monthly Rainy Season Construction Site Inspection List

G-3 **Inspections of Sites with Pervious Paving: Starting 7/1/16**, Regulated projects that are installing 3,000 sq.ft. or more of pervious paving (see cell **I.B.1.e.1**) (excluding private-use patios in single family homes, townhomes, or condominiums) must have the paving system inspected by the jurisdiction upon completion of the installation and the site must be added to the jurisdiction's list of sites needing inspections at least once every five years – see provision C.3.h. Pervious pavement systems include pervious concrete, pervious asphalt, pervious pavers and grid pavers etc. and are described in the C3 Technical Guidance (Version 4.1) downloadable at: www.flowstobay.org/newdevelopment.

☐ Yes ☐ No If yes, then add site to Staff's Lists for Inspections at the end of Construction and O&M.

Operations and Maintenance (O&M) Submittals

G-4 Stormwater Treatment Measure and/HM Control Owner or Operator's Information:

Name:_____

Address:_____

Phone:_____ Email:_____

- *Applicant must call for inspection and receive inspection within 45 days of installation of treatment measures and/or hydromodification management controls.*

The following questions apply to C.3 Regulated Projects and Hydromodification Management Projects.

	Yes	No	N/A
G-4.1 Was maintenance plan submitted?	☐	☐	☐
G-4.2 Was maintenance plan approved?	☐	☐	☐
G-4.3 Was maintenance agreement submitted? (Date executed:_____)	☐	☐	☐

- *Attach the executed maintenance agreement as an appendix to this checklist.*

G-5 **Annual Operations and Maintenance (O&M) Submittals (for municipal staff use only):**

For C.3 Regulated Projects and Hydromodification Management Projects, indicate the dates on which the Applicant submitted annual reports for project O&M:

_____

G-6 **Comments (for municipal staff use only):**

_____

_____

_____

_____

_____

G-7 NOTES (for municipal staff use only):

Section I Notes:_____

Worksheet A Notes:_____

Worksheet B Notes:_____

Worksheet C Notes:_____

Worksheet D Notes:_____

Worksheet E Notes:_____

Worksheet F Notes:_____

G-8 Project Close-Out (for municipal staff use only):

		Yes	No	NA
8.1	Were final Conditions of Approval met?	☐	☐	
8.2	Was initial inspection of the completed treatment/HM measure(s) conducted? (Date of inspection:_____)	☐	☐	☐
8.3	Was maintenance plan submitted? (Date executed:_____)	☐	☐	☐
8.4	Was project information provided to staff responsible for O&M verification inspections? (Date provided to inspection staff:_____)	☐	☐	☐

G-9 Project Close-Out (Continued -- for municipal staff use only):

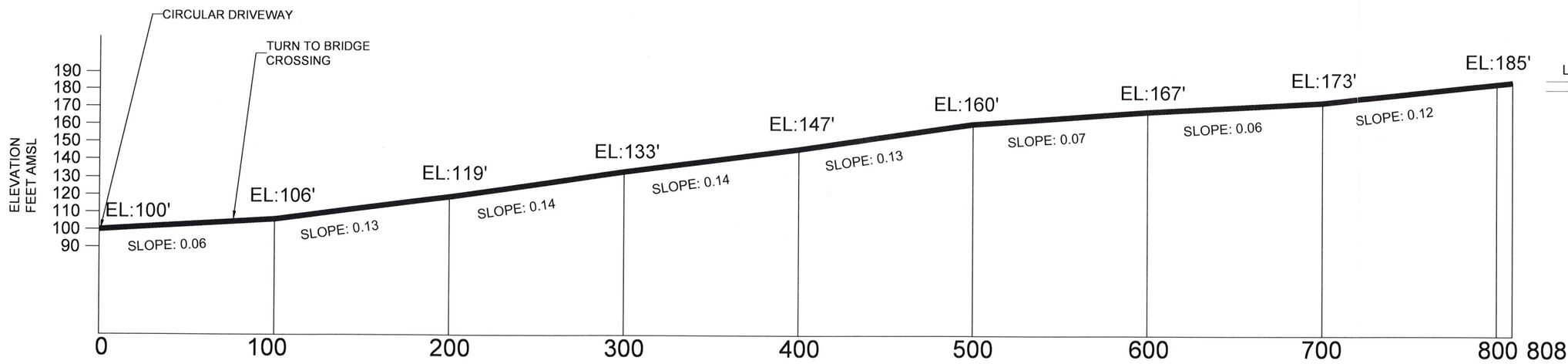
Name of staff confirming project is closed out:_____

Signature:_____ Date:_____

Name of O&M staff receiving information:_____

Signature:_____ Date:_____

PLN2019-00429



ENTRANCE ROAD PROFILE

Note: Elevation based on survey by R&R land Surveying (Jan. 27,2013)
with vertical datum updated by Cross Land Survey, Inc. (April. 2018)

VIDA VERDE

SAN GREGORIO, CA

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REGISTERED PROFESSIONAL ENGINEER JOHNAH N. HANIZSCH No. C24750 12-31-17 EXPIRES CIVIL STATE OF CALIFORNIA

Sht	Rev	Date	By	Description	App'd

Design: NH
Drawn: SY
Checked: NH
Appr'd: NH

ENTRANCE ROAD PROFILE

Size: D | Project: 1600028
Scale: AS NOTED
Date: 12-20-18
SHEET: 1 OF 1

5F