QUESTA
ENGINEERING CORP.

Bay Area Vipassana Center
On-Site Wastewater Disposal
Feasibility Report

9201 El Matador Drive
Gilroy, California

Prepared for:

Santa Clara County
Department of Environmental Health

Prepared by:

Questa Engineering Corporation
1220 Brickyard Cove Road, Suite 206
Point Richmond, California 94801

April 2021

Civil,
Environmental
& Water
Resources

On-Site Wastewater Disposal Feasibility Report

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Prepared for:

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Department of Environmental Health
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Questa Project no. 2000165

April 2021

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SECTION 1: PROJECT OVERVIEW

Background and Introduction

Bay Area Vipassana Center proposes the development of a meditation retreat center to be located on a 54.6-acre parcel at 9201 El Matador Drive in Gilroy, Santa Clara County, California. The new wastewater facilities will serve the meditation center consisting of 16 buildings; accommodations for sleeping, a kitchen dining building, a meditation building, maintenance building, administration building and caretaker's residence. (**Sheet 1**). The Center is split into a lower campus consisting of women's accommodations, volunteer accommodations, the dining hall, administration building, caretaker's cottage and maintenance building; and an upper campus consisting of men's accommodations, teacher's accommodations and meditation hall. Drinking water and irrigation water will be provided by a new well that will be located more than 150 feet from the proposed wastewater system.

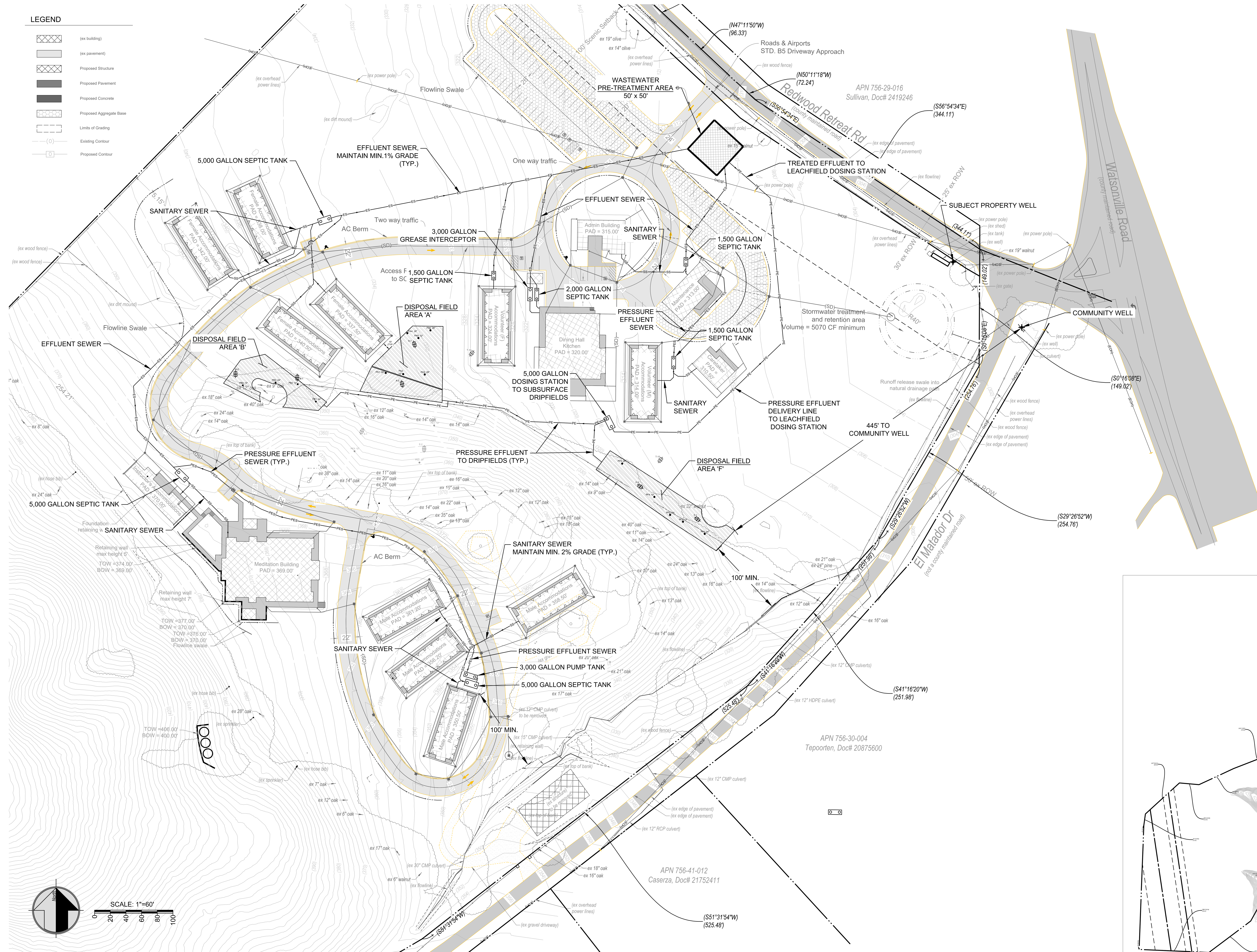
Included in this Feasibility Report are: (a) project background; (b) estimated wastewater flows; (c) description of the proposed wastewater facilities; (d) site review results of soil and percolation testing conducted on the property in the areas of the proposed wastewater disposal field; (e) design analysis for facilities; and (f) cumulative impact analyses.

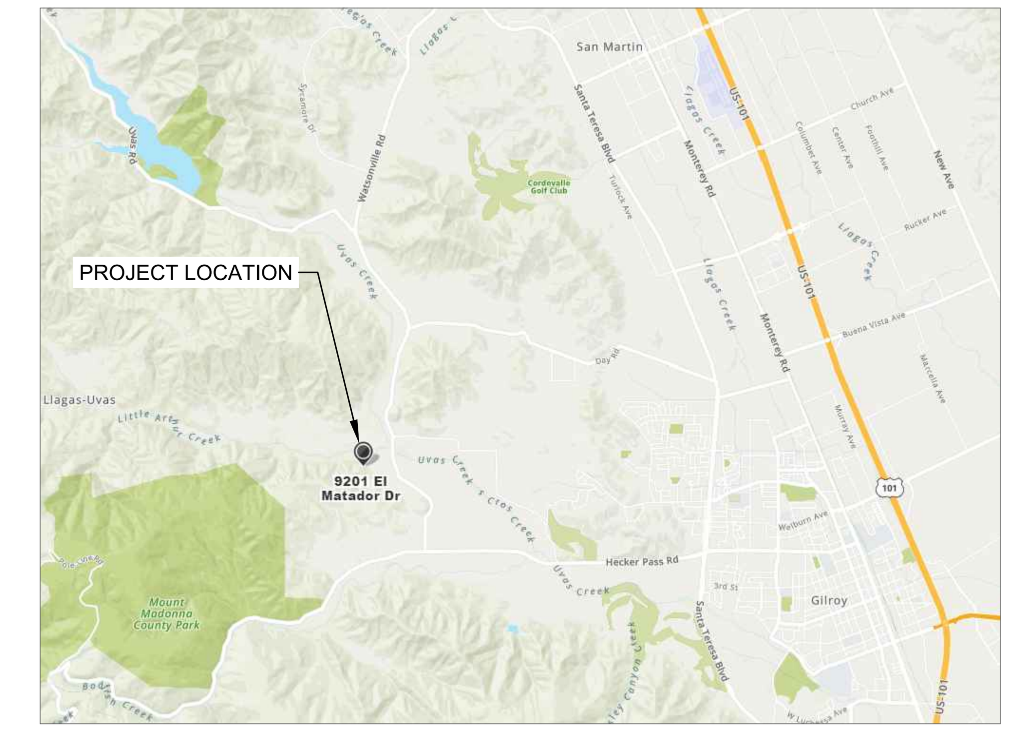
Estimated Wastewater Flows

The new wastewater facilities have been planned to provide capacity for full occupancy and use of the site as proposed under the proposed conditional use permit application with the County of Santa Clara. The facility has been designed to accommodate a maximum capacity of up to 150 persons per day, all of whom can be overnight guests including volunteer staff and caretakers. When occupied at the 150-person capacity, the peak wastewater flow is estimated at 6,900 gpd, with the average daily flow being approximately 80% of peak flow (5,520 gpd) based on historical monitoring of similar facilities (Spirit Rock Meditation Center) in Marin County.

Use at the facility is unique in that it is consistently uniform and will consist of meditation retreats predominately 10 days in length with a two day break in between retreats and the retreats run year round. Meal preparation consists of two meals a day breakfast and lunch ending at 12 noon; no meals are served after 12 noon. There is a kitchen dining building where the meals are prepared and served. The facility will not be used for other purposes such as outside rentals, day use programs or large special events. Guests bring their own bedding and are not provided access to laundry during the typical 10 day stay.

A typical retreat day consists of approximately 10 hours of meditation interspersed with two meals and two rest periods, and shorter breaks between meditation sessions. Unlike a recreational camp the use is very limited in scope and with only 2 communal meals a day and minimal laundry being done on site. Most of the day is spent at the meditation hall. Each guest has a small private room with bathroom and shower.





LOCATION MAP

NOT TO SCALE

1 BOUNDARY MAP

SCALE: 1" = 300'

0 300' 600'

BAY AREA VIPASSANA CENTER

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PRELIMINARY
WASTEWATER FEASIBILITY SITE PLAN

SANTA CLARA COUNTY
GILROY, CA

Size: D
Project: 2000165
Scale: 1" = 60'
Date: 4-13-2021
Sheet: 1 OF 1

The daily wastewater flow generated under maximum occupancy is estimated to be as follows:

- **Dining Hall**: 2 meals a day @5 gal/per meal served = 10gpd/person.
- **Meditation Hall**: 5 toilet uses a day at 2gallons per use (assumes 1.6 gal per flush toilets with 0.4 gallons hand washing) = 10gpd/person.
- **Participant Accommodations**: Sleeping, resting, shower and bathroom use (assumes low flow shower heads and low flow toilets); 25 gpd.
- **Total Daily flow per person for Teachers, Volunteers, Caretakers**: 50 gpd due to access to laundry.
- **Total daily flow for Participants**: 45 gpd for 120 students = 5,400
- **Total flow Volunteers, Caretakers and Teachers**: 50 gpd for 30 people = 1,500 gpd
- **Total maximum daily flow**: 5,400gpd + 1,500 gpd = 6,900 gpd
- **Average flow Daily flow 20% less =** 5,520 gpd

Wastewater flows by building used for septic tank sizing are provided in **Table 1,** as follows:

Table 1: Estimated Wastewater Flows from Buildings

	Buildings	Beds	Design Capacity (Persons)	Unit Flow (gpd per person)	Total Flow (gpd)
1	Kitchen Dining Building		150	10	1,500
2	Participant Accommodations (Per Building)	13*	13	25	325
3	Participant Accommodations (Per Building)	16**	16	25	400
4	Meditation Building	-	150	10	1,500
5	Admin Building (plus laundry)	-	3.4	20***	100[1]
6	Caretaker's Residence	3	3	35	105
7	Instructor's Accommodations	5	5	35	175
8	Volunteer Accommodations (Per Building)	16**	16	30	480

*There are two 14 unit participant accommodations and there are six 16 unit participant accommodations.
** There are two 16 unit volunteer accommodations.
*** Assumes 20 gallon washing machine with 17 people each doing two loads of laundry in 10 day retreat.
[1]Includes 3 admin staff at 10gpd/person

SECTION 2: WASTEWATER FACILITIES PLAN

Overview

The wastewater facilities will consist of new sewage collection lines, septic tanks, effluent collection lines, wastewater pre-treatment system, pressure delivery effluent pipe lines, pump stations, and subsurface drip disposal areas. The preliminary wastewater feasibility site plan is shown on **Sheet 1.**

Wastewater Facilities

The wastewater facilities will serve the sixteen proposed buildings. The maximum daily wastewater flow is estimated to be 6,900 gpd with an average flow of 5,520 gpd. The wastewater facilities will consist of the following key elements:

- **Septic Tanks.** Watertight septic tanks will be required to serve each building at the property. These septic tanks will provide primary sewage treatment. The proposed septic tanks are sited to utilize gravity flow sewer lines from each building, with the exception of the caretakers and one volunteer accommodation building. All tanks will require watertight access risers. New tanks installed as part of the project will be 1,500-gallons minimum or minimum three times daily flow volume, in excess of the two times daily flow required by current Santa Clara County regulations. The extra day flow retention is required for the adequate nitrate, TSS and BOD reduction provided by the proposed pretreatment system. Tanks are sized using building flows from **Table 1**. As shown on the preliminary wastewater feasibility site plan, several buildings are plumbed to one tank in some circumstances. The sewage solids are retained in the septic tank and require periodic pump-out and hauling, as is typical for septic tanks.

- **Pump Stations.** There will be numerous pump stations as part of the facilities plan and all pump stations will be designed per Santa Clara OWTS Manual requirements with adequate emergency storage capacity; most of the pump stations will have duplex pumps to provide an added safety factor in the event of pump failure. There will be several pumps at the pretreatment site near the entrance. These pumps stations will be part of the pretreatment process to recirculate the wastewater through textile filters or equivalent filters. The other pump station will deliver the treated wastewater to a pump station near the dining hall that will deliver the treated wastewater to the three proposed sub-surface drip disposal sites. The main pump stations will have control panels with telemetry to notify the service provider if there are any alarms or malfunctions occurring.

- **Grease Tank**. There will be a grease tank at the dining hall facility. All kitchen waste water (non sanitary) will flow through the grease tank and the grease tank will be properly sized using Santa Clara County OWTS guidelines and EPA guidelines.

- **Pre-treatment System.** A pre-treatment system is required to be implemented to treat the effluent to a suitable level for use in the proposed sub-surface drip disposal system. A commonly used recirculating textile filter system (Orenco AX system) is proposed as the pre-treatment system. For a maximum daily flow of 6,900 gpd, the system would consist of three 8' x 16' fiberglass filter pods, a 7,000 gallon recirculation pump chamber, an emergency storage tank of approximately 8,000 gallons, and a 4,000 gallon pump chamber to deliver the treated water to the drip field dosing tank. There will also be an anoxic tank (approximately 5,000 gallons) that a portion of the treated water is recycled through to aid in nitrogen reduction. All of the tanks are buried and have water tight and air tight access manholes for maintenance. There are no smells since the tanks are air tight and there is no noise since all of the pumps are underground. The Orenco textile pre-treatment system is NSF tested to provide a minimum 50-percent reduction in nitrates and achieve treatment levels of <10mg/L of BOD and TSS. This system is operated with a telemetry control panel that notifies the service provider of any malfunctions and can be monitored remotely to observe daily operations. The system can be designed to operate with an emergency generator in case of power outages.

Sub-Surface Drip Disposal Fields. After the wastewater has been treated, it is delivered to three proposed sub-surface drip disposal fields: Area A, Area B, and Area F. Sub-surface drip disposal fields consist of irrigation tubing buried 8 inches below grade and placed along contour typically on two-foot centers; emitters are typically spaced every two feet. The emitters drip the wastewater into the soil at rates varying from 0.5 to 1.0 gallon per hour and are time dosed from a pump to spread the effluent out over the whole 24-hour day. Consequently, due to the many emitters and the timed dosing, there is a very even distribution of the wastewater over the area, maximizing the ability for the soils to provide further treatment of the wastewater in the shallow soil zone where there is significant biological activity. The drip system has an automatic flushing system to flush the lines of any growth or sediment on a designated timeline determined by the system operator. The sizing calculations for the drip disposal fields are provided later in the report.

Gray Water. Gray water from showers and laundry will be used for seasonal irrigation in an effort to conserve water, if it is practicable to implement. From a wastewater perspective, gray water use would reduce the annual wastewater load on the disposal areas by approximately 25 percent. Gray water use would also provide for an additional annual reduction in nitrates to the groundwater of up to 15 percent.

SECTION 3: SITE REVIEW

Questa Engineering performed a site review at the Bay Area Vipassana Center site from March 22-24, 2021. These included soil profile examinations and percolation testing coordinated with and observed by Santa Clara County Environmental Health Services (EHS) staff. The test locations are shown in **Figures 1** through **3.** Provided below is a description and review of findings from the 2021 investigation.

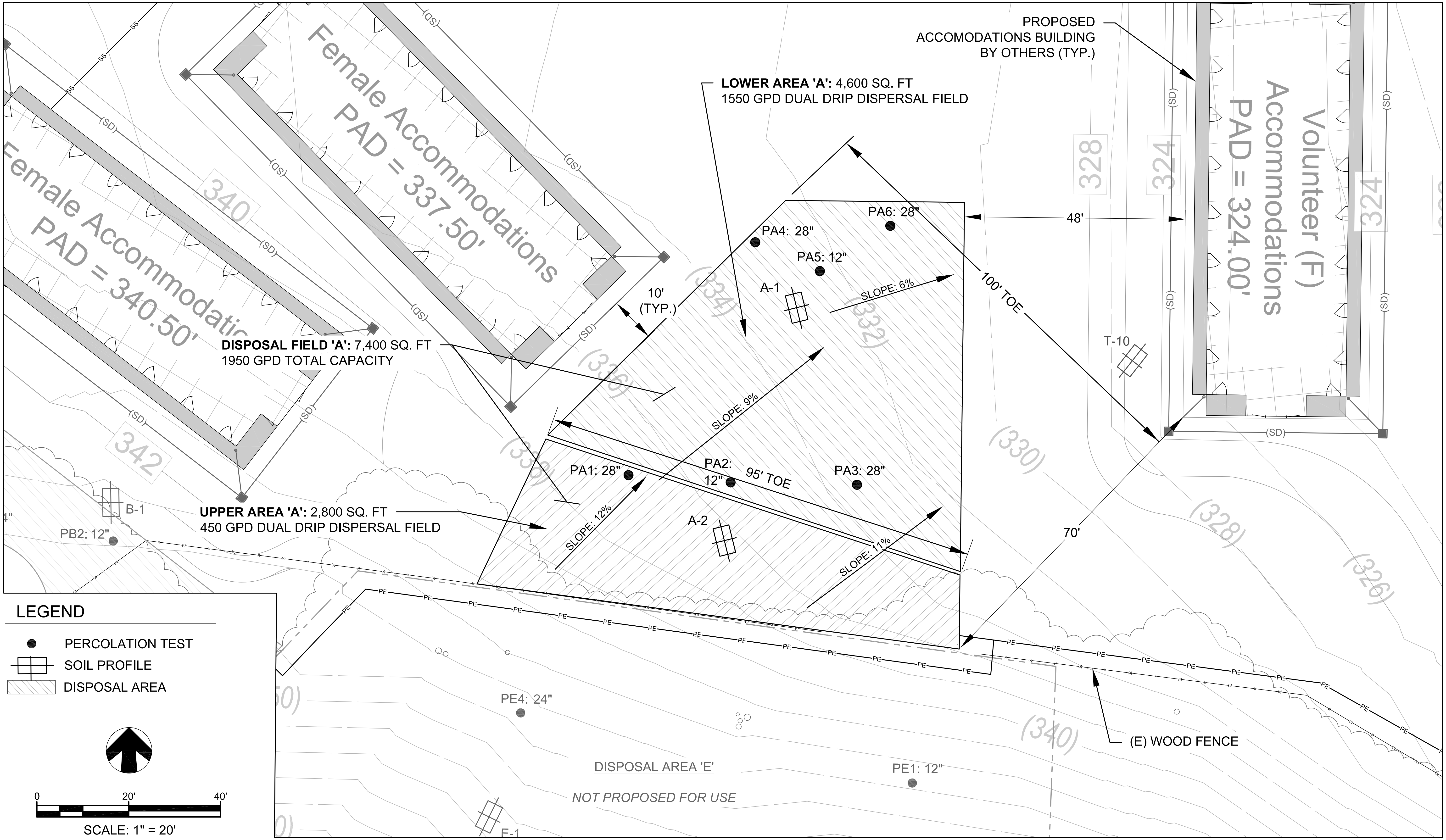
SOIL CONDITIONS

On March 23, 2021, soil profile trenches A-1, A-2, B-1, B-2, F-1, and F-2 were excavated in proposed wastewater disposal Areas A, B, and F; soil profile trenches E-1 and E-2 were also excavated in Area E but this area is not proposed for wastewater disposal. Areas A, B, and F are located at the foot of a prominent sandstone ridge that cuts across the property. The soils at the base of this ridge typically consist of sandy loams and light density sandy clay loams that have accumulated all along the base of this ridge. These soils appear to be very suitable for wastewater disposal. Following is a general description of the soil conditions for each of the proposed disposal areas investigated. Soil profiles are summarized in **Tables 2** through **5**; more detailed soil logs are provided in **Attachment A**.

- **Area A:** Soil conditions in Area A, test pits A-1 and A-2 as shown in **Figure 1**, varied from the lower portion and the upper portion of the site. A-1 in the lower area has deep well drained soils consisting of 19 inches of sandy loam topsoil underlain by very friable light density sandy clay loam to 46 inches which is underlain by gravelly to very gravelly clay loam to light density clay that was dry to 112 inches plus. There were no obvious signs of high groundwater such as mottling. To be conservative the 112-inch depth was assumed to be the restrictive zone or highest groundwater depth even though neither were encountered.

  In the upper portion of Area A, soil profile A-2 has 24 inches of sandy loam topsoil which is underlain by sandy clay loam to a depth of 39 inches. At 39 inches to 83 inches is a compacted sandy clay loam to light density sandy clay. This horizon is acting as a semi restrictive zone at 39 inches because isolated portions of the overlying horizon were very damp. Based on other holes this condition seems isolated or an anomaly; but for groundwater mounding purposes 39 inches is assumed to be the restrictive soil depth for the upper portion of Area A. The upper soil horizons exhibit excellent suitability for sub-surface drip dispersal of treated wastewater. Slopes vary from 6 to 12 percent in this area.

- **Area B:** Soils in Area B, test pits B-1 and B-2 as shown in **Figure 2**, generally consist of sandy loam topsoil and subsoil 49 to 72 inches deep. Below the sandy loam soil, sandy clay was encountered at 72 inches in B-1 and at 49 inches in B-2. In B-1 the light to medium density clay was only 6 inches thick and is underlain weathered sandstone. In B-2 the clay encountered at 49 inches was stiff and extended to 63 inches plus. No mottling was observed in the sandy loam upper horizons and for groundwater mounding calculations 49 inches is the assumed restrictive soil depth even though B-2 is at the western edge of Area B and the soils get deeper across Area A going towards B-1. The



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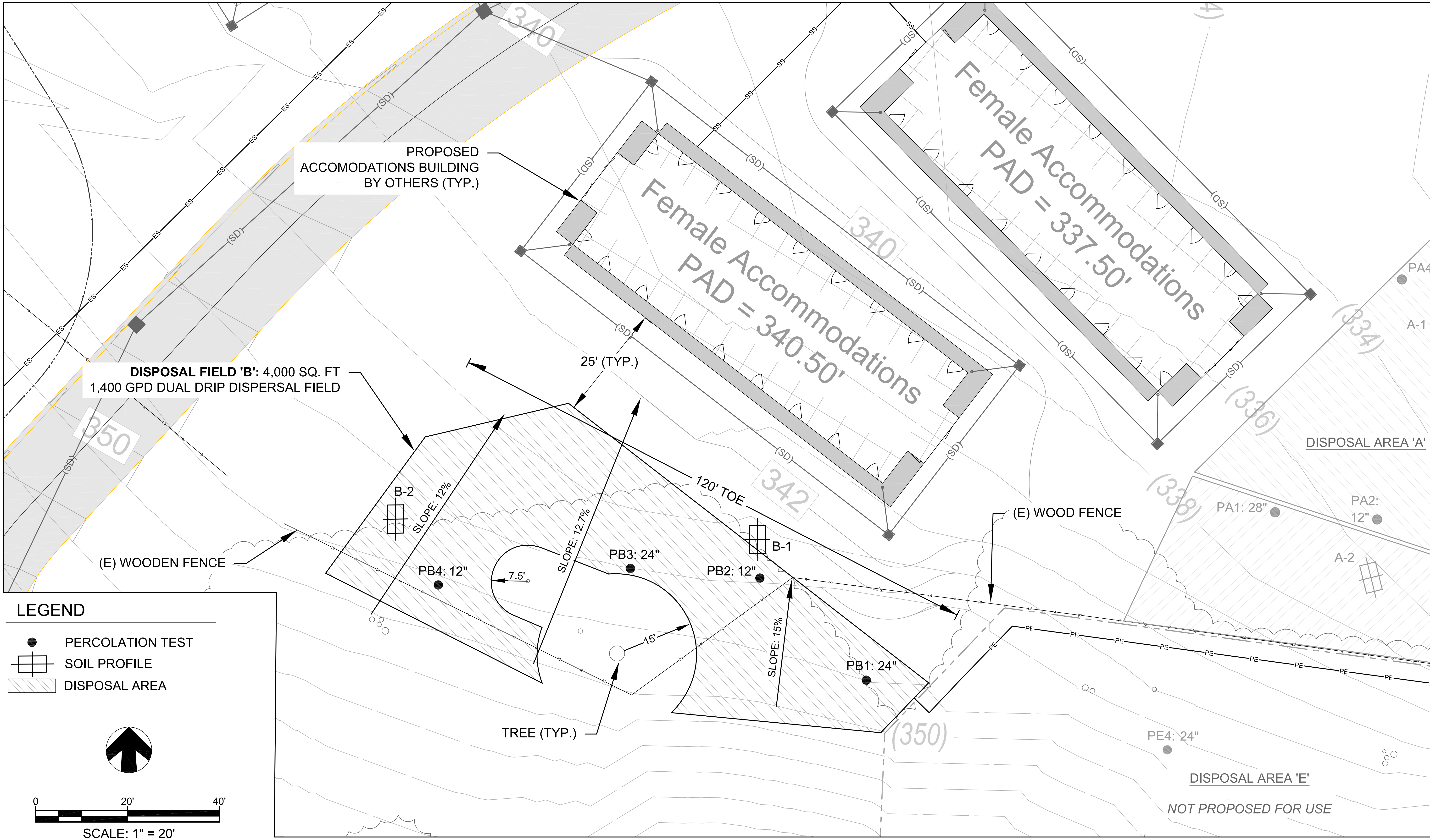
WASTEWATER DISPOSAL PLAN AREA 'A'

SANTA CLARA COUNTY

FIGURE 1



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WASTEWATER DISPOSAL PLAN AREA 'B'

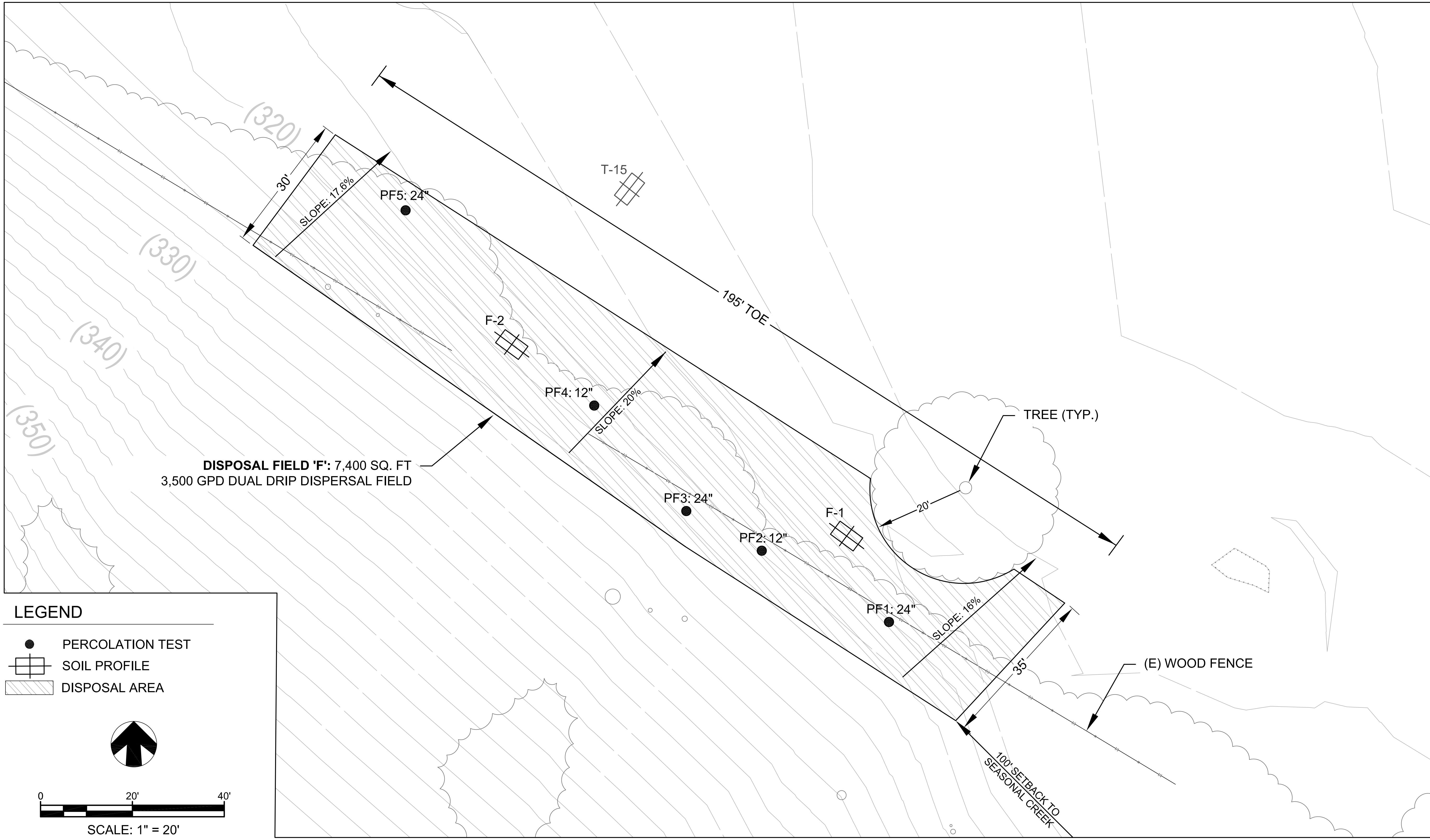
SANTA CLARA COUNTY

FIGURE
2

upper sandy loam soil horizons exhibit excellent suitability for sub-surface drip dispersal. Slopes average 12 to 15 percent in this area.

- **Area F:** Soils in Area F, test pits F-1 and F-2 as shown in **Figure 3,** generally consist of a brown, light density sandy clay loam topsoil in the upper 12 inches. Below this topsoil is a horizon consisting of reddish brown, light density sandy clay loam, extending to depths ranging between 48 inches and 59 inches. In F-1 the soil horizon below 48 inches is very friable clay loam due to reduced colors starting at 66 inches. The 66-inch depth is considered the seasonal high groundwater depth for groundwater mounding calculations. Weathered sandstone was encountered at 78 inches. In F-2, the lowermost horizon, extending from 59 inches to 89 inches, is a friable light density clay loam. It appears to be an older colluvial deposit. There were some minor zones of reduced color but groundwater or a restrictive zone did not appear to be a constraint in this profile. The upper soil horizons exhibit excellent suitability for sub-surface drip dispersal. Slopes vary from 16 to 20 percent in this area.

- **Area E:** Area E is not proposed for wastewater disposal but was explored as a possible area and is described as follows. Area E is located on the north facing slopes of the prominent sandstone ridge located upslope of Area A. (See **Figure 1**). The slopes average approximately 25 to 30 percent. Soils in Area E (test pits E-1 and E-2) generally consist of sandy loam topsoil in the upper 12 inches to 29 inches. Underlying the topsoil is very weathered sandstone that hand textures to sandy loam in trench E-2 and textures as light density sandy clay to sandy clay loam to depths of 48 inches. Due to the steeper slopes and well drained sandy soils shallow groundwater is not a constraint in this area. The soil exhibits suitable conditions for sub-surface drip dispersal of treated wastewater. Area E was not chosen as a disposal area due to the density of oak trees in this area and the suitability of Areas A, B, and F to serve the proposed facility.



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WASTEWATER DISPOSAL PLAN AREA 'F'

SANTA CLARA COUNTY

FIGURE
3

Table 2: Summary of Soil Profiles in Area A, March 23, 2021

Soil Profile Trench	*Depth (inches)*	*Description*
A-1	0 – 19	Sandy loam
	19 – 46	Light density sandy clay loam
	46 – 112	Gravelly clay loam to gravelly light clay
A-2	0 – 24	Sandy loam
	24 – 39	Sandy clay loam
	39 – 83	Compacted sandy clay loam to light sandy clay
	83 – 120	Very gravelly light sandy clay loam

Table 3: Summary of Soil Profiles in Area B, March 23, 2021

Soil Profile Trench	*Depth (inches)*	*Description*
B-1	0 – 21	Sandy loam
	21 – 72	Sandy loam
	72 – 90	Sandy clay (light to medium density)
	90 – 96	Weathered Sandstone
B-2	0 – 49	Sandy loam
	49 – 63+	Sandy clay (stiff)

Table 4: Summary of Soil Profiles in Area E, March 23, 2021

Soil Profile Trench	*Depth (inches)*	*Description*
E-1	0 – 29	Sandy loam
	29 – 32	Sandy loam
	32 – 46	Light density sandy clay to clay loam
E-2	0 – 12	Sandy loam
	12 – 48	Very weathered sandstone

Table 5: Summary of Soil Profiles in Area F, March 23, 2021

Soil Profile Trench	*Depth (inches)*	*Description*
F-1	0 – 12	Loam/light sandy clay loam
	12 – 48	Light sandy clay loam
	48 – 78	Clay loam (weathered rock at 78”)
F-2	0 – 12	Loam/light sandy clay loam
	12 – 59	Light sandy clay loam
	59 – 89	Compacted light clay loam

PERCOLATION TESTS

A total of nineteen (19) percolation tests were performed at depths of 12, 24 and 28 inches throughout the proposed wastewater disposal sites. (See **Figure 1** through **3**). The percolation test hole locations and depths were chosen to provide an accurate representation of soil suitability for wastewater disposal in the upper soil horizon of each area. **Table 6 s**ummarizes the results of the percolation testing; percolation test data sheets are provided in **Attachment A**. Of the 19 tests performed, all areas had excellent passing rates averaging between 5.2 minutes per inch (MPI) and 12.4 MPI. Per Santa Clara County Code, all percolation test rates were adjusted for gravel pack around the percolation test pipes by a factor of 1.4. The average percolation rate for soils within the proposed disposal areas are as follows:

- Area A: 12.4 MPI
- Area B: 6.2 MPI
- Area E: 6.0 MPI
- Area F: 5.2 MPI

Based on the test results, all areas tested demonstrate excellent percolation rates for shallow sub-surface drip dispersal systems, with effluent dispersal at a depth of 8 inches below grade.

Table 6: Percolation Test Results, Areas A, B, E, F
March 24, 2021

Area A		
Test Number	***Depth (inches)***	***Perc Rate (MPI)***
PA1	28	9.4
PA2	12	2.4
PA3	28	9.1
PA4	28	42.0
PA5	12	8.0
PA6	28	3.5
Average		**12.4**

Area B		
Test Number	***Depth (inches)***	***Perc Rate (MPI)***
PB1	24	9.1
PB2	12	8.3
PB3	24	3.3
PB4	12	4.2
Average		**6.2**

Area E		
Test Number	***Depth (inches)***	***Perc Rate (MPI)***
PE1	12	9.9
PE2	24	3.9
PE3	12	2.7
PE4	24	7.4
Average		**6.0**

Area F		
Test Number	***Depth (inches)***	***Perc Rate (MPI)***
PF1	24	4.1
PF2	12	5.6
PF3	24	2.1
PF4	12	2.4
PF5	24	12.0
Average		**5.2**

Groundwater

During the site review on March 23, 2021 no groundwater was observed in any of the 8 soil profile holes observed. Groundwater and associated soil conditions are described for each area as follows. Generally the soils in the proposed disposal areas A and F are deep well drained alluvial soils with a distinct sandy loam top soil. In area F, soil profile F-1, a reduced soil color was encountered at 66 inches indicating that this may be the seasonal high groundwater level during a wetter year. For groundwater mounding calculations, 66 inches was assumed to be the groundwater depth in this area. In the upper part of Area A, soil profile A-2, very damp sandy soil was observed perched on a dryer more dense sandy clay loam to light density sandy clay; this was probably an isolated anomaly in this particular hole but for groundwater mounding calculation purposes, 39 inches was designated as the depth to a restrictive zone in the upper part of Area A. In the lower part of Area A, soil profile A-1, deep well drained gravelly alluvial soils were observed dry to 112 inches. To be conservative 112 inches was considered the restrictive zone or high groundwater in this hole even though neither was observed. In Area B we found a clear restrictive layer of stiff clay at 49 inches in profile B-2; B-2 is at the west edge of Area B. Soils get deeper as you cross Area B where profile B-1 shows 72 inches of very suitable sandy loams until a restrictive sandy clay is encountered overlying weather sandstone. For groundwater mounding purposes, 49 inches was designated the depth of the restrictive zone but suitable soils are typically deeper in Area B.

Based on the soil profiles, groundwater should not restrict shallow wastewater disposal in the designated sites. Based on the groundwater mounding calculations, the minimum 2 and 3 foot setbacks can be maintained from the drip tubing to high seasonal groundwater.

Wastewater Disposal Areas Design Analysis

Based on the soil and site characteristics the proposed design includes the use of shallow subsurface drip disposal fields in three areas, Areas A, B and F. The areas total 18,800 square feet in area and can accommodate a dual (200%) sub-surface drip field for a maximum daily wastewater flow of 6,900 gpd. The three areas are spaced apart so they won't affect the performance of other areas. The soils in all the areas had excellent percolation rates averaging between 5.2 MPI to 12.4 MPI.

All standard setback requirements will be maintained for leachfields pertaining to property lines, roads, buildings, drainages and wells. The drip field sizing calculations are as follows:

Drip Field Sizing Analysis

- Total Facility Design Flow:
  - Maximum flow: 6,900 gpd
  - Average flow: 5,520 gpd

- Average percolation rate:
  - Area A (Upper and Lower areas): 12.4 mpi
  - Area B: 6.2 mpi
  - Area F: 5.2 mpi

- Wastewater application rate for Sub-surface Drip disposal fields per Santa Clara County Regulations, Table DD-1:
  - Area A: 1.0 gpd/ft^2
  - Areas B and F: 1.2 gpd/ft^2

- Designated area in square footage ;
  - Area A (upper area): 2,800 sq. ft. (two 1,400 sq. ft. areas)
  - Area A (lower area): 4,600 sq. ft. (two 2,300 sq. ft. areas)
  - Area B: 4,000 sq. ft. (two 2,000 sq. ft. areas)
  - Area F: 7,400 sq. ft. (two 3,700 sq. ft. areas)

- Proposed design flow for each Area:
  - Area A (upper area): 450 gpd
  - Area A (lower area): 1,550 gpd
  - Area B: 1,400 gpd
  - Area F: 3,500 gpd

- Actual wastewater application rate in each Area:
  - Area A (upper area): 450 gpd/1400 sq. ft. = 0.32 gpd/sq. ft.
  - Area A (lower area): 1,550 gpd/2,300 sq. ft. = 0.67 gpd/sq. ft.
  - Area B: 1,400 gpd/2,000 sq. ft. = 0.7 gpd/sq. ft.
  - Area F: 3,500 gpd/3,700 sq. ft. = 0.9 gpd/sq. ft.

- Wastewater loading safety factor :
  - Area A (upper area): 1.0 gpd/sq.ft./0.32 gpd/sq. ft. = 3.1
  - Area A (lower area): 1.0 gpd/sq.ft./0.67 gpd/sq. ft. = 1.5
  - Area B: 1.2 gpd/sq.ft./0.7 gpd/sq. ft. = 1.7
  - Area F: 1.2 gpd/sq.ft./0.9 gpd/sq. ft. = 1.3

SECTION 4: CUMULATIVE IMPACTS

Groundwater Mounding

Groundwater mounding will occur to some degree under any large or concentrated group of soil absorption systems. The analysis was completed to verify that mounding under the sub-surface drip disposal system for Areas A, B, and F, will not reach a critical or unacceptable level that would interfere with either: (1) the normal drainage of water away from the dispersal fields, or (2) the treatment effectiveness of the soil beneath the dispersal fields. The results of the analysis show that excessive groundwater mounding will not occur in the proposed areas.

The groundwater mounding calculations are presented here utilizing Darcy's Law (Q = KiA) for the case of lateral hillside groundwater flow. The analysis assumes the presence of a restrictive soil layer below 39 inches at (Upper) Area A, 112 inches in (Lower) Area A, 49 inches in Area B, and 66 inches in Area F. However, based on soil profiles, soils in Area A and F have permeability at these depths. Consequently, the calculations are very conservative. Analysis was completed for peak flows of 6,900 gpd. The results of the analysis show that excessive groundwater mounding will not occur in the proposed areas.

Factors

The factors utilized in this analysis are as follows:

1. **Flow Rate (Q)**. For this analysis the flow rate, Q, is assumed to be equal to the peak daily wastewater flow for each of the proposed disposal field areas (See **Table 7** for flow rates).

2. **Gradient (*i*)**. The water table gradient is assumed to be equivalent to the average ground slope in the disposal area. The estimated average slopes for each respective area are listed in **Table 7** and slopes in each area are shown in **Figure 1** through **3**.

3. **Hydraulic Conductivity (K)**. Horizontal hydraulic conductivity (i.e., permeability) is used in Darcy's Law for estimation of lateral hillside flow. Ideally, values for K should be estimated from in situ bail tests; however, free groundwater was encountered which is necessary for completion of bail tests. An alternative approximation of K is possible from percolation test data. Using 90-percent of the calculated average percolation rate in the soils, the estimated value of K for each drip field site was determined. The supporting calculations and reference data are provided in **Appendix B** and summarized in **Table 7**.

4. **Cross-Section Area (A)**. In the Darcy equation, the cross-section area (A) for groundwater flow is equal to the depth (D) of saturation multiplied by the length (L) across the slope through which the water can be expected to travel. For this analysis, the depth of flow is calculated from the assumed/estimated values for Q, i, K and L. The calculated value for D can then be compared with the available depth of "permeable" soil below the proposed drip lines in order to determine if adequate depth of unsaturated soil will be maintained below the disposal area.

TABLE 7
GROUNDWATER MOUNDING SUMMARY

Parameter	Sub-Surface Drip Field Area			
	Area A (Upper)	**Area A (Lower)**	**Area B**	**Area F**
Design Flow - gpd	450	2,000*	1,400	3,500
- ft^3/day	60.2	267.4	187.2	467.9
Perc Average (MPI)	6.9	12.4	6.1	5.2
Hydraulic Conductivity (ft/day)	10	10	10	10
Leachfield Cross-Section (length, L) (feet)	95.00	100.00	120.00	195.00
Groundwater Gradient	0.11	0.075	0.12	0.17
Predicted Groundwater Rise (D) - feet	0.6	3.6	1.3	1.4
- inches	6.9	42.8	15.6	16.9
Total Unsaturated Soil Depth (inches)	32.1	69.2	33.4	49.1
Drip Line Depth (inches)	8	8	8	8
Available Unsaturated Soil Depth Below Drip Line (inches)	24.1	61.2	25.4	41.1
Assumed depth to impermeable layer (inches)[1]	39	112	49	66
Required Separation (inches)	24	24	24	24
Toe Loading (gallons/l.f.)	4.8	14.5	11.7	17.2

* Design flow mounding for Lower Area 'A' includes 450 gpd additional flow from Upper

[1] Depth of backhoe hole soils were not restrictive or impermeable, with the exception of Area B

The cross-section length for each respective disposal area are shown in **Figure 1** through **3**, and listed in **Table 7.**

5. **Relationship to Background Groundwater Conditions**. The predicted groundwater rise (i.e., mounding) is in *addition* to any existing background groundwater condition. For these analyses it is assumed that there is a restrictive/perching layer at 39 inches at (Upper) Area A, 112 inches in (Lower) Area A, 49 inches in Area B, and 66 inches in Area F.

6. **Vertical Percolation and Evapotranspiration**. The application of Darcy's Law in this case assumes no vertical percolation of wastewater effluent below the assumed perching soil layer. The soil profile data show that this is not an accurate assumption. However, the assumption of no vertical percolation is more conservative with respect to groundwater mounding conditions than what actually occurs.

Data and Assumptions

The key data and assumptions in this analysis are as follows:

1. **Flow Rate (Q)**. Mounding analysis was conducted for the peak design flow by area. Flow assumptions are listed in the table below.

Table 8. Flow Conditions by Drip Field Areas.

WW Flow Scenario	Proposed Peak Flow (gpd)
Area A (Upper)	450
Area A (Lower)	1,550
Area B	1,400
Area F	3,500
Total Flow	**6,900**

2. **Gradient (i)**. Groundwater gradient is estimated equal to the native ground slope as follows: Upper Area A averages 11% (0.11); Lower Area A averages 7.5% (0.075); Area B averages 12% (0.12); Area F averages 17% (0.17).

3. **Hydraulic Conductivity (K)**. Horizontal hydraulic conductivity (i.e., permeability) is used in Darcy's Law for estimation of lateral hillside flow. A value of 10 ft/day was determined for the sandy loam soils based on consideration of soil survey estimates and percolation test results:

Estimated vertical hydraulic conductivity:

- USDA Soil Survey for sandy loam: Ksat 1.8 to 6 in /hr or 3.6 to 12 feet/day
- Percolation test results: 1-10 MPI
- Use 10 feet/day based on fast percolation rates and higher end of USDA estimate

4. **Cross-Section Area (A)**. In the Darcy equation, the cross-section area (A) for groundwater flow is equal to the depth (D) of saturation multiplied by the length (L) across the slope through which the water can be expected to travel. For this analysis, the depth of flow is calculated from the assumed/estimated values for Q, i, K and L. The calculated value for D can then be compared with the available depth of "permeable" soil below the proposed drip lines in order to determine if an adequate depth of unsaturated soil will be maintained. For wastewater receiving supplemental treatment, a three-foot vertical separation to groundwater is required where percolation rates are between 1 MPI and 5 MPI (Area F), and a two-foot separation to groundwater is required where percolation rates are between 6 and 120 MPI.

<u>Calculation Results and Conclusions</u>

Using Darcy's Law and the above-stated data and assumptions, the calculations are provided in **Appendix B**, and data results are shown in **Table 7**.

$$Q = KiA = Ki(DL)$$

or, rearranging:

$$D = Q/KiL$$

The vertical separation from the drip line to the projected mounded groundwater level meets the applicable 24-inch and 36-inch requirements as follows: 61.2 inches in lower Area A; 24.1 inches in upper Area A; 25.4 inches in Area B; and 41.1 inches in Area F.

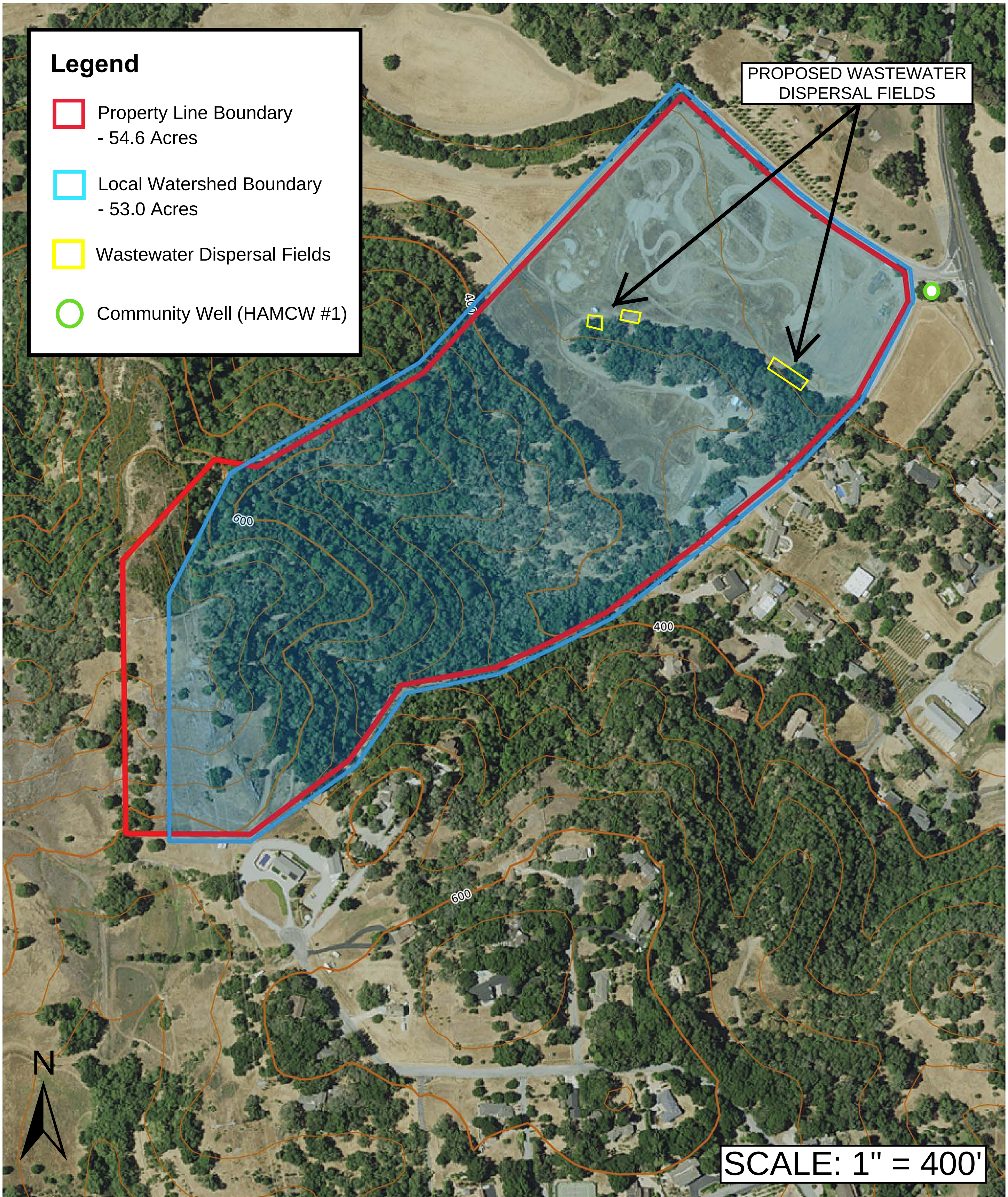
Nitrate Loading Analysis

Approach

Nitrate loading from onsite wastewater disposal systems can potentially degrade groundwater supplies and contribute to nutrient enrichment of surface water bodies. Where development and leachfield sites are widely dispersed, nitrate effects are rarely a significant concern. However, where sewage disposal is concentrated (e.g., in clustered leachfield areas), localized nitrate impacts on groundwater are more likely. The proposed wastewater system for the Bay Area Vipassana Center was evaluated for possible effects on groundwater nitrate levels in accordance with procedures and criteria contained in the Santa Clara County Onsite Wastewater Treatment Systems Manual. The analysis included the projected loading from the proposed new wastewater disposal fields. An overview of the watershed area, wastewater disposal fields locations and other key site features is provided in **Figure 4.**

The nitrate loading analysis presented here utilizes an annual chemical-water mass balance to predict the likely effects on groundwater underlying and down-gradient of the disposal areas. The mass balance analysis follows the methodology presented in the following documents:

- Santa Clara County Onsite Systems Manual, May 2014; Part 2, Attachment E – Guidelines for Cumulative Impact Assessment.



DATE: 04/14/2021 PROJECT: DHAMMA PROJECT NO.: 2000165 DRAWN: DD APPROVED: PP	QUESTA ENGINEERING CORP.	NITRATE LOADING ANALYSIS PROPERTY BOUNDARY MAP	FIGURE 4

- RAMLIT Associates, "Assessment of Cumulative Impacts of Individual Waste Treatment and Disposal Systems - Final Report", for North Coast Regional Water Quality Control Board, February, 1982.

- Hantzsche, Norman N. and E. John Finnemore, "Predicting Ground-Water Nitrate-Nitrogen Impacts", Ground Water, Vol. 30, No. 4, July-August 1992.

The mass balance approach is based upon the understanding that, in the long-term, water quality in the upper groundwater zone is closely approximated by the quality of percolating recharge waters. This is the critical groundwater zone in which potential nitrate impacts are likely to be most strongly expressed. A simplified prediction of the nitrate impacts of an on-site sewage disposal system can therefore be made by constructing a mass balance, considering only inputs from wastewater and recharge of rainfall, and losses due to denitrification in the soil column and the upper portion of the aquifer. The mass balance formula typically used for calculating the resultant average concentration (N_c) of nitrate-nitrogen in recharge waters beneath a wastewater disposal field is as follows:

$$N_c = \frac{(W)(N_w)(1 - d) + (R)(N_B)}{W + R} \qquad (1)$$

where:

W = Annual volume of wastewater discharged to the disposal field (acre-feet)

N_w = Average total nitrogen concentration in wastewater effluent discharged to the disposal field (mg/l)

d = Denitrification rate in the soil and upper saturated zone (as a fraction of the concentration of applied wastewater)

R = Average annual volume of rainfall-recharge (i.e., deep percolation) to the groundwater in the disposal area (acre-feet)

N_B = Average total nitrogen concentration in percolating rainfall (mg/l)

Data and Assumptions

Per the equation presented above, resultant nitrate-nitrogen concentration in the percolating water is estimated to be the weighted average or combined concentration due to wastewater loading and recharge of percolating rainfall ("deep percolation") contributed from the portion of the project site encompassing the wastewater disposal area(s). The following summarize the various assumptions.

- **Recharge Area.** Estimated recharge area includes 53 acres, which all drains in a consistent direction toward Little Arthur Creek and Uvas Creek northeast of the property line and Redwood Retreat Road.

- **Wastewater Volume.** The nitrate loading analysis was completed for an average annual wastewater discharge volume of 6.18 acre-ft per year, based on an average daily flow of 5,520 gpd (80% of maximum occupancy flow conditions). Analysis was also completed to evaluate the reduction in nitrogen loading impacts potentially achievable with the inclusion of seasonal irrigation-reuse of graywater from showers and laundry facilities. For this analysis we assumed graywater flows up to approximately 50% of the total wastewater flow could be diverted for seasonal irrigation of landscaping and gardens during the 6 months of the year, reducing the total average annual wastewater discharge by about 25% to 4,140 gpd.

- **Wastewater Effluent Nitrogen Concentration.** Calculations were made for several different assumed effluent total nitrogen concentrations, 20, 30 and 70 mg-N/L, in order to evaluate and guide the selection of an appropriate limit for the treatment system design. 20 mg/L = Advanced secondary treatment; 30 mg/L = secondary treatment; 70 mg/L = primary treatment (septic tank effluent). Analysis was also completed to evaluate the reduction in nitrogen loading impacts potentially achievable with the inclusion of seasonal irrigation-reuse of graywater from showers and laundry facilities.

- **Soil Denitrification and Plant Uptake.** For conventional leaching trenches, total nitrogen removal in the soil due to denitrification is estimated to be 15 percent of the total nitrogen in the percolating wastewater effluent in well drained soils, such as those found at the site. Higher values up to 30 percent would be justified with the use of drip dispersal methods. Studies of subsurface drip dispersal have documented total rates of nitrogen removal in subsurface drip dispersal systems of 30 to 70 percent of applied nitrogen (Beggs, 2011[1]), including the effects of plant uptake as well as denitrification processes. Our analysis included calculations for 15 and 30-percent soil nitrogen removal to account for a reasonable but conservative (safe) range, taking into account effects of both soil denitrification and plant uptake. For seasonal graywater reuse, we assumed essentially complete removal through plant uptake and denitrification of the nitrogen fraction associated with graywater (typically, about 17% per EPA, 2002[2]).

- **Rainfall Recharge (Deep Percolation).** Rainfall recharge, also termed "deep percolation", is the portion of the seasonal rainfall that does not leave the site as runoff or through plant uptake or evaporation from the land surface ("evapotranspiration"). The estimated rainfall recharge is a function of landscape surface conditions, slope and soils. Since the project site lies in the foothills west of Gilroy, calculations were made using baseline rainfall recharge values contained in the Santa Clara County LAMP for both (a) the South Santa Clara Valley region (8.16 inches per year) and (b) the Santa Cruz Mountains region (10.9 inches per year) of the county. Combining this recharge rate with the recharge areas results in estimated annual rainfall recharge volumes ranging from 49 acre-feet to 65.4 acre-feet for the 53-acre project site recharge area.

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[1] Beggs, RA, Hill DJ, Tchobanoglous, G, Hopmans, JW. "Fate of Nitrogen for Subsurface Drip Dispersal of Effluent from Small Wastewater Systems". Journal of Contaminant Hydrology. September 25, 2011. http://www.ncbi.nlm.nih.gov/pubmed/21708414

[2] U.S. EPA. Onsite Wastewater Treatment Systems Manual. 2002

- **Background Nitrate Concentration**. Estimated background nitrate concentration associated with percolating rainwater recharge was assumed to be 1.2 mg-N/L as this is the average concentration reported at the nearby community well, known as HAMCW Well #1, which is near the identified recharge zones. (Per Mohr HydroGeoScience LLC).

Nitrogen Loading Calculations

Results of the nitrogen loading calculations are provided in **Appendix B** and summarized in **Table 9. Table 10** shows the results for the same range of conditions if a comprehensive seasonal (6 months per year) graywater irrigation-reuse program were to be implemented. The wastewater facilities will include a treatment system capable of providing 30 mg-N/L effluent nitrogen concentration or better, compliant with the indicated limit for wastewater effluent. Monitoring requirements would be established by the DEH as conditions of the operating permit for the project to provide on-going assurance that the system performs as required.

Table 9
Estimated Localized Groundwater Nitrate-Nitrogen Concentration Impacts[1]
(mg-N/L)

Effluent Nitrogen Concentration (mg-N/L)	Conventional Leaching Trench (15% Denitrification)		Drip Dispersal (30% Denitrification)	
	Valley Recharge Estimate (8.16 in/yr)	Mountains Recharge Estimate (10.9 in/yr)	Valley Recharge Estimate (8.16 in/yr)	Mountains Recharge Estimate (10.9 in/yr)
20	3.51	3.00	3.07	2.66
30	4.76	3.97	4.10	3.45
70	9.74	7.84	N/A[2]	N/A[2]

[1] At down slope property line
[2] Drip dispersal requires supplemental treatment; cannot be used with septic tank effluent

Table 10
Estimated Groundwater Nitrate-Nitrogen Concentration Impacts with Graywater Reuse[1]
(mg-N/L)

Effluent Nitrogen Concentration (mg-N/L)	Conventional Leaching Trench (15% Denitrification)		Drip Dispersal (30% Denitrification)	
	Valley Recharge Estimate (8.16 in/yr)	Mountains Recharge Estimate (10.9 in/yr)	Valley Recharge Estimate (8.16 in/yr)	Mountains Recharge Estimate (10.9 in/yr)
20	3.00	2.59	2.66	2.32
30	3.97	3.34	3.46	2.94
70	7.85	6.32	N/A[2]	N/A[2]

[1] At down slope property line; graywater from showers and laundry diverted for landscape and garden irrigation for 6-months/yr
[2] Drip dispersal requires supplemental treatment; cannot be used with septic tank effluent

Using the 7.5 mg-N/L criterion, the results in **Table 9** indicate a concern associated with the use of conventional leaching trenches and providing only primary (septic tank) treatment, with resultant localized groundwater nitrogen impacts potentially between 7.5 and 10 mg-N/L. However, these can be mitigated with the inclusion of supplemental treatment including nitrogen removal as indicated by the results for the 20 and 30 mg-N/L effluent scenarios. Per the results in **Table 10**, nitrogen groundwater impacts can be further reduced through the implementation of a graywater irrigation-reuse program. Our analysis indicates additional nitrogen concentration reductions on the order of about 15 percent for a seasonal graywater irrigation-reuse program diverting roughly 50% of the daily flow during the dry season.

At a minimum, the anticipated system design which will utilize secondary treatment providing 50% nitrogen removal, which can be expected to result in localized nitrogen groundwater concentrations in the range of about 2.5 to 4.0 mg-N/L. Based on this analysis the proposed cumulative wastewater facilities will not have a significant cumulative impact on groundwater nitrate concentrations and any related beneficial uses of water within or beyond the limits of the project site.

SECTION 5: CONCLUSIONS

In conclusion, based on the March 2021 field test results and analysis, the project site can accommodate the anticipated wastewater flows from the proposed BAVC meditation center and meet the requirements of the Santa Clara County Onsite Wastewater Systems Ordinance.

Percolation testing showed excellent rates throughout the three areas proposed for wastewater disposal. Soil conditions in the disposal areas consist of sandy loams and sandy clay loams that are excellent for wastewater disposal.

Proper separation to groundwater can be maintained in the proposed wastewater disposal areas due to the well-drained nature of the soils, lack of any observed mottling in the upper soil horizons, and the proposed use of shallow subsurface drip disposal systems.

Cumulative impact analysis shows that with the combined use of an alternative secondary pre-treatment system and sub-surface drip disposal fields, the proposed system will meet the minimum groundwater mounding requirements in each disposal area and have final nitrate concentration values well below the 7.5 mg/N/L criterion.

Seasonal irrigation reuse of graywater from showers and laundry can reduce the average annual wastewater discharge to the drip fields by approximately 25 percent, and potentially reduce the resultant groundwater nitrogen impacts by an additional 15%.

Appendix A

Soil Profile Description Logs
And
Percolation Test Results

Questa Engineering Corporation

SOIL PROFILE DESCRIPTION

Project Number: 2000165 **Project Name:** Dhamma Santosa **Date:** 3/23/2021
Project Location: 9201 El Matador Road, Gilroy, CA **Boring Method:** Backhoe **Logged By:** PSP
Notes:

Test Hole No: A-1 **Water Table:** **Slope:** **<5%**

Graphic Log	Depth (inches)	Texture	Structure	Color	Rock	Pores	Consistency	Remarks
	0" - 19"	Sandy Loam	weak, sbk	Brown		Common very fine	so, vy frb, ns	No mottling; very fine roots are common
	19" - 46"	Light Density Sandy Clay Loam		Reddish Brown		Common very fine and fine	so, vy frb, ns	No mottling; few very fine roots
	46" - 112"	Gravelly Clay Loam to Gravelly Light Clay		Yellow-Brown	15%-35%		frb/frm, ss	

Notes: No groundwater encountered.

Test Hole No: A-2 **Water Table:** **Slope:** **8%±**

Graphic Log	Depth (inches)	Texture	Structure	Color	Rock	Pores	Consistency	Remarks
	0 - 24"	Sandy Loam	weak, sbk	Brown		Common very fine	so, vy frb, ns	No mottling; Very fine roots are common
	24" - 39"	Sandy Clay Loam		Pale Gray (reduced)	<15%	Common vy fine and fine.	so, frb, ss	Very Damp to wet; Medium mottles 5-15mm; Vy fine and fine roots common
	39" - 83"	Compacted Sandy Clay Loam to Light Sandy Clay		Grayish and Reddish Brown				Restrictive Core
	83" - 120"	Very Gravelly Light Sandy Clay Loam			15%-35% sandstone			Very damp; dry at 9' to 10'

Notes: No groundwater encountered.

Questa Engineering Corporation

SOIL PROFILE DESCRIPTION

Project Number: 2000165 **Project Name:** Dhamma Santosa **Date:** 3/23/2021
Project Location: 9201 El Matador Road, Gilroy, CA **Boring Method:** Backhoe **Logged By:** PSP
Notes:

Test Hole No: B-1 **Water Table:** **Slope:**

Graphic Log	Depth (inches)	Texture	Structure	Color	Rock	Pores	Consistency	Remarks
	0" - 21"	Sandy Loam	weak, abk	Brown	<15%	Many vy fine, Common fine	so, vy frb, ns	No mottling; roots of all sizes common
	21" - 72"	Sandy Loam	weak, sbk	Reddish Brown	<15%	Many vy fine, Common fine	so, vy frb, ns	No mottling; few fine and medium roots
	72" - 90"	Sandy Clay (Light to Medium Density)						
	90" - 96"	Weathered Sandstone						

Notes: No groundwater encountered.

Test Hole No: B-2 **Water Table:** **Slope:** **8%±**

Graphic Log	Depth (inches)	Texture	Structure	Color	Rock	Pores	Consistency	Remarks
	0 - 49"	Sandy Loam	weak, abk	Brown		Common vy fine and fine	so, vy frb, ns	No mottling, roots of all sizes common.
	49" - 63+"	Sandy Clay (Stiff)						

Notes: No groundwater encountered.

Questa Engineering Corporation

SOIL PROFILE DESCRIPTION

Project Number:	2000165	**Project Name:**	Dhamma Santosa	**Date:**	3/23/2021
Project Location:	9201 El Matador Road, Gilroy, CA	**Boring Method:**	Backhoe	**Logged By:**	PSP
Notes:					

Test Hole No: E-1 **Water Table:** **Slope:** **25%**

Graphic Log	Depth (inches)	Texture	Structure	Color	Rock	Pores	Consistency	Remarks
	0" - 29"	Sandy Loam	moderate, abk	Brown		Common vy fine, fine, medium	so, vy frb, ns	No mottling; roots of all sizes common
	29" - 32"	Sandy Loam	weak, abk	Yellow Brown			so, vy frb, ns/ss	No mottling; roots of all sizes common
	32" - 46"	Light Density Sandy Clay to Clay Loam		Pale Yellow Verigated			frb, ss	Lithic mottles

Notes: No groundwater encountered.

Test Hole No: E-2 **Water Table:** **Slope:** **30%±**

Graphic Log	Depth (inches)	Texture	Structure	Color	Rock	Pores	Consistency	Remarks
	0 - 12"	Sandy Loam		Brown				
	12" - 48"	Very Weathered Sandstone	moderate, abk			Common vy fine and fine	so, sh, vy frb/frb	Most of the sandstone textures to sandy soil.

Notes: No groundwater encountered.

Questa Engineering Corporation

SOIL PROFILE DESCRIPTION

Project Number:	2000165	**Project Name:**	Dhamma Santosa	**Date:**	3/23/2021
Project Location:	9201 El Matador Road, Gilroy, CA	**Boring Method:**	Backhoe	**Logged By:**	PSP
Notes:					

Test Hole No: F-1 **Water Table:** **Slope:** **5%±**

Graphic Log	Depth (inches)	Texture	Structure	Color	Rock	Pores	Consistency	Remarks
	0" - 12"	Loam/Light Sandy Clay Loam	weak, sbk	Brown	<15%	Common vy fine, fine, medium	lo, so, frb, ss, np	No mottling; very fine to medium roots common; many coarse roots, boundary is gradual
	12" - 48"	Light Sandy Clay Loam	weak, sbk	Reddish Brown		Common vy fine, fine, medium	so, vy frb, ss	No mottling; very fine to coarse roots common, boundary is gradual
	48" - 78"	Clay Loam		Pale Yellow Verigated Lithic Reds	<15%	Common vy fine, and few fine	so, vy, frb, ss	Reduced color of lithics resembles mottling; fine roots are common

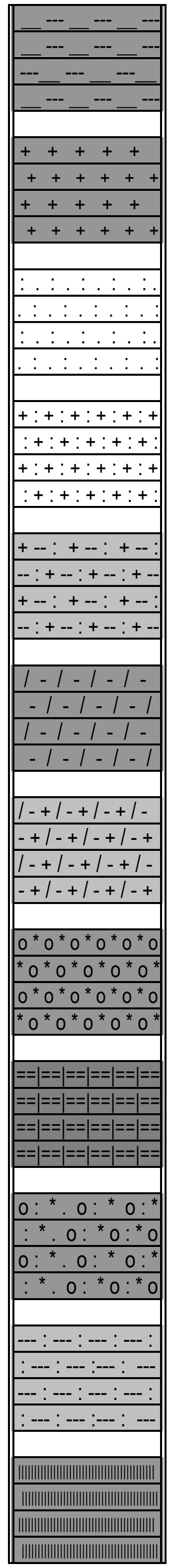
Notes: No groundwater encountered.

Test Hole No: F-2 **Water Table:** **Slope:** **11%**

Graphic Log	Depth (inches)	Texture	Structure	Color	Rock	Pores	Consistency	Remarks
	0 - 12"	Loam/Light Sandy Clay Loam	weak, sbk	Brown	<15%	Common vy fine, fine, medium	lo, so, frb, ss, np	No mottling; very fine to medium roots common; many coarse roots, boundary is gradual
	12" - 59"	Light Sandy Clay Loam	weak, sbk	Reddish Brown		Common vy fine, fine, medium	so, vy frb, ss	No mottling; very fine to coarse roots common, boundary is gradual
	59" - 89"	Compacted Light Clay Loam		Pale Brown		Common vy fine, and fine	sh, frb, ss	Similar to F-1, but more Sandy. Fine <5mm mottles (dry, reduced)

Notes: No groundwater encountered.

SOIL PROFILE
GRAPHIC LEGEND



Clay

Loam

Sand

Sandy Loam

Sandy Clay Loam

Silt Clay

Silt Clay Loam

Gravel

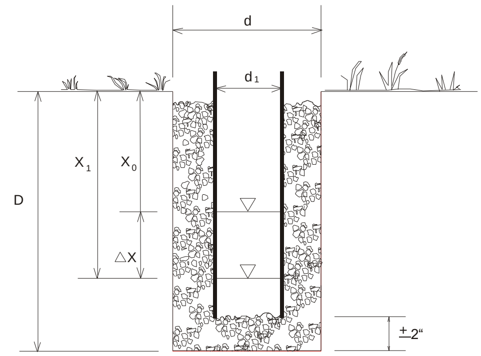
Rock

Sandy Gravel

Sandy Clay

?

PERCOLATION TEST DATA



Project Number:	**2000165**	Date:	**3/24/2021**
Project Name:	**Dhamma Santosa**	Test By:	**MBV/DAD**
APN:	**756-30-024**	Checked By:	**J. Camp**

Test Hole: **A-1** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **28"** Soil Type:

Trial Number	Start Time To	Initial Water Level Inches Xo	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	1 : 28	2	1 : 58	8	30.000	6.000	12.000	5.000
2	2 : 01	2	2 : 31	7	30.000	5.000	10.000	6.000
3	2 : 31	2	3 : 01	6.625	30.000	4.625	9.250	6.500
4	3 : 02	2	3 : 32	6.625	30.000	4.625	9.250	6.500
5	3 : 32	2	4 : 02	6.5	30.000	4.500	9.000	6.700

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **9.4** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak:

Test Hole: **A-2** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **12"** Soil Type:

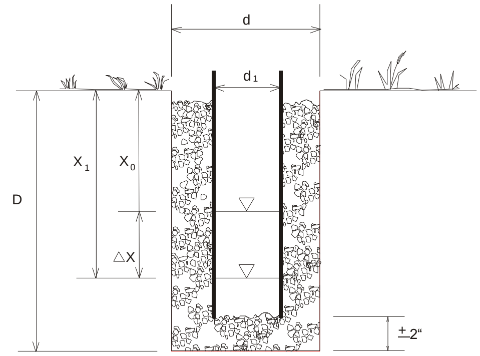
Trial Number	Start Time To	Initial Water Level Inches	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	1 : 30	9	2 : 00	15 DRY	30.000	6.000	12.000	5.000
2	2 : 02	9	2 : 32	15 DRY	30.000	6.000	12.000	5.000
3	2 : 33	9	3 : 03	15 DRY	30.000	6.000	12.000	5.000
4	3 : 03	9	3 : 13	15	10.000	6.000	36.000	1.700
5	3 : 13	9	3 : 23	15	10.000	6.000	36.000	1.700
6	3 : 25	9	3 : 35	15	10.000	6.000	36.000	1.700

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **2.4** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak:

PERCOLATION TEST DATA



Project Number:	**2000165**	Date:	**3/24/2021**
Project Name:	**Dhamma Santosa**	Test By:	**MBV/DAD**
APN:	**756-30-024**	Checked By:	**J. Camp**

Test Hole: **A-3** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **28"** Soil Type:

Trial Number	Start Time To	Initial Water Level Inches Xo	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	1 : 32	14	2 : 02	19.375	30.000	5.375	10.750	5.600
2	2 : 04	14	2 : 34	18.75	30.000	4.750	9.500	6.300
3	2 : 35	14	3 : 05	18.625	30.000	4.625	9.250	6.500
4	3 : 05	14	3 : 35	18.625	30.000	4.625	9.250	6.500

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **9.1** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak:

Test Hole: **A-4** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **28"** Soil Type:

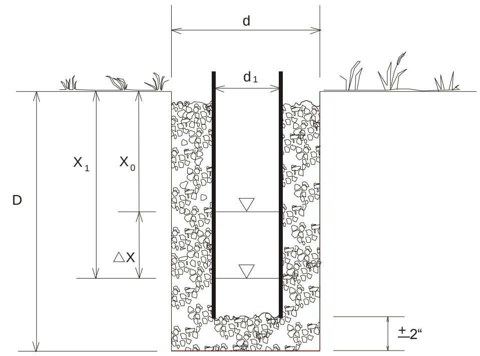
Trial Number	Start Time To	Initial Water Level Inches	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	1 : 36	18	2 : 06	19.875	30.000	1.875	3.750	16.000
2	2 : 06	18	2 : 36	19.125	30.000	1.125	2.250	26.700
3	2 : 36	17.875	3 : 06	18.875	30.000	1.000	2.000	30.000
4	3 : 06	17.75	3 : 36	18.75	30.000	1.000	2.000	30.000

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **42.0** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak:

PERCOLATION TEST DATA



Project Number:	**2000165**	Date:	**3/24/2021**
Project Name:	**Dhamma Santosa**	Test By:	**MBV/DAD**
APN:	**756-30-024**	Checked By:	**J. Camp**

Test Hole: **A-5** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **12"** Soil Type:

Trial Number	Start Time To	Initial Water Level Inches Xo	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	1 : 38	3	1 : 8	9	-30.000	6.000	-12.000	-5.000
2	2 : 09	3	2 : 39	8.5	30.000	5.500	11.000	5.500
3	2 : 40	3	3 : 10	8.375	30.000	5.375	10.750	5.600
4	3 : 10	3	3 : 40	8.25	30.000	5.250	10.500	5.700

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **8.0** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak:

Test Hole: **A-6** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **28"** Soil Type:

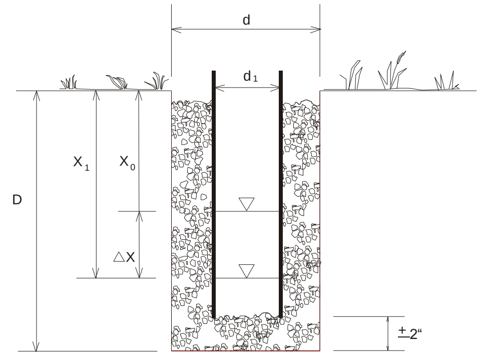
Trial Number	Start Time To	Initial Water Level Inches	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	1 : 40	5	2 : 10	11 DRY	30.000	6.000	12.000	5.000
2	2 : 11	5	2 : 41	11 DRY	30.000	6.000	12.000	5.000
3	2 : 42	5	3 : 12	11 DRY	30.000	6.000	12.000	5.000
4	3 : 12	5	3 : 22	9	10.000	4.000	24.000	2.500
5	3 : 23	5	3 : 33	9	10.000	4.000	24.000	2.500
6	3 : 34	5	3 : 44	9	10.000	4.000	24.000	2.500

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **3.5** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak:

PERCOLATION TEST DATA



Project Number:	**2000165**	Date:	**3/24/2021**
Project Name:	**Dhamma Santosa**	Test By:	**MBV/DAD**
APN:	**756-30-024**	Checked By:	**J. Camp**

Test Hole: **B-1** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **24"** Soil Type:

Trial Number	Start Time To	Initial Water Level Inches Xo	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	1 : 54	5	2 : 24	11 DRY	30.000	6.000	12.000	5.000
2	2 : 24	5	2 : 54	9.5	30.000	4.500	9.000	6.700
3	2 : 54	4.625	3 : 24	9.625	30.000	5.000	10.000	6.000
4	3 : 24	4.625	3 : 54	9.75	30.000	5.125	10.250	5.900
5	3 : 54	5	4 : 24	9.625	30.000	4.625	9.250	6.500
6	4 : 24	5	4 : 54	9.625	30.000	4.625	9.250	6.500

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **9.1** Maximum Application Rate

Adjustment Rate Method: Notes: **Adjacent to watering trough**

Remaining Presoak: **NONE**

Test Hole: **B-2** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **12"** Soil Type:

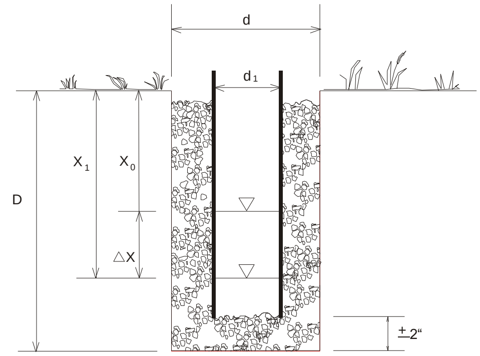
Trial Number	Start Time To	Initial Water Level Inches	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	1 : 56	3	2 : 26	7.5	30.000	4.500	9.000	6.700
2	2 : 26	3	2 : 56	7.875	30.000	4.875	9.750	6.200
3	2 : 56	3	3 : 26	8.25	30.000	5.250	10.500	5.700
4	3 : 26	3	3 : 56	8.25	30.000	5.250	10.500	5.700
5	3 : 56	3	4 : 26	8.125	30.000	5.125	10.250	5.900

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **8.3** Maximum Application Rate

Adjustment Rate Method: Notes: **Nearest to corner of fence**

Remaining Presoak: **NONE**

PERCOLATION TEST DATA



Project Number: **2000165** Date: **3/24/2021**
Project Name: **Dhamma Santosa** Test By: **MBV/DAD**
APN: **756-30-024** Checked By: **J. Camp**

Test Hole: **B-3** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **24"** Soil Type:

Trial Number	Start Time To	Initial Water Level Inches Xo	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	1 : 58	12	2 : 28	18 DRY	30.000	6.000	12.000	5.000
2	2 : 28	12	2 : 58	18 DRY	30.000	6.000	12.000	5.000
3	2 : 58	12	3 : 28	18 DRY	30.000	6.000	12.000	5.000
4	3 : 28	12	3 : 38	16.76	10.000	4.760	28.560	2.100
5	3 : 38	12	3 : 48	16.375	10.000	4.375	26.250	2.300
6	3 : 48	12	3 : 58	16.375	10.000	4.375	26.250	2.300
7	3 : 58	12	4 : 08	16.25	10.000	4.250	25.500	2.400

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **3.3** Maximum Application Rate

Adjustment Rate Method: Notes: **West of B-2, above access road**

Remaining Presoak: **NONE**

Test Hole: **B-4** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **12"** Soil Type:

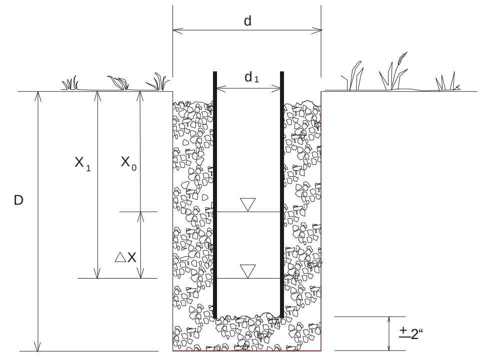
Trial Number	Start Time To	Initial Water Level Inches	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	2 : 00	0	2 : 30	6 DRY	30.000	6.000	12.000	5.000
2	2 : 30	0	3 : 00	6 DRY	30.000	6.000	12.000	5.000
3	3 : 00	0	3 : 30	6 DRY	30.000	6.000	12.000	5.000
4	3 : 30	0	3 : 40	3.5	10.000	3.500	21.000	2.900
5	3 : 40	0	3 : 50	3.5	10.000	3.500	21.000	2.900
6	3 : 50	0	4 : 00	3.375	10.000	3.375	20.250	3.000
7	4 : 00	0	4 : 10	3.375	10.000	3.375	20.250	3.000

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **4.2** Maximum Application Rate

Adjustment Rate Method: Notes: **Closest to access road opening in fence, below rock outcropping**

Remaining Presoak: **NONE**

PERCOLATION TEST DATA



Project Number:	**2000165**	Date:	**3/24/2021**
Project Name:	**Dhamma Santosa**	Test By:	**MBV/DAD**
APN:	**756-30-024**	Checked By:	**J. Camp**

Test Hole: **E-1** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **12"** Soil Type:

Trial Number	Start Time To	Initial Water Level Inches Xo	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	10 : 26	3	10 : 56	8.5	30.000	5.500	11.000	5.500
2	10 : 56	3	11 : 26	8	30.000	5.000	10.000	6.000
3	11 : 26	3	11 : 56	6.625	30.000	3.625	7.250	8.300
4	11 : 56	3	12 : 26	7.125	30.000	4.125	8.250	7.300
5	12 : 26	3	12 : 56	7.25	30.000	4.250	8.500	7.100
6	12 : 56	3	1 : 26	7.25	30.000	4.250	8.500	7.100

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **9.9** Maximum Application Rate

Adjustment Rate Method: Notes: **Bottom left perc for this area (facing hillside) closest to opening in fence, left of access road**

Remaining Presoak: **NONE**

Test Hole: **E-2** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **24"** Soil Type:

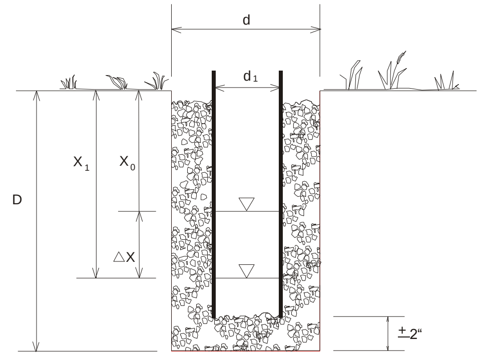
Trial Number	Start Time To	Initial Water Level Inches	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	10 : 28	12	10 : 58	18 DRY	30.000	6.000	12.000	5.000
2	10 : 58	12	11 : 28	18 EVEN	30.000	6.000	12.000	5.000
3	11 : 28	12	11 : 58	18 EVEN	30.000	6.000	12.000	5.000
4	11 : 58	12	12 : 28	18 EVEN	30.000	6.000	12.000	5.000
5	12 : 28	12	12 : 38	15.75	10.000	3.750	22.500	2.700
6	12 : 38	12	12 : 48	15.625	10.000	3.625	21.750	2.800
7	12 : 48	12	12 : 58	15.625	10.000	3.625	21.750	2.800

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **3.9** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak: **NONE**

PERCOLATION TEST DATA



Project Number:	**2000165**	Date:	**3/24/2021**
Project Name:	**Dhamma Santosa**	Test By:	**MBV/DAD**
APN:	**756-30-024**	Checked By:	**J. Camp**

Test Hole: **E-3** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **12"** Soil Type:

Trial Number	Start Time To	Initial Water Level Inches Xo	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	10 : 30	0	11 : 00	6 DRY	30.000	6.000	12.000	5.000
2	11 : 00	0	11 : 30	6 DRY	30.000	6.000	12.000	5.000
3	11 : 30	0	12 : 00	6 DRY	30.000	6.000	12.000	5.000
4	12 : 00	0	12 : 30	6 DRY	30.000	6.000	12.000	5.000
5	12 : 30	0	12 : 40	4.75	10.000	4.750	28.500	2.100
6	12 : 40	0	12 : 50	5.25	10.000	5.250	31.500	1.900
7	12 : 50	0	1 : 00	5.25	10.000	5.250	31.500	1.900
8	1 : 00	0	1 : 10	5.25	10.000	5.250	31.500	1.900

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **2.7** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak: **NONE**

Test Hole: **E-4** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **24"** Soil Type:

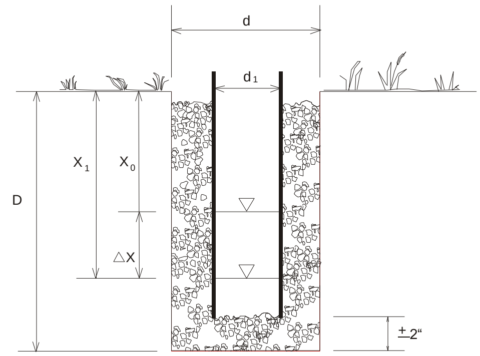
Trial Number	Start Time To	Initial Water Level Inches	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	10 : 32	3	11 : 02	9 DRY	30.000	6.000	12.000	5.000
2	11 : 02	3	11 : 32	8.5	30.000	5.500	11.000	5.500
3	11 : 32	3	12 : 02	7.75	30.000	4.750	9.500	6.300
4	12 : 02	3	12 : 32	8.625	30.000	5.625	11.250	5.300
5	12 : 32	3	1 : 02	8.75	30.000	5.750	11.500	5.200
6	1 : 02	3	1 : 32	8.625	30.000	5.625	11.250	5.300

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **7.4** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak: **NONE**

PERCOLATION TEST DATA



Project Number:	**2000165**	Date:	**3/24/2021**
Project Name:	**Dhamma Santosa**	Test By:	**MBV/DAD**
APN:	**756-30-024**	Checked By:	**J. Camp**

Test Hole: **F-1** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **24"** Soil Type:

Trial Number	Start Time To	Initial Water Level Inches Xo	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	9 : 05	12	9 : 35	18 DRY	30.000	6.000	12.000	5.000
2	9 : 35	12	10 : 05	18 DRY	30.000	6.000	12.000	5.000
3	10 : 05	12	10 : 35	18 DRY	30.000	6.000	12.000	5.000
4	10 : 36	12	10 : 46	16.5	10.000	4.500	27.000	2.200
5	10 : 46	12	10 : 56	15.5	10.000	3.500	21.000	2.900
6	10 : 56	12	11 : 06	15.5	10.000	3.500	21.000	2.900
7	11 : 07	12	11 : 17	15.5	10.000	3.500	21.000	2.900

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **4.1** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak:

Test Hole: **F-2** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **12"** Soil Type:

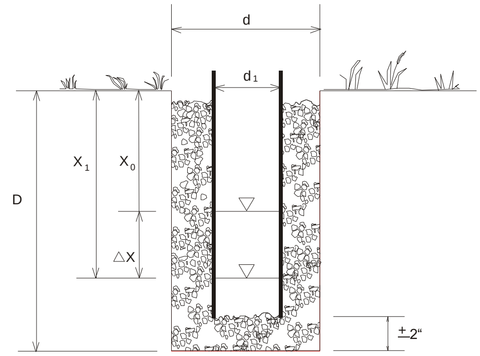
Trial Number	Start Time To	Initial Water Level Inches	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	9 : 07	3	9 : 37	9 DRY	30.000	6.000	12.000	5.000
2	9 : 37	3	10 : 07	9 DRY	30.000	6.000	12.000	5.000
3	10 : 07	3	10 : 37	9 DRY	30.000	6.000	12.000	5.000
4	10 : 37	3	10 : 47	6	10.000	3.000	18.000	3.300
5	10 : 49	3	10 : 59	5.5	10.000	2.500	15.000	4.000
6	10 : 59	3	11 : 09	5.5	10.000	2.500	15.000	4.000
7	11 : 10	3	11 : 20	5.5	10.000	2.500	15.000	4.000

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **5.6** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak:

PERCOLATION TEST DATA



Project Number:	**2000165**	Date:	**3/24/2021**
Project Name:	**Dhamma Santosa**	Test By:	**MBV/DAD**
APN:	**756-30-024**	Checked By:	**J. Camp**

Test Hole: **F-3** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **24"** Soil Type:

Trial Number	Start Time To	Initial Water Level Inches Xo	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	9 : 09	3	9 : 39	9 DRY	30.000	6.000	12.000	5.000
2	9 : 39	3	10 : 09	9 DRY	30.000	6.000	12.000	5.000
3	10 : 09	3	10 : 39	9 DRY	30.000	6.000	12.000	5.000
4	10 : 40	3	10 : 50	9 DRY	10.000	6.000	36.000	1.700
5	10 : 50	3	11 : 00	9 DRY	10.000	6.000	36.000	1.700
6	11 : 01	3	11 : 11	9 DRY	10.000	6.000	36.000	1.700
7	11 : 11	3	11 : 21	9 DRY	10.000	6.000	36.000	1.700
8	**TIMED**	3	**8M, 30SEC**	9	8.500	6.000	42.350	1.400
9	**TIMED**	3	**8M, 37SEC**	9	8.620	6.000	41.760	1.400
10	**TIMED**	3	**9M, 15SEC**	9	9.250	6.000	38.920	1.500

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **2.1** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak:

Test Hole: **F-4** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **12"** Soil Type:

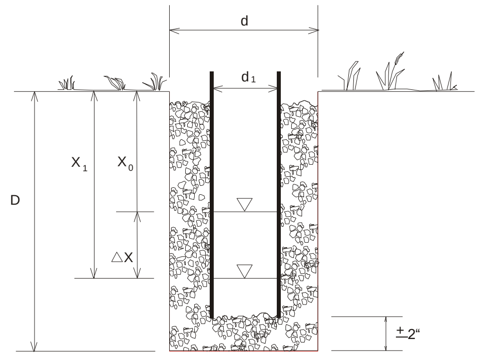
Trial Number	Start Time To	Initial Water Level Inches	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	9 : 11	4	9 : 41	10 DRY	30.000	6.000	12.000	5.000
2	9 : 41	4	10 : 11	10 DRY	30.000	6.000	12.000	5.000
3	10 : 11	4	10 : 41	10 DRY	30.000	6.000	12.000	5.000
4	10 : 41	4	10 : 51	10 DRY	10.000	6.000	36.000	1.700
5	10 : 52	4	11 : 02	10 DRY	10.000	6.000	36.000	1.700
6	11 : 02	4	11 : 12	10	10.000	6.000	36.000	1.700
7	11 : 13	4	11 : 23	10	10.000	6.000	36.000	1.700

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **2.4** Maximum Application Rate

Adjustment Rate Method: Notes:

Remaining Presoak:

PERCOLATION TEST DATA



Project Number: **2000165** Date: **3/24/2021**
Project Name: **Dhamma Santosa** Test By: **MBV/DAD**
APN: **756-30-024** Checked By: **J. Camp**

Test Hole: **F-5** Hole Diameter (d): **12"** Pipe Diameter (d1): **4"** Depth (D): **24"** Soil Type:

Trial Number	Start Time To	Initial Water Level Inches Xo	Time Read T1	Final Water Level Inches X1	Time Interval Minutes T	Water Drop Inches	Percolation Rate Inches per Hour	Percolation Rate Minutes per Inch
1	9 : 13	12	9 : 43	16.375	30.000	4.375	8.750	6.900
2	9 : 43	12	10 : 13	15.875	30.000	3.875	7.750	7.700
3	10 : 13	12	10 : 43	N/A	30.000			
4	10 : 44	12	11 : 14	15.5	30.000	3.500	7.000	8.600
5	11 : 14	12	11 : 44	15.5	30.000	3.500	7.000	8.600
6	11 : 47	12	12 : 17	15.5	30.000	3.500	7.000	8.600

Adjustment Factor: **1.4** Adjusted Stabilized Rate: **12.0** Maximum Application Rate

Adjustment Rate Method:

Remaining Presoak:

Notes: **N/A = FORGOT TO FILL, OK WITH JEFF CAMP TO RUN 3 MORE TESTS**

Appendix B

Cumulative Impacts Calculations

B.A.V.C.

GROUNDWATER MOUNDING ANALYSIS				
AREA A (Upper)				
Daily Design Flow	450	**GPD**	60.2	**(ft^3/day)**

ASSUMPTIONS		
	Zone 1	
P =	13.80	= average percolation rate **(ft/day)** for 6.9 MPI
K_h =	10.00	= horizontal hydraulic conductivity **(ft/day)** (from SCS)
Q =	60.16	= wastewater **(ft^3/day)**
i =	0.11	= groundwater gradient **(% slope)**
L =	95.00	= length of toe **(ft)**
d =		= solve for d

Darcy's Law: Q = KiA

d = depth of mounded groundwater above impermeable surface

from Darcy's Law where **A = (d x L)**

d = Q/KiL	0.6	**(feet)**
	6.9	**(inches)**

B.A.V.C.

GROUNDWATER MOUNDING ANALYSIS

AREA A (Lower)

Daily Design Flow	1,550 +450 = 2000 **GPD**	267.4 **(ft^3/day)**

ASSUMPTIONS

	Zone 1	
P =	9.68	= average percolation rate **(ft/day)** for 12.4 MPI
K_h =	10.00	= horizontal hydraulic conductivity **(ft/day)** (from SCS)
Q =	267.38	= wastewater **(ft^3/day)**
i =	0.075	= groundwater gradient **(% slope)**
L =	100.00	= length of toe **(ft)**
d =		= solve for d

Darcy's Law: Q = KiA

d = depth of mounded groundwater above impermeable surface

from Darcy's Law where **A = (d x L)**

d = Q/KiL 3.6 **(feet)**

42.8 **(inches)**

B.A.V.C.

GROUNDWATER MOUNDING ANALYSIS

AREA B

Daily Design Flow	1,400 **GPD**	187.2 **(ft^3/day)**

ASSUMPTIONS

	Zone 1	
P =	19.67	= average percolation rate **(ft/day)** for 6.1 MPI
K_h =	10.00	= horizontal hydraulic conductivity **(ft/day)** (from SCS)
Q =	187.17	= wastewater **(ft^3/day)**
i =	0.12	= groundwater gradient **(% slope)**
L =	120.00	= length of toe **(ft)**
d =		= solve for d

Darcy's Law: Q = KiA

d = depth of mounded groundwater above impermeable surface

from Darcy's Law where **A = (d x L)**

d = Q/KiL	1.3	**(feet)**
	15.6	**(inches)**

B.A.V.C.

GROUNDWATER MOUNDING ANALYSIS

AREA F

Daily Design Flow	3,500 **GPD**	467.9 **(ft^3/day)**

ASSUMPTIONS

	Zone 1	
P =	23.08	= average percolation rate **(ft/day)** for 5.2 MPI
K_h =	10	= horizontal hydraulic conductivity **(ft/day)** (from SCS)
Q =	467.91	= wastewater **(ft^3/day)**
i =	0.17	= groundwater gradient **(% slope)**
L =	195.00	= length of toe **(ft)**
d =		= solve for d

Darcy's Law: Q = KiA

d = depth of mounded groundwater above impermeable surface

from Darcy's Law where **A = (d x L)**

d = Q/KiL 1.4 **(feet)**

16.9 **(inches)**

Wastewater Nitrogen Loading Analysis - Calculations for BAVC

Nitrogen Mass Loading

Total effluent nitrogen concentration: Calculate for **20, 30 and 70 mg-N/L**

Average annual loading: Ave annual flow*Total N

Assumed nitrogen assimilation by adsorption and denitrifiation: **15% to 30%**

Site Characteristics & Assumptions

Rainfall-Recharge Area: **Proposed Plan: 53acres**

Estimated annual groundwater recharge amount: 10.9 inches/year for Santa Cruz Mountains (Santa Clara County LAMP)

Wastewater Discharge Volume: 80% of ave max weekly wastewater flow: 0.80*6,900 gpd = 5,520 gpd

Water Quality Criteria/Limits

Groundwater nitrate-N drinking water standard: 10 mg-N/L; and OWTS Manual for public water supply areas

Groundwater nitrate-N water quality objective: 7.5 mg-N/L (OWTS Manual for areas with individual wells)

Use 7.5 mg-N/L at point of compliance: downslope (eastern) edge of property.

Table 11a
Nitrate-N Loading Calculations

Wastewater				Average Rainfall Recharge (53ac area)				Resultant
Flow		Effluent Total N_w	Denit.	Recharge Area	Annual Recharge at 10.9 inches per year		Background Nitrogen, N_B	Resultant GW Nitrogen, N_C
gpd	ac-ft/yr	mg-N/L	(fraction)	Acres	feet	ac-ft	mg-N/L	mg-N/L
5,520	6.18	20	0.15	53.0	0.91	48.14	1.2	3.00
5,520	6.18	20	0.30	53.0	0.91	48.14	1.2	2.66
5,520	6.18	30	0.15	53.0	0.91	48.14	1.2	3.97
5,520	6.18	30	0.30	53.0	0.91	48.14	1.2	3.45
5,520	6.18	70	0.15	53.0	0.91	48.14	1.2	7.84
5,520	6.18	70	0.30	53.0	0.91	48.14	1.2	N/A

Wastewater Nitrogen Loading Analysis - Calculations for BAVC

Nitrogen Mass Loading

Total effluent nitrogen concentration: Calculate for **20, 30 and 70 mg-N/L**
Average annual loading: Ave annual flow*Total N
Assumed nitrogen assimilation by adsorption and denitrifiation: **15% to 30%**

Site Characteristics & Assumptions

Rainfall-Recharge Area: **Proposed Plan: 53 acres**
Estimated annual groundwater recharge amount: 8.16 inches/year for S. Santa Clara Valley (Santa Clara County LAMP)

Wastewater Discharge Volume: 80% of ave max weekly wastewater flow: 0.80*6,900 gpd = 5,520 gpd

Water Quality Criteria/Limits

Groundwater nitrate-N drinking water standard: 10 mg-N/L; and OWTS Manual for public water supply areas
Groundwater nitrate-N water quality objective: 7.5 mg-N/L (OWTS Manual for areas with individual wells)

Use 7.5 mg-N/L at point of compliance: downslope (eastern) edge of property.

Table 11b
Nitrate-N Loading Calculations

Wastewater				Average Rainfall Recharge (53 ac area)				Resultant
Flow		Effluent Total N_w	Denit.	Recharge Area	Annual Recharge at 8.16 inches per year		Background Nitrogen, N_B	Resultant GW Nitrogen, N_C
gpd	ac-ft/yr	mg-N/L	(fraction)	Acres	feet	ac-ft	mg-N/L	mg-N/L
5,520	6.18	20	0.15	53.0	0.68	36.04	1.2	3.51
5,520	6.18	20	0.30	53.0	0.68	36.04	1.2	3.07
5,520	6.18	30	0.15	53.0	0.68	36.04	1.2	4.76
5,520	6.18	30	0.30	53.0	0.68	36.04	1.2	4.10
5,520	6.18	70	0.15	53.0	0.68	36.04	1.2	9.74
5,520	6.18	70	0.30	53.0	0.68	36.04	1.2	N/A

Wastewater Nitrogen Loading Analysis - With Seasonal Graywater Reuse

Nitrogen Mass Loading
Total effluent nitrogen concentration: Calculate for **20, 30 and 70 mg-N/L**
Average annual loading: Ave annual flow*Total N
Assumed nitrogen assimilation by adsorption and denitrifiation: **15% to 30%**

Site Characteristics & Assumptions
Rainfall-Recharge Area: **Proposed Plan: 53acres**
Estimated annual groundwater recharge amount: 10.9 inches per year (Santa Clara County LAMP)

Wastewater Discharge Volume: 80% of ave max weekly wastewater flow & 25% reduction for graywater reuse: (6,900 gpd*0.80)*0.75 = 4,140 gpd

Water Quality Criteria/Limits
Groundwater nitrate-N drinking water standard: 10 mg-N/L; and OWTS Manual for public water supply areas
Groundwater nitrate-N water quality objective: 7.5 mg-N/L (OWTS Manual for areas with individual wells)

Use 7.5 mg-N/L at point of compliance: downslope (eastern) edge of property.

Table 11c - With Graywater Reuse
Nitrate-N Loading Calculations

Wastewater				Average Rainfall Recharge (53 ac area)				Resultant
Flow		Effluent Total N_w	Denit.	Recharge Area	Annual Recharge at 10.9 inches per year		Background Nitrogen, N_B	Resultant GW Nitrogen, N_C
gpd	ac-ft/yr	mg-N/L	(fraction)	Acres	feet	ac-ft	mg-N/L	mg-N/L
4,140	4.64	20	0.15	53.0	0.91	48.14	1.2	2.59
4,140	4.64	20	0.30	53.0	0.91	48.14	1.2	2.32
4,140	4.64	30	0.15	53.0	0.91	48.14	1.2	3.34
4,140	4.64	30	0.30	53.0	0.91	48.14	1.2	2.94
								N/A
4,140	4.64	70	0.15	53.0	0.91	48.14	1.2	6.32
4,140	4.64	70	0.30	53.0	0.91	48.14	1.2	N/A

Table 11d - With Graywater Reuse
Nitrate-N Loading Calculations

Wastewater				Average Rainfall Recharge (53 ac area)				Resultant
Flow		Effluent Total N_w	Denit.	Recharge Area	Annual Recharge at 8.16 inches per year		Background Nitrogen, N_B	Resultant GW Nitrogen, N_C
gpd	ac-ft/yr	mg-N/L	(fraction)	Acres	feet	ac-ft	mg-N/L	mg-N/L
4,140	4.64	20	0.15	53.0	0.68	36.04	1.2	3.00
4,140	4.64	20	0.30	53.0	0.68	36.04	1.2	2.66
4,140	4.64	30	0.15	53.0	0.68	36.04	1.2	3.97
4,140	4.64	30	0.30	53.0	0.68	36.04	1.2	3.46
								N/A
4,140	4.64	70	0.15	53.0	0.68	36.04	1.2	7.85
4,140	4.64	70	0.30	53.0	0.68	36.04	1.2	N/A