“F”

Wastewater Feasibility Study

Castlevale Winery P09-00529-UP
Planning Commission Hearing Date August 1, 2018

BARTELT
ENGINEERING

October 2013
#08-22

Kim Withrow
Napa County Planning, Building & Environmental Services
Environmental Health Division
1195 Third Street, Second Floor
Napa, CA 94559

Re: Onsite Wastewater Disposal Feasibility Study for the proposed Castlevale Winery at 3450 Chiles Pope Valley Road, Napa County, CA, APN 025-230-014 & 016

Dear Ms. Withrow:

At the request of Carolyn Martini, we have evaluated the feasibility of providing onsite wastewater disposal for a new winery facility located at 3450 Chiles Pope Valley Road in Napa County, California. It is our understanding that the winery will have a full crushing production of 30,000 gallons of wine per year.

This feasibility study is based on a land survey performed by Michael W. Brooks and Associates, Inc., Professional Land Surveyors, in January 2009 and the site evaluations performed on December 11, 2008 and January 16, 2009 by Bartelt Engineering and witnessed by a representative from Napa County Environmental Health (see attached site evaluation form). As part of our work we have reviewed the files at Napa County Environmental Health as well as performed several site visits to evaluate existing conditions. Based on our review of the files and observations made in the field, it is our opinion that either a conventional gravity type disposal field or a pressure distribution type disposal field can be constructed on this property to accommodate the proposed wastewater flow generated by the new winery facility.

The owners of 3450 Chiles Pope Valley Road are proposing to construct a full crush winery facility with a production of 30,000 gallons of wine per year. The proposed winery's staff will consist of 4 full-time and 2 part-time/harvest employees. The applicant intends to establish a private tasting room with tours and tasting and to hold food and wine pairings at the winery. Private tours and tasting will not be held on the same day as food and wine pairings.

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The following is a summary of the proposed marketing plan for the winery:

Description	Frequency	Number of Visitors
Private Tours & Tasting	3 per day	6 per tour
Food & Wine Pairings	1 per month	30 per event

Water Use Analysis

A Phase One Water Availability Analysis has been completed by Bartelt Engineering for the proposed winery. According to the Phase One Analysis, the parcel is allotted 27.68 acre-feet of water per year. The Phase One Analysis estimates that the proposed water use for the entire parcel (existing residence, existing vineyard and the proposed 30,000 gallon per year winery) will be approximately 15.90 acre-feet of water per year (see the Phase One Water Availability Analysis prepared by Bartelt Engineering dated October 2013 for more information on the proposed water use).

Winery Process Wastewater Flow

Peak Winery Process Wastewater Flow =

$$\frac{(30{,}000 \text{ gallons of wine per year})(1.5 \text{ gallons of water per 1 gallon of wine})}{30 \text{ days of crush per year}}$$

Peak Winery Process Wastewater Flow = 1,500 gallons per day (gpd)

Average Winery Process Wastewater Flow:

$$\frac{(30{,}000 \text{ gallons of wine per year})(6 \text{ gallons of water per 1 gallon of wine})}{365 \text{ days per year}}$$

Average Winery Process Wastewater Flow = 494 gpd

Winery Sanitary Wastewater Flow

Peak sanitary wastewater flows at the proposed winery can be itemized as follows:

Employees:

(4 full-time employees) x (15 gpd per employee) = 60 gpd
(2 part-time employees) x (15 gpd per employee) = 30 gpd

Private Tours & Tasting:

(18 visitors per day) x (3 gallons per visitor) = 54 gpd

Food & Wine Pairings:

(30 guests per event) x (5 gallons per guest) = 150 gpd

Private tours and tasting will not be held on days with food and wine pairings.

The peak winery sanitary wastewater flow is calculated as follows:

(Full Time Employees)	+	(Part Time Employees)	+	(Food and Wine pairings)
60 gpd	+	30 gpd	+	150 gpd

Peak Winery Sanitary Wastewater Flow = 240 gpd

Total Proposed Site Wastewater Flow

The total proposed site wastewater flow is the combination of the proposed winery process wastewater and the proposed winery sanitary wastewater shown as follows:

(Winery Process Wastewater)	+	(Winery Sanitary Wastewater)
1,500 gpd	+	240 gpd

Total peak wastewater produced = 1,500 gpd + 240 gpd = 1,740 gpd

Septic Tank Requirements

The following table summarizes the underground storage tank requirements for the proposed process wastewater and septic system.

Septic Tank Wastewater Source	Peak Flow (gpd)	Retention Time (days)	Recommended Tank Capacity (gallons)
Process Wastewater	1,500	4	6,000
Winery Sanitary	240	5	1,500

The process wastewater septic tank system for the winery should have a Zabel A300 filter or approved equal installed at the outlet to aid in the screening of suspended solids and the reduction of BOD from the wastewater. The process wastewater septic tank(s) storage capacity should be sized to provide a minimum of three days of storage capacity during peak wastewater flow.

The sanitary wastewater septic tank for the winery should have a Zabel A300 filter or approved equal installed at the outlet to aid in the screening of suspended solids and the reduction of BOD from the wastewater. The sanitary wastewater septic tank should be sized to provide a minimum of three days of storage capacity during peak wastewater flow.

Proposed Wastewater Disposal Methods

PRIMARY SYSTEM – CONVENTIONAL GRAVITY DISTRIBUTION DISPOSAL FIELD

Required Length of Trench

The gravity distribution laterals would be installed in 18 inch wide by 30 inch deep trenches with 24 inches of ¾ to 1½ Clear Lake lava rock under the invert of the distribution laterals, 6 inches of ¾ to 1½ inch Clear Lake lava rock over the inverts of the distribution laterals to match original grade. 12 inches of fill material will be placed over the entire disposal field to direct surface water away from the disposal field. The proposed trench section provides 3.67 square feet of effective surface area per lineal foot of trench. For this calculation, we have used an application rate of 0.33 gallon per square foot of sidewall per day based on the clay loam type soils found at this site. (See attached site evaluation and laboratory test results on soil texture analysis).

$$\text{Required length of trench} = \frac{1{,}740 \text{ gpd}}{(3.67 \text{ sf/lf})(0.33 \text{ gal/sf/lf})} = 1{,}437 \text{ lf}$$

Assuming fifteen (15) lines at 100 feet long and 10 foot spacing between each leach line equates to approximately 15,000 square feet of disposal area.

Available Primary Disposal Field Area

There is adequate area available to install a conventional gravity distribution disposal field for wastewater disposal as shown on the attached Use Permit Drawings prepared by Bartelt Engineering dated October 2013.

100% RESERVE AREA – PRESSURE DISTRIBUTION DISPOSAL FIELD

Required Length of Trench

The pressure distribution laterals would be installed in 18 inch wide by 28 inch deep trenches with 18 inches of ¾ to 1½ Clear Lake lava rock under the invert of the distribution laterals, 4 inches of ¾ to 1½ inch Clear Lake lava rock over the inverts of the distribution laterals and 6 inches of soil to match original grade. The entire disposal field area will be covered with 6 inches of native soil to direct surface water away from the disposal field. The proposed trench section provides 3.0 square feet of sidewall per lineal foot of trench. For this calculation, we have used an application rate of 0.60 gallons per day per square foot of sidewall per gallon per day based on the clay loam type soils found at this site. (See attached site evaluation and laboratory test results on soil texture analysis).

$$\text{Required length of trench} = \frac{1{,}740 \text{ gpd}}{(3.0 \text{ sf/lf})(0.60 \text{ gal/sf/lf})} = 967 \text{ lf}$$

Assuming ten (10) lines at 100 feet long and 10 foot spacing between each leach line equates to approximately 10,000 square feet of disposal area.

Available 100% Reserve Area

There is adequate area available to install a pressure distribution disposal field within the 100% reserve area as shown on the attached Use Permit Drawings prepared by Bartelt Engineering dated October 2013.

Conclusions

The parcel will be able to adequately dispose of the wastewater produced by the proposed 30,000 gallon winery utilizing either a conventional gravity distribution disposal field or a pressure distribution type septic system.

The above calculations should be adequate for the Use Permit application to Napa County. Full design calculations and construction plans will be completed after approval of the Use Permit currently under consideration. If you have any questions regarding our recommendations please feel free to call me at (707) 258-1301.

Sincerely,

REGISTERED PROFESSIONAL ENGINEER
PAUL N. BARTELT
No. 45102
CIVIL
STATE OF CALIFORNIA

Paul N. Bartelt, P.E.
Principal Engineer

PNB:sd

Enclosures

cc: Carolyn Martini
Donna Oldford, Plans4Wine

Napa County Department of
Environmental Management

SITE EVALUATION REPORT

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

Permit #: E08-00700
APN: 025-230-016
(County Use Only) Reviewed by: Date:

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner Carolyn Martini	☒ New Construction ☐ Addition ☐ Remodel ☐ Relocation ☐ Other:
Property Owner Mailing Address P.O. Box 61	☐ Residential - # of Bedrooms: Design Flow : gpd
City State Zip St. Helena CA 94574	☒ Commercial – Type: Winery Sanitary Waste: 240 gpd Process Waste: 1,500 gpd
Site Address/Location 3450 Chiles Pope Valley Road, Napa County	☐ Other: Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:

Company Name Bartelt Engineering	Evaluator's Name Paul N. Bartelt, P.E.	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist)
Mailing Address: 1303 Jefferson Street, 200 B		Telephone Number (707) 258-1301
City State Zip Napa CA 94559		Date Evaluation Conducted December 11, 2008 & January 16, 2009

Primary Area See below	Expansion Area See below
Acceptable Soil Depth: 60 - 67 in. Test pit #'s: 1, 3, 4, 8 - 11	Acceptable Soil Depth: 60 - 67 in. Test pit #' : 6, 7, 12 - 15
Soil Application Rate (gal. /sq. ft. /day): 0.6	Soil Application Rate (gal. /sq. ft. /day): 0.6
System Type(s) Recommended: Pressure Distribution	System Type(s) Recommended: Pressure Distribution
Slope: 15 %. Distance to nearest water source: > 300 ft.+	Slope: 15 %. Distance to nearest water source: > 300 ft. +
Hydrometer test performed? No ☐ Yes ☒ (attach results)	Hydrometer test performed? No ☐ Yes ☒ (attach results)
Bulk Density test performed? No ☒ Yes ☐ (attach results)	Bulk Density test performed? No ☒ Yes ☐ (attach results)
Groundwater Monitoring Performed? No ☒ Yes ☐ (attach results)	Groundwater Monitoring Performed? No ☒ Yes ☐ (attach results)

Site constraints/Recommendations:

The property owner is planning to develop a new winery on APN 025-230-016. The site evaluation was conducted on December 11, 2008 and January 16, 2009 by Bartelt Engineering and witnessed by Ray Franklin of Napa County Environmental Health. The goal of the site evaluation was to find a disposal area for the process and sanitary wastewater produced by the proposed 30,000 gallon per year winery. The site evaluation was successful in finding useable soil over a large area in a vineyard near the proposed winery site. The final septic system design will be dependent on the winery design and could possibly be a standard or pressure distribution system. Based on the site evaluation, Bartelt Engineering is confident that there is an adequate area of useable soil to properly dispose of wastewater from a 30,000 gal/year winery on APN 025-230-016. Please see the attached site evaluation results.

Test Pit # 1 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-40*		<15	CL	SSB	SH	FRB	SS	MVF/MF/ CC	MF	None
40-67*	Difuse for root change	<15	CL	SSB	SH	FRB	SS	MVF/MF	None	None

Slope = 5 - 15%. Acceptable soil depth: 67 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 67 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 18, 2008.

Test Pit # 2

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-33		<15	CL	MSB	SH	VFRB	S	MVF/MF	MVF/FF/ FM	None
33-44	Abrupt	>50	Shale Refusal					None	None	None

Slope = 5 - 15%. Acceptable soil depth: 33 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No groundwater observed.

Test Pit # 3 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-60*		<15	SCL	SAB	H	FRB	S	MVF/MF/ FC	CF/FM/ FC	None

Slope = 5 - 15%. Acceptable soil depth: 60 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 60 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 18, 2008.

Test Pit # 4

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-66		<15	SCL	SAB	H	FRB	S	MVF/MF/ FM	MVF/MF/ FC	None

Slope = 5 - 15%. Acceptable soil depth: 66 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 66 inches deep.
No groundwater observed.

Test Pit # 5

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-46		<15	CL	SAB	H	FRB	S	MVF/MF/ FC	MVF/MF/ FC	CMD @ 38"
46-60	G	30-50	Shale Refusal at 60 inches.						FF	FFFt

Slope = 5 - 15%. Acceptable soil depth: 38 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No groundwater observed. Hit vineyard subdrain at 3.5 feet.

Test Pit # 6

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-43		<15	CL	SAB	SH	VFRB	S	MVF/MF/ FC	MVF/MF/ FC	CMD @ 32"
43-64	Difuse change in density	<15	CL	SAB	H/VH	FRB	S	MVF/MF	FF	CMD

Slope = 5 - 15%. Acceptable soil depth: 32 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 64 inches deep.
No groundwater observed.

Test Pit # 7 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-75*		<15	SCL	SSB	SH/H	FRB	S	MVF/MF/ FC	MVF/MF/ FM	None

Slope = 5 - 15%. Acceptable soil depth: 75 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 75 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 18, 2008.

Test Pit # 8

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-66		<15	SCL	SAB	SH	FRB	SS	MF/MVF/ FM	MF	None

Slope = 5 - 15%. Acceptable soil depth: 66 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 66 inches deep.
No groundwater observed.

Test Pit # 9

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-66		<15	SCL	SAB	SH	FRB	SS	FC/MVF/ FM	FC/MF	None

Slope = 5 - 15%. Acceptable soil depth: 66 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 66 inches deep.
No groundwater observed.

Test Pit # 10

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-72		<15	SCL	SAB	SH	FRB	SS	FC/MVF/ FM	FC/MF	None

Slope = 5 - 15%. Acceptable soil depth: 72 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 72 inches deep.
No groundwater observed.

Test Pit # 11

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-71		<15	SCL	SAB	SH	FRB	SS	MF/FM	MF/FC	None

Slope = 5 - 15%. Acceptable soil depth: 71 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 71 inches deep.
No groundwater observed.

Test Pit # 12

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-32		30-50	SCL	SAB	SH	FRB	SS	MF/FM	MF/FC	None
32-65	C	<15	SCL	SAB	SH	FRB	SS	MF/FM	MF/FC	None

Slope = 5 - 15%. Acceptable soil depth: 65 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 65 inches deep.
No groundwater observed.

Test Pit # 13

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36		30-50	SCL	MAB	L	FRB	SS	FM/MF/ MVF	MF/FC	None
36-72	C	<15	SCL	SAB	SH	FRB	SS	FM/MF/ MVF	MF/FC	None

Slope = 5 - 15%. Acceptable soil depth: 72 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 72 inches deep.
No groundwater observed.

Test Pit # 14

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-16		30-50	SCL	SAB	SH	FRB	SS	FM/MF/ MVF	MF/FC	None
16-72	C	<15	SCL	SAB	SH	FRB	SS	FM/MF/ MVF	MF/FC	None

Slope = 5 - 15%. Acceptable soil depth: 72 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 72 inches deep.
No groundwater observed.

Test Pit # 15

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-70		<15	SCL	SAB	SH	FRB	SS	MF/MVF/ FM	MF/FC	None

Slope = 5 - 15%. Acceptable soil depth: 70 inches
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day

No refusal at 70 inches deep.
No groundwater observed.

Table of Abbreviations

Boundary	Texture	Structure	Consistence			Pores	Roots	Mottling
			Side Wall	Ped	Wet			
A=Abrupt <1" **C**=Clear 1"-2.5" **G**=Gradual 2.5"-5" **D**=Difuse >5"	**S**=Sand **LS**=Loamy Sand **SL**=Sandy Loam **SCL**=Sandy Clay Loam **SC**=Sandy Clay **CL**=Clay Loam **L**=Loam **C**=Clay **SiC**=Silty Clay **SiCL**=Silty Clay Loam **SiL**=Silt Loam Si=Silt	**W**=Weak **M**=Moderate **S**=Strong --- **G**=Granular **PL**=Platy **Pr**=Prismatic **C**=Columnar **AB**=Angular Blocky **SB**=Subangular Blocky --- **M**=Massive **C**=Cemented	**L**=Loose **S**=Soft **SH**=Slighty Hard **H**=Hard **VH**=Very Hard **ExH**=Extremely Hard	**L**=Loose **VFRB**=Very Friable **FRB**=Friable **F**=Firm **VF**=Very Firm **ExF**=Extremely Firm	**NS**=NonSticky **SS**=Slightly Sticky **S**=Sticky **VS**=Very Sticky --- **NP**=NonPlastic **SP**=Slightly Plastic **P**=Plastic **VP**=Very Plastic	**Quantity:** **F**=Few **C**=Common **M**=Many **Size:** **VF**=Very Fine **F**=Fine **M**=Medium **C**=Coarse	**Quantity:** **F**=Few **C**=Common **M**=Many **Size:** **VF**=Very Fine **F**=Fine **M**=Medium **C**=Coarse **VC**=Very Course	**Quantity:** **F**=Few **C**=Common **M**=Many **Size:** **F**=Fine **M**=Medium **C**=Coarse **VC**=Very Course **ExC**=Extremely Coarse **Contrast:** **Ft**=Faint **D**=Distinct **P**=Prominent

Attach additional sheets as needed

Alternative Sewage Treatment System Soil Application Rates

TEXTURE	STRUCTURE		APPLICATION RATE (Gal/ft^2/day)	
	Shape	Grade	STE[1]	PTE[1,2]
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	1.0	1.2
Fine Sand, Loamy Fine Sand	Single grain	Structureless	0.6	1.0
Sandy Loam, Loamy Sand	Massive	Structureless	0.35	0.5
	Platy	Weak	0.35	0.5
	Prismatic, blocky, granular	Weak	0.5	0.75
		Moderate, Strong	0.8	1.0
Loam, Silt Loam, Sandy Clay Loam, Fine Sandy Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.5	0.75
		Strong	0.8	1.0
Sandy Clay, Silty Clay Loam, Clay Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.35	0.5
		Strong	0.6	0.75
Clay, Silty Clay	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak		
		Moderate, strong	0.2	0.25

1. See Table 1 in the Design, Construction and Installation of Alternative Sewage Treatment Systems.
2. A higher application rate for pretreated effluent may only be used when pretreatment is not used for one foot of vertical separation credit.

MINIMUM SURFACE AREA GUIDELINES TO DISPOSE OF 100 GPD OF SECONDARY TREATED EFFLUENT FOR SUBSURFACE DRIP DISPERSAL SYSTEMS

		Soil Absorption Rates		Design Application Rate (Gal/ft^2/day)	Total Area Required Sq. ft./100 gallons per day
Soil Class	Soil Type	Est. Soil Perc. Rate minutes/inch	Hydraulic Conductivity inches/hour		
I	Coarse sand	1 – 5	>2	1.400	71.5
I	Fine sand	5 – 10	1.5 – 2	1.200	83.3
II	Sandy loam	10 – 20	1.0 – 1.5	1.000	100.0
II	Loam	20 – 30	0.75 – 1.0	0.700	143.0
III	Clay loam	30 – 45	0.5 – 0.75	0.600	167.0
III	Silt - clay loam	45 – 60	0.3 – 0.5	0.400	250.0
IV	Clay non-swell	60 – 90	0.2 – 0.3	0.200	500.0
IV	Clay - swell	90 – 120	0.1 – 0.2	0.100	1000.0

1. For design purpose, the "Soil Type" category to be used in the above table shall be based on the most restrictive soil type encountered within two feet below the bottom of the drip line.
2. Dispersal field area calculation: Total square feet area of dispersal field = Design flow divided by loading rate.

Conventional Sewage Treatment System Soil Application Rates

TEXTURE	STRUCTURE		APPLICATION RATE (Gal/ft^2 /day)
	Shape	Grade	STE
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	Prohibited
Sandy Loam, Loamy Sand	Massive	Structureless	Prohibited
	Platy	Weak, mod, strong	Prohibited
	Prismatic, blocky, granular	Weak	0.33
		Moderate, strong	0.5
Loam, Silt Loam, Sandy Clay Loam, Fine Sandy Loam	Massive	Structureless	Prohibited
	Platy	Weak, mod, strong	Prohibited
	Prismatic, blocky, granular	Weak	0.25
		Moderate, Strong	0.33
Clay Loam	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak, moderate	0.25
		Strong	0.33
Sandy Clay, Silty Clay Loam	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak, moderate	Prohibited
		Strong	0.25
Clay, Silty Clay	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak	Prohibited
		Moderate, strong	Prohibited

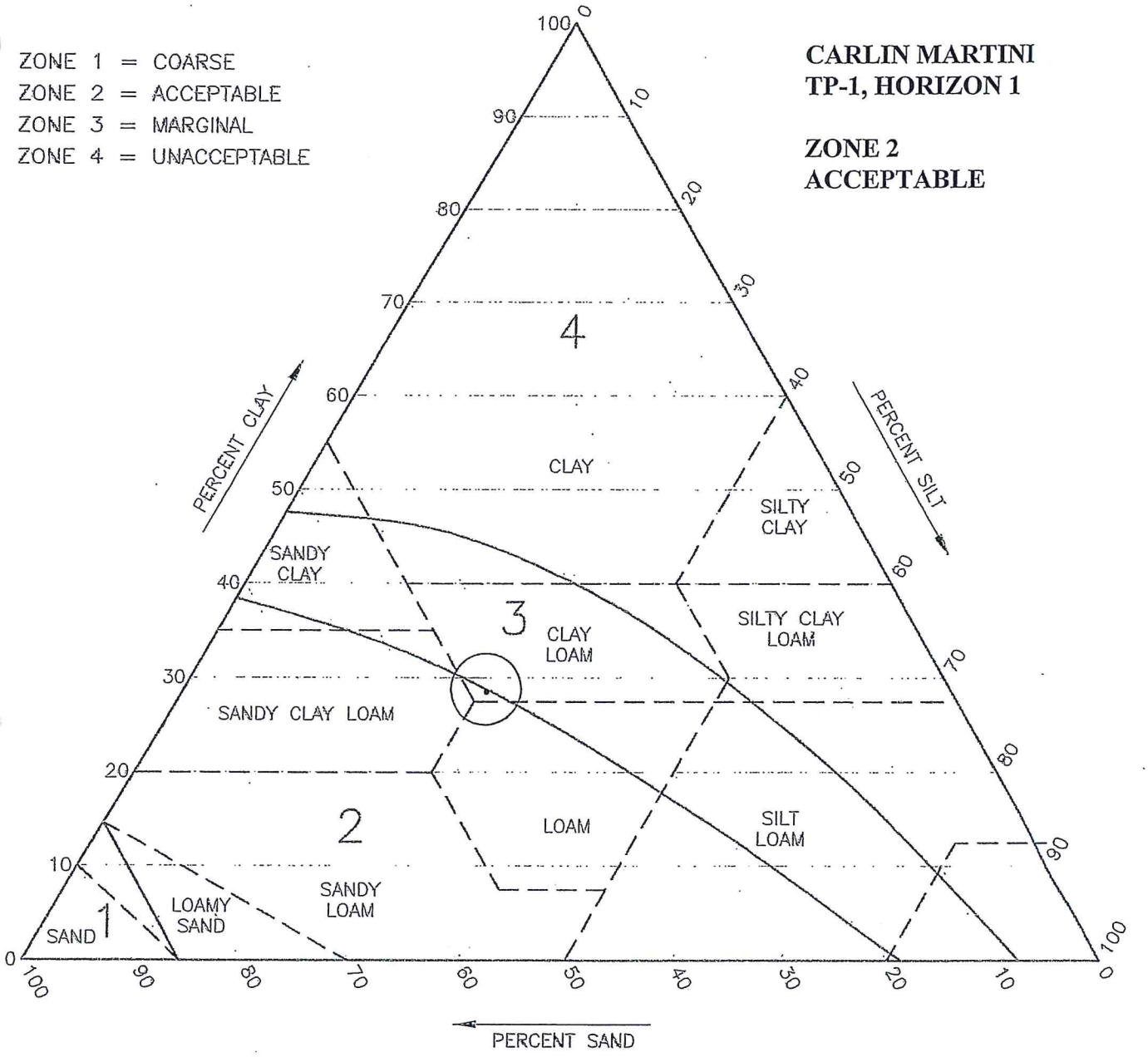
CONVENTIONAL SEWAGE TREATMENT SYSTEM SOIL APPLICATION RATES BASED ON PERCOLATION RATES	
Percolation Rate (mpi)	Application Rate (STE)
< 5 MPI	Prohibited
5 to 10 MPI	0.5
10-20 MPI	0.33
20-60 MPI	0.25
> 60 MPI	Prohibited

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

CARLIN MARTINI
TP-1, HORIZON 1

ZONE 2
ACCEPTABLE



Instructions:

1. Plot texture on triangle based on percent sand, silt, and clay as determined by hydrometer analysis.
2. Adjust for coarse fragments by moving the plotted point in the sand direction an additional 2% for each 10% (by volume) of fragments greater than 2mm in diameter.
3. Adjust for compactness of soil by moving the plotted point in the clay direction an additional 15% for soils having a bulk-density greater than 1.7 gm/cc.

Note:

For soils falling in sand, loamy sand or sandy loam classification bulk density analysis will generally not affect suitability and analysis not neccesary.

R G H

CONSULTANTS, INC.

Geotechnical
Geological
And Laboratory Services

File: 9147.12

December 18, 2008
Bartelt Engineering
1339 Pearl Street, Suite 205
Napa, CA 94559

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
CARLIN MARTINI

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on December 15, 2008.

We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

Size/Density	TP-1 Horizon 1
+ #10 Sieve	19.4 %
Sand	40.4 %
Clay	28.8 %
Silt	30.8 %
Db g/cc	--

We trust this provides the information required at this time. Should you have further questions, please call.

Yours very truly,

RGH GEOTECHNICAL

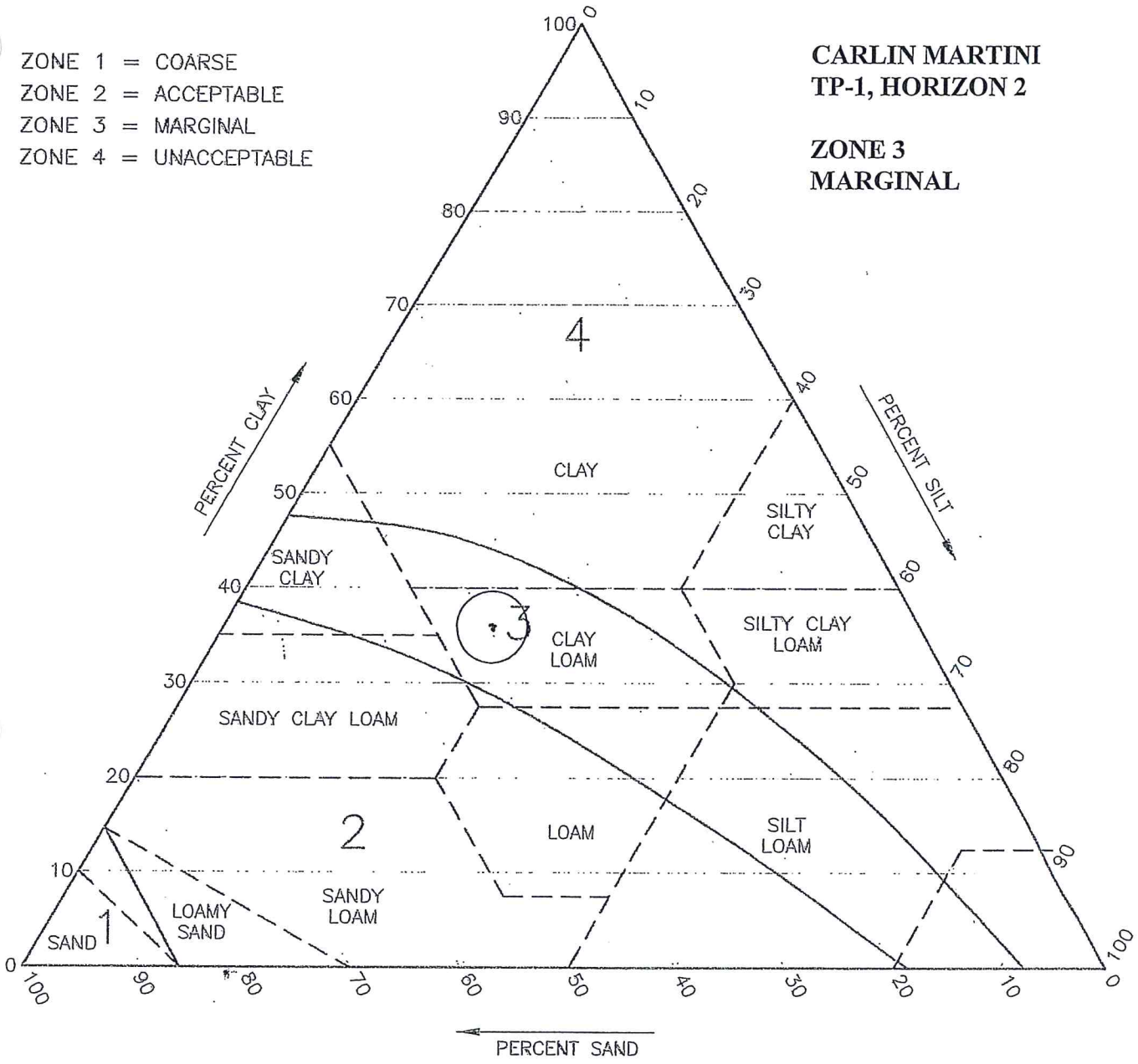
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

CARLIN MARTINI
TP-1, HORIZON 2

ZONE 3
MARGINAL



Instructions:

1. Plot texture on triangle based on percent sand, silt, and clay as determined by hydrometer analysis.
2. Adjust for coarse fragments by moving the plotted point in the sand direction an additional 2% for each 10% (by volume) of fragments greater than 2mm in diameter.
3. Adjust for compactness of soil by moving the plotted point in the clay direction an additional 15% for soils having a bulk-density greater than 1.7 gm/cc.

Note:

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We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

Size/Density	TP-1 Horizon 2
+#10 Sieve	18.1 %
Sand	38.4 %
Clay	35.0 %
Silt	26.6 %
Db g/cc	--

We trust this provides the information required at this time. Should you have further questions, please call.

Yours very truly,

RGH GEOTECHNICAL

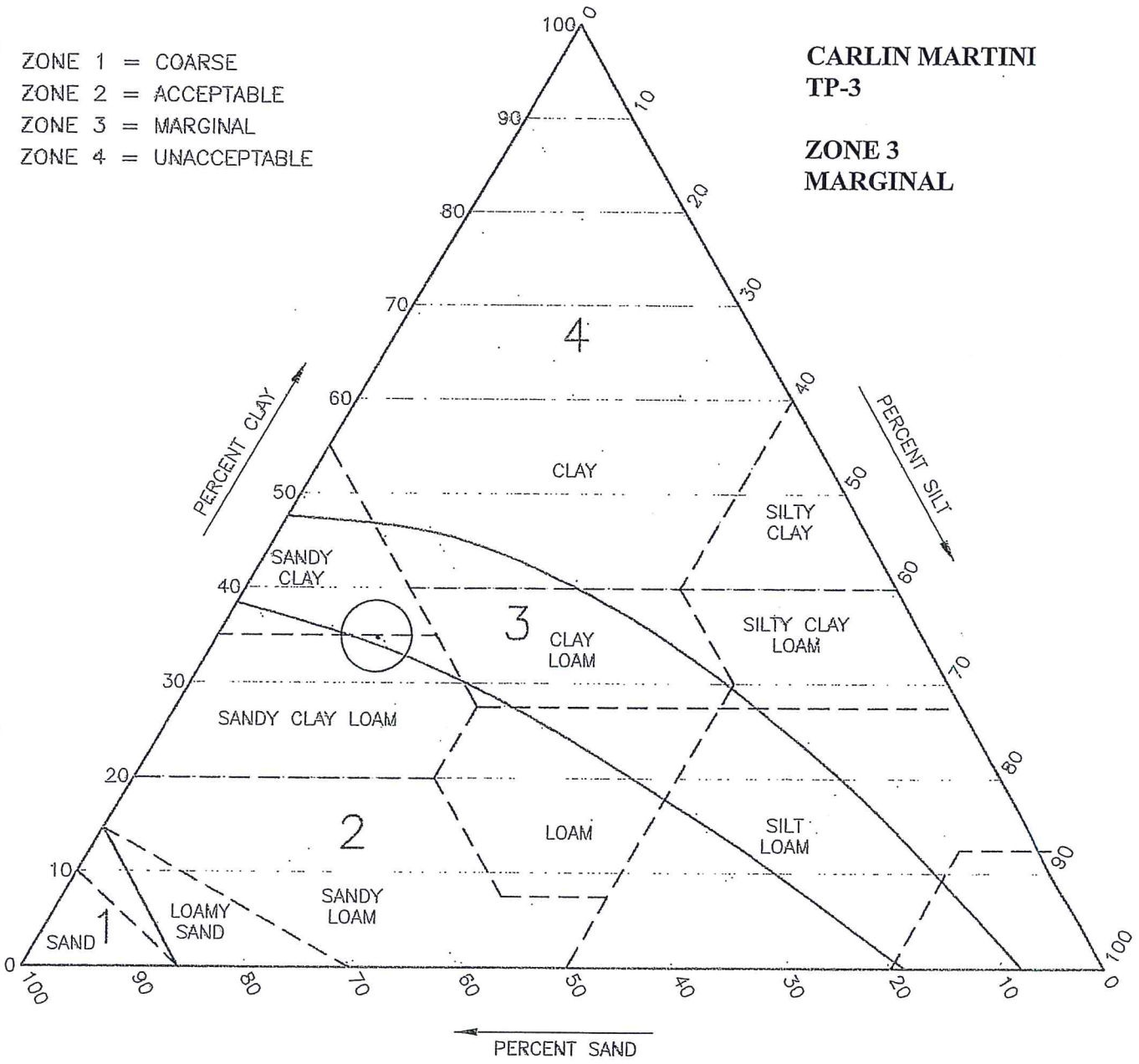
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

CARLIN MARTINI
TP-3

ZONE 3
MARGINAL



Instructions:

1. Plot texture on triangle based on percent sand, silt, and clay as determined by hydrometer analysis.
2. Adjust for coarse fragments by moving the plotted point in the sand direction an additional 2% for each 10% (by volume) of fragments greater than 2mm in diameter.
3. Adjust for compactness of soil by moving the plotted point in the clay direction an additional 15% for soils having a bulk-density greater than 1.7 gm/cc.

Note:

For soils falling in sand, loamy sand or sandy loam classification bulk density analysis will generally not affect suitability and analysis not neccesary.

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Napa, CA 94559

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CARLIN MARTINI

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We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

Size/Density	TP-3
+#10 Sieve	5.8 %
Sand	50.0 %
Clay	34.8 %
Silt	15.2 %
Db g/cc	--

We trust this provides the information required at this time. Should you have further questions, please call.

Yours very truly,

RGH GEOTECHNICAL

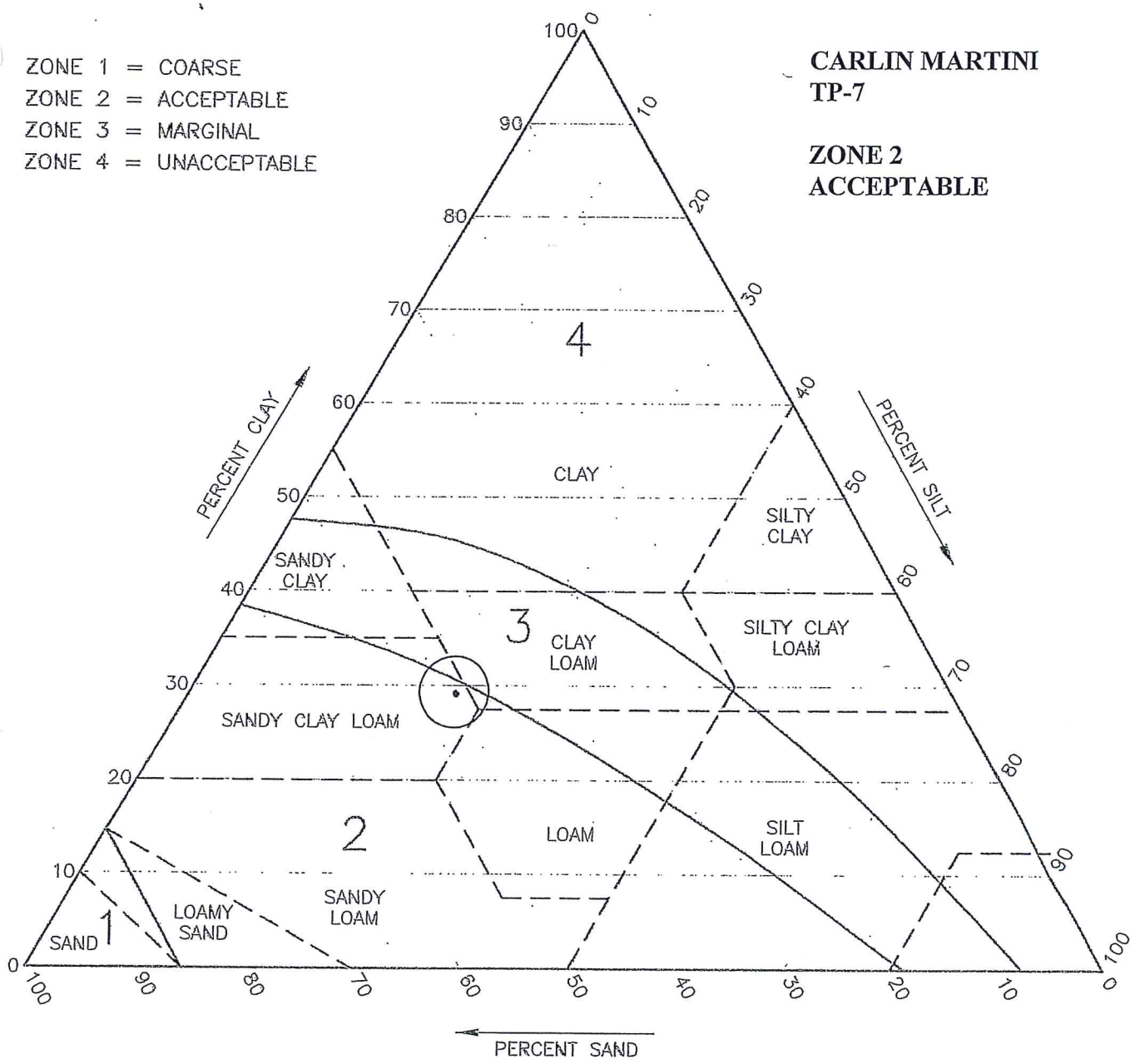
Tarance E. McCue
Senior Laboratory Advisor

SOIL PERCOLATION SUITABILITY CHART

ZONE 1 = COARSE
ZONE 2 = ACCEPTABLE
ZONE 3 = MARGINAL
ZONE 4 = UNACCEPTABLE

CARLIN MARTINI
TP-7

ZONE 2
ACCEPTABLE



Instructions:

1. Plot texture on triangle based on percent sand, silt, and clay as determined by hydrometer analysis.
2. Adjust for coarse fragments by moving the plotted point in the sand direction an additional 2% for each 10% (by volume) of fragments greater than 2mm in diameter.
3. Adjust for compactness of soil by moving the plotted point in the clay direction an additional 15% for soils having a bulk-density greater than 1.7 gm/cc.

Note:

For soils falling in sand, loamy sand or sandy loam classification bulk density analysis will generally not affect suitability and analysis not neccesary.

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December 18, 2008
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1339 Pearl Street, Suite 205
Napa, CA 94559

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Soil Texture Analysis by
Bouyoucos Hydrometry Method
CARLIN MARTINI

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. Your personnel delivered the samples on December 15, 2008.

We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

Size/Density	TP-7
+ #10 Sieve	17.1 %
Sand	44.2 %
Clay	29.0 %
Silt	26.8 %
Db g/cc	--

We trust this provides the information required at this time. Should you have further questions, please call.

Yours very truly,

RGH GEOTECHNICAL

Tarance E. McCue
Senior Laboratory Advisor

R G H

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Red

BOUYOCOUS HYDROMETER

CLIENT Bartelt JOB NAME Cardin Martini JOB# 9147.12

SAMPLE NUMBER	TP-7		TP-3		TP-1		TP-1
DEPTH					Hor 2		Hor 1
A. Oven dry wt. (grams)	50g		50g		50g		50.
B. Starting Time (hr: min: sec:)	11:24		11:22		11:20		11:18
C. Temp. @ 40 sec. (degrees F)	57.4		57.2		56.9		56.8
D. Hydro reading @ 40 sec. (gm/l)	36.5		40.0		39.5		38.5
E. Composite Corr. (gm/l)	-8.6		-8.7		-8.7		-8.7
F. True Density @ 40 sec. (gm/l) D-E	27.9		31.3		30.8		29.8
G. Temp. @ 2 hrs. (degrees F)	57.9		57.7		58.0		57.6
H. Hydro reading @ 2 hrs. (gm/l)	23.0		26.0		26.0		23.0
I. Composite Corr. (gm/l)	-8.5		-8.6		-8.5		-8.6
J. True Density @ 2 hrs. (gm/l) H-I	14.5		17.4		17.5		14.4
K. % Sand = 100 – [(F/A) x 100]	44.2		50.0		38.4		40.4
L. % Clay = [(J/A) x 100]	29.0		24.8		35.0		28.8
M. % Silt = 100-(K+L)	26.8		15.2		26.6		30.8
N. % No. 10 =	17.1		5.8		18.1		19.4

Cup Number	B-17		B-3		B-12		B-22
Dry Before Wash + Tare	717.6		710.2		463.6		550.5
Dry After Wash + Tare	207.9		138.2		168.1		189.0
Dry Wt. Passing #10	509.7		572.0		295.5		361.5
Tare Weight	103.1		103.1		103.0		102.0
Wt. Before Wash	614.5		607.1		360.6		448.5
% Passing #10	82.9		94.2		81.9		80.6
% #10	17.1		5.8		18.1		19.4