ORGANIZED SEWAGE COLLECTION SYSTEM PLAN

Vintage Oaks at the Vineyard
The Groove-Unit 29

Prepared for:
Thad Rutherford
Southstar at Vintage Oaks, LLC
1114 Lost Creek Blvd., Suite 270
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Prepared by:

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STATE OF TEXAS
CHRISTOPHER B. ALLISON
131240
LICENSED
PROFESSIONAL ENGINEER
10/06/2020

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New Braunfels, Texas 78130
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Prepared by:
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M&S Engineering, L.L.C.
Texas Registered Engineering Firm F-1394

October 2020

Texas Commission on Environmental Quality

Edwards Aquifer Application Cover Page

Our Review of Your Application

The Edwards Aquifer Program staff conducts an administrative and technical review of all applications. The turnaround time for administrative review can be up to 30 days as outlined in 30 TAC 213.4(e). Generally administrative completeness is determined during the intake meeting or within a few days of receipt. The turnaround time for technical review of an administratively complete Edwards Aquifer application is 90 days as outlined in 30 TAC 213.4(e). Please know that the review and approval time is directly impacted by the quality and completeness of the initial application that is received. In order to conduct a timely review, it is imperative that the information provided in an Edwards Aquifer application include final plans, be accurate, complete, and in compliance with 30 TAC 213.

Administrative Review

1. Edwards Aquifer applications must be deemed administratively complete before a technical review can begin. To be considered administratively complete, the application must contain completed forms and attachments, provide the requested information, and meet all the site plan requirements. The submitted application and plan sheets should be final plans. Please submit one full-size set of plan sheets with the original application, and half-size sets with the additional copies.

   To ensure that all applicable documents are included in the application, the program has developed tools to guide you and web pages to provide all forms, checklists, and guidance. Please visit the below website for assistance: http://www.tceq.texas.gov/field/eapp.

2. This Edwards Aquifer Application Cover Page form (certified by the applicant or agent) must be included in the application and brought to the administrative review meeting.

3. Administrative reviews are scheduled with program staff who will conduct the review. Applicants or their authorized agent should call the appropriate regional office, according to the county in which the project is located, to schedule a review. The average meeting time is one hour.

4. In the meeting, the application is examined for administrative completeness. Deficiencies will be noted by staff and emailed or faxed to the applicant and authorized agent at the end of the meeting, or shortly after. Administrative deficiencies will cause the application to be deemed incomplete and returned.

   An appointment should be made to resubmit the application. The application is re-examined to ensure all deficiencies are resolved. The application will only be deemed administratively complete when all administrative deficiencies are addressed.

5. If an application is received by mail, courier service, or otherwise submitted without a review meeting, the administrative review will be conducted within 30 days. The applicant and agent will be contacted with the results of the administrative review. If the application is found to be administratively incomplete, it can be retrieved from the regional office or returned by regular mail. If returned by mail, the regional office may require arrangements for return shipping.

6. If the geologic assessment was completed before October 1, 2004 and the site contains "possibly sensitive" features, the assessment must be updated in accordance with the *Instructions to Geologists* (TCEQ-0585 Instructions).

Technical Review

1. When an application is deemed administratively complete, the technical review period begins. The regional office will distribute copies of the application to the identified affected city, county, and groundwater conservation district whose jurisdiction includes the subject site. These entities and the public have 30 days to provide comments on the application to the regional office. All comments received are reviewed by TCEQ.

2. A site assessment is usually conducted as part of the technical review, to evaluate the geologic assessment and observe existing site conditions. The site must be accessible to our staff. The site boundaries should be

clearly marked, features identified in the geologic assessment should be flagged, roadways marked and the alignment of the Sewage Collection System and manholes should be staked at the time the application is submitted. If the site is not marked the application may be returned.

3. We evaluate the application for technical completeness and contact the applicant and agent via Notice of Deficiency (NOD) to request additional information and identify technical deficiencies. There are two deficiency response periods available to the applicant. There are 14 days to resolve deficiencies noted in the first NOD. If a second NOD is issued, there is an additional 14 days to resolve deficiencies. If the response to the second notice is not received, is incomplete or inadequate, or provides new information that is incomplete or inadequate, the application must be withdrawn or will be denied. Please note that because the technical review is underway, whether the application is withdrawn or denied **the application fee will be forfeited**.

4. The program has 90 calendar days to complete the technical review of the application. If the application is technically adequate, such that it complies with the Edwards Aquifer rules, and is protective of the Edwards Aquifer during and after construction, an approval letter will be issued. Construction or other regulated activity may not begin until an approval is issued.

Mid-Review Modifications

It is important to have final site plans prior to beginning the permitting process with TCEQ to avoid delays.

Occasionally, circumstances arise where you may have significant design and/or site plan changes after your Edwards Aquifer application has been deemed administratively complete by TCEQ. This is considered a "Mid-Review Modification". Mid-Review Modifications may require redistribution of an application that includes the proposed modifications for public comment.

If you are proposing a Mid-Review Modification, two options are available:

- If the technical review has begun your application can be denied/withdrawn, your fees will be forfeited, and the plan will have to be resubmitted.
- TCEQ can continue the technical review of the application as it was submitted, and a modification application can be submitted at a later time.

If the application is denied/withdrawn, the resubmitted application will be subject to the administrative and technical review processes and will be treated as a new application. The application will be redistributed to the affected jurisdictions.

Please contact the regional office if you have questions. If your project is located in Williamson, Travis, or Hays County, contact TCEQ's Austin Regional Office at 512-339-2929. If your project is in Comal, Bexar, Medina, Uvalde, or Kinney County, contact TCEQ's San Antonio Regional Office at 210-490-3096

Please fill out all required fields below and submit with your application.

1. Regulated Entity Name: Vintage Oaks at the Vineyard, The Grove- Unit 29						**2. Regulated Entity No.:** N/A			
3. Customer Name: Thad Rutherford						**4. Customer No.:** 604123554			
5. Project Type: **(Please circle/check one)**	New		Modification			Extension		Exception	
6. Plan Type: **(Please circle/check one)**	WPAP	CZP	SCS	UST	AST	EXP	EXT	Technical Clarification	Optional Enhanced Measures
7. Land Use: **(Please circle/check one)**	Residential		Non-residential				**8. Site (acres):**		32.10 ac.
9. Application Fee:	$1320.00		**10. Permanent BMP(s):**				N/A		
11. SCS (Linear Ft.):	2640		**12. AST/UST (No. Tanks):**				N/A		
13. County:	Comal		**14. Watershed:**				Dry Comal		

Application Distribution

Instructions: Use the table below to determine the number of applications required. One original and one copy of the application, plus additional copies (as needed) for each affected incorporated city, county, and groundwater conservation district are required. Linear projects or large projects, which cross into multiple jurisdictions, can require additional copies. Refer to the "Texas Groundwater Conservation Districts within the EAPP Boundaries" map found at:

http://www.tceq.texas.gov/assets/public/compliance/field_ops/eapp/EAPP%20GWCD%20map.pdf

For more detailed boundaries, please contact the conservation district directly.

Austin Region			
County:	**Hays**	**Travis**	**Williamson**
Original (1 req.)	__	__	__
Region (1 req.)	__	__	__
County(ies)	__	__	__
Groundwater Conservation District(s)	__Edwards Aquifer Authority __Barton Springs/ Edwards Aquifer __Hays Trinity __Plum Creek	__Barton Springs/ Edwards Aquifer	NA
City(ies) Jurisdiction	__Austin __Buda __Dripping Springs __Kyle __Mountain City __San Marcos __Wimberley __Woodcreek	__Austin __Bee Cave __Pflugerville __Rollingwood __Round Rock __Sunset Valley __West Lake Hills	__Austin __Cedar Park __Florence __Georgetown __Jerrell __Leander __Liberty Hill __Pflugerville __Round Rock

San Antonio Region					
County:	**Bexar**	**Comal**	**Kinney**	**Medina**	**Uvalde**
Original (1 req.)	__	_X_	__	__	__
Region (1 req.)	__	_X_	__	__	__
County(ies)	__	_X_	__	__	__
Groundwater Conservation District(s)	__ Edwards Aquifer Authority __Trinity-Glen Rose	_X_Edwards Aquifer Authority	__Kinney	__EAA __Medina	__EAA __Uvalde
City(ies) Jurisdiction	__Castle Hills __Fair Oaks Ranch __Helotes __Hill Country Village __Hollywood Park __San Antonio (SAWS) __Shavano Park	__Bulverde __Fair Oaks Ranch __Garden Ridge _X_New Braunfels __Schertz	NA	__San Antonio ETJ (SAWS)	NA

I certify that to the best of my knowledge, that the application is complete and accurate. This application is hereby submitted to TCEQ for administrative review and technical review. Blake Allison, P.E.	
Print Name of Customer/Authorized Agent	
Signature of Customer/Authorized Agent	Date: 10/6/2020

FOR TCEQ INTERNAL USE ONLY			
Date(s)Reviewed:		Date Administratively Complete:	
Received From:		Correct Number of Copies:	
Received By:		Distribution Date:	
EAPP File Number:		Complex:	
Admin. Review(s) (No.):		No. AR Rounds:	
Delinquent Fees (Y/N):		Review Time Spent:	
Lat./Long. Verified:		SOS Customer Verification:	
Agent Authorization Complete/Notarized (Y/N):		Fee Check:	Payable to TCEQ (Y/N):
Core Data Form Complete (Y/N):			Signed (Y/N):
Core Data Form Incomplete Nos.:			Less than 90 days old (Y/N):

General Information

In This Section

TCEQ-0587
General Information Form

Attachment A
Road Map

Attachment B
USGS/Edwards Recharge Zone Map

Attachment C
Project Description

General Information Form

Texas Commission on Environmental Quality

For Regulated Activities on the Edwards Aquifer Recharge and Transition Zones and Relating to 30 TAC §213.4(b) & §213.5(b)(2)(A), (B) Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **General Information Form** is hereby submitted for TCEQ review. The application was prepared by:

Print Name of Customer/Agent: Blake Allison, P.E.

Date: 10/6/2020

Signature of Customer/Agent:

Project Information

1. Regulated Entity Name: Vintage Oaks at the Vineyard, The Grove- Unit 29
2. County: Comal
3. Stream Basin: Dry Comal
4. Groundwater Conservation District (If applicable): Edwards Aquifer Authority & Comal Trinity
5. Edwards Aquifer Zone:

   ☒ Recharge Zone
   ☐ Transition Zone

6. Plan Type:

   ☐ WPAP
   ☒ SCS
   ☐ Modification
   ☐ AST

☐ UST ☐ Exception Request

7. Customer (Applicant):

Contact Person: Thad Rutherford
Entity: Southstar at Vintage Oaks, LLC
Mailing Address: 1114 Lost Creek Blvd., Suite 270
City, State: Austin, Texas Zip: 78746
Telephone: (305)476-1515 FAX: (512)436-9507
Email Address: thad@southstarcommunities.com

8. Agent/Representative (If any):

Contact Person: Blake Allison, P.E.
Entity: M&S Engineering, LLC
Mailing Address: 376 Landa St.
City, State: New Braunfels, Texas Zip: 78130
Telephone: (830)629-2988 FAX: (830)228-4197
Email Address: ballison@msengr.com

9. Project Location:

☐ The project site is located inside the city limits of _____.
☒ The project site is located outside the city limits but inside the ETJ (extra-territorial jurisdiction) of New Braunfels.
☐ The project site is not located within any city's limits or ETJ.

10. ☒ The location of the project site is described below. The description provides sufficient detail and clarity so that the TCEQ's Regional staff can easily locate the project and site boundaries for a field investigation.

The site sits on the East side of Unit 27 and within "The Hills" Unit at the Vintage Oaks at the Vineyard Subdivision. The lots being serviced are located off of the main road that comes off of HWY 46 (Bordeaux Ln) to Sugarcane and Bridle Trail.

11. ☒ **Attachment A – Road Map**. A road map showing directions to and the location of the project site is attached. The project location and site boundaries are clearly shown on the map.

12. ☒ **Attachment B - USGS / Edwards Recharge Zone Map**. A copy of the official 7 ½ minute USGS Quadrangle Map (Scale: 1" = 2000') of the Edwards Recharge Zone is attached. The map(s) clearly show:

☒ Project site boundaries.
☒ USGS Quadrangle Name(s).
☒ Boundaries of the Recharge Zone (and Transition Zone, if applicable).
☒ Drainage path from the project site to the boundary of the Recharge Zone.

13. ☒ **The TCEQ must be able to inspect the project site or the application will be returned**. Sufficient survey staking is provided on the project to allow TCEQ regional staff to locate

the boundaries and alignment of the regulated activities and the geologic or manmade features noted in the Geologic Assessment.

☐ Survey staking will be completed by this date: _____

14. ☒ **Attachment C – Project Description**. Attached at the end of this form is a detailed narrative description of the proposed project. The project description is consistent throughout the application and contains, at a minimum, the following details:

☒ Area of the site
☒ Offsite areas
☒ Impervious cover
☒ Permanent BMP(s)
☒ Proposed site use
☒ Site history
☒ Previous development
☒ Area(s) to be demolished

15. Existing project site conditions are noted below:

☐ Existing commercial site
☐ Existing industrial site
☒ Existing residential site
☒ Existing paved and/or unpaved roads
☐ Undeveloped (Cleared)
☐ Undeveloped (Undisturbed/Uncleared)
☐ Other: _____

Prohibited Activities

16. ☒ I am aware that the following activities are prohibited on the Recharge Zone and are not proposed for this project:

(1) Waste disposal wells regulated under 30 TAC Chapter 331 of this title (relating to Underground Injection Control);

(2) New feedlot/concentrated animal feeding operations, as defined in 30 TAC §213.3;

(3) Land disposal of Class I wastes, as defined in 30 TAC §335.1;

(4) The use of sewage holding tanks as parts of organized collection systems; and

(5) New municipal solid waste landfill facilities required to meet and comply with Type I standards which are defined in §330.41(b), (c), and (d) of this title (relating to Types of Municipal Solid Waste Facilities).

(6) New municipal and industrial wastewater discharges into or adjacent to water in the state that would create additional pollutant loading.

17. ☒ I am aware that the following activities are prohibited on the Transition Zone and are not proposed for this project:

(1) Waste disposal wells regulated under 30 TAC Chapter 331 (relating to Underground Injection Control);

(2) Land disposal of Class I wastes, as defined in 30 TAC §335.1; and

(3) New municipal solid waste landfill facilities required to meet and comply with Type I standards which are defined in §330.41 (b), (c), and (d) of this title.

Administrative Information

18. The fee for the plan(s) is based on:

- ☐ For a Water Pollution Abatement Plan or Modification, the total acreage of the site where regulated activities will occur.
- ☒ For an Organized Sewage Collection System Plan or Modification, the total linear footage of all collection system lines.
- ☐ For a UST Facility Plan or Modification or an AST Facility Plan or Modification, the total number of tanks or piping systems.
- ☐ A request for an exception to any substantive portion of the regulations related to the protection of water quality.
- ☐ A request for an extension to a previously approved plan.

19. ☒ Application fees are due and payable at the time the application is filed. If the correct fee is not submitted, the TCEQ is not required to consider the application until the correct fee is submitted. Both the fee and the Edwards Aquifer Fee Form have been sent to the Commission's:

- ☐ TCEQ cashier
- ☐ Austin Regional Office (for projects in Hays, Travis, and Williamson Counties)
- ☒ San Antonio Regional Office (for projects in Bexar, Comal, Kinney, Medina, and Uvalde Counties)

20. ☒ Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions. The copies must be submitted to the appropriate regional office.

21. ☒ No person shall commence any regulated activity until the Edwards Aquifer Protection Plan(s) for the activity has been filed with and approved by the Executive Director.

Attachment A

Road Map

ATTACHMENT A - ROAD MAP

SHEET:	JOB: 7019BSW004	
ATTACHMENT A	DATE: SEPTEMBER 2020	
	DRAWN:	PM:
	DESIGN:	DM:
	PEER:	OTHER:

VINTAGE OAKS AT THE VINEYARD

THE GROVE

UNIT 29

M&S ENGINEERING
CIVIL | ELECTRICAL | STRUCTURAL | MEP | SURVEYING
TEXAS REGISTERED ENGINEERING FIRM F-1394 SURVEYING FIRM # 10044200

CONTACT
WWW.MSENGR.COM
PHONE: (830) 228-5446
FAX: (830) 885-2170

MAIN OFFICE
P.O. BOX 970
6477 FM 311
SPRING BRANCH, TX 78070

BRANCH OFFICE
376 LANDA ST.
NEW BRAUNFELS, TX 78130
PHONE: (830) 629-2988

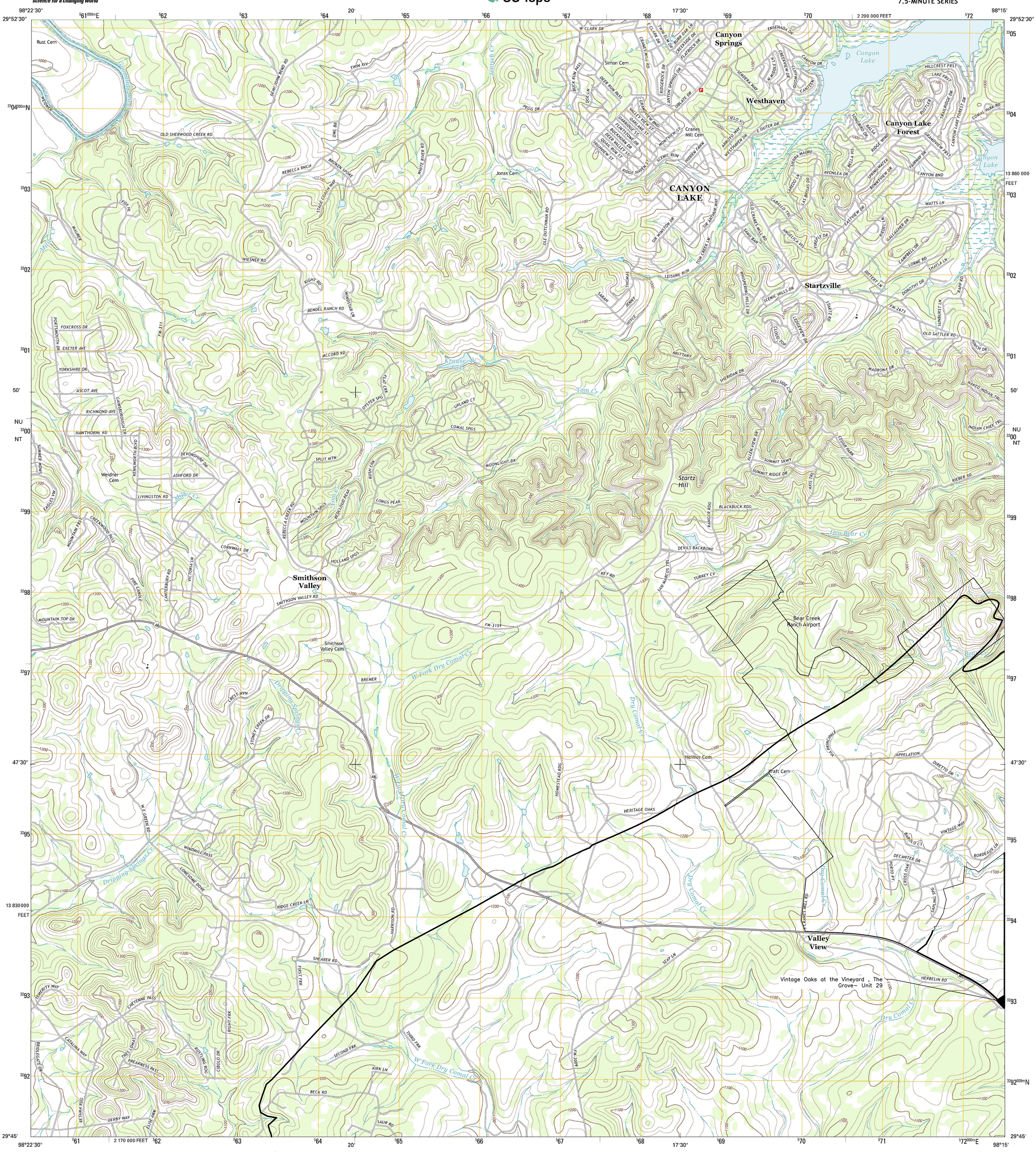
Attachment B

Usgs/Edwards Recharge Zone Map

U.S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

The National Map US Topo

SMITHSON VALLEY QUADRANGLE
TEXAS-COMAL CO.
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 14R
10 000-foot ticks: Texas Coordinate System of 1983 (south central zone)

Imagery.....NAIP, May 2010
Roads.....©2006-2012 TomTom
Names.....GNIS, 2012
Hydrography.....National Hydrography Dataset, 2010
Contours.....National Elevation Dataset, 2003
Boundaries.....Census, IBWC, IBC, USGS, 1972 - 2012

MN
GN
4° 41′
83 MILS
0° 20′
6 MILS

UTM GRID AND 2013 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID NU / NT 33 00
Grid Zone Designation 14R

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.7

TEXAS

QUADRANGLE LOCATION

Spring Branch	Fischer	Devils Backbone
Anhalt	Smithson Valley	Sattler
Bulverde	Bat Cave	New Braunfels West

ADJOINING 7.5' QUADRANGLES

ROAD CLASSIFICATION

Interstate Route
US Route
Ramp
State Route
Local Road
4WD

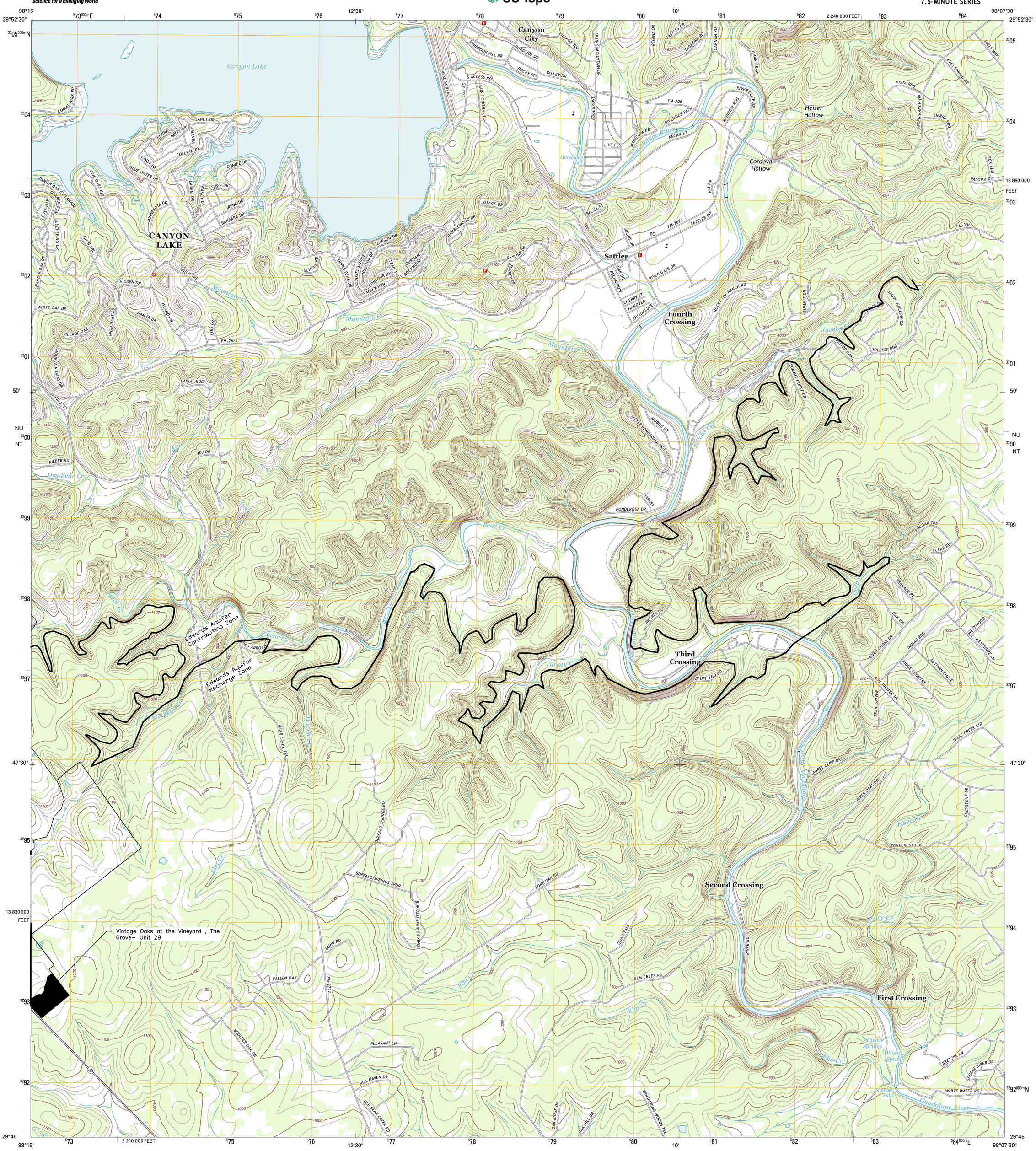
Interstate Route
US Route
State Route

SMITHSON VALLEY, TX
2013

U.S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

The National Map
US Topo

SATTLER QUADRANGLE
TEXAS-COMAL CO.
7.5-MINUTE SERIES



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10 000-foot ticks: Texas Coordinate System of 1983 (south central zone)

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Names.....GNIS, 2012
Hydrography.....National Hydrography Dataset, 2010
Contours.....National Elevation Dataset, 2003
Boundaries.....Census, IBWC, IBC, USGS, 1972 - 2012

MN
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7 MILS
UTM GRID AND 2013 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
NU / NT 33 00
Grid Zone Designation 14R

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

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A metadata file associated with this product is draft version 0.6.7

TEXAS
QUADRANGLE LOCATION

Fischer	Devils Backbone	Wimberley
Smithson Valley	Sattler	Hunter
Bat Cave	New Braunfels West	New Braunfels East

ADJOINING 7.5′ QUADRANGLES

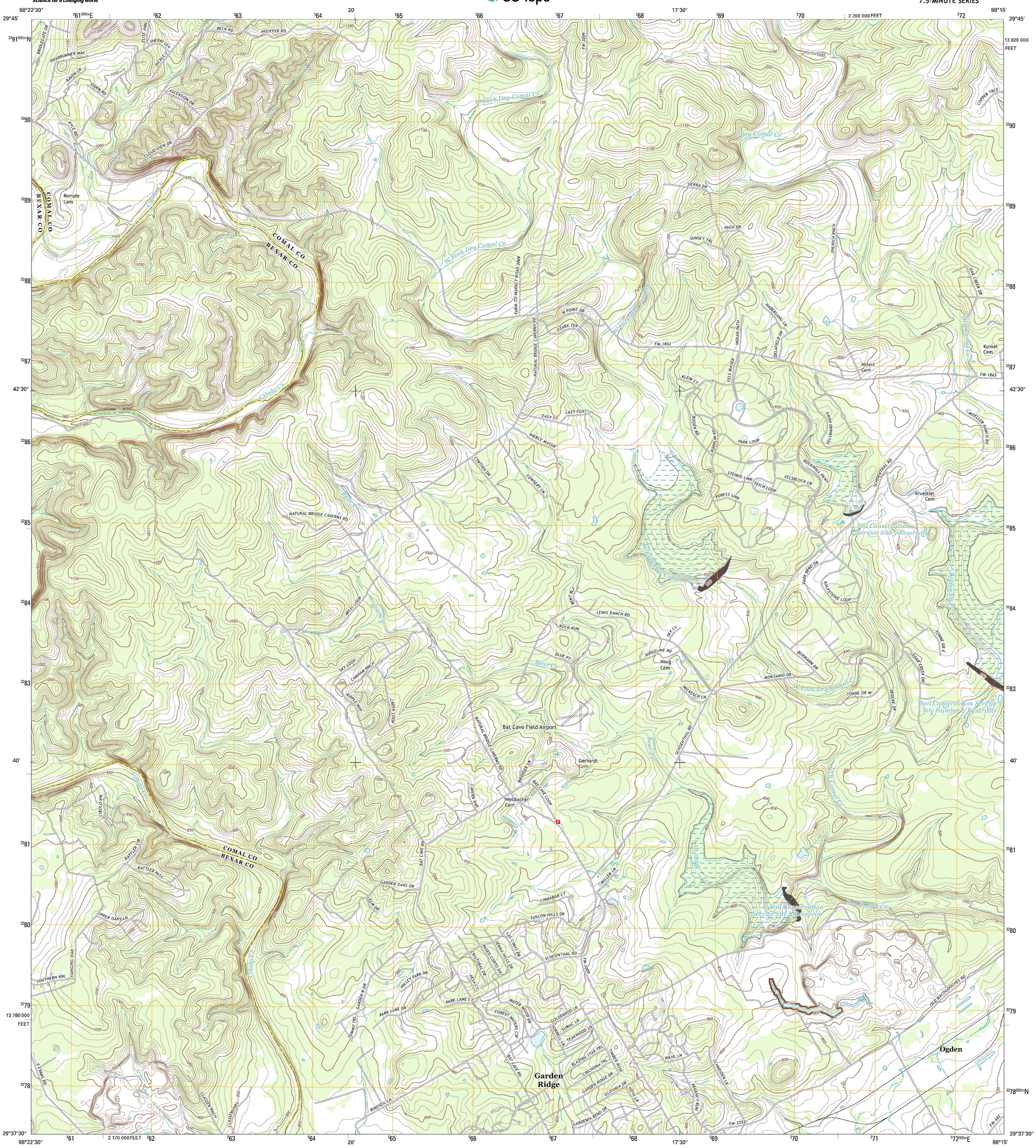
ROAD CLASSIFICATION
Interstate Route
US Route
Ramp
State Route
Local Road
4WD
Interstate Route
US Route
State Route

SATTLER, TX
2013

U.S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

The National Map
US Topo

BAT CAVE QUADRANGLE
TEXAS
7.5-MINUTE SERIES



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10 000-foot ticks: Texas Coordinate System of 1983 (south central zone)

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Roads.....©2006-2012 TomTom
Names.....GNIS, 2012
Hydrography.....National Hydrography Dataset, 2010
Contours.....National Elevation Dataset, 2004
Boundaries.....Census, IBWC, IBC, USGS, 1972 - 2012

MN
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U.S. National Grid
100,000-m Square ID
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Grid Zone Designation
14R

SCALE 1:24 000

KILOMETERS
METERS
MILES
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

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A metadata file associated with this product is draft version 0.6.7

TEXAS
QUADRANGLE LOCATION

Anhalt	Smithson Valley	Sattler
Bulverde	Bat Cave	New Braunfels West
Longhorn	Schertz	Marion

ADJOINING 7.5' QUADRANGLES

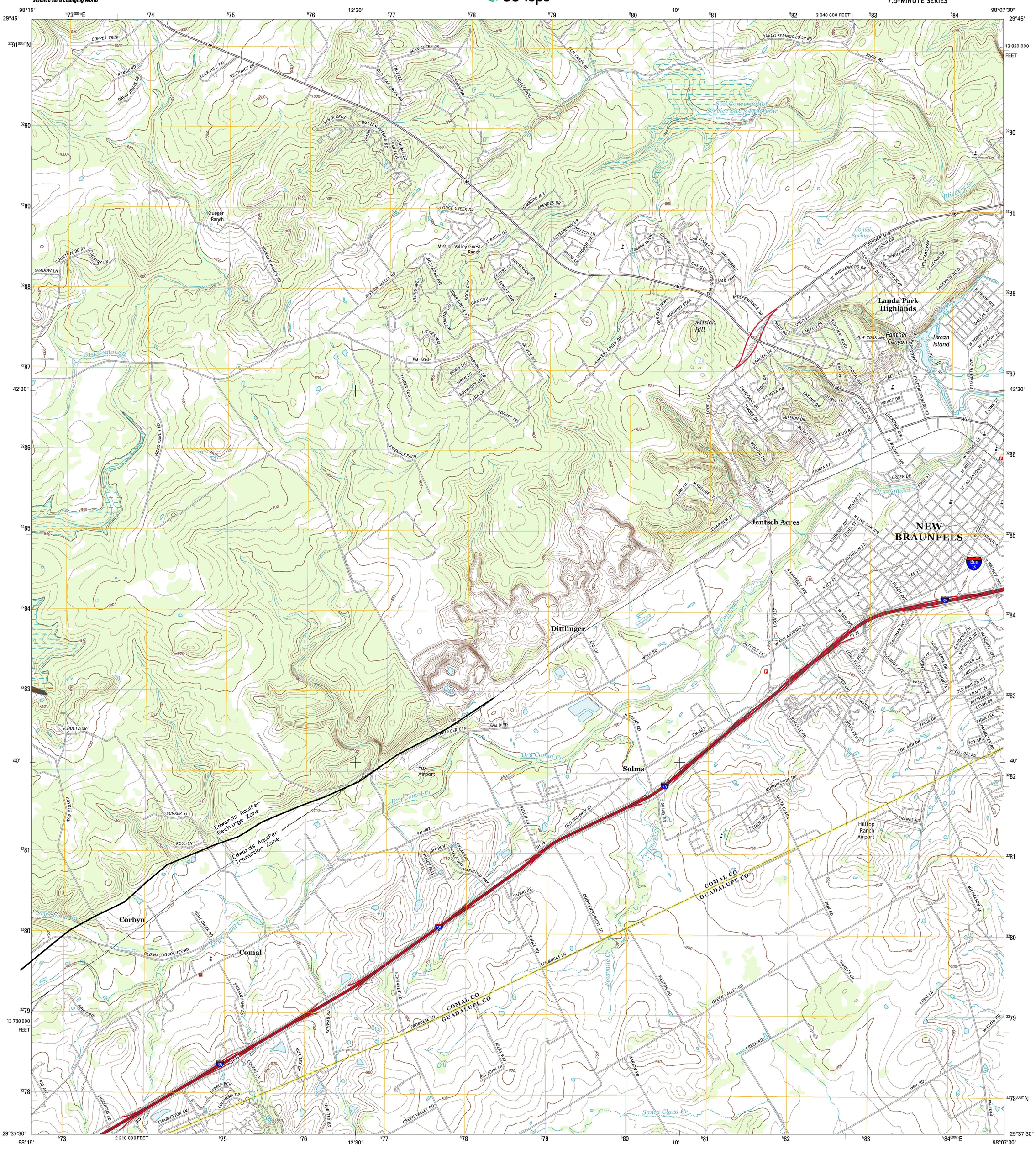
ROAD CLASSIFICATION
Interstate Route
US Route
Ramp
State Route
Local Road
4WD
Interstate Route
US Route
State Route

BAT CAVE, TX
2013

U.S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

The National Map
US Topo

NEW BRAUNFELS WEST QUADRANGLE
TEXAS
7.5-MINUTE SERIES



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North American Datum of 1983 (NAD83)
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Hydrography.....National Hydrography Dataset, 2010
Contours.....National Elevation Dataset, 2004
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UTM GRID AND 2013 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
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TEXAS
QUADRANGLE LOCATION

Smithson Valley	Sattler	Hunter
Bat Cave	New Braunfels West	New Braunfels East
Schertz	Marion	McQueeney

ADJOINING 7.5′ QUADRANGLES

ROAD CLASSIFICATION
Interstate Route
US Route
Ramp
State Route
Local Road
4WD
Interstate Route
US Route
State Route

NEW BRAUNFELS WEST, TX
2013

Attachment C

Project Description

Attachment C

PROJECT DESCRIPTION

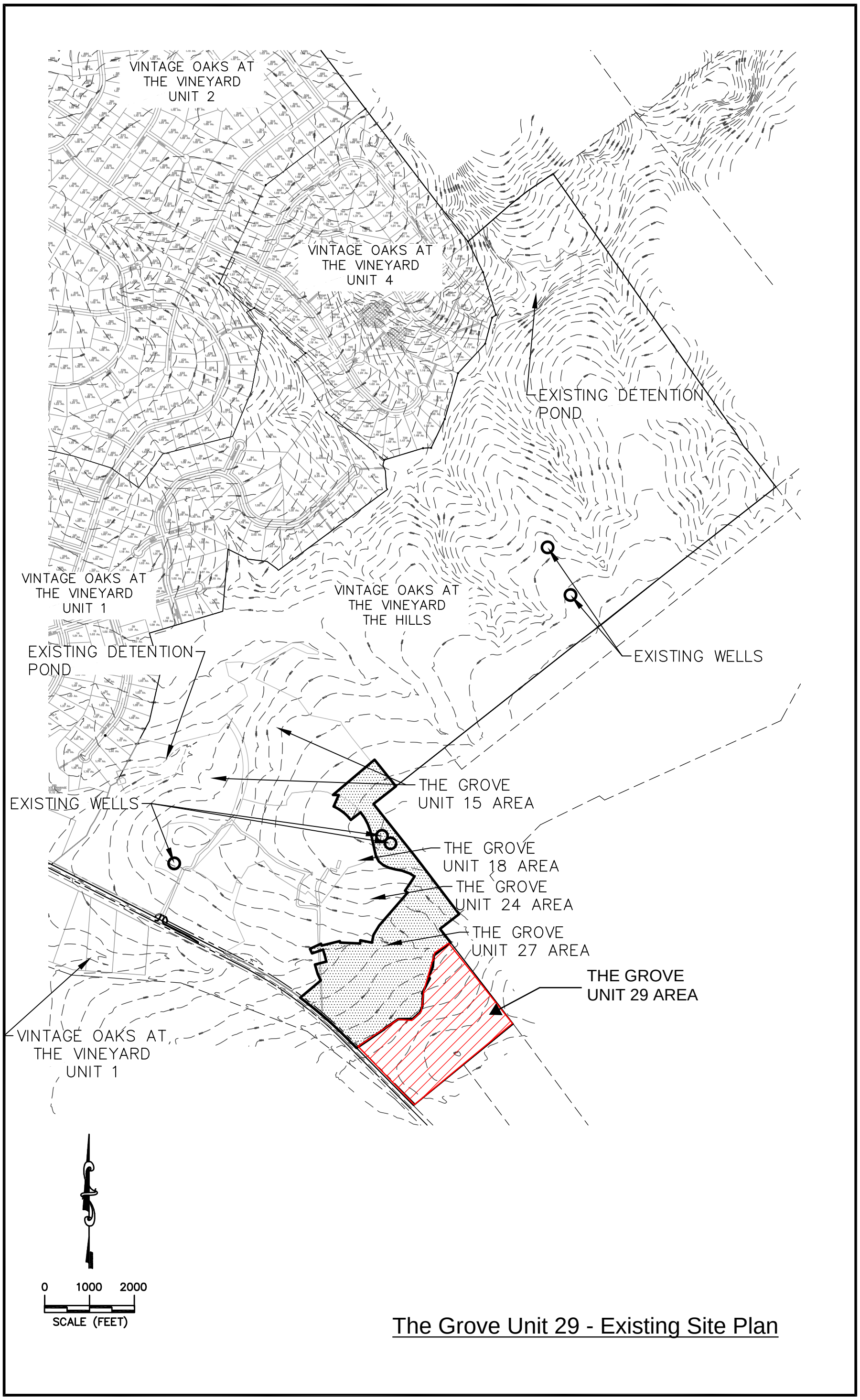
The area of the site is in the ETJ on New Braunfels, but is grandfathered out due to the masterplan being submitted prior to annexation into the ETJ. A letter from the county has been attached. At one point this site was a residential tract. The existing impervious cover are building structures, water wells and ranch roads on site (See Attached Existing Site Plan). The site was a home/farm and used for agricultural purposes.

The Grove- Unit 29 is made up of 66 residential lots along the main road that provides access to "The Hills" unit of Vintage Oaks. The entrance to the main road is adjacent to highway 46. To the northwest is an effluent pond for the treatment plant that also provides water to the designated irrigation areas. There is also land dedicated to irrigation that is associated with the treatment facility.

The organized sewage collection system that is being proposed for The Grove is a Septic Tank Effluent Pumping System or STEP System. This system was selected due to the state of the proposed site. Currently, there is no point of connection to an existing sewer system; therefore onsite treatment is needed. The terrain of the site varies in elevation, which is not conducive to a gravity system. Lastly, this is a proven system that the owner and engineer selected based on previous installations.

This system will be developed in phases; this being the fifth. The first phase was constructed with The Grove- Unit 15; approved on July 12, 2016. The second phase was constructed with The Grove – Unit 18; approved on November 30, 2017. The third phase was constructed with The Grove- Unit 24; approved on January 18, 2019. The fourth phase was constructed with The Grove- Unit 27; approved on June 4, 2019. The fifth phase will be constructed to consist of 2640 linear feet of pipe. That total includes 1230 linear feet of 2-inch pipe and 1410 linear feet of 3-inch pipe. All effluent will be conveyed to the onsite Ovivo Micro BLOX MBR Treatment facility.

No permanent BMPS are being proposed with regards to the SCS. There is a natural filter strip that has been proposed and approved in the WPAP for Vintage Oaks The Hills (RN 108334111). No portions of The Grove- Unit 29 are located in the 100-year floodplain area. This can be verified by Panel 48091C0245F, effective September 2, 2009 from the FEMA Floodplain Maps. The site is located within the Dry Comal Creek watershed.



The Grove Unit 29 - Existing Site Plan

Comal County

OFFICE OF COMAL COUNTY ENGINEER

September 9, 2013

Ms. Shannon Mattingly,
Director of Planning and Community Development
City of New Braunfels Planning Dept.
424 S. Castell Ave.
New Braunfels, TX 78130

Re: Vintage Oaks at the Vineyard, within Comal County, Texas

Dear Ms. Mattingly,

During their meeting of September 5, 2013, the Comal County Commissioners Court considered and granted your request to vary from the "Interlocal Cooperation Agreement between Comal County and the City of New Braunfels for Subdivision Regulation within the Extraterritorial Jurisdiction of the City of New Braunfels" regarding proposed units within the referenced subdivision.

Pursuant to actions taken by the City Council on August 26, 2013, and by Commissioners Court on September 5, 2013, Comal County will enforce its subdivision rules and regulations for Vintage Oaks at the Vineyard, lying within the City of New Braunfels Extraterritorial Jurisdiction.

Should you have any questions, please let us know.

Thank you.

Sincerely,

Betty Lien
Subdivision Coordinator

xc: Mr. Gene Szakacsy, Comal County Road Superintendent (via email)

195 David Jonas Drive • New Braunfels, Texas 78132-3760 • (830) 608-2090 FAX (830) 608-2009 • www.ccco.org

Geologic Assessment

In This Section

TCEQ-0858
Geologic Assessment

Narrative Description of Geology

Overview Maps

Site Geologic Map and Geologic Assessment Tables

Site Photographs

Geologic Assessment

The following Geological Assessment was conducted for the WPAP Vintage Oaks at the Vineyard The Hills. The Grove- Unit 29 is located within the scope of this Geological Assessment. Based on the Geological Assessment, there are no sensitive features located within the boundary of The Grove- Unit 29.

GEOLOGIC ASSESSMENT

For

VINTAGE OAKS AT THE VINEYARDS THE HILLS
HIGHWAY 46
COMAL COUNTY, TEXAS

Prepared for

M&S ENGINEERING LTD.
376 LANDA STREET
NEW BRAUNFELS, TEXAS 78130

Prepared by

Professional Service Industries, Inc.
3 Burwood Lane
San Antonio, Texas 78216
Telephone (210) 342-9377

PSI PROJECT NO.: 0435- 2481

November 13, 2015

November 13, 2015

M&S Engineering, Ltd.
6477 F.M. 311, P.O. Box 970
Spring Branch, Texas 78070

Attn: Mr. Heath Woods, P.E.

Re: Geologic Assessment
Vintage Oaks at The Vineyard The Hills
Approximate 637-Acre Tract
Highway 46, Comal County, Texas
PSI Project No. 435-2481

Dear Mr. Woods:

Professional Service Industries, Inc. (PSI) has completed a geologic recharge assessment for the above referenced project in compliance with the Texas Commission on Environmental Quality (TCEQ) requirements for regulated developments located on the Edwards Aquifer Recharge Zone (EARZ). The purpose of this report is to describe surficial geologic units and identify the locations and extent of significant recharge features present in the development area.

AUTHORIZATION

Authorization to perform this assessment was given by a signed copy of PSI Proposal No. 164692 between M&S Engineering, Ltd. and PSI dated October 16, 2015.

PROJECT DESCRIPTION

The subject site is located on the north side of Highway 46, east of Cranes Mill Road, in Comal County, Texas. The Hills Tract is approximately 637-acres in size, and is an irregularly shaped parcel of undeveloped land that is hilly and rugged in places although some areas are open relatively flat fields of grass. The hillside slopes are occasionally steep and can dip in all directions. Northerly tributaries of Bear Creek drain the property in a general northeasterly or southeasterly direction. The site vegetation consists primarily of native grasses, ashe juniper, live oak, burr oak, cedar elm and persimmon trees, with abundant mountain laurel, agarita, and prickly pear cactus.

REGIONAL GEOLOGY

Physiography

Comal County lies within two physiographic provinces, the Edwards Plateau and the Blackland Prairie. Most of Comal County lies within the Edwards Plateau, which is characterized by rugged and hilly terrain, with elevations in excess of 1,400' feet above sea

level in the northwestern portion of the county. This area is underlain by beds of limestone that dip gently to the southeast. South of the Edwards Plateau is the Balcones Fault Zone, which is also the northernmost limit of the Blackland Prairie. The Balcones Fault Zone extends northeast-southwest across Comal County and is composed of fault blocks of limestone, chalk, shale and marl. The undulating, hilly topography of the Blackland Prairie ranges in elevation from about 650 feet to 1100 feet above sea level. The regional dip of the lower Cretaceous rocks in Comal County is approximately 15 feet per mile towards the southeast. The faults are predominantly normal, down-to-the southeast with near vertical throws. Elevations at the Vintage Oaks at the Vineyard The Hills Tract site range from approximately 1,060 feet above mean sea level in the southwest portion of the tract to approximately 1,180 feet above mean sea level along the eastern property line of the tract.

Stratigraphy and Structure

Rocks at the site are members of the Lower Cretaceous Edwards Kainer Formation. The site is covered with a thin veneer of soil, and scattered expanses of dense to vuggy and fractured rock outcrops which are exposed throughout the site. In general, the hillsides contained variable amounts of boulder float and soil with outcrops exhibiting varying degrees of fractures and vug development. According to "The Geologic Framework and Hydrogeologic Characteristics of the Edwards Aquifer Outcrop, Comal County Texas" written by the USGS, the Kainer Formation ranges between 260 and 310 feet thick and forms the lower member of the Edwards Group, beneath the Person Formation which compromises the Edwards Aquifer, a federally-designated sole source aquifer for the region. The underlying Glen Rose Formation is composed of yellowish-tan, thinly bedded marly limestone.

The rocks at the site are mapped as the Dolomitic member of the Kainer Formation, which is a mudstone to grainstone, cherty, massively bedded, crystalline limestone. The rock weathers to a light gray in outcrop, and has abundant *Toucasia* bivalves. The underlying Basal nodular member of the Kainer Formation was also observed on the tract, and consists of shaly, nodular limestone and burrowed mudstone to wackestone, with gastropods, miliolids and *exogyra texana* bivalves. It is considered regionally as a lower confining unit, but locally water bearing through dissolution along bedding planes.

Four sensitive features scoring more than 40 points on the F-0585 form was observed on the subject tract and consisted of vuggy fractured rock zones in the Little Bear Creek streambed in the northeastern extension "arm". One of the features, S-10 is a large outcrop that has been partially cleared for site development activities associated with a nearby flood control spillway. The other feature, S-11 is heavily fractured, and shows the contact between the Kainer dolomitic member and the underlying basal nodular member. The other two are small caves on the east side of the tract (S-24 and S-25).

SITE INVESTIGATION

The site investigation was performed by systematically traversing the subject tract, and mapping fractured or vuggy rock outcrops, closed depressions, sinkholes, caves, or indications of fault/fracture zones. The purpose of the site investigation was to delineate

features with recharge potential that may warrant special protection or consideration. The results of the site investigation are included in the attached TCEQ report format.

SUMMARY

Four sensitive features were noted on The Hills tract. Two are in the northeast flowing Little Bear Creek drainage way in the northeastern "arm" of the site. These features are in alignment with a mapped fault that traverses the northeast "arm" of the subject tract, and receive directed water flow during precipitation events. Two small caves are located at fairly high elevations on the east side of the tract. Other, non-sensitive, predominantly man-made features were also identified, and included water wells, stock tanks, flood control spill ways and a septic tank. Please note that subtle features, buried or obscured from view, may be present on the tract. It is possible that clearing/construction activities will reveal the presence of features currently hidden by thick vegetation and/or soil cover. If caves, sinkholes, or solution cavities are encountered during future clearing/construction activities, please contact our office for additional assistance.

We appreciate this opportunity to be of service to you. If you have any questions, please do not hesitate to contact our office.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.

John Langan, P.G.
Environmental Department Manager

STATE OF TEXAS
JL 11/13/15
John Langan
Geology
4871
LICENSED
PROFESSIONAL GEOSCIENTIST

psi

WARRANTY

The field observations and research reported herein are considered sufficient in detail and scope to form a reasonable basis for a general geological recharge assessment of this site. PSI warrants that the findings and conclusions contained herein have been promulgated in accordance with generally accepted geologic methods, only for the site described in this report. These methods have been developed to provide the client with information regarding apparent indications of existing or potential conditions relating to the subject site and are necessarily limited to the conditions observed at the time of the site visit and research. This report is also limited to the information available at the time it was prepared. In the event additional information is provided to PSI following the report, it will be forwarded to the client in the form received for evaluation by the client. There is a possibility that conditions may exist which could not be identified within the scope of the assessment or which were not apparent during the site visit. PSI believes that the information obtained from others during the review of public information is reliable; however, PSI cannot warrant or guarantee that the information provided by others is complete or accurate.

This report has been prepared for the exclusive use of M&S Engineering, Ltd. for the site discussed herein. Reproductions of this report cannot be made without the expressed approval M&S Engineering, Ltd. The general terms and conditions under which this assessment was prepared apply solely to M&S Engineering, Ltd. No other warranties are implied or expressed.

Geologic Assessment

Texas Commission on Environmental Quality

For Regulated Activities on The Edwards Aquifer Recharge/transition Zones and Relating to 30 TAC §213.5(b)(3), Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. My signature certifies that I am qualified as a geologist as defined by 30 TAC Chapter 213.

Print Name of Geologist: John Langan

Telephone: 210/342-9377

Date: 11/13/15

Fax: 210/342-9401

Representing: PSI TBPG No. 50128 (Name of Company and TBPG or TBPE registration number)

Signature of Geologist:

STATE OF TEXAS
JL 11/13/15
John Langan
Geology
4871
LICENSED
PROFESSIONAL GEOSCIENTIST

Regulated Entity Name: Vintage Oaks at thbe Vineyard - The Hills

Project Information

1. Date(s) Geologic Assessment was performed: 10-11/15
2. Type of Project:

   ☒ WPAP
   ☐ SCS
   ☐ AST
   ☐ UST

3. Location of Project:

   ☒ Recharge Zone
   ☐ Transition Zone
   ☐ Contributing Zone within the Transition Zone

4. ☒ **Attachment A - Geologic Assessment Table**. Completed Geologic Assessment Table (Form TCEQ-0585-Table) is attached.

5. ☐ Soil cover on the project site is summarized in the table below and uses the SCS Hydrologic Soil Groups* (Urban Hydrology for Small Watersheds, Technical Release No. 55, Appendix A, Soil Conservation Service, 1986). If there is more than one soil type on the project site, show each soil type on the site Geologic Map or a separate soils map.

Soil Name	Group*	Thickness(feet)

Table 1 - Soil Units, Infiltration Characteristics and Thickness

Soil Name	Group*	Thickness(feet)
Anhalt clay, 1-3% Slopes	B	2
Rumple-Comfort Asso., undulating	B	2

** Soil Group Definitions (Abbreviated)*

A. Soils having a high infiltration rate when thoroughly wetted.
B. Soils having a moderate infiltration rate when thoroughly wetted.
C. Soils having a slow infiltration rate when thoroughly wetted.
D. Soils having a very slow infiltration rate when thoroughly wetted.

6. ☒ **Attachment B – Stratigraphic Column**. A stratigraphic column showing formations, members, and thicknesses is attached. The outcropping unit, if present, should be at the top of the stratigraphic column. Otherwise, the uppermost unit should be at the top of the stratigraphic column.

7. ☒ **Attachment C – Site Geology**. A narrative description of the site specific geology including any features identified in the Geologic Assessment Table, a discussion of the potential for fluid movement to the Edwards Aquifer, stratigraphy, structure(s), and karst characteristics is attached.

8. ☒ **Attachment D – Site Geologic Map(s)**. The Site Geologic Map must be the same scale as the applicant's Site Plan. The minimum scale is 1": 400'

   Applicant's Site Plan Scale: 1" = 400'
   Site Geologic Map Scale: 1" = 400'
   Site Soils Map Scale (if more than 1 soil type): 1" = 400'

9. Method of collecting positional data:

   ☒ Global Positioning System (GPS) technology.
   ☐ Other method(s). Please describe method of data collection: _____

10. ☒ The project site and boundaries are clearly shown and labeled on the Site Geologic Map.

11. ☒ Surface geologic units are shown and labeled on the Site Geologic Map.

12. ☒ Geologic or manmade features were discovered on the project site during the field investigation. They are shown and labeled on the Site Geologic Map and are described in the attached Geologic Assessment Table.

    ☐ Geologic or manmade features were not discovered on the project site during the field investigation.

13. ☐ The Recharge Zone boundary is shown and labeled, if appropriate.

14. All known wells (test holes, water, oil, unplugged, capped and/or abandoned, etc.): If applicable, the information must agree with Item No. 20 of the WPAP Application Section.

    ☒ There are 5 (#) wells present on the project site and the locations are shown and labeled. (Check all of the following that apply.)
    - ☐ The wells are not in use and have been properly abandoned.
    - ☒ The wells are not in use and will be properly abandoned. Note: 4 wells will be abandoned
    - ☒ The wells are in use and comply with 16 TAC Chapter 76. 1 will remain in use (Feature S-7)

    ☐ There are no wells or test holes of any kind known to exist on the project site.

Administrative Information

15. ☒ Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions. The copies must be submitted to the appropriate regional office.

STRATIGRAPHIC COLUMN

Vintage Oaks at The Vineyard The Hills Tract
Highway 46
Comal County, Texas

FORMATION	THICKNESS	LITHOLOGIC DESCRIPTION
Georgetown Formation	2-20'	Light tan limestone identified by proximity to Del Rio clay and diagnostic marker fossil: *waconella wacoensis* brachiopod; low porosity and permeability development.
Person Formation	180-224'	Limestones and dolomites, extensive porosity development in "honeycomb sections, interbedded with massive recrystallized limestones with more limited permeabilities (especially Regional Dense Member separating the Person and Kainer Formations.
Kainer Formation	260-310'	Hard, miliolid limestones, overlying calcified dolomites and dolomite. Leached evaporitic "Kirschberg" zone of very porous and permeable collapse breccia formed by the dissolution of gypsum. Overlies the basal nodular (Walnut) bed.
Glen Rose Limestone (upper)	350-500	Yellowish-tan thinly bedded limestone and marl. Alternating beds of varying hardness erodes to "stairstep" topography. Marine fossils common.

psi

SOILS NARRATIVE

According to the Soil Survey of Comal County, published by the United States Department of Agriculture, Soil Conservation Service, in cooperation with the Texas Agricultural Extension Service, reissued in 1984, the soils beneath the subject property have been classified as Comfort-Rock outcrop complex, undulating (CrD), Rumple-Comfort association, undulating (RUD), Anhalt clay, 1 to 3% slopes (AnB), Eckrant-Rock outcrop complex, steep (ErG) and Brackett-Rock outcrop Real complex, steep (BtG)

Comfort extremely stony clay makes up between 49 and 95% of the Comfort-Rock outcrop series, and indurated rock outcrop and soil less than 4 inches deep make up 5 to 36% of the complex. Typically, the surface layer is dark brown extremely stony soil about 6 inches thick. Cobbles, stones and "float" rock comprise about 45% of the surface. The subsoil extends to about 13 inches, and overlies the fractured limestone parent material. Comfort soil is well-drained, with slow to medium surface runoff, slow permeability, and very low water capacity.

Rumple-Comfort association soils are shallow to moderately deep soils on uplands in the Edwards Plateau. The surface layer is a dark reddish brown cherty clay loam about 10 inches thick, and overlies a subsoil of reddish brown cherty clay with abundant limestone fragments to a depth of 28 inches. The underlying parent material is an indurated limestone. The soil is well drained, with medium surface runoff, moderately slow permeability, and very low available water capacity. The soil is not suited for cropland, or cultivation, but is used as range land and habitat for wildlife.

Eckrant-Rock outcrop complex, steep is similar in profile, but are found on long, narrow slopes on high hills and ridges and along escarpments. The surface layer of Eckrant soil is very dark gray extremely stony clay about 10 inches thick. The lower portion of the surface layer is up to 75% stones and cobbles, and overlies the fractured limestone parent material.

Anhalt clays are well-drained clays that form as residuum on weathered limestones. The depth to the parent material is between 20 and 40 inches. It has low to moderately low permeability, and low water capacity, and well suited for agriculture.

Brackett-Rock outcrop series consist of shallow, loamy soils and rock outcrop on uplands in the Edwards Plateau land resource area. The surface layer is grayish brown gravelly clay loam that is between 6 and 14 inches thick. The underlying parent material is a weakly cemented limestone interbedded with a thin strata of pale yellow or pale brown shaly clay. These soils are well-drained with rapid surface runoff, moderately slow permeability, and very low available water capacity The soils are used as rangelands or habitat for wildlife, and are not suited for pasture or crops.

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SITE GEOLOGIC NARRATIVE

Physiography

Comal County lies within two physiographic provinces, the Edwards Plateau and the Blackland Prairie. Most of Comal County lies within the Edwards Plateau, which is characterized by rugged and hilly terrain, with elevations in excess of 1,400' feet above sea level in the northwestern portion of the county. This area is underlain by beds of limestone that dip gently to the southeast. South of the Edwards Plateau is the Balcones Fault Zone, which is also the northernmost limit of the Blackland Prairie. The Balcones Fault Zone extends northeast-southwest across Comal County and is composed of fault blocks of limestone, chalk, shale and marl. The undulating, hilly topography of the Blackland Prairie ranges in elevation from about 650 feet to 1100 feet above sea level. The regional dip of the lower Cretaceous rocks in Comal County is approximately 15 feet per mile towards the southeast. The faults are predominantly normal, down-to-the southeast with near vertical throws. Elevations at the Vintage Oaks at the Vineyard The Hills Tract site range from approximately 1,170 feet above mean sea level in the east area of the tract to approximately 1,000 feet above mean sea level in the northeastern "arm" area of the tract.

Stratigraphy and Structure

Rocks at the site are members of the Lower Cretaceous Edwards Kainer Formation. The site is covered with a thin veneer of soil, and scattered expanses of dense to vuggy and fractured rock outcrops which are exposed throughout the site. In general, the hillsides contained variable amounts of boulder float and soil with outcrops exhibiting varying degrees of fractures and vug development. According to "The Geologic Framework and Hydrogeologic Characteristics of the Edwards Aquifer Outcrop, Comal County Texas" written by the USGS, the Kainer Formation ranges between 260 and 310 feet thick and forms the lower member of the Edwards Group, beneath the Person Formation which compromises the Edwards Aquifer, a federally-designated sole source aquifer for the region. The underlying Glen Rose Formation is composed of yellowish-tan, thinly bedded marly limestone.

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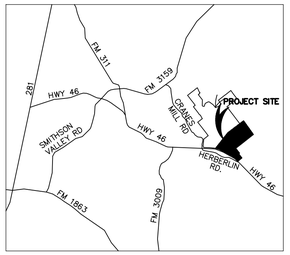
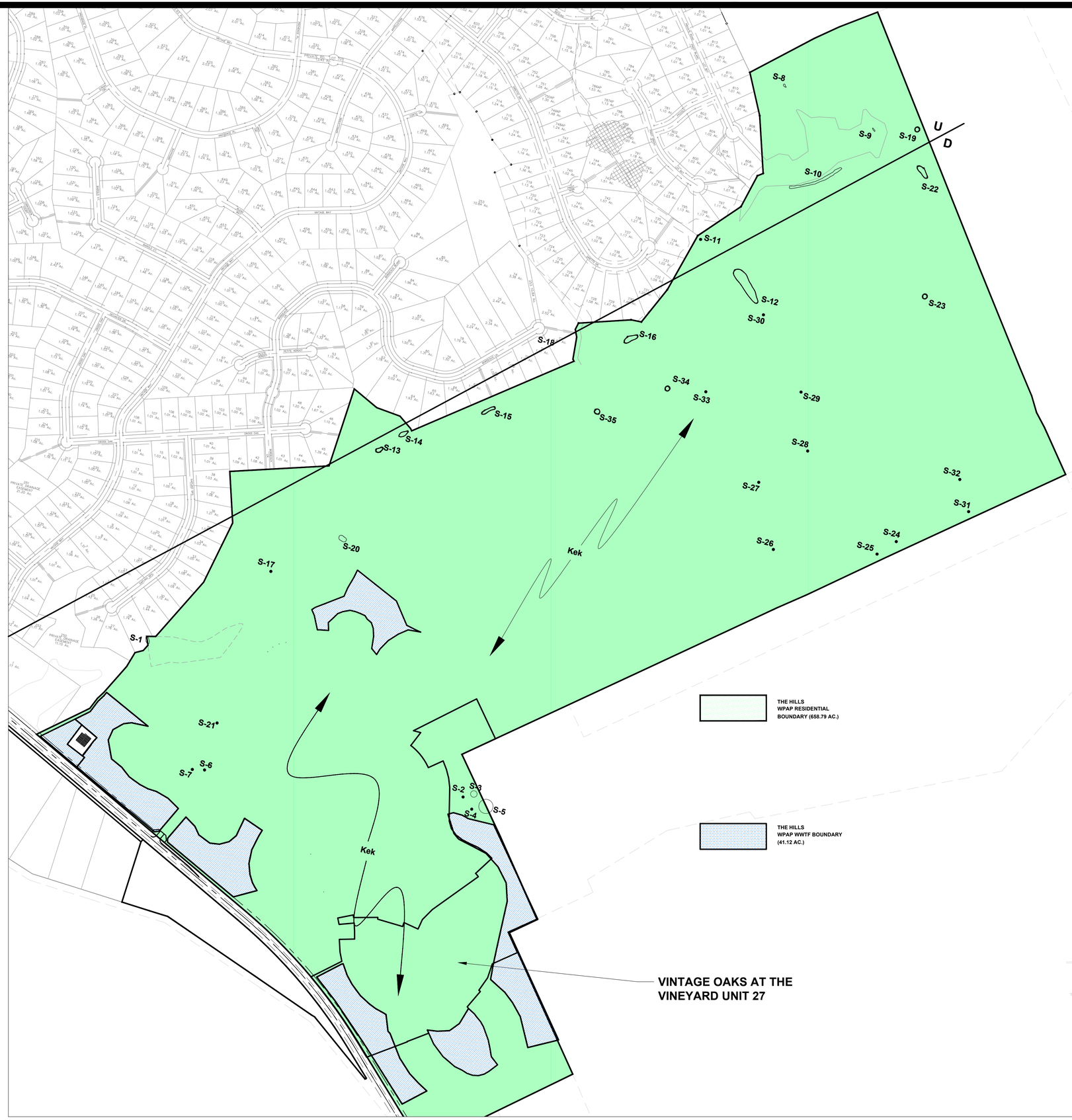


LOCATION MAP
NOT TO SCALE



SCALE:
1" = 400' HORIZONTAL

LEGEND

	BOUNDARY LINE
S-1	ROCK OUTCROP
Kek	LOWER CRETACEOUS EDWARDS KANIER FORMATION

GEOLOGIC ASSESSMENT for THE HILLS COMAL COUNTY, TEXAS

STATE OF TEXAS
John Langan
Geology
4871
LICENSED
PROFESSIONAL GEOSCIENTIST
5/20/19

psi
Information To Build On
Engineering • Consulting • Testing
THREE BURWOOD LANE
SAN ANTONIO, TEXAS 78216

REVISIONS:

JOB NO. 04352483
FILE: 04352483-01
DATE: 11/10/2015
DESIGN: ~
DRAWN: J LEAL
CHECKED: J LANGAN
SHEET 1 OF 1

GEOLOGIC ASSESSMENT TABLE

PROJECT NAME: Vintage Oaks at the Vineyard The Hills

LOCATION			FEATURE CHARACTERISTICS												EVALUATION			PHYSICAL SETTING		
1A	1B *	1C*	2A	2B	3	4			5	5A	6	7	8A	8B	9	10		11		12
FEATURE ID	LATITUDE	LONGITUDE	FEATURE TYPE	POINTS	FORMATION	DIMENSIONS (FEET)			TREND (DEGREES)	DIP	DENSITY (NO/FT)	APERTURE (FEET)	INFILL	RELATIVE INFILTRATION RATE	TOTAL	SENSITIVITY		CATCHMENT AREA (ACRES)		TOPOGRAPHY
						X	Y	Z		10						<40	>40	<1.6	>1.6	
S-1	29-46-23.4	98-15-31.1	MB	30	Kek	320	125	12						5	35	X			X	Hillside
S-2	29-46-15	98.15-5.1	MB/Well	30	Kek	1	1	>100						5	35	X		X		Hillside
S-3	29-46-16.8	98-15-4.8	MB	30	Kek	150	40	7						5	35	X			X	Hillside
S-4	29-46-15	98-15-5	MB/Well	30	Kek	1	1	>100						5	35	X		X		Hillside
S-5	29-46-17	98-14-56.5	MB	30	Kek	325	250	12						15	20	X			X	Hillside
S-6	29-46-14.5	98-15-23.2	MB	30	Kek	4	4	5						9	39	X		X		Hillside
S-7	29-46-14.9	98-15-25.3	MB/Well	30	Kek	1	1	>100						5	35	X		X		Hillside
S-8	29-47-22	98-14-43	MB	30	Kek	250	90	10								X			X	Hillside
S-9	29-47-20.2	98-14-34	MB	30	Kek	350	180	12						5	35				X	Hillside
S-10	29-47-16	98-14-38	Z	30	Kek	650	150	15	N30E	10	3	0.4	N	35	75		X		X	Streambed
S-11	29-47-6.7	98-14-48.8	Z	30	Kek	50	140	5			5	0.4	C	35	65		X		X	Streambed
S-12	29-47-7.7	98-14-45.3	O	5	Kek	250	100	8			1	0.1	N	15	20	X			X	Streambed
S-13	29-46-45.2	98-15-12	CD	5	Kek	15	5	3					F	20	25	X			X	Streambed
S-14	29-46-46	98-15-12.6	MB	30	Kek	125	35	5						5	35	X			X	Hillside
S-15	29-46-51	98-15-4.2	O	5	Kek	50	20	5			2	0.2	F	20	25	X			X	Streambed
S-16	29-46-57.4	98-14-54.7	O	5	Kek	250	75	8			3	0.4	C	25	30	X			X	Streambed
S-17	29-46-29.9	98-15-22	CD	5	Kek	3	3	0.5					F	15	20	X		X		Hillside
S-18	29-47-3	98-14-52.8	F		Kek	>5000	50	75					F	18	38	X			X	Streambed

* DATUM: _____

2A TYPE	TYPE	2B POINTS
C	Cave	30
SC	Solution cavity	20
SF	Solution-enlarged fracture(s)	20
F	Fault	20
O	Other natural bedrock features	5
MB	Manmade feature in bedrock	30
SW	Swallow hole	30
SH	Sinkhole	20
CD	Non-karst closed depression	5
Z	Zone, clustered or aligned features	30

8A INFILLING	
N	None, exposed bedrock
C	Coarse - cobbles, breakdown, sand, gravel
O	Loose or soft mud or soil, organics, leaves, sticks, dark colors
F	Fines, compacted clay-rich sediment, soil profile, gray or red colors
V	Vegetation. Give details in narrative description
FS	Flowstone, cements, cave deposits
X	Other materials

12 TOPOGRAPHY

Cliff, Hilltop, Hillside, Drainage, Floodplain, Streambed

I have read, I understood, and I have followed the Texas Commission on Environmental Quality's Instructions to Geologists. The information presented here complies with that document and is a true representation of the conditions observed in the field.

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Date 11/13/15

Sheet 1 of 3

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Geology
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TCEQ-0585-Table (Rev. 10-01-04)

GEOLOGIC ASSESSMENT TABLE			PROJECT NAME: VOATV The Hills																		
LOCATION			FEATURE CHARACTERISTICS												EVALUATION			PHYSICAL SETTING			
1A	1B *	1C*	2A	2B	3	4			5	5A	6	7	8A	8B	9	10		11		12	
FEATURE ID	LATITUDE	LONGITUDE	FEATURE TYPE	POINTS	FORMATION	DIMENSIONS (FEET)			TREND (DEGREES)	RQD	DENSITY (NO/FT)	APERTURE (FEET)	INFILL	RELATIVE INFILTRATION RATE	TOTAL	SENSITIVITY		CATCHMENT AREA (ACRES)		TOPOGRAPHY	
						X	Y	Z		10						<40	≥40	<1.6	≥1.6		
S-19	29-47-18.1	98-14-29	O	5	Kek	100	15	10			3	0.2	C	15	20	X			X	drainage	
S-20	29-46-35.9	98-15-17.8	MB	30	Kek	140	140	8					F	4	34	X			X	stock tank	
S-21	29-46-17.5	98-15-23.9	CD	5	Kek	1.5	1	0.5					F	10	15	X		X		hillside	
S-22	29-47-20.5	98-14-29.8	O	5	Kek	80	25	10			4	0.1	C	15	20	X			X	drainage	
S-23	29-47-10	98-14-26	O	5	Kek	30	15	20			1	0.2		7	12	x			x	drainage	
S-24	29-46-47.2	98-14-23.1	C	30	Kek	8	8	4					C	25	55		X	X		hillside	
S-25	29-46-45.4	98-14-24.3	C	30	Kek	4	4	7					C	25	55		X	X		hillside	
S-26	29-46-44	98-14-34.3	MB	30	Kek	1	1	>100						5	35	X		X		hillside/well	
S-27	29-46-48.6	98-14-36.9	MB	30	Kek	1	1	>100						5	35	X		X		hillside/well	
S-28	29-46-53	98-14-33	O	5	Kek	25	20	5					C	10	15	X			X	drainage	
S-29	29-46-58	98-14-35	O	5	Kek	35	15	7					N	10	15	X			X	drainage	
S-30	39-47-3	98-14-41	O	5	Kek	75	25	10					C	15	20	X			X	drainage	
S-31	29-46-50	98-14-17	O	5	Kek	20	15	5			1	0.2	F	10	15	X			X	drainage	
S-32	29-46-53	98-14-18	O	5	Kek	25	10	3					C	5	10	X			X	drainage	

* DATUM:

2A TYF	TYPE	2B POINTS
C	Cave	30
SC	Solution cavity	20
SF	Solution-enlarged fracture(s)	20
F	Fault	20
O	Other natural bedrock features	5
MB	Manmade feature in bedrock	30
SW	Swallow hole	30
SH	Sinkhole	20
CD	Non-karst closed depression	5
Z	Zone, clustered or aligned features	30

8A INFILLING	
N	None, exposed bedrock
C	Coarse - cobbles, breakdown, sand, gravel
O	Loose or soft mud or soil, organics, leaves, sticks, dark colors
F	Fines, compacted clay-rich sediment, soil profile, gray or red colors
V	Vegetation. Give details in narrative description
FS	Flowstone, cements, cave deposits
X	Other materials

12 TOPOGRAPHY

Cliff, Hilltop, Hillside, Drainage, Floodplain, Streambed

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Date: November 13, 2015

Sheet 2 3

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TCEQ-0585-Table (Rev. 10-01-04)

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FEATURE ID	LATITUDE	LONGITUDE	FEATURE TYPE	POINTS	FORMATION	DIMENSIONS (FEET)			TREND (DEGREES)	CODE	DENSITY (NO/FT)	APERTURE (FEET)	INFILL	RELATIVE INFILTRATION RATE	TOTAL	SENSITIVITY		CATCHMENT AREA (ACRES)		TOPOGRAPHY
						X	Y	Z		10						<40	≥40	<1.6	≥1.6	
S-33	29-46-52	98-14-45	O	5	Kek	20	10	3					C	5	10	X			X	drainage
S-34	29-46-54	98-14-46	O	5	Kek	25	15	5					C	5	10	X			X	drainage
S-35	29-46-53	98-14-52	O	5	Kek	5	2	1					C	5	10	X			X	hillside

* DATUM: _____

2A TYF	TYPE	2B POINTS
C	Cave	30
SC	Solution cavity	20
SF	Solution-enlarged fracture(s)	20
F	Fault	20
O	Other natural bedrock features	5
MB	Manmade feature in bedrock	30
SW	Swallow hole	30
SH	Sinkhole	20
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8A INFILLING	
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12 TOPOGRAPHY

Cliff, Hilltop, Hillside, Drainage, Floodplain, Streambed

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Date: November 13, 2015

Sheet 3 3

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TCEQ-0585-Table (Rev. 10-01-04)

Map Scale: 1:26,800 if printed on A size (8.5" x 11") sheet.

N

Meters: 0, 350, 700, 1,400, 2,100

Feet: 0, 1,000, 2,000, 4,000, 6,000

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Gully

Short Steep Slope

Other

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:26,800 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 14N NAD83

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

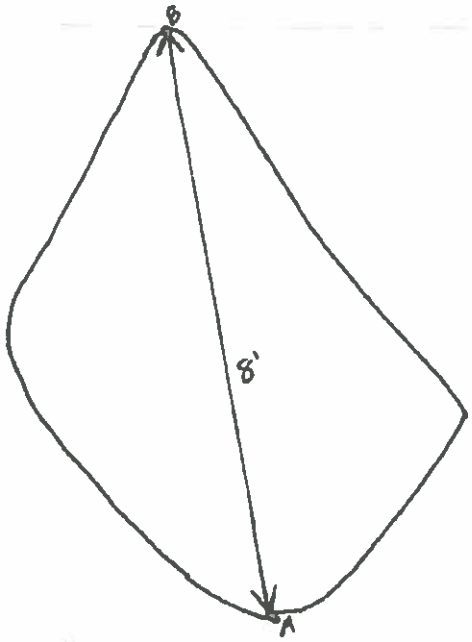
Soil Survey Area: Comal and Hays Counties, Texas
Survey Area Data: Version 8, Sep 21, 2012

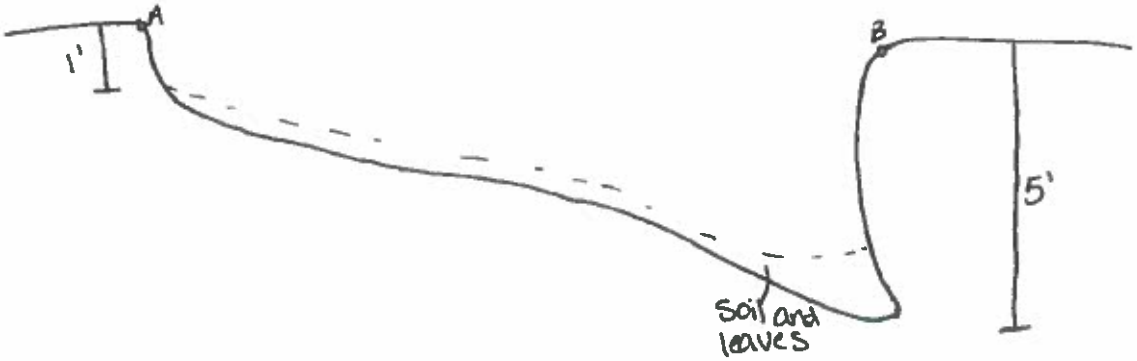
Date(s) aerial images were photographed: Data not available.

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

Map Unit Legend

Comal and Hays Counties, Texas (TX604)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AnB	Anhalt clay, 1 to 3 percent slopes	100.7	3.5%
BtG	Brackett-Rock outcrop-Real complex, 8 to 30 percent slopes	59.0	2.1%
CrD	Comfort-Rock outcrop complex, 1 to 8 percent slopes	1,458.3	50.9%
ErG	Eckrant-Rock outcrop complex, 8 to 30 percent slopes	329.1	11.5%
RUD	Rumple-Comfort association, 1 to 8 percent slopes	894.5	31.2%
TaB	Tarpley clay, 1 to 3 percent slopes	25.7	0.9%
Totals for Area of Interest		**2,867.4**	**100.0%**





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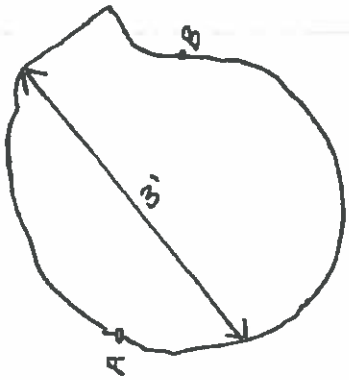
Information To Build On Engineering • Consulting • Testing PSI, Inc. Three Burwood Lane San Antonio, Texas 78216	**PROJECT NAME:** Vintage Oaks at the Vineyards the Hills Comal County, Texas PROJECT NO.:435-2483	**Cave Features** **S-24**	N



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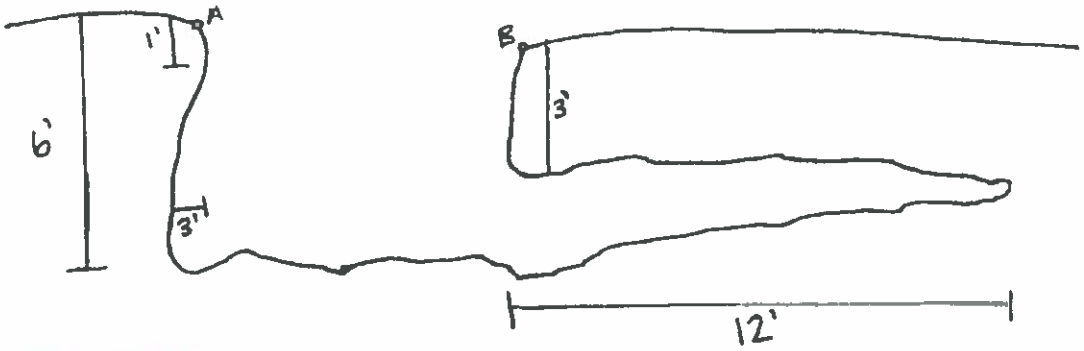
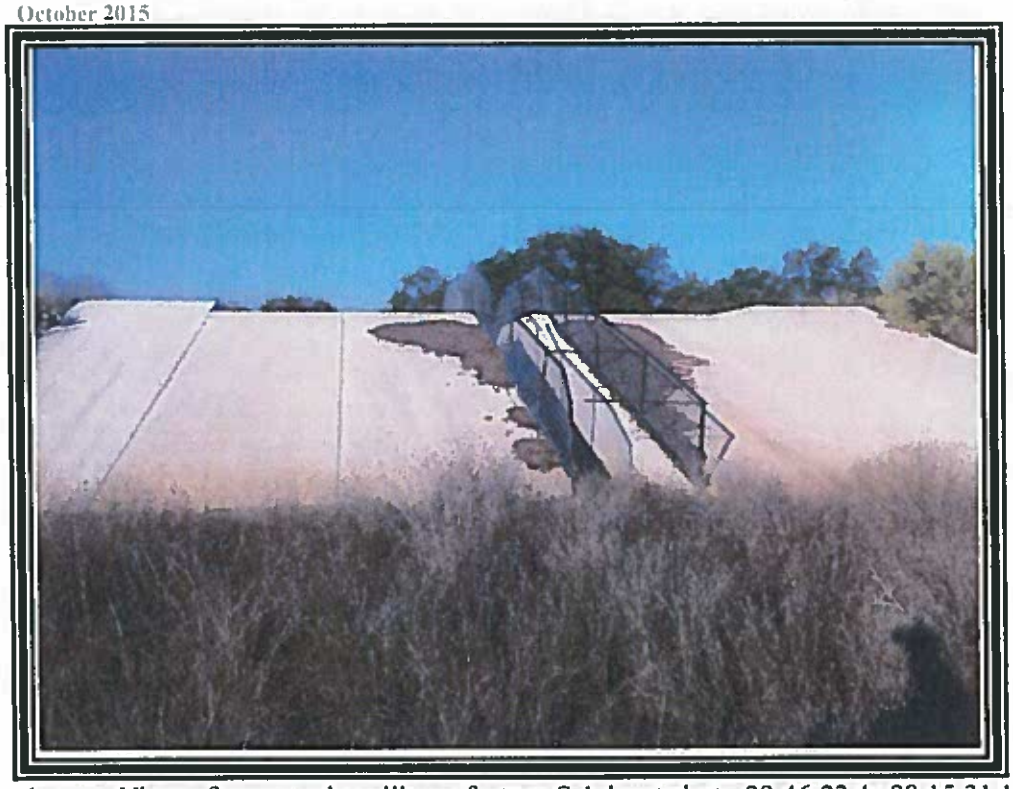
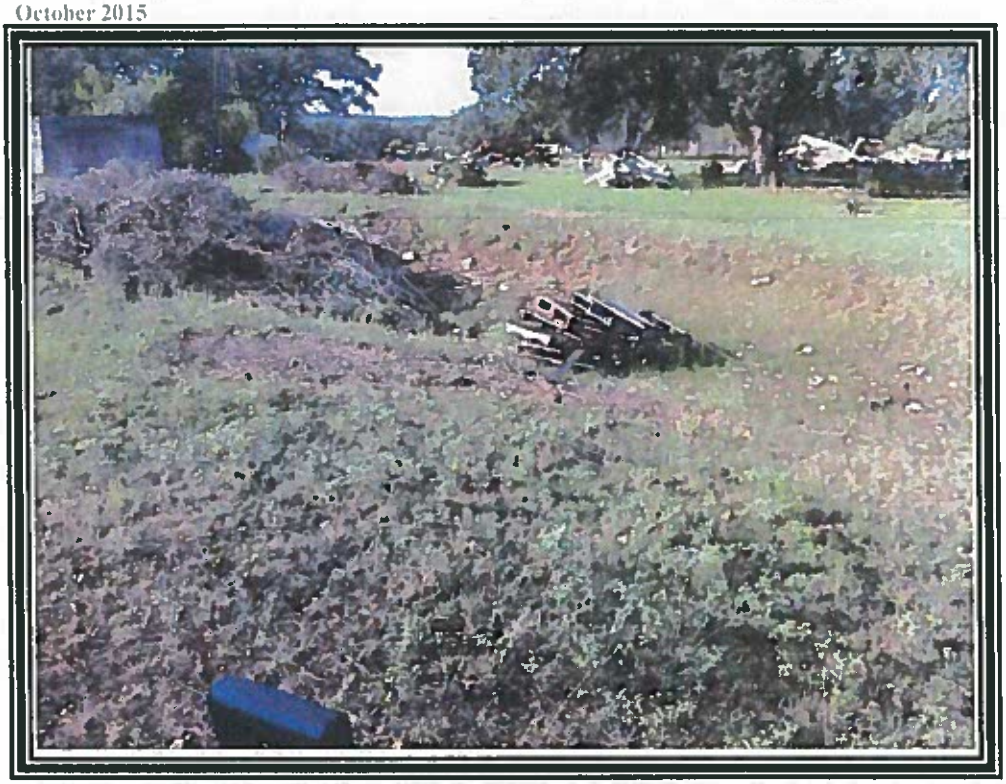


PSI Information To Build On Engineering • Consulting • Testing PSI, Inc. Three Burwood Lane San Antonio, Texas 78216	**PROJECT NAME:** Vintage Oaks at the Vineyards the Hills Comal County, Texas PROJECT NO. 435-2483	**Cave Features** **S-25**	N



1. View of man-made spillway feature S-1 located at 29-46-23.4; 98-15-31.1, in the western portion of The Hills tract, roughly 1,200 feet north of Highway 46.

2. View man-made water well feature S-2 located at 29-46-16; 98-15-5.1, in the northeast portion of the site.

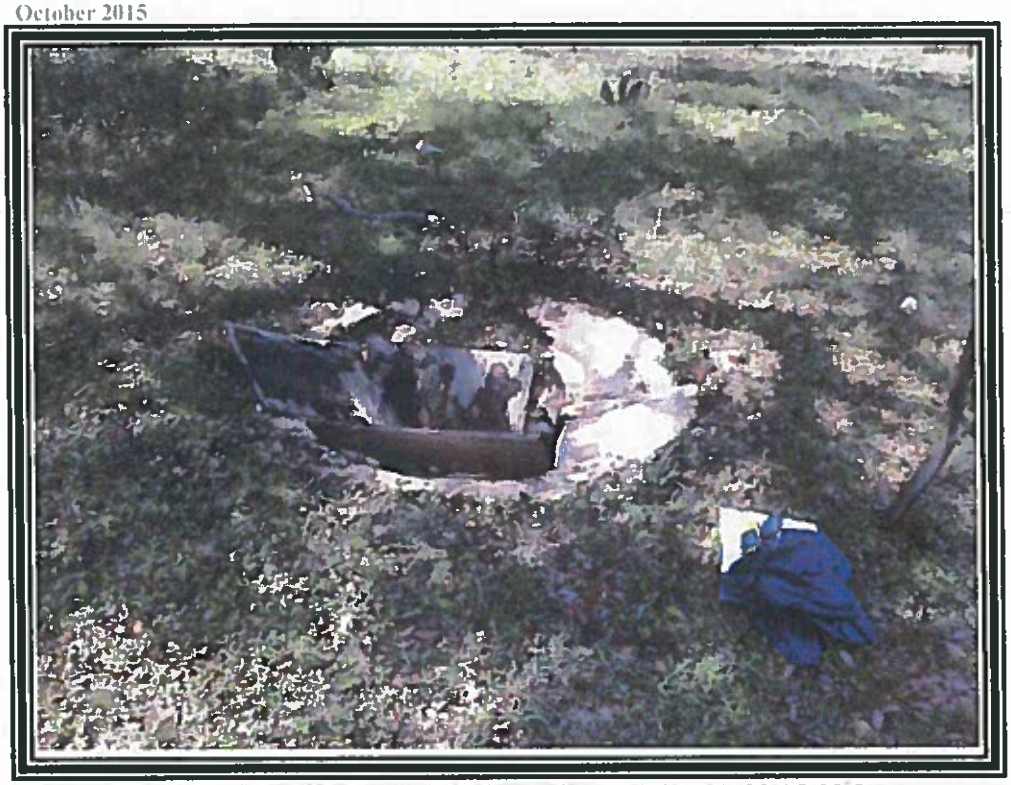


3. View of man-made stock tank feature S-3, located at 29-46-16.8; 98-15-4.8, just north of well feature S-2 in the northeast portion of the site.

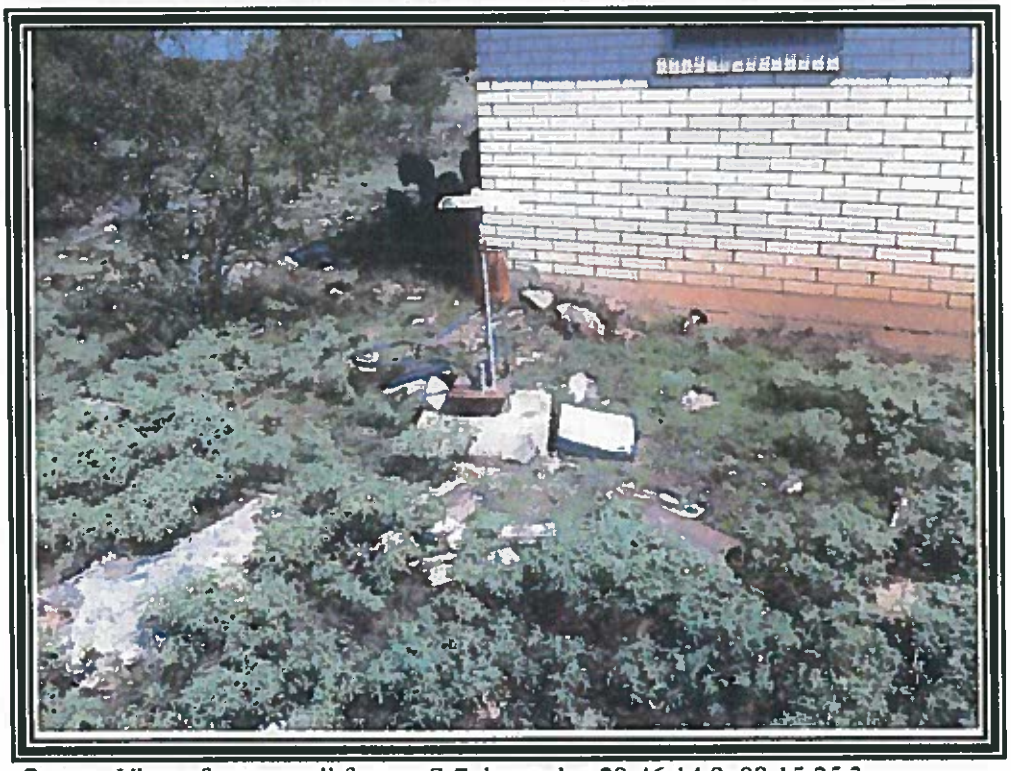
4. View of another well feature S-4, located at 29-46-15; 98-15-5, south of well feature S-2.

5. View of well house of feature S-4.

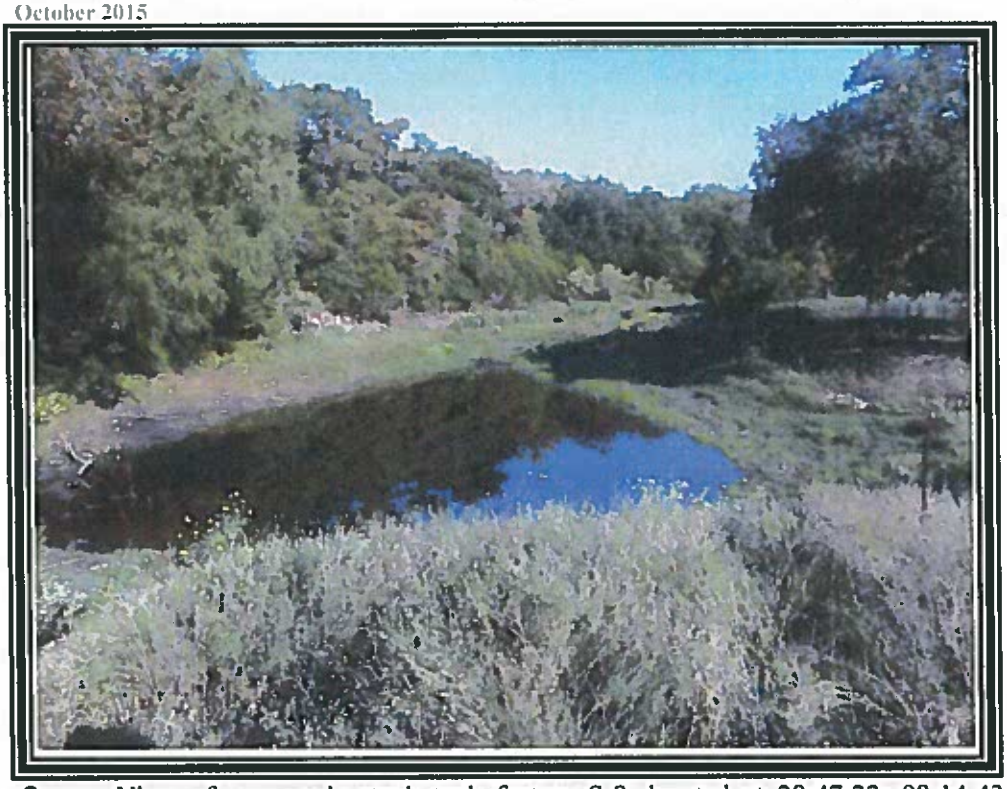
6. View of stock tank feature S-5, located at 29-46-17; 98-14-56.5, in the northeast portion of the site.



7. View of septic tank feature S-6, located at 29-46-14.5; 98-15-23.2.

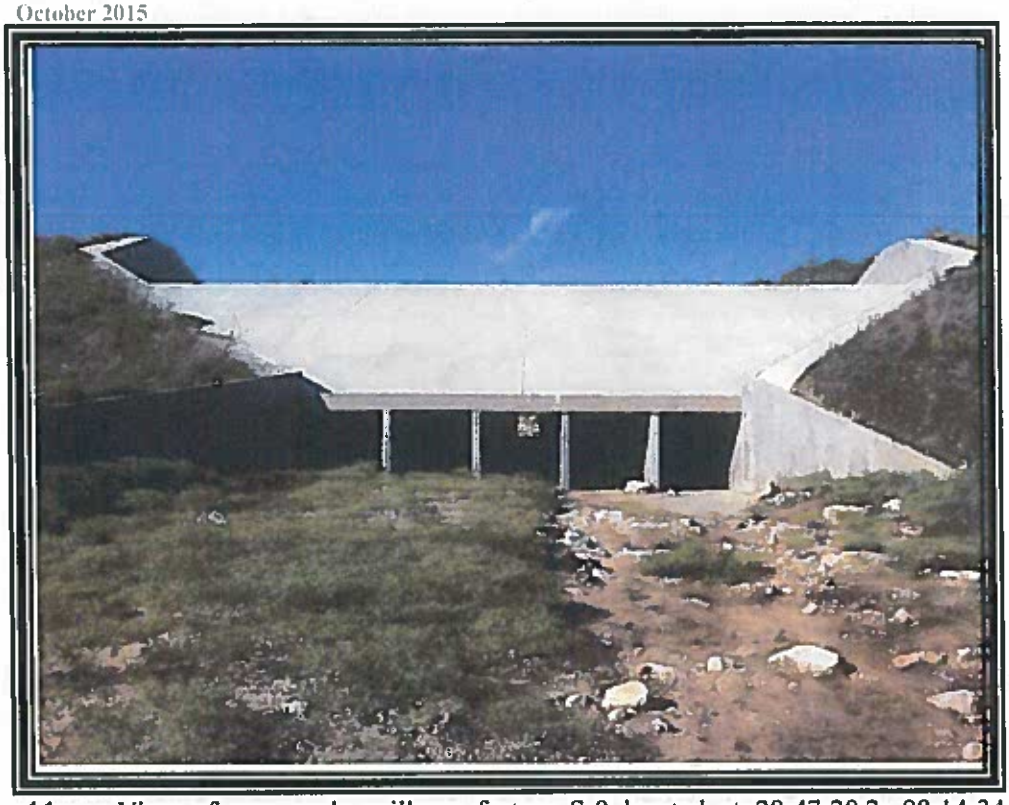


8. View of water well feature S-7, located at 29-46-14.9; 98-15-25.3.



9. View of man-made stock tank feature S-8, located at 29-47-22; 98-14-43, in the northern portion of the site.

10. View of feature S-8, after several precipitation events, on November 8, 2015.



11. View of man-made spillway feature S-9 located at 29-47-20.2; 98-14-34, in the northern portion of the site.

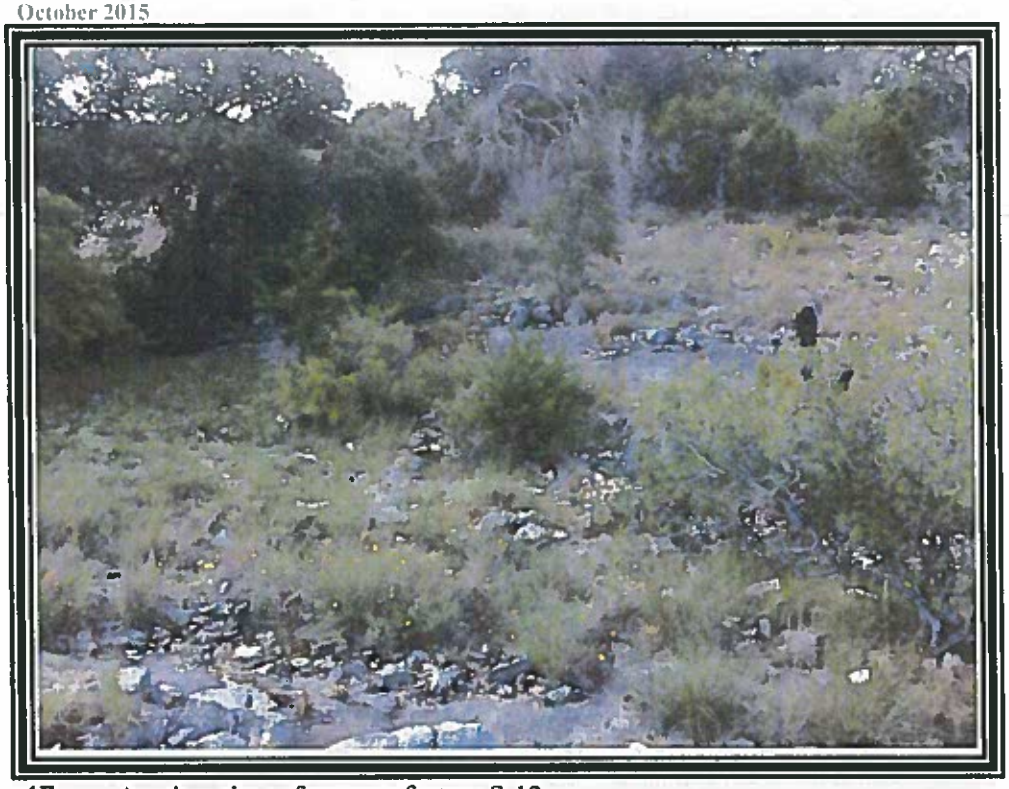
12. View of the fractured rock outcrop feature S-10, at 29-47-15; 98-14-43.1. This area has undergone clearing activity between 2012 and 2014.

13. View of vuggy rock in feature S-10.

14. View of exposed vuggy rock in feature S-10. This feature has had some limited clearing done as part of site development.

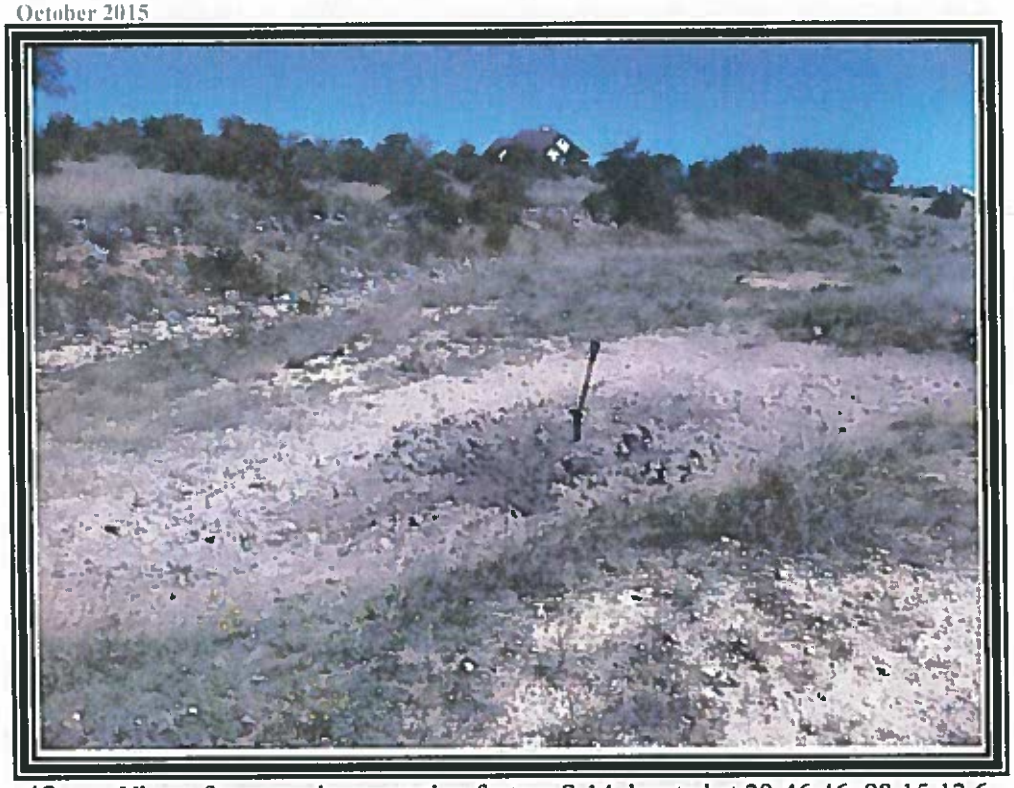
15. View of outcrop feature S-11, located at 29-47-6.7; 98-14-48.8. In the northern portion of the site. This photo shows the contact between the overlying Dolomitic member of the Kainer with the Basal Nodular member of the Kainer.

16. View of outcrop feature S-12, located at 29-47-7.7; 98-14-45.3.

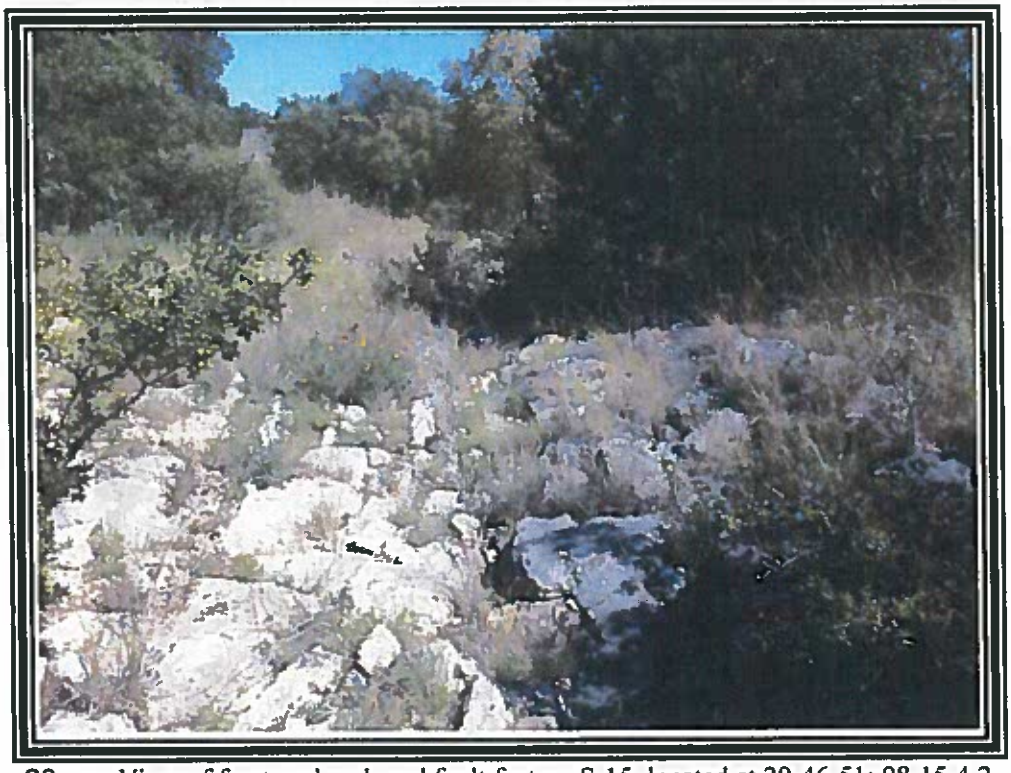


17. Another view of outcrop feature S-12.

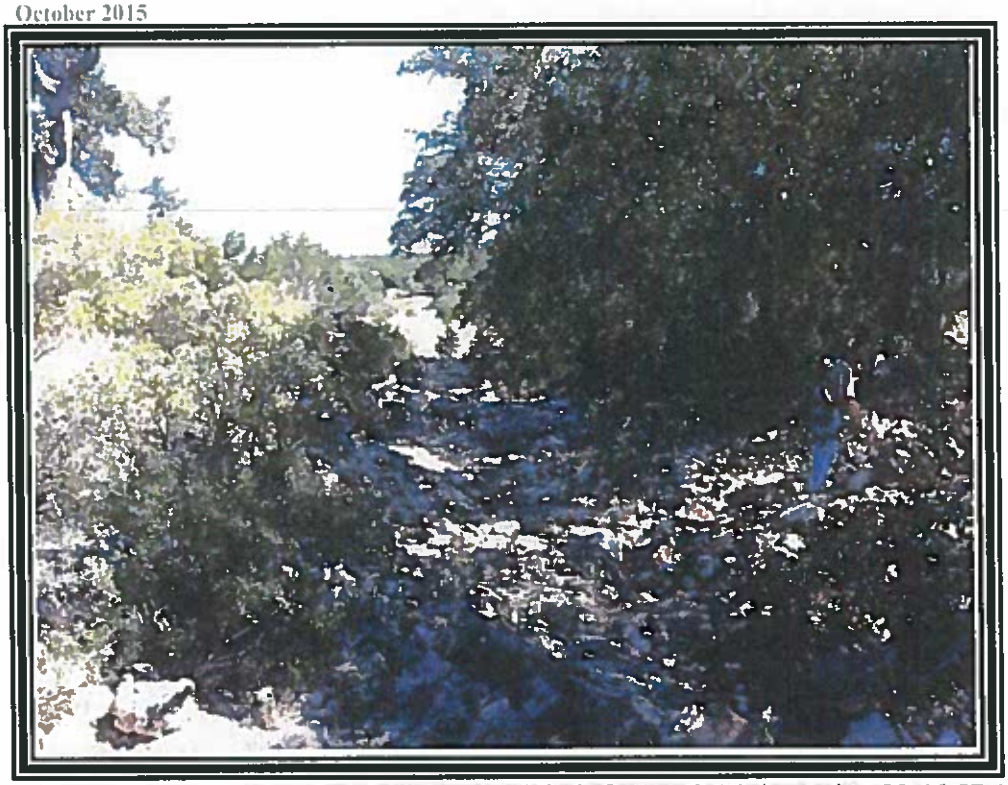
18. View of closed depression feature S-13, located at 29-46-45.2; 98-15-12.



19. View of man-made excavation feature S-14, located at 29-46-46; 98-15-12.6.

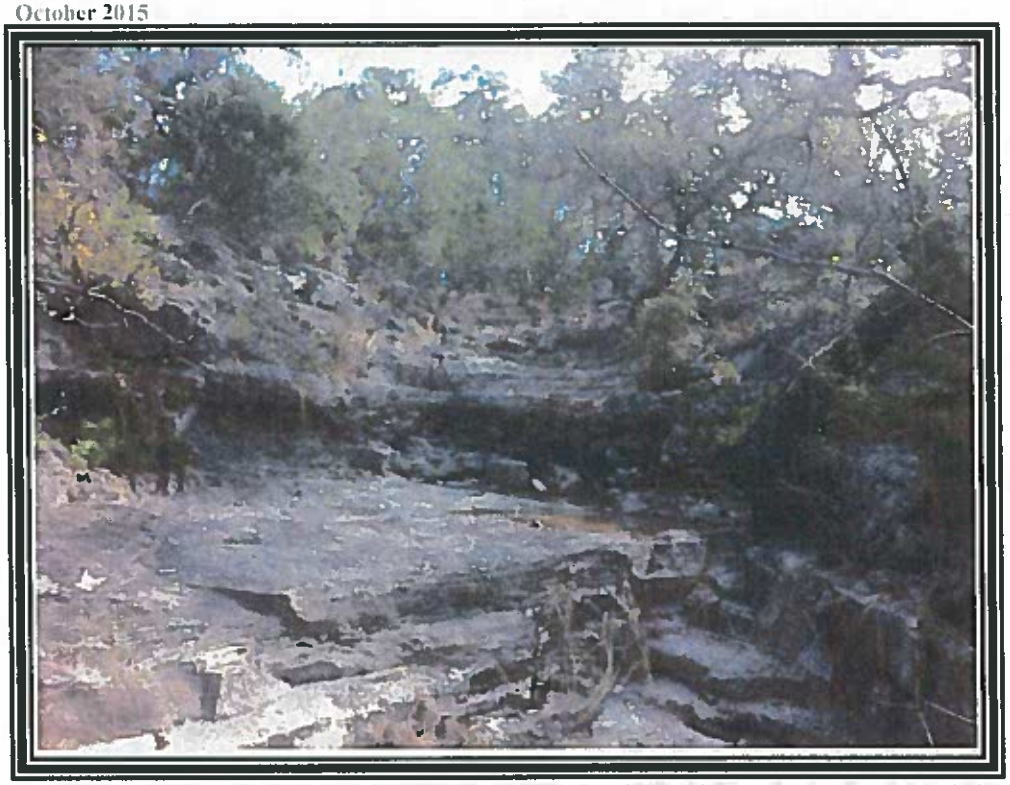


20. View of fractured rock and fault feature S-15, located at 29-46-51; 98-15-4.2.



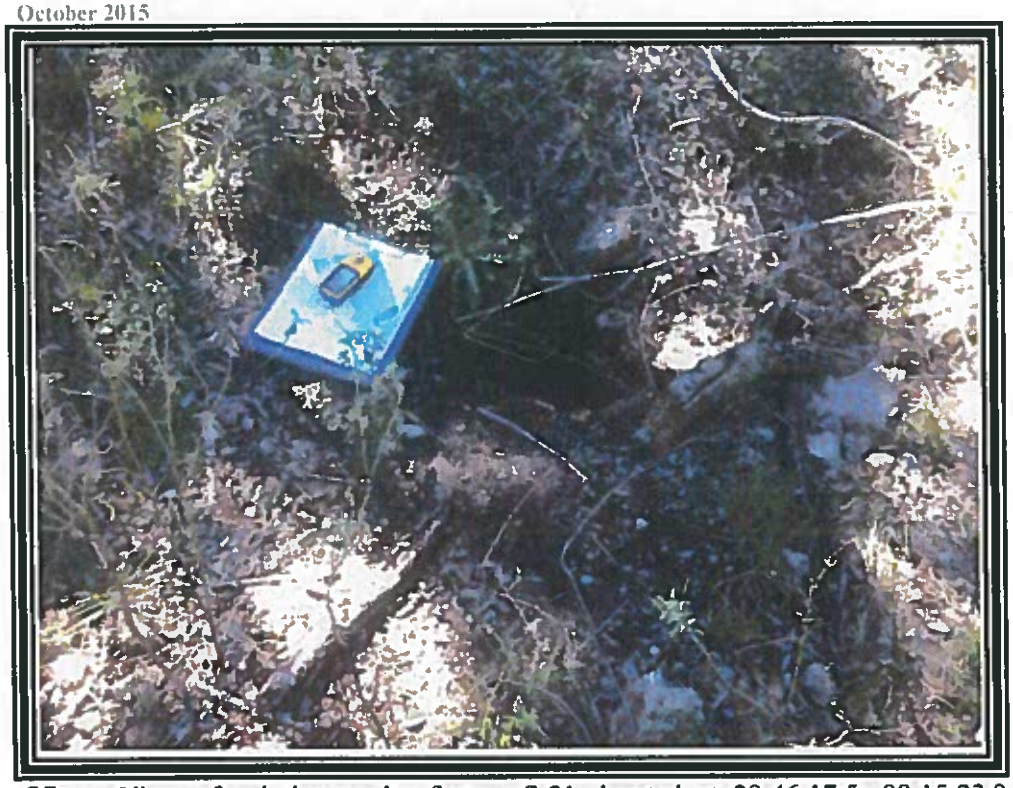
21. View of fractured rock outcrop and fault feature S-16, located at 29-46-57.4; 98-14-54.7.

22. View of closed depression feature S-17 located at 29-46-29.9; 98-15-22, in the western portion of The Hills tract, southeast of Sapling Spring.



23. View of fractured rock outcrop feature S-19 located at 29-47-19; 98-14-29, in the north corner of The Hills tract, east of Pinot Blanc Lane.

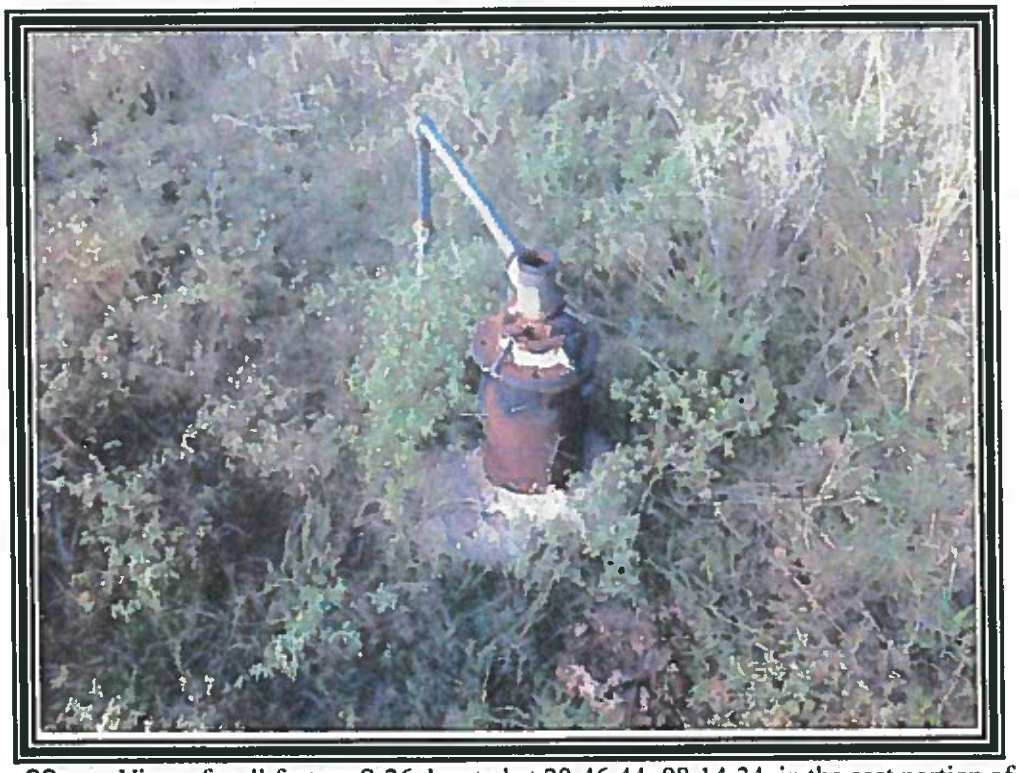
24. View of man-made stock tank feature S-20 located at 29-46-35.9; 98-15-17.8, in the west-central portion of The Hills tract, southeast of Bordeaux Lane.



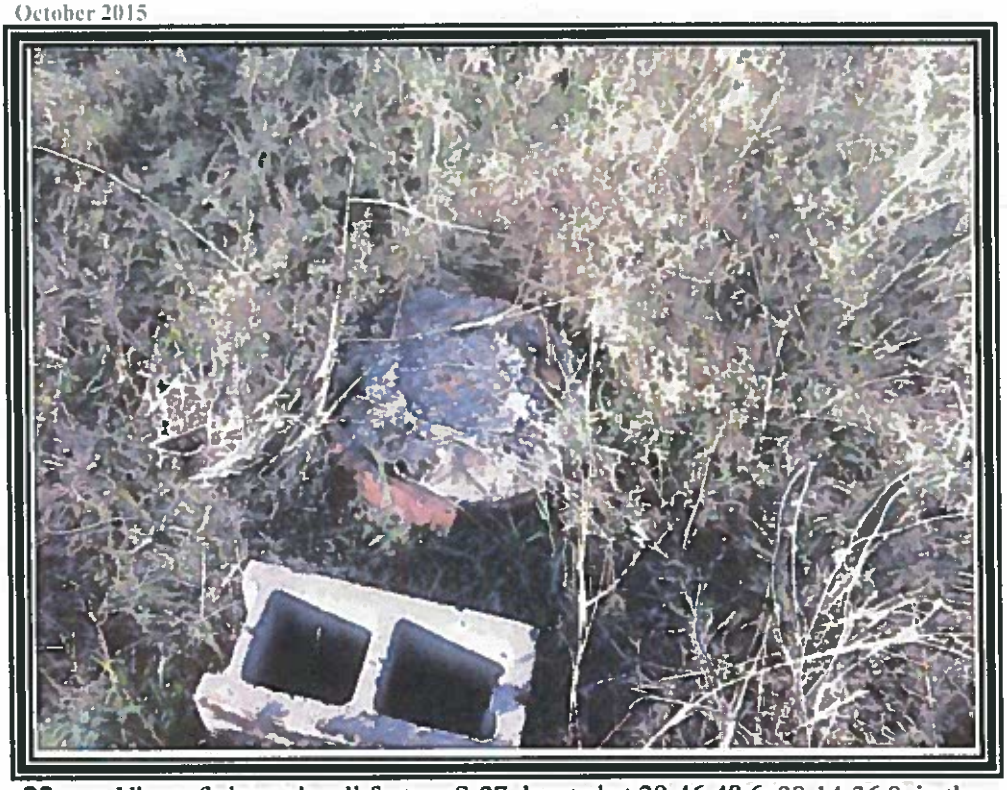
25. View of solution cavity feature S-21, located at 29-46-17.5; 98-15-23.9, in the southwestern portion of the site.

26. View of cave feature S-24, located at 29-46-47.2; 98-14-23.1, near the eastern property line of the site.

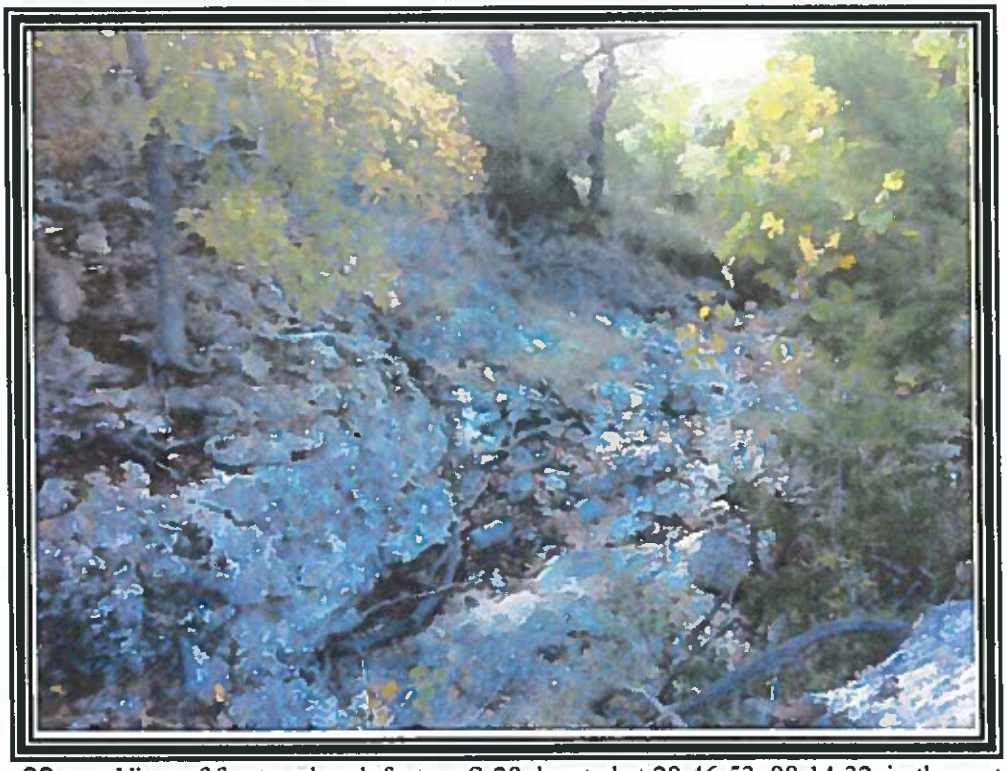
27. View of cave feature S-25, located at 29-46-45.4; 98-14-24.3, a few feet southwest of feature S-24.



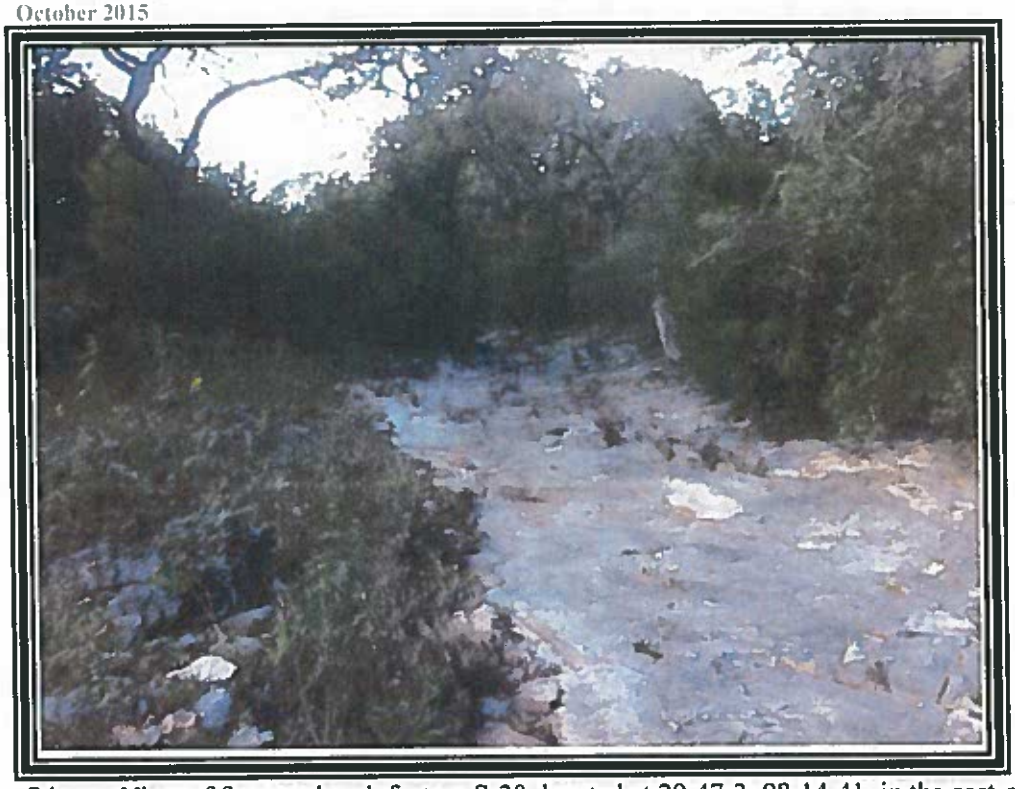
28. View of well feature S-26, located at 29-46-44; 98-14-34, in the east portion of the site.



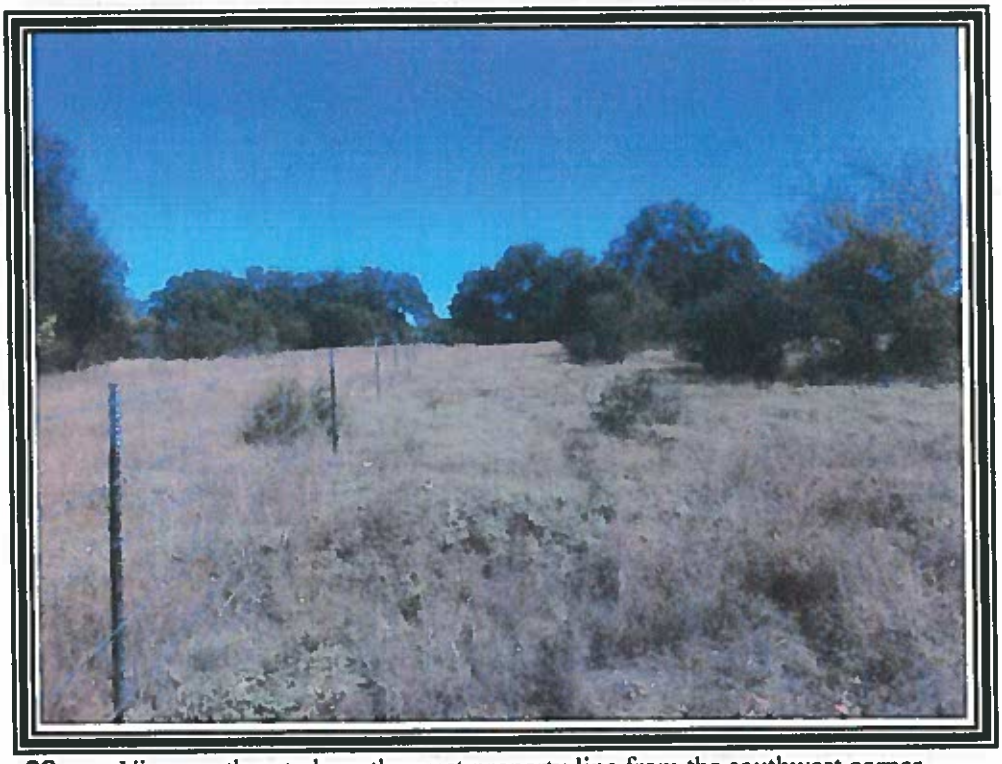
29. View of plugged well feature S-27, located at 29-46-48.6; 98-14-36.9, in the east portion of the site.



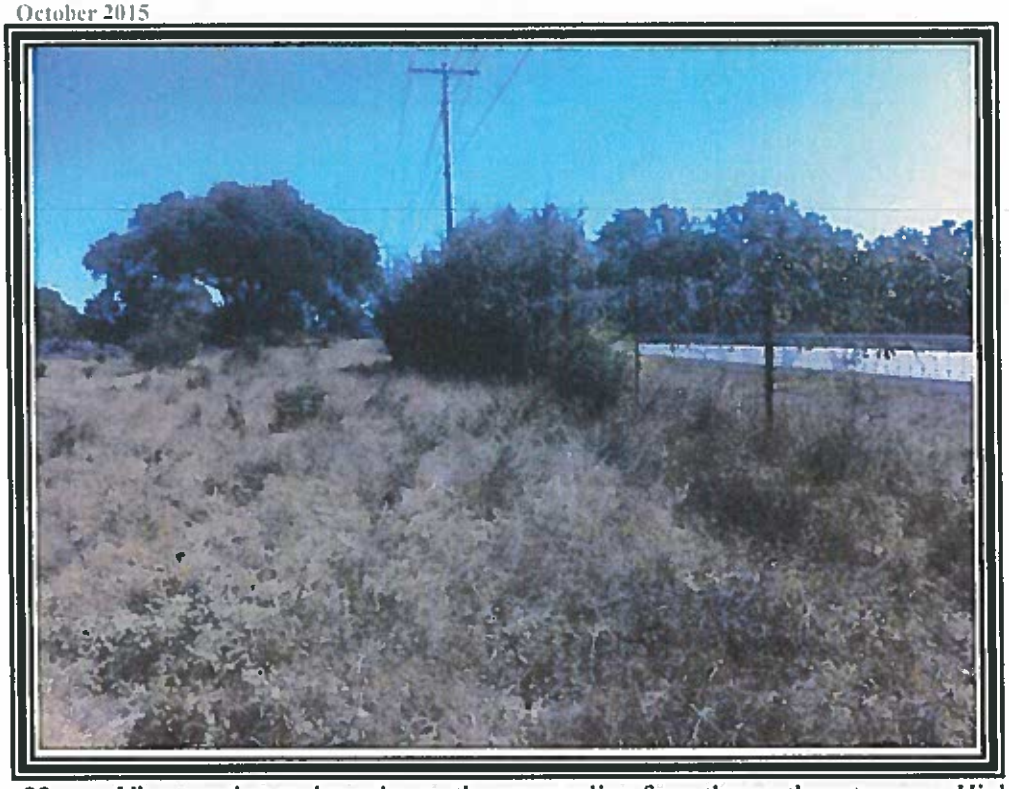
30. View of fractured rock feature S-28, located at 29-46-53; 98-14-32, in the east-central portion of the site.



31. View of fractured rock feature S-30, located at 29-47-3; 98-14-41, in the east-central portion of the site.



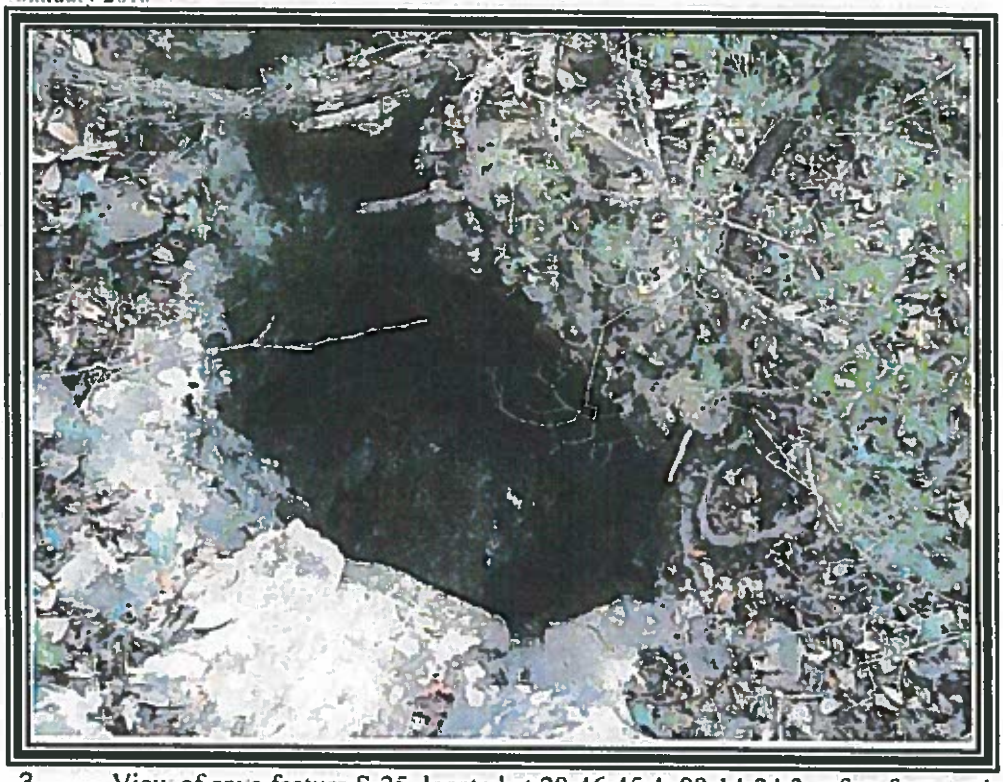
32. View northeast along the west property line from the southwest corner.



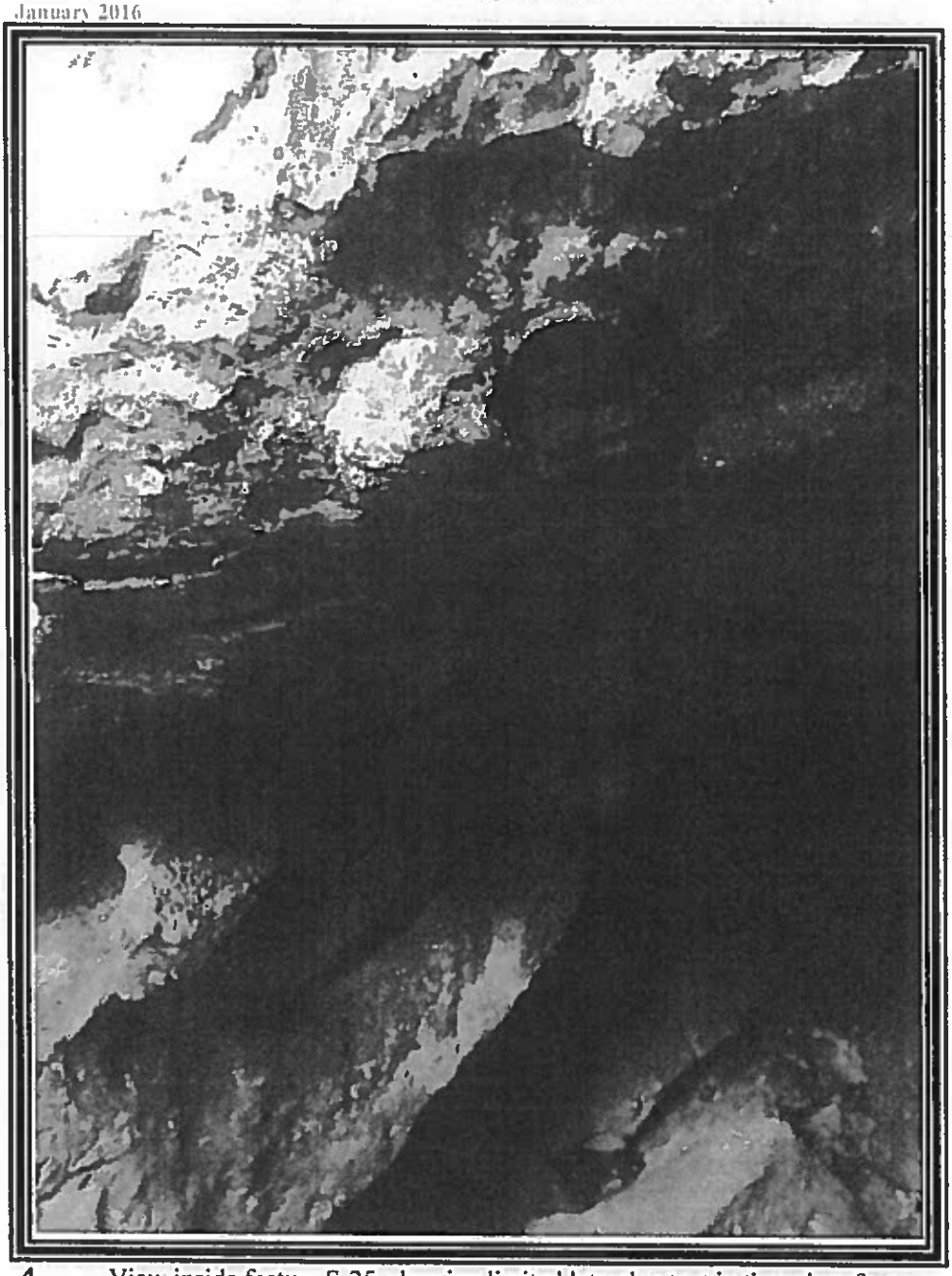
33. View southeast along the south property line from the southwest corner. Highway 46 is on the right.

1. View of cave feature S-24, located at 29-46-47.2; 98-14-23.1, near the eastern property line of the site.

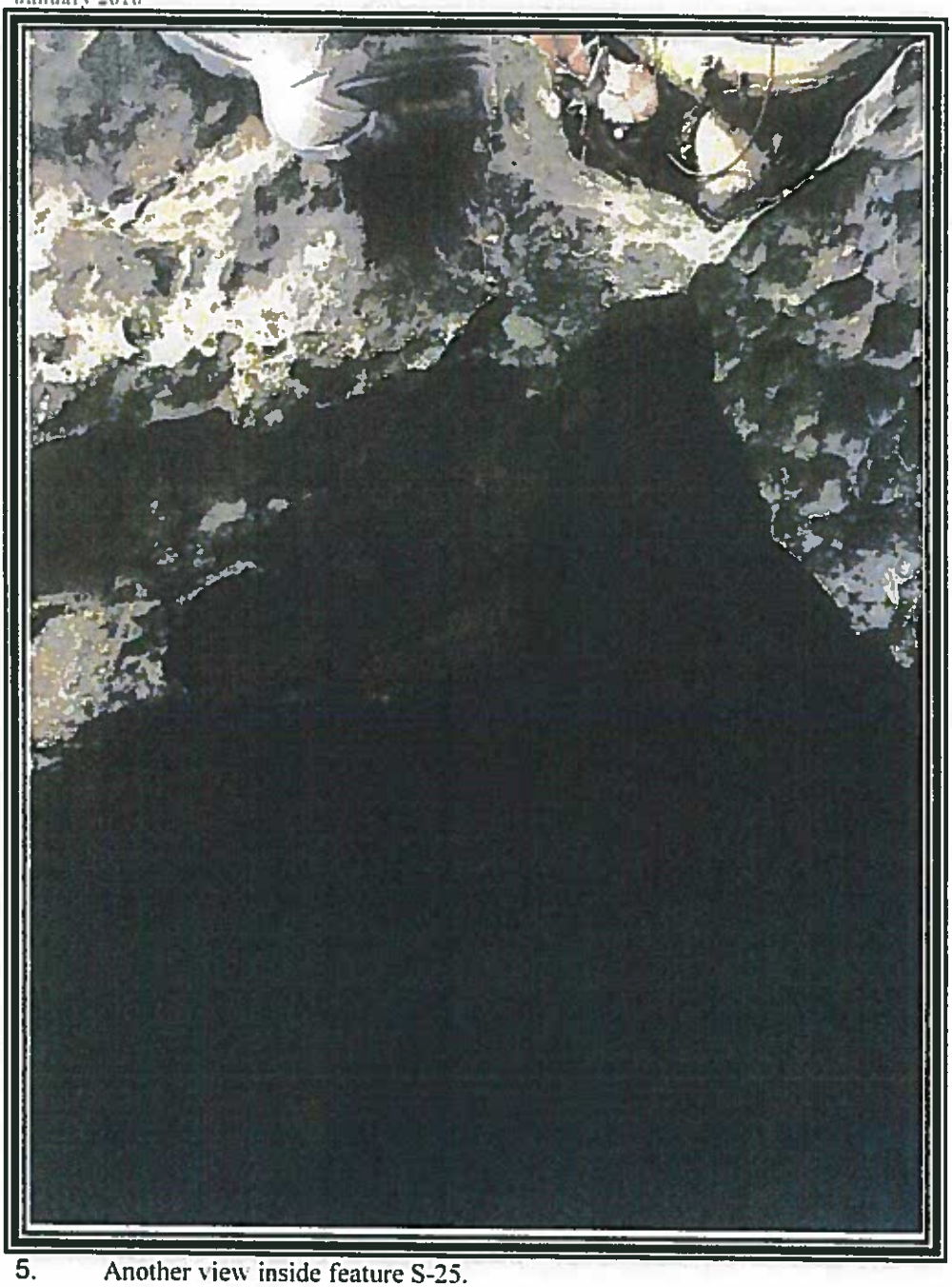
2. View of cave footprint of S-24, with virtually no lateral openings beyond the surface expression.



3. View of cave feature S-25. located at 29-46-45.4; 98-14-24.3, a few feet southwest of feature S-24.



4. View inside feature S-25, showing limited lateral extent in the subsurface.



5. Another view inside feature S-25.

In This Section

TCEQ-0582
Organized Sewage Collection System Plan

Attachment A
Engineering Design Report

Attachment B
Justification and Calculations for Deviation in Straight Alignment Without Manholes

Attachment C
Justification for Variance from Manhole Spacing

Attachment D
Explanation for Slopes for Flows Greater Than 10.0 Feet Per Second

Site Plan

Final Plan and Profiles Sheets

Organized Sewage Collection System Application

Texas Commission on Environmental Quality

For Regulated Activities on the Edwards Aquifer Recharge Zone and Relating to 30 TAC §213.5(c), Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

Regulated Entity Name: Vintage Oaks at the Vineyard, The Grove- Unit 29

1. ☒ **Attachment A – SCS Engineering Design Report**. This Engineering Design Report is provided to fulfill the requirements of 30 TAC Chapter 217, including 217.10 of Subchapter A, §§217.51 – 217.70 of Subchapter C, and Subchapter D as applicable, and is required to be submitted with this SCS Application Form.

Customer Information

2. The entity and contact person responsible for providing the required engineering certification of testing for this sewage collection system upon completion (including private service connections) and every five years thereafter to the appropriate TCEQ region office pursuant to 30 TAC §213.5(c) is:

   Contact Person: Jim Vater
   Entity: SouthStar Communities
   Mailing Address: 1114 Lost Creek Blvd., Suite #270
   City, State: Austin. Texas Zip: 78746
   Telephone: 512-865-5898 Fax: N/A
   Email Address: jim@southstarcommunities.com
   The appropriate regional office must be informed of any changes in this information within 30 days of the change.

3. The engineer responsible for the design of this sewage collection system is:

   Contact Person: Blake Allison, P.E.
   Texas Licensed Professional Engineer's Number: 131240
   Entity: M&S Engineering
   Mailing Address: 376 Landa St.
   City, State:New Braunfels, Texas Zip: 78130
   Telephone:830-629-2988 Fax:830-228-4197
   Email Address:ballison@msengr.com

Project Information

4. Anticipated type of development to be served (estimated future population to be served, plus adequate allowance for institutional and commercial flows):

   ☒ Residential: Number of single-family lots: 66
   ☐ Multi-family: Number of residential units: _____
   ☐ Commercial
   ☐ Industrial
   ☐ Off-site system (not associated with any development)
   ☐ Other: _____

5. The character and volume of wastewater is shown below:

100% Domestic	16,905 gallons/day
_____% Industrial	_____ gallons/day
_____% Commingled	_____ gallons/day

   Total gallons/day: 16,905

6. Existing and anticipated infiltration/inflow is 0 gallons/day. This will be addressed by: A STEP System is being proposed, so no infiltration/inflow will take place.

7. A Water Pollution Abatement Plan (WPAP) is required for construction of any associated commercial, industrial or residential project located on the Recharge Zone.

   ☒ The WPAP application for this development was approved by letter dated 11/27/18. A copy of the approval letter is attached.
   ☐ The WPAP application for this development was submitted to the TCEQ on _____, but has not been approved.
   ☐ A WPAP application is required for an associated project, but it has not been submitted.
   ☐ There is no associated project requiring a WPAP application.

8. Pipe description:

Table 1 - Pipe Description

Pipe Diameter(Inches)	*Linear Feet (1)*	*Pipe Material (2)*	*Specifications (3)*
2	1230	HDPE	ASTM F714
3	1410	HDPE	ASTM F714

Total Linear Feet: 2640

(1) Linear feet - Include stub-outs and double service connections. Do not include private service laterals.
(2) Pipe Material - If PVC, state SDR value.
(3) Specifications - ASTM / ANSI / AWWA specification and class numbers should be included.

9. The sewage collection system will convey the wastewater to the Ovivo Micro BLOX MBR (name) Treatment Plant. The treatment facility is:

   ☒ Existing
   ☐ Proposed

10. All components of this sewage collection system will comply with:

   ☒ The City of New Braunfels standard specifications.
   ☐ Other. Specifications are attached.

11. ☐ No force main(s) and/or lift station(s) are associated with this sewage collection system.

   ☒ A force main(s) and/or lift station(s) is associated with this sewage collection system and the **Lift Station/Force Main System Application** form (TCEQ-0624) is included with this application.

Alignment

12. ☒ There are no deviations from uniform grade in this sewage collection system without manholes and with open cut construction.

13. ☒ There are no deviations from straight alignment in this sewage collection system without manholes.

   ☐ **Attachment B - Justification and Calculations for Deviation in Straight Alignment without Manholes**. A justification for deviations from straight alignment in this sewage collection system without manholes with documentation from pipe manufacturer allowing pipe curvature is attached.

   ☐ For curved sewer lines, all curved sewer line notes (TCEQ-0596) are included on the construction plans for the wastewater collection system.

Manholes and Cleanouts

14. ☒ Manholes or clean-outs exist at the end of each sewer line(s). These locations are listed below: (Please attach additional sheet if necessary)

Table 2 - Manholes and Cleanouts

Line	*Shown on Sheet*	*Station*	*Manhole or Clean-out?*
Sugarcane	C10.3 Of N/A	STA 9+98	Cleanout
Catnip	C10.4 Of N/A	STA 1+24	Cleanout
Catnip	C10.4 Of N/A	STA 11+21	Cleanout
Bridle Trail	C10.5 Of N/A	STA 8+01	Cleanout
	Of		
	Of		
	Of		

Line	*Shown on Sheet*	*Station*	*Manhole or Clean-out?*
	Of		
	Of		
	Of		

15. ☐ Manholes are installed at all Points of Curvature and Points of Termination of a sewer line.

16. ☐ The maximum spacing between manholes on this project for each pipe diameter is no greater than:

Pipe Diameter (inches)	Max. Manhole Spacing (feet)
6 - 15	500
16 - 30	800
36 - 48	1000
≥54	2000

☐ **Attachment C – Justification for Variance from Maximum Manhole Spacing**. The maximum spacing between manholes on this project (for each pipe diameter used) is greater than listed in the table above. A justification for any variance from the maximum spacing is attached, and must include a letter from the entity which will operate and maintain the system stating that it has the capability to maintain lines with manhole spacing greater than the allowed spacing.

17. ☐ All manholes will be monolithic, cast-in-place concrete.

☐ The use of pre-cast manholes is requested for this project. The manufacturer's specifications and construction drawings, showing the method of sealing the joints, are attached.

Site Plan Requirements

Items 18 - 25 must be included on the Site Plan.

18. ☒ The Site Plan must have a minimum scale of 1" = 400'.

Site Plan Scale: 1" = 400'.

19. ☒ The Site Plan must include the sewage collection system general layout, including manholes with station numbers, and sewer pipe stub outs (if any). Site plan must be overlain by topographic contour lines, using a contour interval of not greater than ten feet and showing the area within both the five-year floodplain and the 100-year floodplain of any drainage way.

20. Lateral stub-outs:

☐ The location of all lateral stub-outs are shown and labeled.
☒ No lateral stub-outs will be installed during the construction of this sewer collection system.

21. Location of existing and proposed water lines:

☒ The entire water distribution system for this project is shown and labeled.
☐ If not shown on the Site Plan, a Utility Plan is provided showing the entire water and sewer systems.
☐ There will be no water lines associated with this project.

22. 100-year floodplain:

☒ After construction is complete, no part of this project will be in or cross a 100-year floodplain, either naturally occurring or manmade. (Do not include streets or concrete-lined channels constructed above of sewer lines.)
☐ After construction is complete, all sections located within the 100-year floodplain will have water-tight manholes. These locations are listed in the table below and are shown and labeled on the Site Plan. (Do not include streets or concrete-lined channels constructed above sewer lines.)

Table 3 - 100-Year Floodplain

Line	***Sheet***	***Station***
	of N/A	to
	of N/A	to
	of N/A	to
	of	to

23. 5-year floodplain:

☒ After construction is complete, no part of this project will be in or cross a 5-year floodplain, either naturally occurring or man-made. (Do not include streets or concrete-lined channels constructed above sewer lines.)
☐ After construction is complete, all sections located within the 5-year floodplain will be encased in concrete or capped with concrete. These locations are listed in the table below and are shown and labeled on the Site Plan. (Do not include streets or concrete-lined channels constructed above sewer lines.)

Table 4 - 5-Year Floodplain

Line	***Sheet***	***Station***
	of N/A	to
	of N/A	to
	of N/A	to
	of	to

24. ☒ Legal boundaries of the site are shown.

25. ☒ The ***final plans and technical specifications*** are submitted for the TCEQ's review. Each sheet of the construction plans and specifications are dated, signed, and sealed by the Texas Licensed Professional Engineer responsible for the design on each sheet.

Items 26 - 33 must be included on the Plan and Profile sheets.

26. ☒ All existing or proposed water line crossings and any parallel water lines within 9 feet of sewer lines are listed in the table below. These lines must have the type of pressure rated pipe to be installed shown on the plan and profile sheets. Any request for a variance from the required pressure rated piping at crossings must include a variance approval from 30 TAC Chapter 290.

☐ There will be no water line crossings.
☐ There will be no water lines within 9 feet of proposed sewer lines.

Table 5 - Water Line Crossings

Line	***Station or Closest Point***	***Crossing or Parallel***	***Horizontal Separation Distance***	***Vertical Separation Distance***
Sugarcane	8+38	Crossing	3'	3'
Catnip	7+20	Crossing	3'	3'

27. Vented Manholes:

☒ **No part** of this sewer line is within the 100-year floodplain and vented manholes are not required by 30 TAC Chapter 217.
☐ **A portion** of this sewer line is within the 100-year floodplain and vented manholes will be provided at less than 1500 foot intervals. These water-tight manholes are listed in the table below and labeled on the appropriate profile sheets.
☐ **A portion** of this sewer line is within the 100-year floodplain and an alternative means of venting shall be provided at less than 1500 feet intervals. A description of the alternative means is described on the following page.
☐ **A portion** of this sewer line is within the 100-year floodplain; however, there is no interval longer than 1500 feet located within. No vented manholes will be used.

Table 6 - Vented Manholes

Line	***Manhole***	***Station***	***Sheet***
N/A	N/A	N/A	N/A

Line	*Manhole*	*Station*	*Sheet*

28. Drop manholes:

☒ There are no drop manholes associated with this project.
☐ Sewer lines which enter new or existing manholes or "manhole structures" higher than 24 inches above the manhole invert are listed in the table below and labeled on the appropriate profile sheets. These lines meet the requirements of 30 TAC §217.55(l)(2)(H).

Table 7 - Drop Manholes

Line	*Manhole*	*Station*	*Sheet*
N/A	N/A	N/A	N/A

29. Sewer line stub-outs (For proposed extensions):

☒ The placement and markings of all sewer line stub-outs are shown and labeled.
☐ No sewer line stub-outs are to be installed during the construction of this sewage collection system.

30. Lateral stub-outs (For proposed private service connections):

☐ The placement and markings of all lateral stub-outs are shown and labeled.
☒ No lateral stub-outs are to be installed during the construction of this sewage collection system.

31. Minimum flow velocity (From Appendix A)

☒ Assuming pipes are flowing full; all slopes are designed to produce flows equal to or greater than 2.0 feet per second for this system/line.

32. Maximum flow velocity/slopes (From Appendix A)

☒ Assuming pipes are flowing full, all slopes are designed to produce maximum flows of less than or equal to 10 feet per second for this system/line.
☐ **Attachment D – Calculations for Slopes for Flows Greater Than 10.0 Feet per Second.** Assuming pipes are flowing full, some slopes produce flows which are greater than 10 feet per second. These locations are listed in the table below. Calculations are attached.

Table 8 - Flows Greater Than 10 Feet per Second

Line	*Profile Sheet*	*Station to Station*	*FPS*	*% Slope*	*Erosion/Shock Protection*
N/A	N/A	N/A	N/A	N/A	N/A

33. Assuming pipes are flowing full, where flows are ≥ 10 feet per second, the provisions noted below have been made to protect against pipe displacement by erosion and/or shock under 30 TAC §217.53(l)(2)(B).

☐ Concrete encasement shown on appropriate Plan and Profile sheets for the locations listed in the table above.
☐ Steel-reinforced, anchored concrete baffles/retards placed every 50 feet shown on appropriate Plan and Profile sheets for the locations listed in the table above.
☒ N/A

Administrative Information

34. ☒ The final plans and technical specifications are submitted for TCEQ review. Each sheet of the construction plans and specifications are dated, signed, and sealed by the Texas Licensed Professional Engineer responsible for the design on each sheet.

35. ☒ Standard details are shown on the detail sheets, which are dated, signed, and sealed by the Texas Licensed Professional Engineer, as listed in the table below:

Table 9 - Standard Details

Standard Details	*Shown on Sheet*
Lateral stub-out marking **[Required]**	C10.6 of N/A
Manhole, showing inverts comply with 30 TAC §217.55(l)(2) **[Required]**	N/A of N/A
Alternate method of joining lateral to existing SCS line for potential future connections **[Required]**	C10.7 of N/A
Typical trench cross-sections **[Required]**	C10.7 of N/A
Bolted manholes **[Required]**	N/A of N/A
Sewer Service lateral standard details **[Required]**	C10.7 of N/A
Clean-out at end of line **[Required, if used]**	C10.7 of N/A
Baffles or concrete encasement for shock/erosion protection **[Required, if flow velocity of any section of pipe >10 fps]**	N/A of N/A
Detail showing Wastewater Line/Water Line Crossing **[Required, if crossings are proposed]**	C10.7 of N/A
Mandrel detail or specifications showing compliance with 30 TAC §217.57(b) and (c) **[Required, if Flexible Pipe is used]**	N/A of N/A

Standard Details	*Shown on Sheet*
Drop manholes **[Required, if a pipe entering a manhole is more than 24 inches above manhole invert]**	N/A of N/A

36. ☒ All organized sewage collection system general construction notes (TCEQ-0596) are included on the construction plans for this sewage collection system.

37. ☒ All proposed sewer lines will be sufficiently surveyed/staked to allow an assessment prior to TCEQ executive director approval. If the alignments of the proposed sewer lines are not walkable on that date, the application will be deemed incomplete and returned.

    ☐ Survey staking was completed on this date: _____

38. ☒ Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions. The copies must be submitted to the appropriate regional office.

39. ☒ Any modification of this SCS application will require TCEQ approval, prior to construction, and may require submission of a revised application, with appropriate fees.

Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **Organized Sewage Collection System Application** is hereby submitted for TCEQ review and executive director approval. The system was designed in accordance with the requirements of 30 TAC §213.5(c) and 30 TAC §217 and prepared by:

Print Name of Licensed Professional Engineer: Blake Allison, P.E.

Date: 10/6/2020

Place engineer's seal here:

STATE OF TEXAS
CHRISTOPHER B. ALLISON
131240
LICENSED
PROFESSIONAL ENGINEER

Signature of Licensed Professional Engineer:

Appendix A-Flow Velocity Table

Flow Velocity (Flowing Full) All gravity sewer lines on the Edwards Aquifer Recharge Zone shall be designed and constructed with hydraulic slopes sufficient to give a velocity when flowing full of not less than 2.0 feet per second, and not greater than 10 feet per second. The grades shown in the following table are based on Manning's formula and an n factor of 0.013 and shall be the minimum and maximum acceptable slopes unless provisions are made otherwise.

Table 10 - Slope Velocity

Pipe Diameter(Inches)	*% Slope required for minimum flow velocity of 2.0 fps*	*% Slope which produces flow velocity of 10.0 fps*
6	0.50	12.35
8	0.33	8.40
10	0.25	6.23
12	0.20	4.88
15	0.15	3.62
18	0.11	2.83
21	0.09	2.30
24	0.08	1.93
27	0.06	1.65
30	0.055	1.43
33	0.05	1.26
36	0.045	1.12
39	0.04	1.01
>39	*	*

**For lines larger than 39 inches in diameter, the slope may be determined by Manning's formula (as shown below) to maintain a minimum velocity greater than 2.0 feet per second when flowing full and a maximum velocity less than 10 feet per second when flowing full.*

$$v = \frac{1.49}{n} \times R_h^{0.67} \times \sqrt{S}$$

Figure 1 - Manning's Formula

Where:

v = velocity (ft/sec)
n = Manning's roughness coefficient (0.013)
Rh = hydraulic radius (ft)
S = slope (ft/ft)

Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Toby Baker, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

November 27, 2018

Mr. Thad Rutherford
Southstar at Vintage Oaks, LLC
1114 Lost Creek Blvd. Suite 270
Austin, Texas 78746

Re: Edwards Aquifer, Comal County

NAME OF PROJECT: Vintage Oaks at the Vineyard The Hills; Located 0.53 miles NW of Herbelin Rd and HWY 46 intersection; New Braunfels, Texas

PLAN TYPE: Request for the Modification of an approved Water Pollution Abatement Plan (WPAP); 30 Texas Administrative Code (TAC) Chapter 213; Edwards Aquifer Protection Program

Regulated Entity ID: RN108334111; Additional ID No.: 13000744

Dear Mr. Rutherford:

The Texas Commission on Environmental Quality (TCEQ) has completed its review of the WPAP Modification application for the above-referenced project submitted to the San Antonio Regional Office by M&S Engineering, LLC on behalf of Southstar at Vintage Oaks, LLC on August 3, 2018. Final review of the WPAP was completed after additional material was received on November 1, 2018 and November 26, 2018. As presented to the TCEQ, the Temporary and Permanent Best Management Practices (BMPs) were selected and construction plans were prepared by a Texas Licensed Professional Engineer to be in general compliance with the requirements of 30 TAC Chapter 213. These planning materials were sealed, signed and dated by a Texas Licensed Professional Engineer. Therefore, based on the engineer's concurrence of compliance, the planning materials for construction of the proposed project and pollution abatement measures are hereby approved subject to applicable state rules and the conditions in this letter. The applicant or a person affected may file with the chief clerk a motion for reconsideration of the executive director's final action on this Edwards Aquifer Protection Plan. A motion for reconsideration must be filed no later than 23 days after the date of this approval letter. *This approval expires two (2) years from the date of this letter unless, prior to the expiration date, more than 10 percent of the construction has commenced on the project or an extension of time has been requested.*

BACKGROUND

Vintage Oaks at the Vineyard, The Hills (13000039) was approved on February 19, 2016 for residential development within 652.55 acres. It will include the development of 750 single-family residential lots, associated utilities, and roads, including TxDOT improvements. There is a designated green space of 157.18 acres. The impervious cover will be 130.15 acres (19.94 percent). The project was approved with no more than 20 percent impervious cover.

PROJECT DESCRIPTION

The proposed modification includes the relocation of greenspace, a revised layout of single-family units resulting in 753 residential lots, a slight increase in roadway lengths, and a correction in the amount of allotted greenspace to be 521.97 acres. The project area has increased to 658.14 acres and proposes 128.85 acres of impervious cover (19.58-percent). The decrease in impervious cover was a result of reducing the size and amount of impervious cover associated with larger lots.

Project wastewater generated by 476 single-family residential lots will be disposed of by conveyance to the proposed Vintage Oaks at the Vineyard - The Hills (WQ0015320001) package plant owned by Southstar at Vintage Oaks, LLC. Project wastewater generated by 277 lots, that are greater than one acre, will be serviced by on-site sewage facilities. According to a letter dated, December 8, 2015, signed by Mr. Robert Boyd, P.E., with Comal County, the site in the development is acceptable for the use of on-site sewage facilities.

PERMANENT POLLUTION ABATEMENT MEASURES

This single-family residential project will not have more than 20 percent impervious cover.

GEOLOGY

According to the geologic assessment included with the application, the project site is underlain by the Lower Cretaceous member of the Person Formation. A total of thirty-five features were identified in the assessment. Four sensitive geologic features were described as two caves, features S-24 and S-25, and two fractured rock zones, features S-10 and S-11. The remaining non-sensitive features include thirteen manmade features and eighteen geologic features. The San Antonio Regional Office site assessment conducted on September 28, 2018 revealed the site generally as described in the application.

Natural buffers were proposed for the four natural sensitive features, S-10, S-11, S-24 and S-25. No regulated activities such as construction or soil disturbing activities will take place within the 50-foot natural buffers. The size is generally based on the drainage area for each sensitive feature.

The odd shape buffers for features S-24 and S-25 are illustrated on the construction plans. The buffers for each feature are described in the following table.

Identification No.	Buffer Description
S-10	50 ft. north, 50 ft. south, 50 ft. east, 50 ft. west
S-11	50 ft. north, 50 ft. south, 50 ft. east, 50 ft. west
S-24	50 ft. north, 180 ft. south, 50 ft. east, 50 ft. west
S-25	50 ft. north, 180 ft. south, 50 ft. east, 50 ft. west

SPECIAL CONDITIONS

I. This modification is subject to all Special and Standard Conditions listed in the WPAP approval letter dated February 19, 2016.

II. Since this project will not have more than 20 percent impervious cover, an exemption from additional permanent BMPs is approved. If the percent impervious cover ever increases above 20 percent or the land use changes, the exemption for the whole site as described in the property boundaries required by §213.4(g), may no longer apply and the property owner must notify the appropriate regional office of these changes.

III. As proposed in the approved application, the maximum impervious cover per small residential lot (less than 1 acre) shall be 3,900 square feet or less and maximum impervious cover per large residential lot (1 acre or greater) shall be 8,000 square feet or less in order to not exceed 20 percent impervious cover within the residential subdivision.

STANDARD CONDITIONS

1. Pursuant to Chapter 7 Subchapter C of the Texas Water Code, any violations of the requirements in 30 TAC Chapter 213 may result in administrative penalties.
2. The holder of the approved Edwards Aquifer protection plan must comply with all provisions of 30 TAC Chapter 213 and all best management practices and measures contained in the approved plan. Additional and separate approvals, permits, registrations and/or authorizations from other TCEQ Programs (i.e., Stormwater, Water Rights, UIC) can be required depending on the specifics of the plan.
3. In addition to the rules of the Commission, the applicant may also be required to comply with state and local ordinances and regulations providing for the protection of water quality.

Prior to Commencement of Construction:

4. Within 60 days of receiving written approval of an Edwards Aquifer Protection Plan, the applicant must submit to the San Antonio Regional Office, proof of recordation of notice in the county deed records, with the volume and page number(s) of the county deed records of the county in which the property is located. A description of the property boundaries shall be included in the deed recordation in the county deed records. A suggested form (Deed Recordation Affidavit, TCEQ-0625) that you may use to deed record the approved WPAP is enclosed.
5. All contractors conducting regulated activities at the referenced project location shall be provided a copy of this notice of approval. At least one complete copy of the approved WPAP and this notice of approval shall be maintained at the project location until all regulated activities are completed.
6. Modification to the activities described in the referenced WPAP application following the date of approval may require the submittal of a plan to modify this approval, including the payment of appropriate fees and all information necessary for its review and approval prior to initiating construction of the modifications.
7. The applicant must provide written notification of intent to commence construction, replacement, or rehabilitation of the referenced project. Notification must be submitted to the San Antonio Regional Office no later than 48 hours prior to commencement of the regulated activity. Written notification must include the date on which the regulated activity will commence, the name of the approved plan and program ID number for the regulated activity, and the name of the prime contractor with the name and telephone number of the contact person. The executive director will use the notification to determine if the approved plan is eligible for an extension.
8. Temporary erosion and sedimentation (E&S) controls, i.e., silt fences, rock berms, stabilized construction entrances, or other controls described in the approved WPAP, must be installed prior to construction and maintained during construction. Temporary E&S controls may be removed when vegetation is established, and the construction area is stabilized. If a water quality pond is proposed, it shall be used as a sedimentation basin during construction. The TCEQ may monitor stormwater discharges from the site to evaluate the adequacy of temporary E&S control measures. Additional controls may be necessary if excessive solids are being discharged from the site.
9. All borings with depths greater than or equal to 20 feet must be plugged with non-shrink grout from the bottom of the hole to within three (3) feet of the surface. The remainder of the hole must be backfilled with cuttings from the boring. All borings less than 20 feet must be backfilled with

cuttings from the boring. All borings must be backfilled or plugged within four (4) days of completion of the drilling operation. Voids may be filled with gravel.

During Construction:

10. During the course of regulated activities related to this project, the applicant or agent shall comply with all applicable provisions of 30 TAC Chapter 213, Edwards Aquifer. The applicant shall remain responsible for the provisions and conditions of this approval until such responsibility is legally transferred to another person or entity.

11. This approval does not authorize the installation of temporary aboveground storage tanks on this project. If the contractor desires to install a temporary aboveground storage tank for use during construction, an application to modify this approval must be submitted and approved prior to installation. The application must include information related to tank location and spill containment. Refer to Standard Condition No. 6, above.

12. If any sensitive feature (caves, solution cavities, sink holes, etc.) is discovered during construction, all regulated activities near the feature must be suspended immediately. The applicant or his agent must immediately notify the San Antonio Regional Office of the discovery of the feature. Regulated activities near the feature may not proceed until the executive director has reviewed and approved the methods proposed to protect the feature and the aquifer from potentially adverse impacts to water quality. The plan must be sealed, signed, and dated by a Texas Licensed Professional Engineer.

13. Five (5) wells exists on site. All water wells, including injection, dewatering, and monitoring wells must be in compliance with the requirements of the Texas Department of Licensing and Regulation under Title 16 TAC Chapter 76 (relating to Water Well Drillers and Pump Installers) and all other locally applicable rules, as appropriate.

14. If sediment escapes the construction site, the sediment must be removed at a frequency sufficient to minimize offsite impacts to water quality (e.g., fugitive sediment in street being washed into surface streams or sensitive features by the next rain). Sediment must be removed from sediment traps or sedimentation ponds not later than when design capacity has been reduced by 50 percent. Litter, construction debris, and construction chemicals shall be prevented from becoming stormwater discharge pollutants.

15. Intentional discharges of sediment laden water are not allowed. If dewatering becomes necessary, the discharge will be filtered through appropriately selected best management practices. These may include vegetated filter strips, sediment traps, rock berms, silt fence rings, etc.

16. The following records shall be maintained and made available to the executive director upon request: the dates when major grading activities occur, the dates when construction activities temporarily or permanently cease on a portion of the site, and the dates when stabilization measures are initiated.

17. Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, and construction activities will not resume within 21 days. When the initiation of stabilization measures by the 14th day is precluded by weather conditions, stabilization measures shall be initiated as soon as practicable.

After Completion of Construction:

18. A Texas Licensed Professional Engineer must certify in writing that the permanent BMPs or measures were constructed as designed. The certification letter must be submitted to the San Antonio Regional Office within 30 days of site completion.

19. The applicant shall be responsible for maintaining the permanent BMPs after construction until such time as the maintenance obligation is either assumed in writing by another entity having ownership or control of the property (such as without limitation, an owner's association, a new

property owner or lessee, a district, or municipality) or the ownership of the property is transferred to the entity. The regulated entity shall then be responsible for maintenance until another entity assumes such obligations in writing or ownership is transferred. A copy of the transfer of responsibility must be filed with the executive director through San Antonio Regional Office within 30 days of the transfer. A copy of the transfer form (TCEQ-10263) is enclosed.

20. Upon legal transfer of this property, the new owner(s) is required to comply with all terms of the approved Edwards Aquifer protection plan. If the new owner intends to commence any new regulated activity on the site, a new Edwards Aquifer protection plan that specifically addresses the new activity must be submitted to the executive director. Approval of the plan for the new regulated activity by the executive director is required prior to commencement of the new regulated activity.

21. An Edwards Aquifer protection plan approval or extension will expire and no extension will be granted if more than 50 percent of the total construction has not been completed within ten years from the initial approval of a plan. A new Edwards Aquifer protection plan must be submitted to the San Antonio Regional Office with the appropriate fees for review and approval by the executive director prior to commencing any additional regulated activities.

22. At project locations where construction is initiated and abandoned, or not completed, the site shall be returned to a condition such that the aquifer is protected from potential contamination.

This action is taken under authority delegated by the Executive Director of the Texas Commission on Environmental Quality. If you have any questions or require additional information, please contact Ms. Lillian Butler of the Edwards Aquifer Protection Program of the San Antonio Regional Office at (210) 403-4026.

Sincerely,

Lynn Bumguardner, Water Section Manager
San Antonio Region
Texas Commission on Environmental Quality

LB/LB/eg

Enclosures: Deed Recordation Affidavit, Form TCEQ-0625
Change in Responsibility for Maintenance of Permanent BMPs, Form TCEQ-10263

cc: Mr. Trevor N. Tast, P.E., M&S Engineering, LLC
Mr. Mark Enders, City of New Braunfels
Mr. Roland Ruiz, Edwards Aquifer Authority
Mr. Thomas H. Hornseth, P.E., Comal County
Mr. H. L. Saur, Comal Trinity Groundwater Conservation District

Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Toby Baker, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

November 27, 2018

Mr. Thad Rutherford
Southstar at Vintage Oaks, LLC
1114 Lost Creek Blvd. Suite 270
Austin, Texas 78746

Re: Edwards Aquifer, Comal County

Name of Project: Vintage Oaks at the Vineyard WWTF; located in the Vintage Oaks at the Vineyard subdivision "The Hills" off Hwy 46 in the New Braunfels ETJ, Texas

PLAN TYPE: Request for the Modification of an approved Water Pollution Abatement Plan (WPAP); 30 Texas Administrative Code (TAC) Chapter 213; Edwards Aquifer Protection Program

Regulated Entity ID: RN108877069; Additional ID No.: 13000745

Dear Mr. Rutherford:

The Texas Commission on Environmental Quality (TCEQ) has completed its review of the WPAP Modification application for the above-referenced project submitted to the San Antonio Regional Office by M&S Engineering, LLC on behalf of Southstar at Vintage Oaks, LLC on August 3, 2018. Final review of the WPAP was completed after additional material was received on November 1, 2018 and November 26, 2018. As presented to the TCEQ, the Temporary and Permanent Best Management Practices (BMPs) were selected and construction plans were prepared by a Texas Licensed Professional Engineer to be in general compliance with the requirements of 30 TAC Chapter 213. These planning materials were sealed, signed and dated by a Texas Licensed Professional Engineer. Therefore, based on the engineer's concurrence of compliance, the planning materials for construction of the proposed project and pollution abatement measures are hereby approved subject to applicable state rules and the conditions in this letter. The applicant or a person affected may file with the chief clerk a motion for reconsideration of the executive director's final action on this Edwards Aquifer Protection Plan. A motion for reconsideration must be filed no later than 23 days after the date of this approval letter. *This approval expires two (2) years from the date of this letter unless, prior to the expiration date, more than 10 percent of the construction has commenced on the project or an extension of time has been requested.*

BACKGROUND

Vintage Oaks at the Vineyard, WWTF (13000029) was approved January 26, 2016 as a commercial project of approximately 51.03 acres. It was to include the construction of a wastewater treatment facility (WWTF) accompanied with irrigation spray fields. The impervious cover was to be 0.22 acres (0.43 percent). The approved permanent BMP was a natural vegetative filter strip.

PROJECT DESCRIPTION

The proposed modification includes the relocation of the irrigation area and the addition of an access roadway for the WWTF. The project area has decreased to 41.12 acres and has 1.12 acres of impervious cover (2.72-percent). No wastewater is generated by this project

PERMANENT POLLUTION ABATEMENT MEASURES

To prevent the pollution of stormwater runoff originating on-site or upgradient of the site and potentially flowing across and off the site after construction, an engineered vegetative filter strip and a natural vegetated filter strip (VFS), designed using the TCEQ technical guidance document, Complying with the Edwards Aquifer Rules: Technical Guidance on Best Management Practices (2005), will be constructed to treat stormwater runoff. The required total suspended solids (TSS) treatment for this project is 1,005 pounds of TSS generated from the 1.12 acres of impervious cover. The approved measures meet the required 80 percent removal of the increased load in TSS caused by the project.

The engineered VFS shall have a uniform slope of less than 20-percent and vegetated cover of at least 80-percent which will extend along the entire length of the contributing area and will be free of gullies or rills that can concentrate overland flow. The contributing area shall be relatively flat to evenly distribute runoff, and the impervious cover in the direction of flow shall not exceed 72-feet. The proposed VFS is treating the access roadway.

The natural VFS will be 50 feet wide, a uniform grade not to exceed 10 percent, and will be free of gullies or rills that can concentrate overland flow. The natural VFS will surround the contributing area, which shall be relatively flat to evenly distribute runoff or create concentrated flow to the filter strip and shall not exceed 72 feet of impervious cover in the direction of flow.

GEOLOGY

According to the geologic assessment included with the application, the project site is underlain by the Lower Cretaceous member of the Person Formation. One (1) non-sensitive geologic feature was identified during the assessment. The San Antonio Regional Office site assessment conducted on September 28, 2018 revealed the site generally as described in the application.

SPECIAL CONDITIONS

I. This modification is subject to all Special and Standard Conditions listed in the WPAP approval letter dated January 26, 2016.

II. All permanent pollution abatement measures shall be inspected, and all measures be fully operational prior to first use of the newly constructed facilities.

STANDARD CONDITIONS

1. Pursuant to Chapter 7 Subchapter C of the Texas Water Code, any violations of the requirements in 30 TAC Chapter 213 may result in administrative penalties.
2. The holder of the approved Edwards Aquifer protection plan must comply with all provisions of 30 TAC Chapter 213 and all best management practices and measures contained in the approved plan. Additional and separate approvals, permits, registrations and/or

authorizations from other TCEQ Programs (i.e., Stormwater, Water Rights, UIC) can be required depending on the specifics of the plan.

3. In addition to the rules of the Commission, the applicant may also be required to comply with state and local ordinances and regulations providing for the protection of water quality.

Prior to Commencement of Construction:

4. Within 60 days of receiving written approval of an Edwards Aquifer Protection Plan, the applicant must submit to the San Antonio Regional Office, proof of recordation of notice in the county deed records, with the volume and page number(s) of the county deed records of the county in which the property is located. A description of the property boundaries shall be included in the deed recordation in the county deed records. A suggested form (Deed Recordation Affidavit, TCEQ-0625) that you may use to deed record the approved WPAP is enclosed.

5. All contractors conducting regulated activities at the referenced project location shall be provided a copy of this notice of approval. At least one complete copy of the approved WPAP and this notice of approval shall be maintained at the project location until all regulated activities are completed.

6. Modification to the activities described in the referenced WPAP application following the date of approval may require the submittal of a plan to modify this approval, including the payment of appropriate fees and all information necessary for its review and approval prior to initiating construction of the modifications.

7. The applicant must provide written notification of intent to commence construction, replacement, or rehabilitation of the referenced project. Notification must be submitted to the San Antonio Regional Office no later than 48 hours prior to commencement of the regulated activity. Written notification must include the date on which the regulated activity will commence, the name of the approved plan and program ID number for the regulated activity, and the name of the prime contractor with the name and telephone number of the contact person. The executive director will use the notification to determine if the approved plan is eligible for an extension.

8. Temporary erosion and sedimentation (E&S) controls, i.e., silt fences, rock berms, stabilized construction entrances, or other controls described in the approved WPAP, must be installed prior to construction and maintained during construction. Temporary E&S controls may be removed when vegetation is established, and the construction area is stabilized. If a water quality pond is proposed, it shall be used as a sedimentation basin during construction. The TCEQ may monitor stormwater discharges from the site to evaluate the adequacy of temporary E&S control measures. Additional controls may be necessary if excessive solids are being discharged from the site.

9. All borings with depths greater than or equal to 20 feet must be plugged with non-shrink grout from the bottom of the hole to within three (3) feet of the surface. The remainder of the hole must be backfilled with cuttings from the boring. All borings less than 20 feet must be backfilled with cuttings from the boring. All borings must be backfilled or plugged within four (4) days of completion of the drilling operation. Voids may be filled with gravel.

During Construction:

10. During the course of regulated activities related to this project, the applicant or agent shall comply with all applicable provisions of 30 TAC Chapter 213, Edwards Aquifer. The applicant shall remain responsible for the provisions and conditions of this approval until such responsibility is legally transferred to another person or entity.

11. This approval does not authorize the installation of temporary aboveground storage tanks on this project. If the contractor desires to install a temporary aboveground storage tank for

use during construction, an application to modify this approval must be submitted and approved prior to installation. The application must include information related to tank location and spill containment. Refer to Standard Condition No. 6, above.

12. If any sensitive feature (caves, solution cavities, sink holes, etc.) is discovered during construction, all regulated activities near the feature must be suspended immediately. The applicant or his agent must immediately notify the San Antonio Regional Office of the discovery of the feature. Regulated activities near the feature may not proceed until the executive director has reviewed and approved the methods proposed to protect the feature and the aquifer from potentially adverse impacts to water quality. The plan must be sealed, signed, and dated by a Texas Licensed Professional Engineer.

13. No wells exist on site. All water wells, including injection, dewatering, and monitoring wells must be in compliance with the requirements of the Texas Department of Licensing and Regulation under Title 16 TAC Chapter 76 (relating to Water Well Drillers and Pump Installers) and all other locally applicable rules, as appropriate.

14. If sediment escapes the construction site, the sediment must be removed at a frequency sufficient to minimize offsite impacts to water quality (e.g., fugitive sediment in street being washed into surface streams or sensitive features by the next rain). Sediment must be removed from sediment traps or sedimentation ponds not later than when design capacity has been reduced by 50 percent. Litter, construction debris, and construction chemicals shall be prevented from becoming stormwater discharge pollutants.

15. Intentional discharges of sediment laden water are not allowed. If dewatering becomes necessary, the discharge will be filtered through appropriately selected best management practices. These may include vegetated filter strips, sediment traps, rock berms, silt fence rings, etc.

16. The following records shall be maintained and made available to the executive director upon request: the dates when major grading activities occur, the dates when construction activities temporarily or permanently cease on a portion of the site, and the dates when stabilization measures are initiated.

17. Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, and construction activities will not resume within 21 days. When the initiation of stabilization measures by the 14th day is precluded by weather conditions, stabilization measures shall be initiated as soon as practicable.

<u>After Completion of Construction:</u>

18. A Texas Licensed Professional Engineer must certify in writing that the permanent BMPs or measures were constructed as designed. The certification letter must be submitted to the San Antonio Regional Office within 30 days of site completion.

19. The applicant shall be responsible for maintaining the permanent BMPs after construction until such time as the maintenance obligation is either assumed in writing by another entity having ownership or control of the property (such as without limitation, an owner's association, a new property owner or lessee, a district, or municipality) or the ownership of the property is transferred to the entity. The regulated entity shall then be responsible for maintenance until another entity assumes such obligations in writing or ownership is transferred. A copy of the transfer of responsibility must be filed with the executive director through San Antonio Regional Office within 30 days of the transfer. A copy of the transfer form (TCEQ-10263) is enclosed.

20. Upon legal transfer of this property, the new owner(s) is required to comply with all terms of the approved Edwards Aquifer protection plan. If the new owner intends to commence any

new regulated activity on the site, a new Edwards Aquifer protection plan that specifically addresses the new activity must be submitted to the executive director. Approval of the plan for the new regulated activity by the executive director is required prior to commencement of the new regulated activity.

21. An Edwards Aquifer protection plan approval or extension will expire, and no extension will be granted if more than 50 percent of the total construction has not been completed within ten years from the initial approval of a plan. A new Edwards Aquifer protection plan must be submitted to the San Antonio Regional Office with the appropriate fees for review and approval by the executive director prior to commencing any additional regulated activities.
22. At project locations where construction is initiated and abandoned, or not completed, the site shall be returned to a condition such that the aquifer is protected from potential contamination.

This action is taken under authority delegated by the Executive Director of the Texas Commission on Environmental Quality. If you have any questions or require additional information, please contact Ms. Lillian Butler of the Edwards Aquifer Protection Program of the San Antonio Regional Office at (210) 403-4026.

Sincerely,

Lynn Bumguardner, Water Section Manager
San Antonio Region
Texas Commission on Environmental Quality

LB/LB/eg

Enclosures: Deed Recordation Affidavit, Form TCEQ-0625
Change in Responsibility for Maintenance of Permanent BMPs, Form TCEQ-10263

cc: Mr. Trevor N. Tast, P.E., M&S Engineering, LLC
Mr. Mark Enders, City of New Braunfels
Mr. Roland Ruiz, Edwards Aquifer Authority
Mr. Thomas H. Hornseth, P.E., Comal County
Mr. H. L. Saur, Comal Trinity Groundwater Conservation District

Attachment A

Engineering Design Report

SEWER COLLECTION SYSTEM ENGINEERING DESIGN REPORT

Vintage Oaks at the Vineyard, The Grove- Unit 29
Comal County, Texas

Owner:

Thad Rutherford
Southstar at Vintage Oaks, LLC
1114 Lost Creek Blvd Suite 270
Austin, TX 78746

Prepared by:

BUILDING COMMUNITY
M&S ENGINEERING
ELECTRICAL | CIVIL | STRUCTURAL | MEP

M&S Engineering Project Number: 7019BSW00004

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October 2020

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III. INTRODUCTION

M&S Engineering has prepared this report for the Sewer Collection System (SCS) application for Vintage Oakes at the Vineyard, The Grove- Unit 29. The site is located within the Vintage Oaks at the Vineyard Unit named "The Hills." The WPAP for this unit (Regulated Entity ID: RN 108334111) was approved on November 27, 2018. It is an approximately 32.10 acres out of the 652.55 acres tract of land assigned to "The Hills" Unit of Vintage Oaks. Currently, the Texas Land Application Permit (TLAP) was approved by The Texas Commission on Environmental Quality (TCEQ) on January 17, 2017 (Permit Number: WQ0015320-001).

M&S Engineering is preparing this report, plans, and other required documentation to acquire construction authorization of the SCS to be constructed for The Grove- Unit 29. The SCS application includes information on the septic tank effluent pump (STEP), pipe material and sizing, irrigation system.

IV. PROJECT OVERVIEW

LOCATION

This property is located within the Vintage Oaks at the Vineyard Subdivision off Hwy 46. This unit is directly adjacent to The Grove- Unit 29 approximately 4100 feet east from the Hwy 46 and Vintage Way intersection. Both the Wastewater Treatment Facility (WWTF) and the service area are in the Edwards Aquifer's recharge zone. The existing site is a largely undeveloped tract of land with ranch roads.

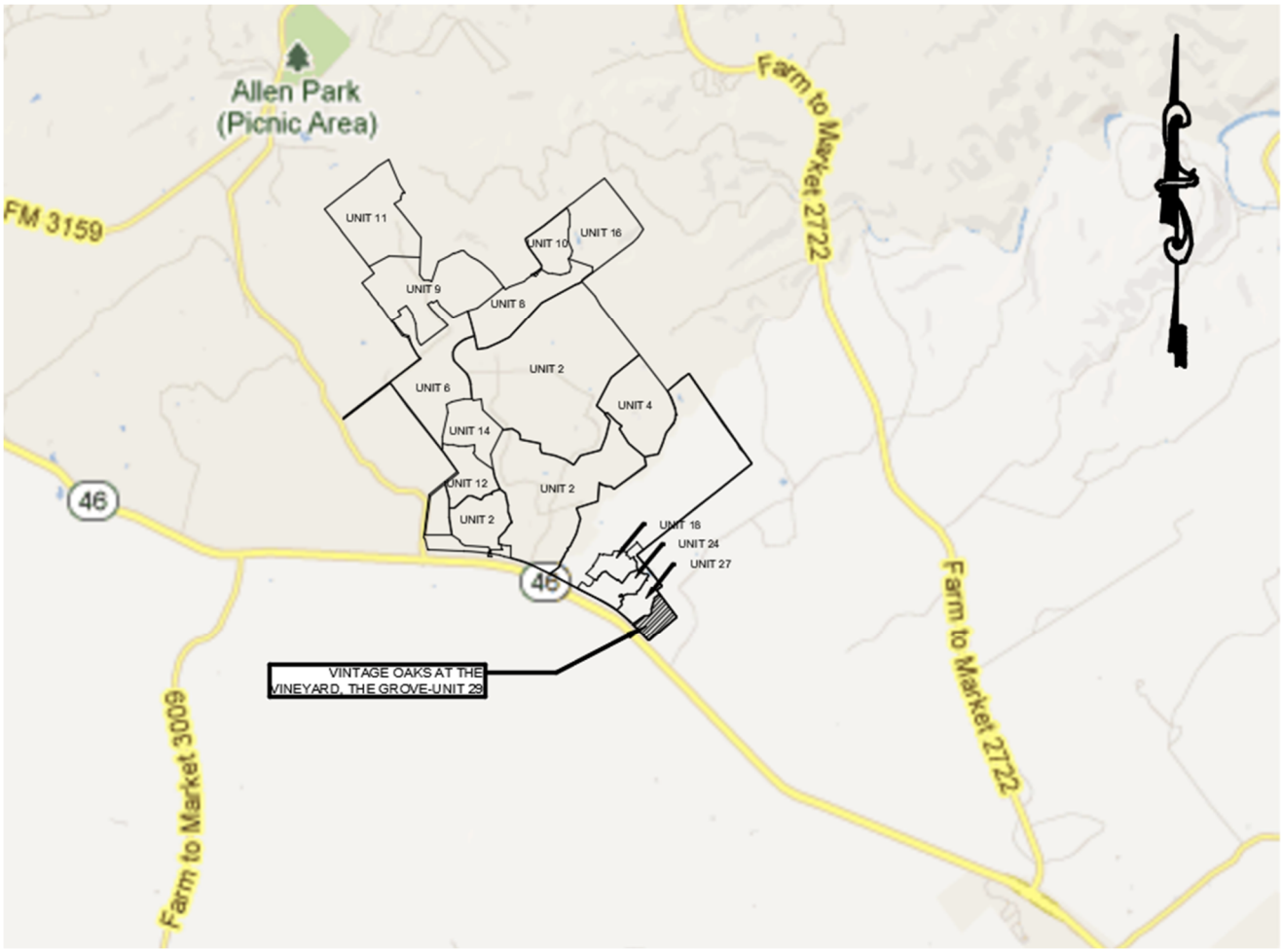

Figure 1: Vicinity Map

GEOLOGY AND SOILS

The geological assessment was performed by Professional Service Industries, Inc. for this site. The geological assessment is associated with Vintage Oaks at the Vineyard, The Hills WPAP (Regulated Entity ID: RN 108334111) was approved on November 27, 2018. . There were no sensitive features identified within the SCS zone. The geological assessments have been included in the Organized Sewage Collection System Application and location of site features are on site plans produced by John Langan.

SERVICE AREA

The service area for the WWTF, when completed, is 244.09 acres. Figure 2 shows the relative location of the WWTF and the overall plan for the service area. Unit 29 will consist of a total of 66 single family residential units. Each lot will contain a tank that will feed that lot's effluent to the WWTF through small diameter high density polyethylene (HDPE) pressure lines. The WWTF and Organized Sewage Collection System will be maintained and operated by the Canyon Lake Water Service Company (CLWSC). See Appendix E for Service Agreement Draft. Please note a special condition will be written to document service agreements must be executed between the collection system owner and each property owner.

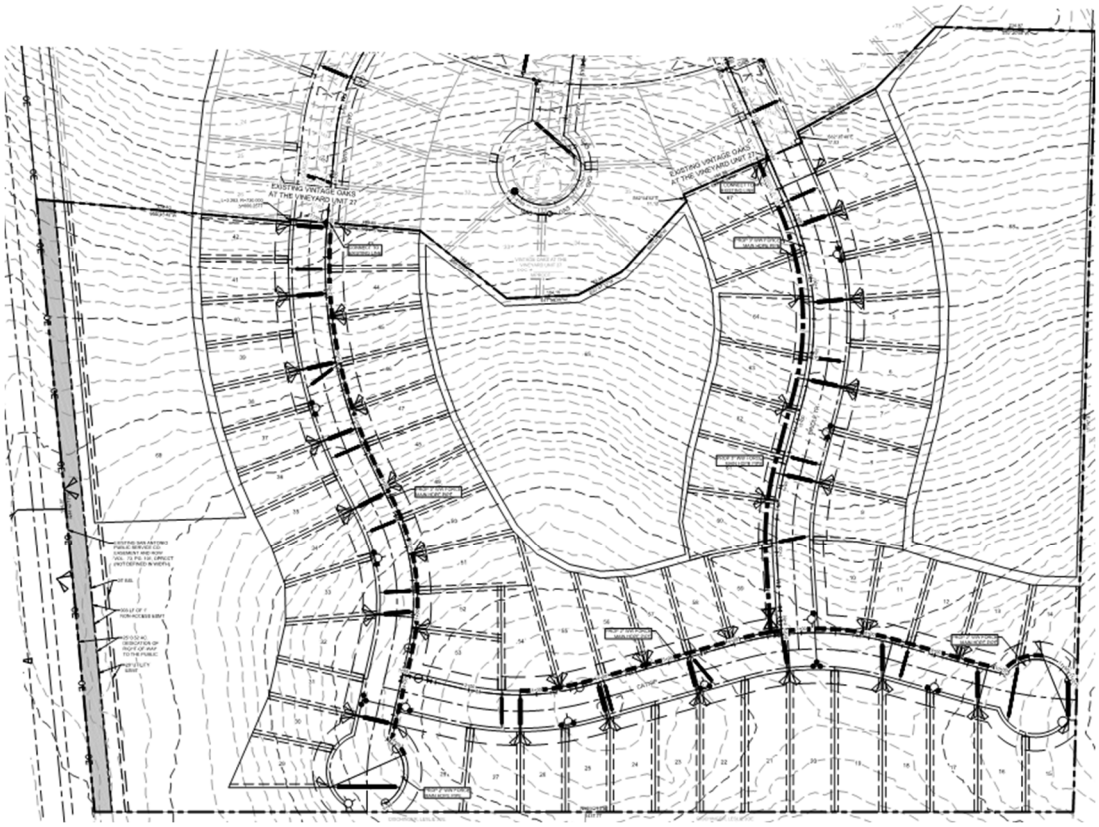

Figure 2: Service Area for Unit 29

100-YEAR FLOODPLAIN

No Portion of the SCS is located in a FEMA 100-year floodplain based on parcel map 48091C0245F and 48091C0265F from the FEMA Flood Insurance Rate Map.

WATER POLLUTION ABATEMENT PLAN

The WWTF's WPAP for the service area was approved on November 27, 2018 (Regulated Entity ID: RN 108877069). The Vintage Oaks at the Vineyard, The Hills WPAP, which contains the residential lots for The Grove, was approved on November 27, 2018 (Regulated Entity ID: RN 108334111).

V. BASIS FOR DESIGN

DESIGN FLOW – AVERAGE DAILY FLOW

The design flow was calculated based on the number of lots being serviced during each phase of construction and the design standards set by New Braunfels Utilities Water and Wastewater Design Criteria 2.9.3 Wastewater Systems. Based on said standards, it is assumed that a single family unit is to produce an average wastewater flow of 245 gallons/day.

The System will be developed in phases; see the following table for Average Daily Flows:

Average Daily Flows

Phase	Lots	ADF (gpd)
Unit 15	105	25725
Unit 18	100	24500
Unit 24	110	26950
Unit 27	103	25235
Unit 29	66	16170
Total :	484	118580

DESIGN FLOW – PEAK FLOW

The design peak flow rate is calculated based on the Equation D.2 from the Texas Administrative Code Rule 217.92 in Chapter 217 Subsection D. It is assumed that each residential servicing unit has equivalent dwelling unit (EDU) of 1 based on an occupancy of 3.5 people. The following is the governing equation:

Design Flow Rate (gpm) = (Design Coefficient* Number of EDU) + Safety Factor

It is assumed that the design coefficient is typically 0.5; while the safety factor is assumed to be 20; however when 20 or more are used this factor will be omitted. Using said equation, the design flow rate for the entire system site is 424 gpm. The peak flow rate for each segment of collection pipe for Unit 29 is summarized in Table 1.

WASTEWATER CHARACTERISTICS

Influent Characteristics

The influent of the site is classified as domestic residential sewage. Based on classification the following concentrations for BOD_5 and TSS were set. This list also includes the effluent BOD_5 and TSS concentrations of the effluent after the raw sewage is treated by the step system.

Parameter	Concentration
BOD_5 - Raw Wastewater	300 mg/l
Following STEP System	140 mg/l
TSS -Domestic Wastewater	240 mg/l
Screened Effluent	40 mg/l

COLLECTION SYSTEM DESIGN

Due to the characteristics and carious site constraints, the collection system will consist of a septic tank effluent pump (STEP) system. There will be a 1,500 gallon capacity baffled septic tank with pumping system located on each lot. The septic tanks will settle out most of the solids from the waste stream and the remaining effluent will be pumped via a small diameter collection system to the WWTF. 2" and 3" lines will convey the effluent to the treatment facility and discharged to a nearby irrigation pond.

Pipes within the collection system are high density polyethylene, and will have butt (heat) fusion joints as outlined in ASTM D2657 and conforming to the Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe, Technical Report TR-33/2005, published by the Plastic Pipe Institute (PPI).

HDPE pipe- SDR-11 with pressure rating of 200 psi and meets the performance requirements of ASTM D 2241 Class 200 PVC pipe for pipes under pressure flow conditions. A summary of pipe sizes per section can be found in table 1. The pipe is manufacture by Performance Pipe. The pipes are flexible and comes in coils. See manufacturer standards in Appendix A.

Performance Pipe equation for minimum bend radius of the pipe is calculated as the following:

Minimum Bend Radius (in) = Minimum Bend Ratio*Outside Diameter of Pipe (in)

Minimum bend radii can be found in Appendix A.

Additional equipment used in the WWTF system includes isolation valves, cleanouts, and air relief/vacuum valves. See Figure 3 show the relative layout for The Grove- Unit 29 system.

Isolation valves will be used to isolate sections of the total system as needed. The isolation valves are to be constructed from corrosion-resistant materials and is located in a locked valve box. If the system is operating normally, the valves will remain in there operating position. Air relief /vacuum valves are used to release air that is trapped in the pipe system and protect the pipe from developing vacuums. These valves will be installed at all of the high points within the valves.

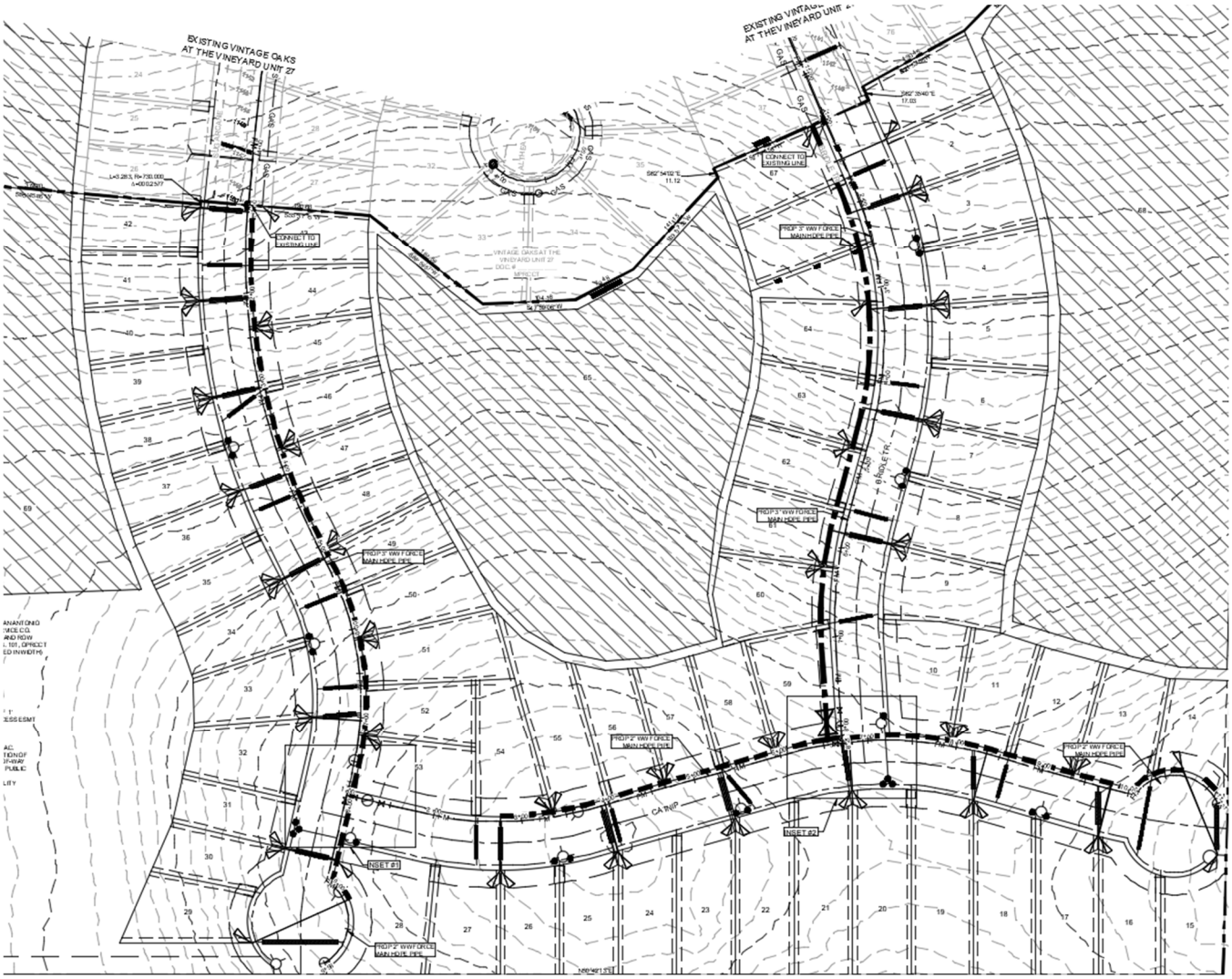

Figure 3: Unit 29 Step System Schematic

DESIGN CRITERIA

The STEP system design conforms to the TCEQ 217.91-217.100. The line size is determined based on the peak flow rates and velocities. The line length, number of connecting residential units, peak flow rates, line size, head loss and velocity can be found in Table 1. The velocities in all force mains are above or at 1.0 feet per seconds per TCEQ Section 217.96. The Hazen-Williams equation was used to determine the head loss and a "C" values of 140 was used based on the TCEQ requirement. The original Orenco report and supporting calculations are in Appendix A and B. Sizing of proposed pipe were based this report. It should be noted that the layout and calculations in that report are based on an old site layout. The calculations in Table 1 is based off the new proposed layout. All pipes have been sized the same as stated in the Orenco report or larger to mitigate the variation of lots serviced.

Equations Used:

$$Q=A*N+B$$

Where:
A=Coefficient, typically 0.5
Q= Peak Flow Rate (gpm)
N=Number of Equivalent Dwelling Units
B=Factor based upon quantity and type of pump used. Omitted if more than 20 connections.

$$hf = \frac{(10.56)(L)}{D^{4.87}}\left(\frac{Q}{C}\right)^{1.85}$$

Where:

hf = Head loss due to pipe friction, ft
L = Force main line length, ft

D = Inside diameter of the pipe, in
Q = Flow rate through force main
C = Hazen-Williams roughness coefficient

Line	Line Length (ft)	Peak Flow Rate (gpm)	Nominal Size (in)	Inner Diameter Size (in)	Total Head Loss (ft)	Max Velocity (ft/s)
Sugarcane	898	32.5	3	2.95	19.01	2.83
Catnip	1020	12.5	2	1.92	3.07	1.13
Bridle Tr	720	22.5	3	2.95	13.46	2.50

*NOTE – All above information has been sourced from the Orenco Report.

Table 1: Collection System Detail

RESIDENTIAL PUMP PACKAGE

The Residential Pump Package contains tank, pump system, floats/level controls, splice box, discharge assembly anti-siphoning devices, control and alarm panel information.

Septic Tank
The septic tanks will consist of a 1,500 gallon, 2-compartment tank manufactured by Comal Precast or other approved vendors. The tanks are designed and constructed in accordance with TCEQ Section 285.32(b) (1). There is a 4" inlet, two 24" manways, and a simplex pumping system located in the second chamber of the tank. The pump chamber is hydraulically independent from the primary chamber. The Standard detail for the tank will be included in the SCS Plan Set and in Appendix F.

Pump System
The pump is an Orenco PF Series submersible effluent pump model PF100511 with a flow control disk designed to pump approximately 10 gallons per minute. The pump system is located in a Biotube filter that removes the solids; leaving only the liquid from the tank's clear zone to be pumped to the treatment plant. Appendix C contains the pump curve and technical data sheet.

Floats/Level Controls

Three signal-related, UL listed, normally open float switches, Orenco Model A or approved equal, is to be mounted on adjustable PVC collars with the following functions: high-level alarm, pump on, and pump off. The floats will be installed to provide a minimum of 100 gallons of emergency storage above the high-level alarm and to allow for a 40-50 gallon dose each pump cycle, while accommodating the minimum liquid level of the specified pump.

Splice Box

The internal splice box will be located in the access rise where the pump and floats are located. This is required so that electrical components can be safely and legally removed and replaced. The splice boxes conform to UL512C and will be UL Type 4X rated. They will include watertight cord grips and waterproof wire nuts, a neoprene sealing gasket, and four stainless steel lid screws. Conduit seal kits shall be required on the conduit run between the splice box and the control panel.

Discharge Assembly

Discharge Assemblies shall be corrosion-resistant and adjustable for a proper fit. Discharge assemblies are composed of PVC valves and flexible hose that simplify installation and maintenance. Assemblies shall include a check-valve, disconnect union, and a flow–control disk. All parts are either solvent welded or threaded and sealed with Teflon paste. Orenco System model HV100BCFCX or approved equal shall be used.

Anti-siphoning Devices

An anti-siphon device is required on systems where the tank may be higher in elevation than the collection main line. The system will be evaluated to determine areas were an anti-siphon device will be required.

Control and Alarm Panel

Control Panels shall be electro-mechanical panels for controlling single pumps. Panels shall include an Automatic/Off/Manual toggle switch, 102 VAC controls circuit breaker, 120 VAC pump circuit breaker, automatic motor control operation , and an audible/visible high water level alarm with auto reset. Each system will include a fiberglass enclosed panel that controls the pump needs.

The control/alarm panel shall be located near the side of the house mounted on a 4x4 pressure-treated post or on the side of the garage at a height that is convenient and accessible for maintenance. It shall be located close to and in sight of the pump and out of the direct sun and rain. A high liquid level in the tank activates an alarm light and a buzzer which may be silenced by pressing the illuminated button on the front of the control panel. The alarm light stays on until the high level condition is corrected and then the alarm circuit automatically resets. When an alarm occurs, the user calls the district's phone number on the panel cover. An operator should be on-call 24 hours in order to respond to any issues that require attention.

Cleanouts

Cleanouts are installed with this system per the 30TAC217.96 Small diameter Effluent Sewers (D). Cleanouts extends to ground level and terminates in a watertight valve box and are installed at the following location:

- An upstream terminus;
- A minor junction

- A change in pipe diameter
- Intervals of no more than 1,000 feet

Air Release Valve

Air releases have been installed in previous units to treat the addition of this unit's service lines. Air release valves must be constructed of corrosion-resistant material and located in a vault. The air release valve will be installed at peaks in elevation and each location where air may accumulate. A detail of Canyon Lake Water Service Company's Air Valve Detail is included in the SCS Construction Sheet Set. Any valve within 50 feet of a residence or building must have odor control. The Canyon Lake Water Service Company installs carbon filters in each air release valve for the odor control measures necessary to prevent the collection system from becoming a nuisance.

TESTING REQUIREMENTS FOLLOWING INSTALLATION

Following construction, the STEP system shall be tested to meet or exceed TAC 217.99 for collection pipe (small diameter effluent sewer). The pipe pressures test in TAC 217.99 (e)(1) will be used to test the HDPE pipe. For testing conditions, a minimum of 25 pounds per square inch or 1.5 times the maximum pipe design pressure, whichever is larger, will be used. The contractor shall prepare a comprehensive field testing plan for Engineers approval in accordance with TAC 217.99, ASTM F2164 and AWWA Manual M55.

Appendix A: HDPE PIPE DETAIL

Technical Note PP 819-TN
Field Bending of DriscoPlex® Pipe

Polyethylene pipe's flexibility makes the pipe easy to handle and install. Not only can small diameter (6" and less) pipes be purchased in coils to reduce joining costs but the tight curvature permitted in polyethylene pipelines reduces the need for fittings. All of the major trenchless installation methods rely on the pipe's flexibility for avoiding obstacles and handling curvature in the bore path or misalignment in host pipes. Generally, its great flexibility makes polyethylene pipe the preferred pipe for installation.

Bend Radius

The measure for curvature in a pipeline is the bend radius. See Figure 1.

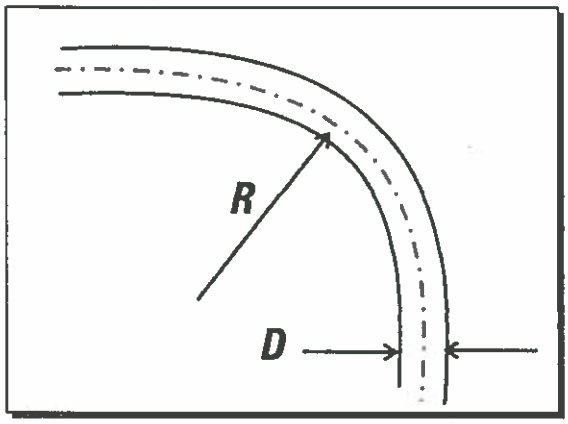

Figure 1. Bend Radius, R

Tightening the curvature of a pipeline results in a smaller (tighter) bend radius. The *minimum bend radius* is defined as the smallest radius to which the pipe may be safely curved.

The *minimum bend radius* for polyethylene pipe is given by Equation 1.

$$R = \alpha(OD) \qquad (1)$$

Where

R = *minimum bend radius* for the pipe (in)

α = *minimum bend ratio*

OD = pipe outside diameter (in)

October 2007 Supersedes all previous publications
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The longitudinal wall strain in a curved pipe is proportional to the bend ratio. Generally, the strain capacity of polyethylene is sufficiently safe for a bend ratio of 20. However, there is another limit to bending. Longitudinal bending induces ovality in the ring direction of the pipe thus reducing the resistance to kinking (local buckling). Thicker wall pipes have higher resistance to kinking and therefore can safely withstand more curvature than thinner wall pipes. Likewise, temporary curvature is less likely to cause kinking than permanent curvature because polyethylene's modulus decreases with time under load. Therefore, the *minimum bend ratio* depends on the DR and the duration of curvature. Table 1 contains *minimum long-term bend ratios* for DriscoPlex® pipe. Because fittings and flanges are rigid compared to pipe, the *minimum bend ratio* must be increased to 100 where fittings or flanges are present in the curve. The *long-term bend ratio* applies to installed pipe but it is also recommended for safely limiting curvature during handling and installation.

Table 1. Minimum Long-Term Bend Ratio for DriscoPlex® Pipe

Dimension Ratio, DR	*Minimum Bend Ratio, α*[1]
7	20
7.3	20
9	20
11	25
13.5	25
17	27
21	27
26	34
32.5	42
41	52
Fitting or flange present in bend	100

Example 1. What is the *minimum bend radius* for a 12" IPS DR17 pipe?

Solution: Find the *minimum bend ratio* in Table 1 for DR17 pipe and solve Equation 1 for the *minimum bend radius.*

$$R = \alpha(OD) = 27\,(12.75\,in) = 344.25\,in = 28.7\,ft$$

[1] See limitations for horizontal directional drilling.

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Installation of Pipe in Curves

Field bending involves excavating the trench to the desired bend radius, then sweeping or pulling the pipe string into the required bend and placing it in the trench. Temporary restraints may be required to bend the pipe, and to maintain the bend while placing the pipe in the trench and placing initial backfill. Temporary blocks or restraints must be removed before installing final backfill, and any voids must be filled with compacted initial backfill material.

Considerable force may be required to field bend the pipe, and the pipe may spring back forcibly if the restraints slip or are inadvertently released while bending. Observe appropriate safety precautions during field bending.

Special Considerations for Horizontal Directional Drilling

Directional drillers prefer polyethylene pipe over other materials as it offers them more options in determining laydown locations. They can string the pipe around roadway curves and intersections that would be impossible to do with other types of pipes. The pipe's flexibility allows installers to string pipe perpendicular to the direction of the bore and then sweep the pipe through a tight curve into the bore for pullback and it allows the driller to locate the break-over section closer to the bore. For large diameter pipe installations drillers can usually get by with a single small crane at the break-over as opposed to steel pipes which need multiply cranes. Even though stringing is a temporary condition, Table 1 is recommended for calculating the *minimum bend radius* as the pipe may remain curved for several hours or even days and be exposed to the sun.

The amount of permissible curvature in the bore itself is generally limited by the drill stem's bending capability and not the polyethylene pipe. **However, due to the increased stress in the pipe during a directional drill, the minimum bend ratio in the bore itself should not be less than two times the value shown in Table 1.** For example, a 36" IPS DR 13.5 pipe has a *minimum bend radius* of 75 feet for an open cut installation. In a bore the same pipe would have a *minimum bend radius* of two times 75 feet or 150 feet. The larger radius is rarely a limitation for the driller as the drill stem used with this size pipe (5") generally has at least a 700 foot bend radius.

Special Considerations for Plowing and Planting

Plowing and planting involve cutting a narrow trench, and feeding the pipe into the trench through a shoe or chute fitted just behind the trench cutting equipment. The shoe or chute feeds the pipe into the bottom of the cut. The *minimum bend radius* of the pipe through the shoe may be tighter than the *minimum bend radius* of the pipe used for a permanent long-term installation, but it must not be so tight that the pipe kinks. Table 2 presents the *minimum short-term bend ratio* for applications such as plowing and planting. The pipe's path through the shoe or chute should be as friction free as practicable to reduce additional outerfiber tensile stresses. Generally plowing and planting is limited to 12" and smaller pipes.

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Table 2. Minimum Short-Term Bending Radius

Pipe Dimension Ratio	*Minimum Short-Term Bend Ratio,* α_{ST}
7.3	10
9	10
11	13
13.5	13
17	17
21	17

Summary

Field bending of polyethylene pipes often eliminates the need for fittings. An example is bending the pipe to align it with the curvature in a cul-de-sac. The bending flexibility of polyethylene pipe allows for its installation by trenchless methods, such as sliplining, pipe bursting, and directional drilling and by submerging off shore. To ensure maximum performance of the pipe limit the *minimum long-term bend radius* of pipeline curves to the values given in Table 1.

NOTICE. This publication is intended for use as a guide to support the designer of piping systems, but it should not be used in place of the advice of a professional engineer. Performance Pipe has made every reasonable effort to ensure the accuracy of this publication, but it may not provide all necessary information, particularly with respect to special or unusual applications. This publication may be changed from time to time without notice. The most current version will be available on our website at www.PerformancePipe.com.

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DRISCOPLEX® 4000/4100 Series Municipal and Industrial HDPE Pipe

DRISCOPLEX® HDPE Pipe is available to meet your needs in compliance with ASTM D3035/AWWA C901 or ASTM F714/AWWA C906 and NSF/ANSI 61 product standards. Factory Mutual FM1613 product standard is also available.

Produced from only the highest rated HDPE pipe material, DRISCOPLEX® 4000/4100 Series Pipe is manufactured from PE4710 resin as listed in PPI-TR4.

DRISCOPLEX® HDPE Pipe Advantages:

- ✓ Durable
- ✓ Leak Tight
- ✓ Excellent Flow
- ✓ Low Surge
- ✓ Fatigue Free
- ✓ Impact Resistant
- ✓ Trenchless Install
- ✓ Bend Radius
- ✓ Chemical Resistant
- ✓ UV Protection
- ✓ Flexibility
- ✓ Environmental

Optional Color Stripes to Identify the Application	
Color	**Application**
Blue	Potable Water
Green	Wastewater
Purple	Treated Effluent, Reclaimed Water
Red	Factory Mutual, Underground Fire Main
White – Gray – Brown	Customer Specified

Standard product is solid black with no stripes. IPS – 4 single stripes / DIPS – 3 sets of dual stripes.
Factory Mutual FM1613 pipe available as DriscoPlex® 4000/4100 FM.
Available in DR 9 (PC 200 psi) and DR 11 (PC 150 psi) sizes.

NSF FM Approvals

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DRISCOPLEX® 4000/4100 Series

DriscoPlex® Series Pipe Material Physical Properties		
Property	**Standard**	**Typical Value†**
Material Designation	ASTM F714	PE4170
Cell Classification	ASTM D3350	445574C (black)
Density [4]	ASTM D1505	0.960 g/cc (black)
Melt Index [4]	ASTM D1238	0.08 g/10 min
Flexural Modulus [5]	ASTM D790	>120,000 psi
Tensile Strength [5]	ASTM D638 Type IV	>3500 psi
SCG (PENT) [7]	ASTM F1473	>500 hours
HDB at 73°F (23°C) [4]	ASTM D2837	1600 psi
Color; UV stabilizer [C] [E]	ASTM D3350	Black Color with UV Stabilizer

This is not a product specification and does not guarantee or establish specific minimum or maximum values or manufacturing tolerance for material or piping products to be supplied. Values obtained from tests of specimens taken from piping product may vary from these typical values.

Additional Sizes and DR available. Contact Performance Pipe or visit www.performancepipe.com

Selected Dimension Ratios for DriscoPlex® 4000 DIPS Pipe
(Additional Sizes and DR's available. Contact Performance Pipe)

DIPS		DR 17			DR 11		
ASTM F714 PR		PR = 125 psi			PR = 200 psi		
AWWA C906 PC		PC = 100 psi			PC = 160 psi		
Pipe Size, in.	OD, in.	Min Wall in.	Avg. ID in.	Wgt. lbs/ft	Min Wall in.	Avg. ID in.	Wgt. lbs/ft
4	4.80	0.282	4.201	1.76	0.436	3.876	2.62
6	6.90	0.406	6.040	3.64	0.627	5.571	5.42
8	9.05	0.532	7.921	6.26	0.823	7.305	9.33
10	11.10	0.653	9.716	9.42	1.009	8.961	14.03
12	13.20	0.776	11.554	13.32	1.200	10.656	19.84
14	15.30	0.900	13.392	17.89	1.391	12.351	26.65
16	17.40	1.024	15.230	23.14	1.582	14.046	34.47
18	19.50	1.147	17.068	29.07	1.773	15.741	43.30
20	21.60	1.271	18.906	35.68	1.964	17.436	53.13
24	25.80	1.518	22.583	50.88	2.345	20.829	75.77
30	32.00	1.882	28.009	78.28	2.909	25.833	116.58
36	38.30	2.253	33.524	112.13	3.482	30.918	167.02
42	44.50	2.618	38.951	151.37			

Selected Dimension Ratios for DriscoPlex® 4100 IPS Pipe
(Additional Sizes and DR's available. Contact Performance Pipe)

IPS		DR 17			DR 11		
ASTM F714 PR		PR = 125 psi			PR = 200 psi		
AWWA C906 PC		PC = 100 psi			PC = 160 psi		
Pipe Size, in.	OD, in.	Min Wall in.	Avg. ID in.	Wgt. lbs/ft	Min Wall in.	Avg. ID in.	Wgt. lbs/ft
2	2.375	0.140	2.078	0.43	0.216	1.917	0.64
3	3.50	0.206	3.063	0.94	0.318	2.826	1.39
4	4.50	0.265	3.938	1.55	0.409	3.633	2.31
6	6.63	0.390	5.798	3.36	0.602	5.349	5.00
8	8.63	0.507	7.550	5.69	0.784	6.963	8.47
10	10.75	0.632	9.410	8.83	0.977	8.679	13.16
12	12.75	0.750	11.160	12.43	1.159	10.293	18.51
14	14.00	0.824	12.253	14.98	1.273	11.301	22.32
16	16.00	0.941	14.005	19.57	1.455	12.915	29.15
18	18.00	1.059	15.755	24.77	1.636	14.532	36.89
20	20.00	1.176	17.507	30.58	1.818	16.146	45.54
22	22.00	1.294	19.257	37.00	2.000	17.760	55.10
24	24.00	1.412	21.007	44.03	2.182	19.374	65.58
26	26.00	1.529	22.759	51.67	2.364	20.988	76.96
28	28.00	1.647	24.508	59.93	2.545	22.605	89.26
30	30.00	1.765	26.258	68.80	2.727	24.219	102.47
32	32.00	1.882	28.010	78.28	2.909	25.833	116.58
34	34.00	2.000	29.760	88.37	3.091	27.447	131.61
36	36.00	2.118	31.510	99.07	3.273	29.061	147.55
42	42.00	2.471	36.761	134.84	3.818	33.905	200.84
48	48.00	2.824	42.013	176.12			
54	54.00	3.176	47.266	222.90			

This product flyer is intended for reference purposes. It should not be used in place of the advice from a licensed Professional Engineer. Pressure Ratings and Pressure Class are based on operating temperature up to 80°F. Pressure class is based on a 0.5 Design Factor for water application from AWWA while Pressure Rating is based on a 0.63 Design Factor per PPI TR-41. Average inside diameter is calculated using Nominal OD and Minimum Wall plus 6% for use in estimating fluid flow. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimensions and tolerances in the applicable pipe manufacturing specification. Additional information available at www.performancepipe.com

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Revised 06-28-2013

IPS Size and Dimension Data

PE4710 (PE3408)

DriscoPlex® Municipal, Industrial & Energy Series

Pressure Ratings are calculated using 0.63 design factor for HDS at 73°F as listed in PPI TR-4 for PE 4710 materials. HDPE can accomodate up to 1.5 times the pipe pressure rating for a recurring surge and up to 2.0 times the pipe pressure rating for an occasional surge. Temperature, Chemical, and Environmental use considerations may require use of additional design factors.

Pressure Rating		317 psi DR 7.3			250 psi DR 9.0			200 psi DR 11.0			160 psi DR 13.5			
Nominal Pipe Size	IPS OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Nominal Pipe Size
1 1/4"	1.660	0.227	1.179	0.45	0.184	1.270	0.37	0.151	1.340	0.31	0.123	1.399	0.26	1 1/4"
1 1/2"	1.900	0.260	1.349	0.59	0.211	1.453	0.49	0.173	1.533	0.41	0.141	1.601	0.34	1 1/2"
2"	2.375	0.325	1.686	0.92	0.264	1.815	0.77	0.216	1.917	0.64	0.176	2.002	0.53	2"
3"	3.500	0.479	2.485	1.99	0.389	2.675	1.66	0.318	2.826	1.39	0.259	2.951	1.16	3"
4"	4.500	0.616	3.194	3.29	0.500	3.440	2.75	0.409	3.633	2.31	0.333	3.794	1.92	4"
6"	6.625	0.908	4.700	7.12	0.736	5.065	5.96	0.602	5.349	5.00	0.491	5.584	4.15	6"
8"	8.625	1.182	6.119	12.07	0.958	6.594	10.11	0.784	6.963	8.47	0.639	7.270	7.04	8"
10"	10.750	1.473	7.627	18.75	1.194	8.219	15.70	0.977	8.679	13.16	0.796	9.062	10.93	10"
12"	12.750	1.747	9.046	26.38	1.417	9.746	22.08	1.159	10.293	18.51	0.944	10.749	15.38	12"
14"	14.000	1.918	9.934	31.81	1.556	10.701	26.63	1.273	11.301	22.32	1.037	11.802	18.54	14"
16"	16.000	2.192	11.353	41.55	1.778	12.231	34.78	1.455	12.915	29.15	1.185	13.488	24.22	16"
18"	18.000	2.466	12.772	52.58	2.000	13.760	44.02	1.636	14.532	36.89	1.333	15.174	30.65	18"
20"	20.000	2.740	14.191	64.91	2.222	15.289	54.34	1.818	16.146	45.54	1.481	16.860	37.84	20"
22"	22.000	3.014	15.610	78.55	2.444	16.819	65.75	2.000	17.760	55.10	1.630	18.544	45.79	22"
24"	24.000	3.288	17.029	93.48	2.667	18.346	78.25	2.182	19.374	65.58	1.778	20.231	54.49	24"
26"	26.000				2.889	19.875	91.84	2.364	20.988	76.96	1.926	21.917	63.95	26"
28"	28.000				3.111	21.405	106.51	2.545	22.605	89.26	2.074	23.603	74.17	28"
30"	30.000				3.333	22.934	122.27	2.727	24.219	102.47	2.222	25.289	85.14	30"
32"	32.000				3.556	24.462	139.12	2.909	25.833	116.58	2.370	26.976	96.87	32"
34"	34.000				3.778	25.991	157.05	3.091	27.447	131.61	2.519	28.660	109.36	34"
36"	36.000				4.000	27.520	176.07	3.273	29.061	147.55	2.667	30.346	122.60	36"
42"	42.000							3.818	33.906	200.84	3.111	35.405	166.88	42"
48"	48.000													48"
54"	54.000													54"

This size and dimension chart is intended for reference purposes. It should not be used in place of the advice from a licensed Professional Engineer. Pipe weights are calculated in accordance with PPI TR-7. Average inside diameter is calculated using IPS OD and Minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimension and tolerances in the applicable pipe manufacturing specification.

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Revised 06/28/2013

IPS Size and Dimension Data

PE4710 (PE3408)

DriscoPlex® Municipal, Industrial & Energy Series

Pressure Ratings are calculated using 0.63 design factor for HDS at 73°F as listed in PPI TR-4 for PE 4710 materials. HDPE can accomodate up to 1.5 times the pipe pressure rating for a recurring surge and up to 2.0 times the pipe pressure rating for an occasional surge. Temperature, Chemical, and Environmental use considerations may require use of additional design factors.

Pressure Rating		125 psi DR 17.0			100 psi DR 21.0			80 psi DR 26.0			63 psi DR 32.5			
Nominal Pipe Size	IPS OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Nominal Pipe Size
1 1/4"	1.660													1 1/4"
1 1/2"	1.900													1 1/2"
2"	2.375	0.140	2.078	0.43										2"
3"	3.500	0.206	3.063	0.94										3"
4"	4.500	0.265	3.938	1.55	0.214	4.046	1.27							4"
6"	6.625	0.390	5.798	3.36	0.315	5.957	2.75	0.255	6.084	2.24	0.204	6.193	1.81	6"
8"	8.625	0.507	7.550	5.69	0.411	7.754	4.66	0.332	7.921	3.80	0.265	8.063	3.07	8"
10"	10.750	0.632	9.410	8.83	0.512	9.665	7.24	0.413	9.874	5.91	0.331	10.048	4.77	10"
12"	12.750	0.750	11.160	12.43	0.607	11.463	10.19	0.490	11.711	8.31	0.392	11.919	6.71	12"
14"	14.000	0.824	12.253	14.98	0.667	12.586	12.28	0.538	12.859	10.02	0.431	13.086	8.09	14"
16"	16.000	0.941	14.005	19.57	0.762	14.385	16.04	0.615	14.696	13.09	0.492	14.957	10.56	16"
18"	18.000	1.059	15.755	24.77	0.857	16.183	20.30	0.692	16.533	16.57	0.554	16.826	13.37	18"
20"	20.000	1.176	17.507	30.58	0.952	17.982	25.07	0.769	18.370	20.45	0.615	18.696	16.50	20"
22"	22.000	1.294	19.257	37.00	1.048	19.778	30.33	0.846	20.206	24.75	0.677	20.565	19.97	22"
24"	24.000	1.412	21.007	44.03	1.143	21.577	36.10	0.923	22.043	29.45	0.738	22.435	23.76	24"
26"	26.000	1.529	22.759	51.67	1.238	23.375	42.36	1.000	23.880	34.57	0.800	24.304	27.89	26"
28"	28.000	1.647	24.508	59.93	1.333	25.174	49.13	1.077	25.717	40.09	0.862	26.173	32.34	28"
30"	30.000	1.765	26.258	68.80	1.429	26.971	56.40	1.154	27.554	46.02	0.923	28.043	37.13	30"
32"	32.000	1.882	28.010	78.28	1.524	28.769	64.17	1.231	29.390	52.36	0.985	29.912	42.24	32"
34"	34.000	2.000	29.760	88.37	1.619	30.568	72.44	1.308	31.227	59.11	1.046	31.782	47.69	34"
36"	36.000	2.118	31.510	99.07	1.714	32.366	81.21	1.385	33.064	66.27	1.108	33.651	53.46	36"
42"	42.000	2.471	36.761	134.84	2.000	37.760	110.54	1.615	38.576	90.20	1.292	39.261	72.77	42"
48"	48.000	2.824	42.013	176.12	2.286	43.154	144.38	1.846	44.086	117.81	1.477	44.869	95.05	48"
54"	54.000	3.176	47.266	222.90	2.571	48.549	182.73	2.077	49.597	149.10	1.662	50.477	120.29	54"

This size and dimension chart is intended for reference purposes. It should not be used in place of the advice from a licensed Professional Engineer. Pipe weights are calculated in accordance with PPI TR-7. Average inside diameter is calculated using IPS OD and Minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimension and tolerances in the applicable pipe manufacturing specification.

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Appendix B: SUBMERSIBLE EFFLUENT PUMPS CHARTS AND SPECIFICATIONS

Technical Data Sheet

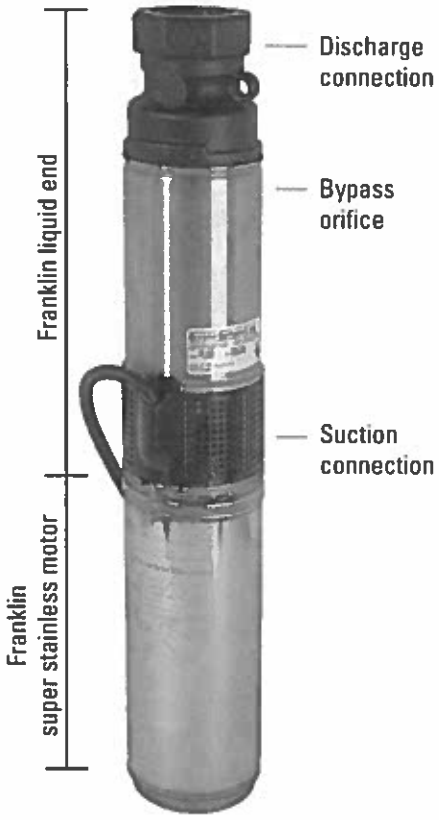
PF Series 4" (100 mm) Submersible Effluent Pumps

Orenco Systems® Incorporated
800-348-9843

Applications

Our 4" (100 mm) Submersible Effluent Pumps are designed to transport screened effluent (with low TSS counts) from septic tanks or separate dosing tanks. All our pumps are constructed of lightweight, corrosion-resistant stainless steel and engineered plastics; all are field-serviceable and repairable with common tools; and all 60-Hz PF Series models are CSA certified to the U.S. and Canadian safety standards for effluent pumps, meeting UL requirements.

Orenco's Effluent Pumps are used in a variety of applications, including pressurized drainfields, packed bed filters, mounds, aerobic units, effluent irrigation, effluent sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault or after a secondary treatment system.



C US
LR80980
LR2053896

Powered by Franklin Electric

Features/Specifications

To specify this pump for your installation, require the following:

- Minimum 24-hour run-dry capability with no deterioration in pump life or performance*
- ⅛-inch (3-mm) bypass orifice (patent pending) to ensure flow recirculation for motor cooling and to prevent air bind
- Liquid end repair kits available for better long-term cost of ownership
- TRI-SEAL™ floating impeller design on 10, 15, 20, and 30 gpm (0.6, 1.3, and 1.9 L/sec) models; floating stack design on 50 and 75 gpm (3.2 and 4.7 L/sec) models
- Super stainless Franklin Electric motor, rated for continuous use and frequent cycling
- Type SOOW 600-V motor cable (suitable for Class I, Division 1 and Division 2 applications)
- Five-year warranty on pump or retrofit liquid end from date of manufacture against defects in materials or workmanship

** Not applicable for 5-hp (3.73 kW) models*

Standard Models

See specifications chart, pages 2-3, for a list of standard pumps. For a complete list of available pumps, call Orenco.

Nomenclature

PF [10] [05] [1] [1] - [ ]

Cord length, ft (m):
Blank = 10 (3) 20[1] = 20 (6)
30 = 30 (9) 50 = 50 (15)

Voltage, nameplate:
1 = 115[2] 200 = 200
2 = 230[3] 4 = 460

Frequency:
1 = single-phase 60 Hz 3 = three-phase 60 Hz
5 = single-phase 50 Hz

Horsepower (kW):
03 = ⅓ hp (0.25) 05 = ½ hp (0.37)
07 = ¾ hp (0.56) 10 = 1 hp (0.75)
15 = 1-½ hp (1.11) 20 = 2 hp (1.50)
30 = 3 hp (2.24) 50 = 5 hp (3.73)

Nominal flow, gpm (L/sec):
10 = 10 (0.6) 15 = 15 (1.0)
20 = 20 (1.3) 30 = 30 (1.9)
50 = 50 (3.2) 75 = 75 (4.7)

Pump (PF Series)

[1] Note: 20-foot cords are available only for single-phase pumps through 1-½ hp
[2] ½-hp (0.37kW) only
[3] 220 volts for 50 Hz pumps

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PF Series 4" Submersible Effluent Pumps

Specifications, 60 Hz

Pump Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Impellers	Discharge size and material[1]	Length, in. (mm)	Min. liquid level,[2] in. (mm)	Weight,[3] lb (kg)	Rated cycles/day
PF100511	10 (0.6)	0.50 (0.37)	1	115	120	12.7	12.7	6	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100512	10 (0.6)	0.50 (0.37)	1	230	240	6.3	6.3	6	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF10053200	10 (0.6)	0.50 (0.37)	3	200	208	3.8	3.8	6	1 ¼ in. GFP	23.0 (660)	16 (406)	26 (12)	300
PF100712 [4, 5]	10 (0.6)	0.75 (0.56)	1	230	240	8.3	8.3	8	1 ¼ in. GFP	25.9 (658)	17 (432)	30 (14)	300
PF10073200 [4, 5]	10 (0.6)	0.75 (0.56)	3	200	208	5.1	5.2	8	1 ¼ in. GFP	25.4 (645)	17 (432)	31 (14)	300
PF101012 [5, 6]	10 (0.6)	1.00 (0.75)	1	230	240	9.6	9.6	9	1 ¼ in. GFP	27.9 (709)	18 (457)	33 (15)	100
PF10103200 [5, 6]	10 (0.6)	1.00 (0.75)	3	200	208	5.5	5.5	9	1 ¼ in. GFP	27.3 (693)	18 (457)	37 (17)	300
PF102012 [5, 6, 7, 8]	10 (0.6)	2.00 (1.49)	1	230	240	12.1	12.1	18	1 ¼ in. SS	39.5 (1003)	22 (559)	48 (22)	100
PF102032 [5, 6, 8]	10 (0.6)	2.00 (1.49)	3	230	240	7.5	7.6	18	1 ¼ in. SS	37.9 (963)	20 (508)	44 (20)	300
PF10203200 [5, 6, 8]	10 (0.6)	2.00 (1.49)	3	200	208	8.7	8.7	18	1 ¼ in. SS	37.9 (963)	20 (508)	44 (20)	300
PF150311	15 (1.0)	0.33 (0.25)	1	115	120	8.7	8.8	3	1 ¼ in. GFP	19.5 (495)	15 (380)	23 (10)	300
PF150312	15 (1.0)	0.33 (0.25)	1	230	240	4.4	4.5	3	1 ¼ in. GFP	19.5 (495)	15 (380)	23 (10)	300
PF200511	20 (1.5)	0.50 (0.37)	1	115	120	12.3	12.5	4	1 ¼ in. GFP	22.3 (566)	18 (457)	25 (11)	300
PF200512	20 (1.5)	0.50 (0.37)	1	230	240	6.4	6.5	4	1 ¼ in. GFP	22.5 (572)	18 (457)	26 (12)	300
PF20053200	20 (1.5)	0.50 (0.37)	3	200	208	3.7	3.8	4	1 ¼ in. GFP	22.3 (566)	18 (457)	26 (12)	300
PF201012 [4, 5]	20 (1.5)	1.00 (0.75)	1	230	240	10.5	10.5	7	1 ¼ in. GFP	28.4 (721)	20 (508)	33 (15)	100
PF20103200 [4, 5]	20 (1.5)	1.00 (0.75)	3	200	208	5.8	5.9	7	1 ¼ in. GFP	27.8 (706)	20 (508)	33 (15)	300
PF201512 [4, 5]	20 (1.5)	1.50 (1.11)	1	230	240	12.4	12.6	9	1 ¼ in. GFP	34.0 (864)	24 (610)	41 (19)	100
PF20153200 [4, 5]	20 (1.5)	1.50 (1.11)	3	200	208	7.1	7.2	9	1 ¼ in. GFP	30.7 (780)	20 (508)	35 (16)	300
PF300511	30 (1.9)	0.50 (0.37)	1	115	120	11.8	11.8	3	1 ¼ in. GFP	21.3 (541)	20 (508)	28 (13)	300
PF300512	30 (1.9)	0.50 (0.37)	1	230	240	6.2	6.2	3	1 ¼ in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF30053200	30 (1.9)	0.50 (0.37)	3	200	208	3.6	3.6	3	1 ¼ in. GFP	21.3 (541)	20 (508)	25 (11)	300
PF300712	30 (1.9)	0.75 (0.56)	1	230	240	8.5	8.5	5	1 ¼ in. GFP	24.8 (630)	21 (533)	29 (13)	300
PF30073200	30 (1.9)	0.75 (0.56)	3	200	208	4.9	4.9	5	1 ¼ in. GFP	24.6 (625)	21 (533)	30 (14)	300
PF301012 [4]	30 (1.9)	1.00 (0.75)	1	230	240	10.4	10.4	6	1 ¼ in. GFP	27.0 (686)	22 (559)	32 (15)	100
PF30103200 [4]	30 (1.9)	1.00 (0.75)	3	200	208	5.8	5.8	6	1 ¼ in. GFP	26.4 (671)	22 (559)	33 (15)	300
PF301512 [4, 5]	30 (1.9)	1.50 (1.11)	1	230	240	12.6	12.6	8	1 ¼ in. GFP	32.8 (833)	24 (610)	40 (18)	100
PF30153200 [4, 5]	30 (1.9)	1.50 (1.11)	3	200	208	6.9	6.9	8	1 ¼ in. GFP	29.8 (757)	22 (559)	34 (15)	300
PF301534 [4, 5]	30 (1.9)	1.50 (1.11)	3	460	480	2.8	2.8	8	1 ¼ in. GFP	29.5 (685)	22 (559)	34 (15)	300
PF302012 [5, 6, 7]	30 (1.9)	2.00 (1.49)	1	230	240	11.0	11.0	10	1 ¼ in. SS	35.5 (902)	26 (660)	44 (20)	100
PF30203200 [5, 6]	30 (1.9)	2.00 (1.49)	3	200	208	9.3	9.3	10	1 ¼ in. SS	34.0 (864)	24 (610)	41 (19)	300
PF303012 [5, 6, 7, 8]	30 (1.9)	3.00 (2.23)	1	230	240	16.8	16.8	14	1 ¼ in. SS	44.5 (1130)	33 (838)	54 (24)	100
PF303032 [5, 6, 8]	30 (1.9)	3.00 (2.23)	3	230	240	10.0	10.1	14	1 ¼ in. SS	44.3 (1125)	27 (686)	52 (24)	300
PF305012 [5, 6, 7, 8]	30 (1.9)	5.00 (3.73)	1	230	240	25.6	25.8	23	1 ¼ in. SS	66.5 (1689)	53 (1346)	82 (37)	100
PF305032 [5, 6, 8]	30 (1.9)	5.00 (3.73)	3	230	240	16.6	16.6	23	1 ¼ in. SS	60.8 (1544)	48 (1219)	66 (30)	300
PF30503200 [5, 6, 8]	30 (1.9)	5.00 (3.73)	3	200	208	18.7	18.7	23	1 ¼ in. SS	60.8 (1544)	48 (1219)	66 (30)	300
PF500511	50 (3.2)	0.50 (0.37)	1	115	120	12.1	12.1	2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500512	50 (3.2)	0.50 (0.37)	1	230	240	6.2	6.2	2	2 in. SS	20.3 (516)	24 (610)	27 (12)	300
PF500532	50 (3.2)	0.50 (0.37)	3	230	240	3.0	3.0	2	2 in. SS	20.3 (516)	24 (610)	28 (13)	300
PF50053200	50 (3.2)	0.50 (0.37)	3	200	208	3.7	3.7	2	2 in. SS	20.3 (516)	24 (610)	28 (13)	300
PF500534	50 (3.2)	0.50 (0.37)	3	460	480	1.5	1.5	2	2 in. SS	20.3 (516)	24 (610)	28 (13)	300
PF500712	50 (3.2)	0.75 (0.56)	1	230	240	8.5	8.5	3	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF500732	50 (3.2)	0.75 (0.56)	3	230	240	3.9	3.9	3	2 in. SS	23.7 (602)	25 (635)	32 (15)	300
PF50073200	50 (3.2)	0.75 (0.56)	3	200	208	4.9	4.9	3	2 in. SS	23.1 (587)	26 (660)	32 (15)	300

Continued on next page

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PF Series 4" Submersible Effluent Pumps

Specifications, 60 Hz (continued)

Pump Model	Design gpm (L/sec)	Horsepower (kW)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Impellers	Discharge size and material[1]	Length, in. (mm)	Min. liquid level,[2] in. (mm)	Weight,[3] lb (kg)	Rated cycles/day
PF500734	50 (3.2)	0.75 (0.56)	3	460	480	1.8	1.8	3	2 in. SS	34.8 (884)	25 (635)	31 (14)	300
PF501012	50 (3.2)	1.00 (0.75)	1	230	240	10.1	10.1	4	2 in. SS	27.0 (686)	26 (660)	35 (16)	100
PF50103200	50 (3.2)	1.00 (0.75)	3	200	208	5.7	5.7	4	2 in. SS	26.4 (671)	26 (660)	39 (18)	300
PF501034	50 (3.2)	1.00 (0.75)	3	460	480	2.2	2.2	4	2 in. SS	26.4 (671)	26 (660)	39 (18)	300
PF501512[4]	50 (3.2)	1.50 (1.11)	1	230	240	12.5	12.6	5	2 in. SS	32.5 (826)	30 (762)	41 (19)	100
PF50153200[4]	50 (3.2)	1.50 (1.11)	3	200	208	7.0	7.0	5	2 in. SS	29.3 (744)	26 (660)	35 (16)	300
PF503012[4, 5, 7, 8]	50 (3.2)	3.00 (2.23)	1	230	240	17.7	17.7	8	2 in. SS	43.0 (1092)	37 (940)	55 (25)	100
PF50303200[4, 5, 8]	50 (3.2)	3.00 (2.23)	3	200	208	13.1	13.1	8	2 in. SS	43.4 (1102)	30 (762)	55 (25)	300
PF503034 [4, 5, 8]	50 (3.2)	3.00 (2.23)	3	460	480	5.3	5.3	8	2 in. SS	40.0 (1016)	31 (787)	55 (25)	300
PF505012 [5,6,7,8]	50 (3.2)	5.00 (3.73)	1	230	240	26.2	26.4	13	2 in. SS	65.4 (1661)	55 (1397)	64 (29)	300
PF505032 [5,6,7,8]	50 (3.2)	5.00 (3.73)	3	230	240	16.5	16.5	13	2 in. SS	59.3 (1506)	49 (1245)	64 (29)	300
PF751012	75 (4.7)	1.00 (0.75)	1	230	240	9.9	10.0	3	2 in. SS	27.0 (686)	27 (686)	34 (15)	100
PF751512	75 (4.7)	1.50 (1.11)	1	230	240	12.1	12.3	4	2 in. SS	33.4 (848)	30 (762)	44 (20)	100

Specifications, 50 Hz,

Pump Model													
PF100552	10 (0.6)	0.50 (0.37)	1	220	230	3.9	4.1	6	1 ¼ in. GFP	23.0 (584)	17 (432)	26 (12)	300
PF100752 [4, 5]	10 (0.6)	0.75 (0.56)	1	220	230	6.2	6.2	9	1 ¼ in. GFP	26.8 (658)	17 (432)	30 (14)	300
PF101552 [5, 6]	10 (0.6)	1.50 (1.11)	1	220	230	10.5	11.4	18	1 ¼ in. SS	39.5 (1003)	22 (559)	46 (21)	300
PF300552	30 (1.9)	0.50 (0.37)	1	220	230	4.1	4.1	4	1 ¼ in. GFP	22.5 (572)	19 (483)	26 (12)	300
PF300752	30 (1.9)	0.75 (0.56)	1	220	230	6.1	6.1	5	1 ¼ in. GFP	24.8 (630)	19 (483)	29 (13)	300
PF301052	30 (1.9)	1.00 (0.75)	1	220	230	7.4	7.4	7	1 ¼ in. GFP	28.4 (721)	20 (508)	32 (15)	100
PF301552 [4, 5]	30 (1.9)	1.50 (1.11)	1	220	230	9.3	9.3	8	1 ¼ in. GFP	35.4 (899)	24 (610)	40 (18)	100
PF500552	50 (3.2)	0.50 (0.37)	1	220	230	4.0	4.0	2	2 in. SS	20.3 (516)	25 (635)	29 (13)	300
PF500752	50 (3.2)	0.75 (0.56)	1	220	230	6.3	6.4	3	2 in. SS	23.7 (602)	25 (635)	31 (14)	300
PF501052	50 (3.2)	1.00 (0.75)	1	220	230	7.3	7.4	4	2 in. SS	27.0 (686)	26 (660)	35 (16)	100
PF501552	50 (3.2)	1.50 (1.11)	1	220	230	9.1	9.1	5	2 in. SS	32.5 (826)	30 (762)	42 (19)	100
PF751052	75 (3.2)	1.00 (0.75)	1	220	230	7.3	7.3	4	2 in. SS	30.0 (762)	27 (686)	34 (15)	100

[1] GFP = glass-filled polypropylene; SS = stainless steel. The 1 ¼-in. NPT GFP discharge is 2 ⅛ in. octagonal across flats; the 1 ¼-in. NPT SS discharge is 2 ⅛ in. octagonal across flats; and the 2-in. NPT SS discharge is 2 ⅛ in. hexagonal across flats. Discharge is female NPT threaded, U.S. nominal size, to accommodate Orenco® discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect hose and valve assemblies to metric-sized piping.

[2] Minimum liquid level is for single pumps when installed in an Orenco Biotube® Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.

[3] Weight includes carton and 10-ft (3-m)cord.

[4] High-pressure discharge assembly required.

[5] Do not use cam-lock option (Q) on discharge assembly.

[6] Custom discharge assembly required for these pumps. Contact Orenco.

[7] Capacitor pack (sold separately or installed in a custom control panel) required for this pump. Contact Orenco.

[8] Torque locks are available for all pumps, and are supplied with 3-hp and 5-hp pumps.

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PF Series High-Head Effluent Pumps

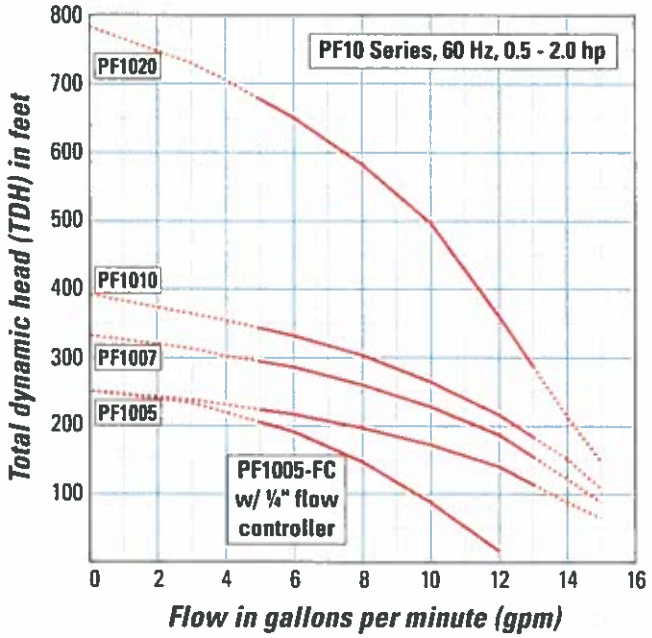
Materials of Construction

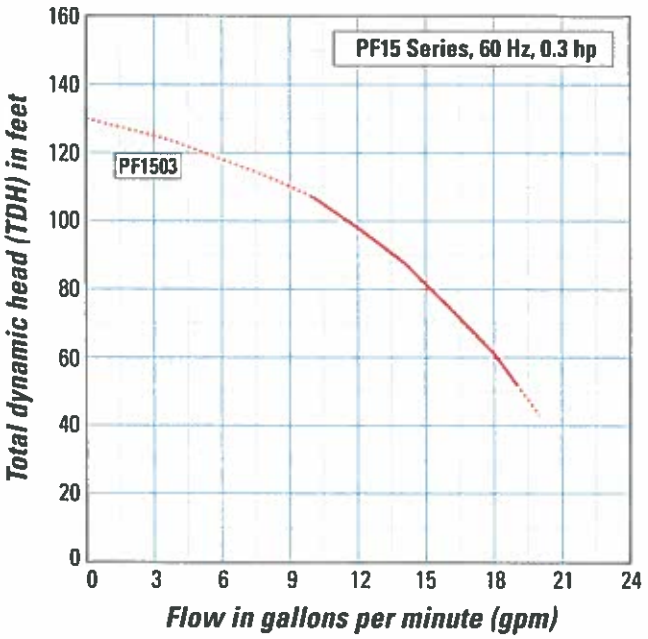
Discharge:	Glass-filled polypropylene or stainless steel
Discharge bearing:	Engineered thermoplastic (PEEK)
Diffusers:	Glass-filled PPO (Noryl GFN3)
Impellers:	Celcon® acetal copolymer on 10-, 20, and 30-gpm models; 50-gpm impellers are Noryl GFN3
Intake screen:	Polypropylene
Suction connection:	Stainless steel
Drive shaft:	7/16 inch hexagonal stainless steel, 300 series
Coupling:	Sintered stainless steel, 300 series
Shell:	Stainless steel, 300 series
Motor:	Franklin motor exterior constructed of stainless steel. Motor filled with deionized water and propylene glycol for constant lubrication. Hermetically sealed motor housing ensures moisture-free windings. All thrust absorbed by Kingsbury-type thrust bearing. Rated for continuous duty. Single-phase motors and 200 and 230 V 3-phase motors equipped with surge arrestors for added security. Single-phase motors through 1.5 hp (1.11 kW) have built-in thermal overload protection, which trips at 203-221° F (95-105° C).

Using a Pump Curve

A *pump curve* helps you determine the best pump for your system. Pump curves show the relationship between flow (gpm or L/sec) and pressure (total dynamic head, or TDH), providing a graphical representation of a pump's optimal performance range. Pumps perform best at their *nominal flow rate* — the value, measured in gpm, expressed by the first two numerals in an Orenco pump nomenclature. The graphs in this section show optimal pump operation ranges with a solid line. Flow flow rates outside of these ranges are shown with a dashed line. For most accurate pump specification, use Orenco's PumpSelect™ software.

Pump Curves, 60 Hz Models





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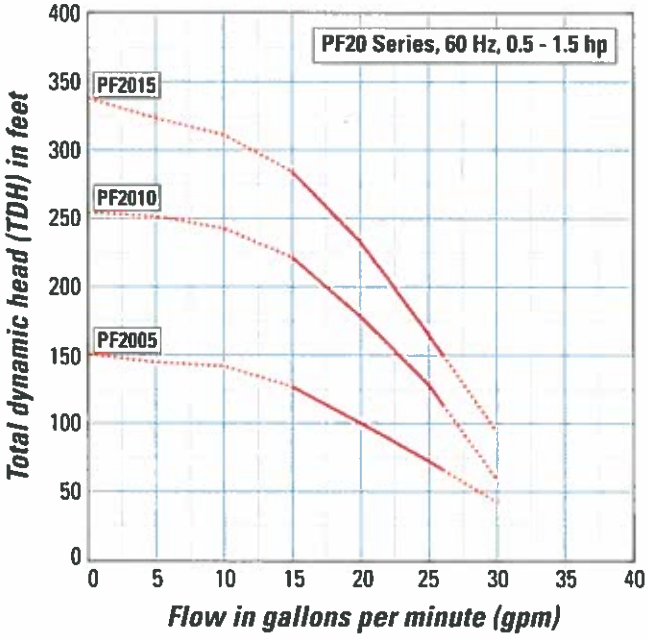
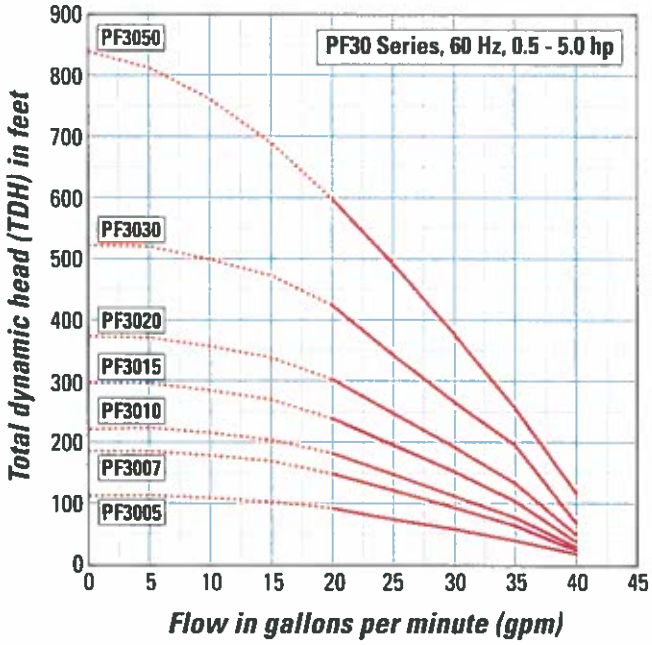
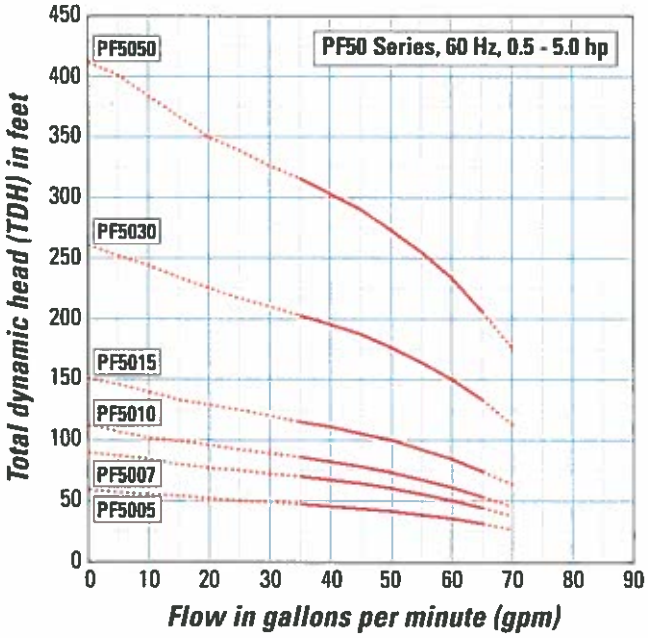
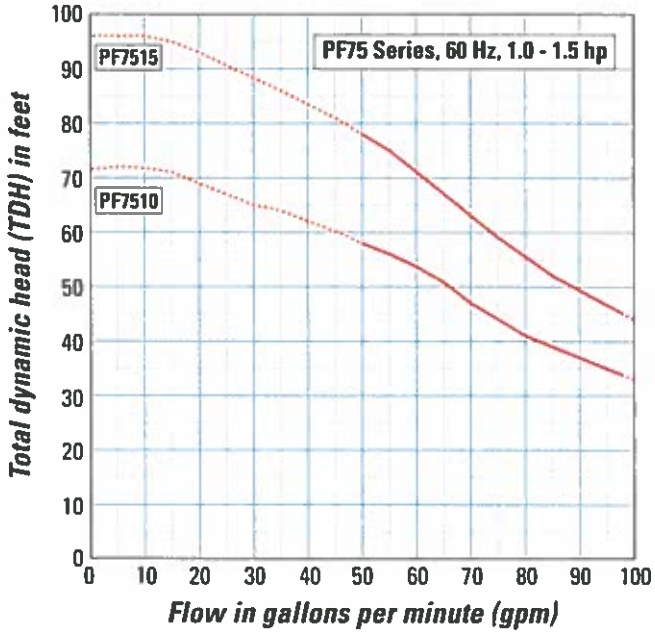
60 Hz Models (continued)









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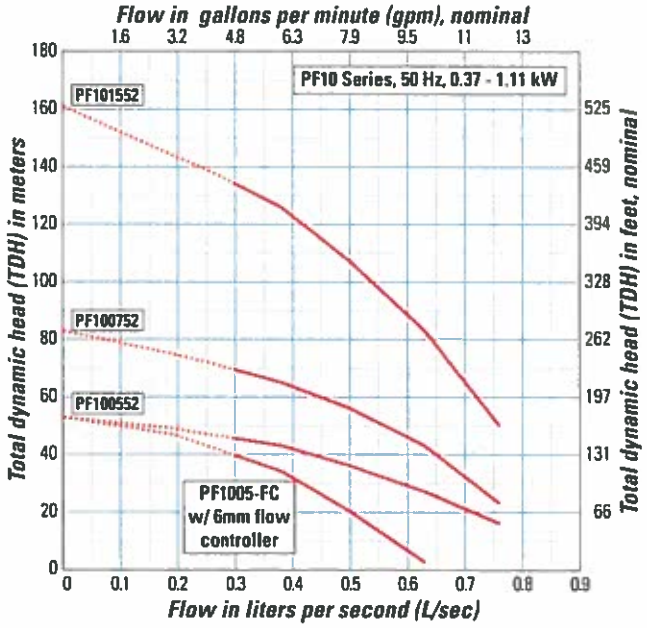
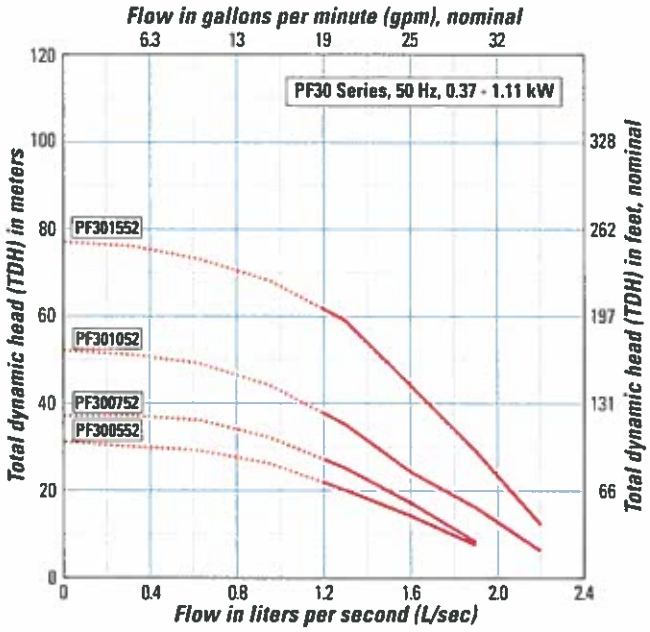
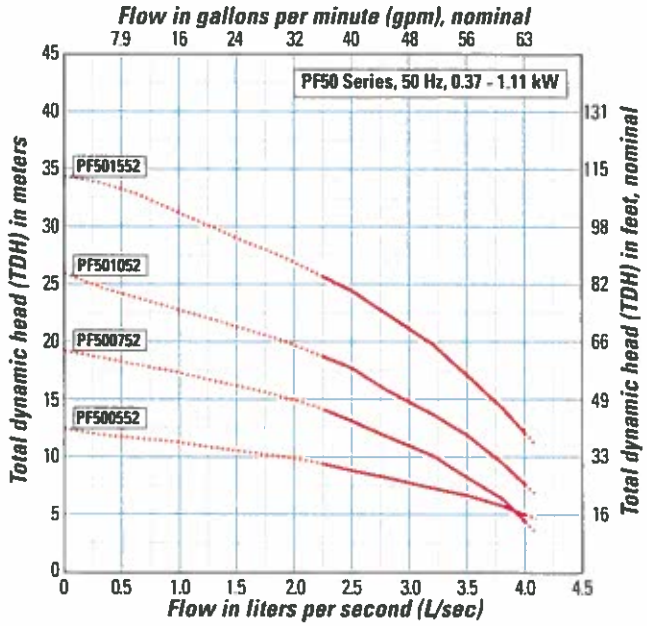
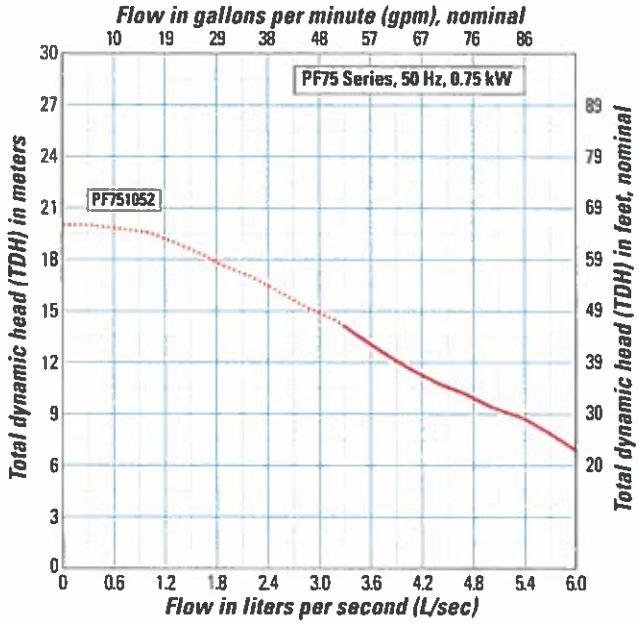
Pump Curves, 50 Hz Models









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Appendix C: ORENCO FORCE MAIN CALCULATIONS WITH HYDRAULIC GRADE LINE ANALYSIS REPORT

Hydraulic Grade Line Analysis of an Orenco® Sewer System

Project Name
Vintage Oaks at The Vineyard

Prepared for
Jeremy More, E.I.T.
M&S Engineering

Prepared by
Patrick Foley

Date
March 22, 2019

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SECTION 1: INTRODUCTION

The purpose of this analysis is to determine the delivery method, line size, and pump type necessary for a successful Orenco Sewer collection system for Vintage Oaks at the Vineyard – Phase 2. This report provides recommended pipe sizing.

Sections 2 explains the design methodologies of an Orenco Sewer (aka effluent sewer), the proposed pipe layout, and pump recommendations. Appendix A contains the report that contains the line sizes, lengths, and other pertinent data.

With an Orenco Sewer, raw sewage flows from the building to a watertight underground tank, where primary treatment occurs via settling and natural biological processes. Solids remain in the tank, decreasing in volume, which reduces biosolids treatment costs. Filtered liquid effluent is then discharged (by high-head pump) through small-diameter service lines to small-diameter collection lines. These service and collection lines are shallowly buried and follow the contour of the land. The entire system is watertight, reducing costs from infiltration. No expensive manholes or lift station are required and energy consumption is minimal.

An Orenco Sewer uses small diameter – typically 2”-6” – pipe that follows the contour of the land, to significantly reduce construction costs. Unlike conventional approaches, such as gravity or grinder systems, Orenco Sewers provide a modular solution that can be incrementally installed, resulting in lower up-front capital costs that do not unfairly burden initial users.

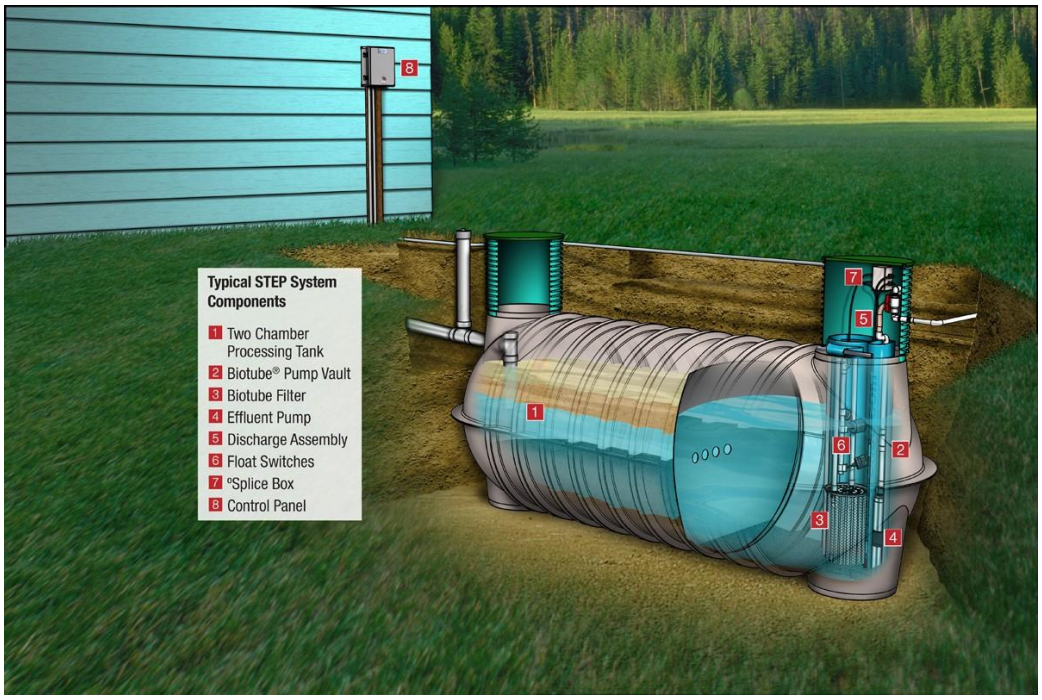

Figure 1. Typical STEP Systems Components

SECTION 2: DESIGN PARAMETERS AND HYDRAULIC MODEL

Information provided by the designer included flow parameters based on information provided by M&S Engineering. With this information a hydraulic grade line (HGL) was produced to analyze the proposed effluent sewer and determine effluent line diameters and pumps/ packages required. Please review the enclosed results to ensure the assumptions and conclusions are accurate.

Design Criteria:

The criteria used to analyze the system and make design recommendations is as follows:

- Limiting the Total Dynamic Head (TDH) in the system analysis to allow a single model of turbine pump to be used at all contribution points, or STEP connections.

Equivalent Dwelling Unit (EDU)

Equivalent dwellings units are used to describe the type of connection and the contributing flow rate that is generated. The standard density of the EDU is 3 but this value can be changed to reflect the specific application and can therefore change the amount of wastewater flow generated.

Flow Rate

The Simplified Equation is the most common rational method used for determining peak flows in the collection lines (USEPA, 1991)

$Q_p = A\,N + B$

Where:

- Q_p = Peak flow in collection line, gpm
- A = Coefficient, typically 0.5 (assumes P_c = 3 capita/EDU, Q_c = 150 gpd/EDU)
- N = Number of Equivalent Dwelling Units
- Factor based upon quantity and type of pumps used. Omitted if more than 20 connections.

Head Loss Equation

The friction head loss calculations were done using the Hazen-Williams Equation. HDPE pipe with a Hazen-Williams coefficient of (140) was used. Head loss values can be seen in Appendix A.

$$hf = \frac{(10.56)(L)}{D^{4.87}}\left(\frac{Q}{C}\right)^{1.85}$$

Where:

hf = Head loss due to pipe friction, ft
L = Force main line length, ft

D = Inside diameter of the pipe, in
Q = Flow rate through force main
C = Hazen-Williams roughness coefficient

General Design Considerations:

The service line between the tank and the main line should be laid at a constant grade to eliminate high points where gasses may collect.

The following are critical components that ensure a successful effluent sewer system design. They are not included in this analysis, but we recommend that they are incorporated in the design when needed:

- Properly sized and watertight tanks with effluent filters or screened pumps and control panels
- Service connection assemblies (ball valve and check valve) just off the main lines for all service lines
- Isolation valves at main line intersections
- Proper cleanout accessibility. The exact location and number of automatic air release valve (AARV) assemblies should be analyzed in the field and specified as needed. Manual air release valves could be installed at questionable locations, and replaced later with automatic valves if necessary.

For more information about effluent sewer design, please refer to the Orenco Systems Effluent Sewer Design Manual, which can be found at the Orenco website (copy link to browser):

http://www.orenco.com/doclib/documents/nda-efs-1.pdf

SECTION 3: Vintage Oaks STEP Layout

The proposed layout for this analysis is a community STEP system that will service 105 residential connections in the first phase, and ~440 residential connections at full build-out. This report includes the addition of unit 27, which is proposed to be 15 homes.

These mainlines will have varying diameters to keep the total dynamic head below 165 feet. Section 4 of this report will display the individual pipe size and length.

It is recommended that air release valves be placed in high elevation points in the effluent mainlines to ensure air can release, as well as constant effluent flow to the treatment plant.

Figure 2. Approximate FM Layout

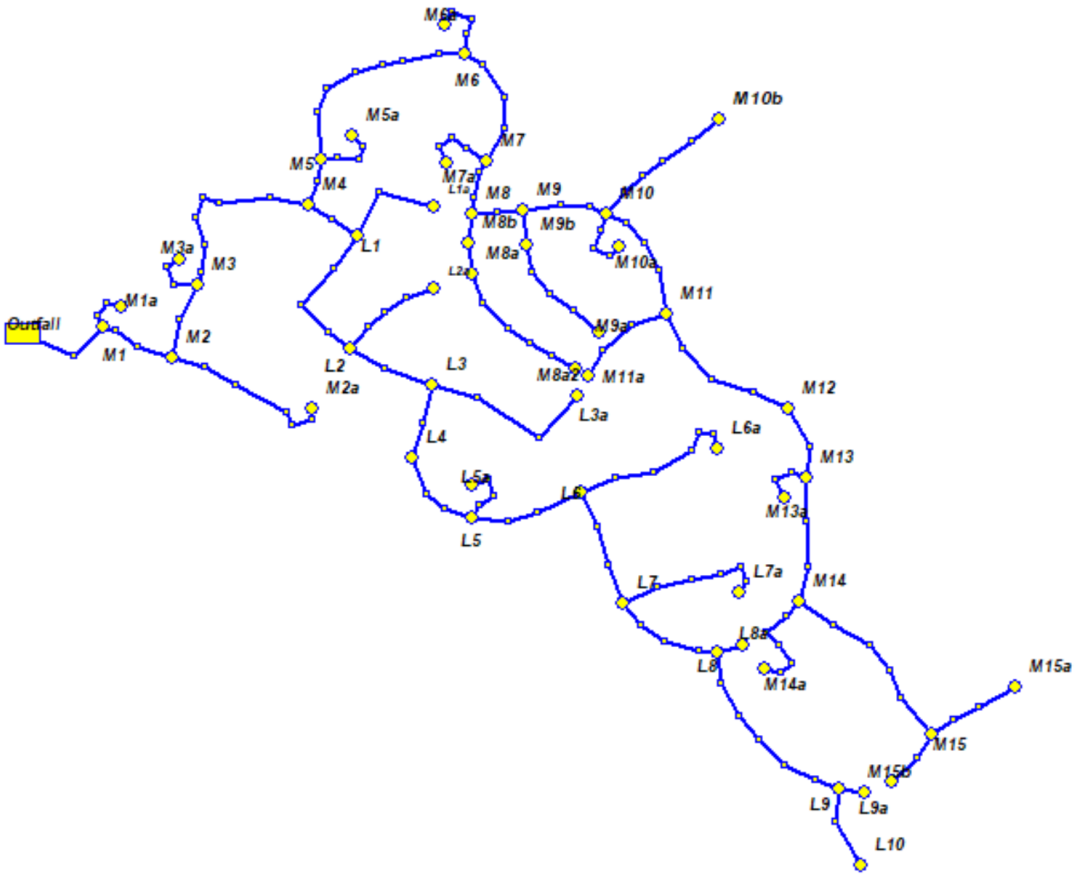

Figure 3. Approximate FM Layout, No Background

SECTION 5: ANALYSIS RESULTS

Outputs

Headloss calculations and main line sizing was based on using the inner diameters of SDR11 pipe.

The Hydraulic Grade Line Analysis concludes that each connection will require a STEP package with a PF100511fc pump. Also, the analysis concluded that all connections require a STEP application (no STEG) and anti-siphon valves would be required in the discharge assemblies. The analysis was based on every connection being a residential, single-family dwelling. Industrial or manufacturing facilities were not included in the analysis. If Industrial or Manufacturing connections or larger commercial facilities are present, please contact Orenco.

Pump Information

The PF100511FC is a 4" submersible effluent pump that is designed to overcome large amounts of head and to send a small, yet controlled, amount of septic tank effluent to a pressurized sewer line. Pump information can be seen below.

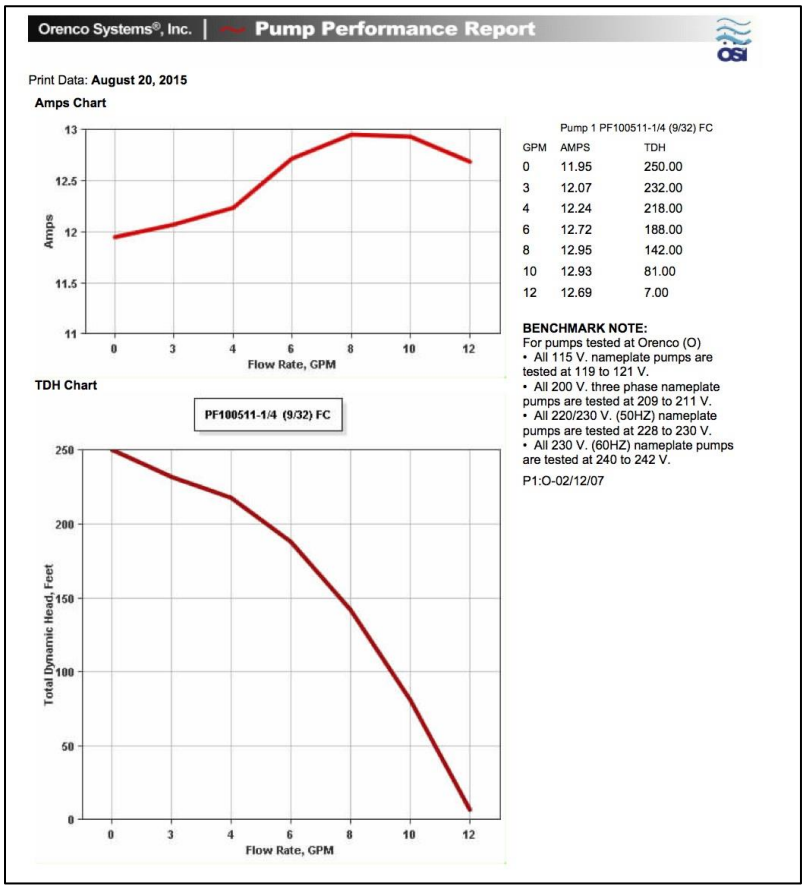

Figure 4. PF1005FC Pump Performance Curve

APPENDIX: A

U N I T S S P E C I F I E D

FLOWRATE ..... = gallons/minute
HEAD (HGL) ..... = feet
PRESSURE ..... = psig

P I P E L I N E D A T A

PIPE NAME	NODE NAMES #1	#2	LENGTH (ft)	DIAMETER (in)
P-1	M7	M8	263.50	2.83
P-2	M7	M7a	352.60	1.53
P-3	M7	M6	602.90	3.63
P-4	M6	M5	1014.50	3.63
P-5	M6	M6a	328.10	1.53
P-6	M5	M5a	312.90	1.53
P-7	M5	M4	228.30	3.63
P-8	M4	L1	270.50	3.63
P-9	M4	M3	926.40	3.63
P-10	M3	M3a	266.10	1.53
P-11	M3	M2	363.30	3.63
P-12	M1	Outfall	443.40	5.35
P-13	M1	M1a	204.20	1.53
P-14	M2	M1	360.10	3.63
P-15	M2	M2a	801.40	1.53
P-16	M8b	M8a	143.40	1.53
P-17	L1	L1a	480.10	1.53
P-18	M8a	M8a2	681.70	1.53
P-19	M8	M8b	137.50	1.92
P-20	M8	M9	237.30	2.83
P-21	M10	M10a	310.60	1.53
P-22	M10	M11	584.90	2.83
P-23	M9	M10	398.50	2.83
P-24	M9	M9b	166.40	1.92
P-25	M11	M12	761.80	2.83

P-26	M11	M11a	487.90	1.53
P-27	L1	L2	727.50	3.63
P-28	L2	L3	421.30	2.83
P-29	L2	L2a	489.90	1.53
P-30	L3	L3a	829.90	1.53
P-31	L3	L4	359.90	2.83
P-32	L5	L5a	316.70	1.53
P-33	L5	L6	543.10	2.83
P-34	L6	L6a	794.10	1.92
P-35	L6	L7	557.50	2.83
P-36	M13	M14	579.90	1.92
P-37	M13	M13a	255.80	1.53
P-38	L7	L7a	710.80	1.92
P-39	L7	L8	518.60	1.92
P-40	L8	L8a	122.70	1.53
P-41	L8	L9	910.00	1.92
P-42	M14	M14a	544.50	1.53
P-43	M14	M15	906.10	1.92
P-44	M15	M15a	447.70	1.53
P-45	M15	M15b	285.30	1.53
P-46	L9	L9a	118.90	1.53
P-47	L9	L10	387.80	1.53
P-48	M12	M13	353.60	2.83
P-49	L4	L5	423.60	2.83
P-50	M9b	M9a	552.00	1.92
P-51	M10	M10b	691.90	1.92

P I P E L I N E R E S U L T S

PIPE NAME	NODE NUMBERS #1	#2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s
P-1	M7	M8	104.50	10.18	0.00	5.35
P-2	M7	M7a	7.00	1.78	0.00	1.22
P-3	M7	M6	116.50	8.37	0.00	3.61
P-4	M6	M5	126.50	16.40	0.00	3.91
P-5	M6	M6a	7.00	1.66	0.00	1.22
P-6	M5	M5a	7.00	1.58	0.00	1.22

P-7	M5	M4	133.50	4.08	0.00	4.13
P-8	M4	L1	118.50	3.88	0.00	3.67
P-9	M4	M3	252.00	53.68	0.00	7.80
P-10	M3	M3a	7.00	1.35	0.00	1.22
P-11	M3	M2	259.00	22.15	0.00	8.02
P-12	M1	Outfall	273.00	4.53	0.00	3.90
P-13	M1	M1a	7.00	1.03	0.00	1.22
P-14	M2	M1	266.00	23.06	0.00	8.23
P-15	M2	M2a	7.00	4.06	0.00	1.22
P-16	M8b	M8a	11.50	1.82	0.00	2.00
P-17	L1	L1a	7.00	2.43	0.00	1.22
P-18	M8a	M8a2	7.00	3.45	0.00	1.22
P-19	M8	M8b	11.50	0.59	0.00	1.28
P-20	M8	M9	93.00	7.39	0.00	4.76
P-21	M10	M10a	7.00	1.57	0.00	1.22
P-22	M10	M11	63.50	8.98	0.00	3.25
P-23	M9	M10	83.50	10.16	0.00	4.27
P-24	M9	M9b	9.50	0.50	0.00	1.06
P-25	M11	M12	53.50	8.52	0.00	2.74
P-26	M11	M11a	7.00	2.47	0.00	1.22
P-27	L1	L2	108.00	8.78	0.00	3.34
P-28	L2	L3	96.50	14.05	0.00	4.94
P-29	L2	L2a	7.50	2.82	0.00	1.30
P-30	L3	L3a	8.50	6.02	0.00	1.48
P-31	L3	L4	86.00	9.70	0.00	4.40
P-32	L5	L5a	7.00	1.60	0.00	1.22
P-33	L5	L6	69.50	9.86	0.00	3.56
P-34	L6	L6a	12.50	3.97	0.00	1.39
P-35	L6	L7	51.50	5.81	0.00	2.64
P-36	M13	M14	35.00	19.53	0.00	3.89
P-37	M13	M13a	7.00	1.29	0.00	1.22
P-38	L7	L7a	10.50	2.57	0.00	1.17
P-39	L7	L8	40.00	22.37	0.00	4.45
P-40	L8	L8a	8.00	0.80	0.00	1.39
P-41	L8	L9	25.50	17.05	0.00	2.83
P-42	M14	M14a	8.00	3.53	0.00	1.39
P-43	M14	M15	22.50	13.46	0.00	2.50
P-44	M15	M15a	6.50	1.98	0.00	1.13
P-45	M15	M15b	6.00	1.09	0.00	1.04

P-46	L9	L9a	8.00	0.77	0.00	1.39
P-47	L9	L10	7.00	1.96	0.00	1.22
P-48	M12	M13	53.50	3.95	0.00	2.74
P-49	L4	L5	86.00	11.41	0.00	4.40
P-50	M9b	M9a	9.50	1.66	0.00	1.06
P-51	M10	M10b	10.00	2.29	0.00	1.11

N O D E R E S U L T S

NODE NAME	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
L1	3.50	1202.30	1120.00	82.30	35.67
L10	7.00	1303.29	1180.00	123.29	53.42
L1a	7.00	1204.73	1130.00	74.73	32.39
L2	4.00	1211.08	1129.00	82.08	35.57
L2a	7.50	1213.90	1140.00	73.90	32.02
L3	2.00	1225.13	1133.00	92.13	39.92
L3a	8.50	1231.15	1143.00	88.15	38.20
L4	0.00	1234.83	1118.00	116.83	50.62
L5	9.50	1246.24	1108.00	138.24	59.90
L5a	7.00	1247.84	1114.00	133.84	58.00
L6	5.50	1256.10	1119.00	137.10	59.41
L6a	12.50	1260.07	1134.00	126.07	54.63
L7	1.00	1261.91	1115.00	146.91	63.66
L7a	10.50	1264.48	1131.00	133.48	57.84
L8	6.50	1284.27	1135.00	149.27	64.69
L8a	8.00	1285.07	1139.00	146.07	63.30
L9	10.50	1301.32	1182.00	119.32	51.71
L9a	8.00	1302.09	1186.00	116.09	50.31
M1	0.00	1099.53	1095.00	4.53	1.96
M10	3.00	1255.02	1165.00	90.02	39.01
M10a	7.00	1256.59	1167.00	89.59	38.82
M10b	10.00	1257.31	1158.00	99.31	43.03
M11	3.00	1264.00	1167.00	97.00	42.03
M11a	7.00	1266.47	1150.00	116.47	50.47
M12	0.00	1272.52	1145.00	127.52	55.26
M13	11.50	1276.48	1135.00	141.48	61.31

M13a	7.00	1277.77	1133.00	144.77	62.73
M14	4.50	1296.01	1139.00	157.01	68.04
M14a	8.00	1299.54	1150.00	149.54	64.80
M15	10.00	1309.47	1181.00	128.47	55.67
M15a	6.50	1311.45	1184.00	127.45	55.23
M15b	6.00	1310.56	1186.00	124.56	53.98
M1a	7.00	1100.57	1090.00	10.57	4.58
M2	0.00	1122.60	1105.00	17.60	7.63
M2a	7.00	1126.65	1113.00	13.65	5.92
M3	0.00	1144.75	1122.00	22.75	9.86
M3a	7.00	1146.09	1115.00	31.09	13.47
M4	0.00	1198.43	1114.00	84.43	36.59
M5	0.00	1202.51	1107.00	95.51	41.39
M5a	7.00	1204.09	1107.00	97.09	42.07
M6	3.00	1218.91	1131.00	87.91	38.10
M6a	7.00	1220.57	1126.00	94.57	40.98
M7	5.00	1227.28	1145.00	82.28	35.66
M7a	7.00	1229.07	1135.00	94.07	40.76
M8	0.00	1237.47	1150.00	87.47	37.90
M8a	4.50	1239.87	1150.00	89.87	38.95
M8a2	7.00	1243.33	1150.00	93.33	40.44
M8b	0.00	1238.05	1150.00	88.05	38.16
M9	0.00	1244.85	1157.00	87.85	38.07
M9a	9.50	1247.02	1162.00	85.02	36.84
M9b	0.00	1245.36	1158.00	87.36	37.85
Outfall	----	1095.00	1095.00	0.00	0.00

M A X I M U M A N D M I N I M U M V A L U E S

P R E S S U R E S

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
M14	68.04	M1	1.96
M14a	64.80	M1a	4.58
L8	64.69	M2a	5.92
L7	63.66	M2	7.63
L8a	63.30	M3	9.86

V E L O C I T I E S

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
P-14	8.23	P-45	1.04
P-11	8.02	P-24	1.06
P-9	7.80	P-50	1.06
P-1	5.35	P-51	1.11
P-28	4.94	P-44	1.13

S U M M A R Y O F F L O W S

NODE NAME	FLOWRATE gpm
Outfall	273.00

Appendix D: CANYON LAKE WATER SERVICE COMPANY DRAFT SERVICE AGREEMENT

WASTEWATER UTILITY SERVICE AGREEMENT BETWEEN THE HILLS AT VINTAGE OAKS SUBDIVISION

This Wastewater Utility Service Agreement (this "Agreement") is entered into as of April ___, 2016 (the "Effective Date") by and between SJWTX, Inc., d/b/a Canyon Lake Water Service Company, a Texas corporation ("CLWSC"), and Southstar At Vintage Oaks, LLC ("Developer"), a Texas limited liability company. Individually, CLWSC and Developer are sometimes referred to herein as a "Party" and collectively as the "Parties."

RECITALS

A. WHEREAS, CLWSC holds retail water Certificate of Convenience No. 10692 and retail wastewater Certificate of Convenience and Necessity No. 20877 (the "CCN") issued by the Texas Commission on Environmental Quality ("TCEQ") and regulated now by the Public Utility Commission of Texas (the "PUCT");

B. WHEREAS, CLWSC provides retail wastewater service to areas within its certificated wastewater service area (the "Service Area");

C. WHEREAS, Developer owns approximately 252 acres of land more particularly described in Exhibit "A" attached hereto (the "Development Property") located within CLWSC's Water CCN service area but outside of its Wastewater CCN service area that Developer is planning to develop for residential purposes that will require no more than 440 living unit equivalents of wastewater service;

D. WHEREAS, the current land use plan for the Development Property is attached hereto as Exhibit B;

E. WHEREAS, the CLWSC and Developer's predecessor in interest, Bluegreen Southwest One, LP, previously entered into that certain "Developer's Water Utility Service Agreement" dated effective May 11, 2006, as amended, setting forth the terms and conditions pursuant to which CLWSC agreed to provide retail potable water service within the Development Property and other lands owned by Developer;

F. WHEREAS, in order to develop the Development Property for the intended use, the Developer also needs wastewater service to be provided to the Development Property;

G. WHEREAS, the provision of wastewater service to the Development Property will require the construction of wastewater collection, treatment and disposal facilities and the expansion of CLWSC's Wastewater CCN service area to include the Development Property; and

H. WHEREAS, the Parties desire to enter into this Agreement setting forth the terms and conditions pursuant to which CLWSC will provide retail wastewater service to the Development Property.

NOW, THEREFORE, in consideration of the mutual covenants and agreements hereinafter set forth, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties hereby agree as follows:

II. DEFINITIONS

When used in this Agreement, the following terms will have the meanings set forth below:

1.1 **"Agreement"** means this Wastewater Utility Service Agreement.

1.2 **"Wastewater CCN"** means CLWSC's Certificate of Convenience and Necessity No. 20877.

1.3 **"Closing"** means the execution and delivery by Developer, and the acceptance by CLWSC, of all documents conveying, selling, transferring or assigning the interests and property of the Developer and any Interests to be Acquired to CLWSC, and the performance of all acts necessary to complete such execution and delivery and to comply with all of Developer's obligations hereunder.

1.4 **"Closing Date"** means the date on which the Closing occurs.

1.5 **"CLWSC"** means SJWTX, Inc., d/b/a Canyon Lake Water Service Company, a Texas corporation that is a private investor-owned utility regulated by the Public Utility Commission of Texas and the Texas Commission on Environmental Quality, that has its principal place of business in Comal County, Texas, and that is authorized to do business in the State of Texas.

1.6 **"CLWSC System"** means the wastewater system now owned by CLWSC and those facilities to be constructed by or for Developer and to be conveyed to CLWSC to serve the its Service Area (including the Development Property subsequent to the completion of the actions contemplated by this Agreement) and any expansions, improvements, enlargements, additions and replacements thereto, including the Interests to be Acquired, subject to the terms of this Agreement.

1.7 **"Contracts"** means the contracts, leases, permits, franchises and licenses relating to or arising out of the acquisition, construction and operation of the Interests to be Acquired.

1.8 **"Customer Premises Equipment"** means the individual underground pretreatment tank and service lines, together with all related equipment, appliances and appurtenances thereto, to be constructed on each lot as a condition of wastewater service by CLWSC. The Customer Premises Equipment shall not qualify as "Developer Facilities" for purposes of this Agreement, and each applicant for service shall be responsible for construction, ownership, operation and maintenance of Customer Premises Equipment, and connection thereof to the CLWSC System, in accordance with the terms of the Tariff.

1.9 **"Developer"** means Southstar At Vintage Oaks, LLC, its permitted successors and assigns.

1.10 **"Developer Facilities"** mean the sewer laterals, wastewater collection, transmission, storage, pumping, treatment, and disposal facilities, and all associated equipment and appurtenances thereto, including the Sewer Laterals, the Wastewater Effluent Disposal System, the Effluent Disposal Lands and the Wastewater Treatment Plant to be constructed by or on behalf of Developer in accordance with the terms of this Agreement for CLWSC to provide retail wastewater service to the customers within the Development Property, which improvements are generally described in Developer's Master Wastewater Plan. The Developer Facilities will include, without limitation, the following: (i) the Sewer Laterals and all lines, trunk lines, lift stations and other components necessary to transport wastewater received from the Customer Premises Equipment within residential and commercial lots in the Development Property to the Wastewater Treatment Plant; (ii) the Wastewater Treatment Plant; and (iii) the Wastewater Effluent Disposal System and (iv) the Effluent Disposal Lands. The Developer Facilities shall not include the Customer Premises Equipment or any other facilities or equipment located on the customer's side of each Sewer Lateral.

1.11 **"Developer Facilities Costs"** means all costs incurred by the Developer in connection with the design and construction of the Developer Facilities, including, without limitation, all costs of design, engineering, engineering review, materials, labor, construction and inspection arising in connection with the Developer Facilities; all payments arising under any contracts entered into by the Developer for the construction of the Developer Facilities; all costs incurred by the Developer in connection with obtaining governmental, regulatory, and CLWSC approvals, certificates, permits, easements, rights-of-way, or sites required as a part of the construction of the Developer Facilities; and all out-of-pocket expenses incurred by Developer and CLWSC in connection with the construction and approval of the Developer Facilities.

1.12 **"Developer Master Wastewater Plan"** means the description of the Developer Facilities to be constructed by Developer for service to the Development Property, including the proposed phasing of construction for service to the Phase I Lands, Phase II Lands, and Phase III Lands. A copy of the Developer Master Wastewater Plan is attached hereto as Exhibit "B." The Developer Master Wastewater Plan may be revised from time to time by Developer with the prior written approval of CLWSC.

1.13 **"Development Property"** means that certain tract of real property more particularly described on Exhibit "A" attached hereto, and commonly referred to as the The Hills at Vintage Oaks Subdivision.

1.14 **"Effluent Disposal System"** means the effluent (wastewater) disposal and irrigation system consisting of a variable number and sizes of pipelines, above ground sprinkler heads and appurtenances (including, but not limited to, valves, service connections, manholes, clean-outs, sample stations, lift stations, booster pumps, concrete or metal vaults, irrigation equipment and required electrical lines) in, on, under and across the "Effluent Disposal Lands" (as defined below), all a designed to irrigate the natural surfaces of the Effluent Disposal Lands.

1.15 **"Effluent Disposal Lands"** means that certain __- acre real property tract within the Development Property where treated wastewater effluent shall be disposed in accordance with the Permit. The Effluent Disposal Lands are more particularly described in Exhibit "C" attached hereto.

1.16 **"Expansion Facilities"** means the Developer Facilities to be constructed in two parts by Developer and conveyed to CLWSC in accordance with the terms of this Agreement as a condition of retail wastewater service by CLWSC to the Phase II Lands and the Phase III Lands. The first part of the Expansion Facilities are those facilities required by CLWSC to serve the Phase II Lands, and the second part of the Expansion Facilities are those facilities required by CLWSC to serve the Phase III Lands. The Expansion Facilities are more particularly described in the Developer Master Wastewater Plan.

1.17 **"Force Majeure"** means acts of God, strikes, lockouts, or other industrial disturbances, acts of a public enemy or terrorist, orders or actions of any kind of government of the United States, the State of Texas or any local government or political subdivision, or any civil or military authority, insurrection, riot, terrorist act or incident, epidemic, landslide, lightning, earthquake, fire, hurricane, storm, flood, washout, drought, arrest, restraint of government and people, civil disturbance, explosion, breakage or accident to a lift station or sewer lateral or main, and any inability of a Party to perform in accordance with the terms, conditions, standards and requirements of this Agreement on account of any other cause not reasonably within the control of such Party and beyond events that should be anticipated by a Party in the ordinary course of business. Failure of Developer to timely make payments of any kind is not a Force Majeure.

1.18 **"Interests to be Acquired"** means the Developer Facilities, the Plant Site, the easements for Developer Facilities not located on public rights-of-way, the rights, title and interest in the Contracts, the Permit, other permits and all other interests, if any, that the Developer will construct and convey to CLWSC as required by this Agreement.

1.19 **"Living Unit Equivalent" or "LUE"** shall mean the quantity of wastewater service associated with one single-family residential connection. For purposes of this Agreement, an LUE shall be defined as an average daily wastewater flow of 250 [295??] gallons/day as measured over a thirty day period. Unless Developer or an applicant for service obtains the express written consent of CLWSC, each residential connection on the Development Property will be sized for a 5/8-inch or ¾-inch water meter and, therefore, will be considered one (1) LUE. For purposes of this Agreement, the number of equivalent LUE's attributed to a commercial service connection will be determined based on the size of the meter for potable water service used at the connection as shown below:

Meter Size	No. of LUE's
¾"	1.5
1"	2.5
1½"	5
2"	8
3"	15
4"	30
6"	50

1.20 **"Party"** or **"Parties"** means CLWSC and/or the Developer, individually or collectively, as applicable.

1.21 "**Permit**" means collectively, those permits issued by the TCEQ for the construction and operation of the Wastewater Treatment Plant, an organized sewage collection system to serve the Development Property and a land application disposal system for the disposition of the treated wastewater on the Effluent Disposal Lands, and all other permits from all regulatory entities, including, without limitation, the TCEQ, for the operation of the organized sewage collection system and the Wastewater Treatment Plant and disposal of the treated wastewater effluent therefrom.

1.22 "**Phase I Facilities**" means the Developer Facilities to be constructed and conveyed to CLWSC by Developer as a condition of service to the Phase I Lands, as more particularly described in the Developer Master Wastewater Plan.

1.23 "**Phase I Lands**" means the ___-acre tract within the Development Property to which CLWSC shall provide retail wastewater service in a quantity not to exceed 119 LUEs upon completion of construction by Developer, and conveyance to CLWSC, of Phase I Facilities. The Phase I Lands are more particularly shown on Exhibit "B" attached hereto.

1.24 "**Phase II Facilities**" means the Developer Facilities to be constructed and conveyed to CLWSC by Developer as a condition of service to the Phase II Lands, as more particularly described in the Developer Master Wastewater Plan.

1.25 "**Phase II Lands**" means the ___-acre tract within the Development Property to be added to the Phase I Lands to which combined tracts CLWSC shall provide retail wastewater service in a quantity not to exceed 238 LUEs upon completion of construction by Developer, and conveyance to CLWSC, of Phase II Facilities. The Phase II Lands are more particularly shown on Exhibit "B" attached hereto.

1.26 "**Phase III Facilities**" means the Developer Facilities to be constructed and conveyed to CLWSC by Developer as a condition of service to the Phase III Lands, as more particularly described in the Developer Master Wastewater Plan.

1.27 "**Phase III Lands**" means the ___-acre tract within the Development Property to be added to the Phase I Lands and the Phase II Lands to which combined tracts CLWSC shall provide retail wastewater service in a quantity not to exceed 440 LUEs upon completion of construction by Developer, and conveyance to CLWSC, of Phase I Facilities and the Expansion Facilities. The Phase III Lands are more particularly shown on Exhibit "B" attached hereto.

1.28 "**Plant Site**" means the real property in the Development Property on which the Wastewater Treatment Plant, as defined below, will be located. The Plant Site is more particularly described in Exhibit "D" attached hereto, and the Plant Site shall qualify as "Real Property" for purposes of this Agreement.

1.29 "**PUCT**" means the Public Utility Commission of Texas and its successor state agencies.

1.30 "**Real Property**" means any of the Interests to be Acquired that constitute real property or real property interests for Developer Facilities that are not constructed within public rights-of-way.

1.31 "**Service Area**" means all lands to which CLWSC is authorized to provide retail wastewater and sewer service under its CCN, as it may be amended from time to time.

1.32 "**Service Commitment**" means the 440 LUEs of retail wastewater service that CLWSC agrees to make available within the Development Property in accordance with the terms of this Agreement. Of this amount, 119 LUEs of retail wastewater service rights shall be allocated to the Phase I Lands, an additional 119 LUE's of retail wastewater service rights shall be allocated to the Phase II Lands, and the remaining 202 LUEs of retail wastewater service rights shall be allocated to the Phase III Lands.

1.33 "**Sewer Lateral**" means a branch of CLWSC's wastewater collection pipeline system that runs from the common wastewater collection line to the private sewer service line, which will be constructed by individual property owners to the boundary of their lots as part of the Customer Premises Equipment. The Sewer Laterals shall be deemed "Developer Facilities" for purposes of this Agreement. Each property owner (or a builder) will be required to tap its private service line into the Sewer Lateral in accordance with the terms of CLWSC's Tariff.

1.34 "**Tariff**" means the tariff approved by the PUCT for CLWSC, as the tariff may be amended and changed from time to time, that sets forth CLWSC's fees, rates and charges, rules and policies relating to wastewater service by CLWSC, a copy of which may be found at www.clwsc.com or obtained from CLWSC.

1.35 "**TCEQ**" means the Texas Commission on Environmental Quality, the Texas state agency that regulates CLWSC as a wastewater service provider, and its successor state agencies.

1.36 "**Warranty Period**" means the warranty period for the Developer Facilities more particularly defined in Section 6.2.

1.37 "**Wastewater**" means liquid and water-carried waste discharged from sanitary conveniences of dwellings and retail businesses, including garbage that has been shredded to such degree that all particles will be carried freely under flow conditions normally prevailing in public sewers, with no particle greater than one-half inch in any dimension. Grease traps, oil water separators, and/or other pre-treatment measures may be required by CLWSC in accordance with its tariff depending on the characteristics of the flow coming from various commercial sources. Individual retail customers shall be responsible for such pre-treatment measures, and Developer shall have no responsibility for pre-treatment or for the quality of Wastewater discharged into the Facilities by third parties.

1.38 "**Wastewater Effluent Disposal System**" means that certain treated effluent transmission, storage and irrigation system to be utilized for the disposal of treated wastewater effluent from the Wastewater Treatment Plant in accordance with the Permit. The Effluent Disposal System may be constructed by Developer in phases to serve the Phase I Lands, the Phase II Lands, and the Phase III Lands, as more fully described in the Developer Master Wastewater Plan and this Agreement. The Wastewater Effluent Disposal System shall qualify as "Developer

Facilities" for purposes of this Agreement. The Wastewater Effluent Disposal System will include the effluent (wastewater) disposal and irrigation system consisting of a variable number and sizes of pipelines, above ground sprinkler heads, and appurtenances (including, but not limited to, valves, service connections, manholes, clean-outs, sample stations, lift stations, booster pumps, concrete or metal vaults, irrigation equipment, and required electrical lines) to, in, on, under, and across the Effluent Disposal Lands, all designed to irrigate the natural surface areas of the Effluent Disposal Lands.

1.39 **"Wastewater Treatment Plant"** means the wastewater treatment facilities located on and within the Plant Site utilized for the storage, treatment and disposal of wastewater and effluent in accordance with the Permit, as may be amended from time to time. The Wastewater Treatment Plant may be constructed in 3 phases by Developer in accordance with the phasing authorized by the Permit and as necessary to serve each the Phase I Lands, the Phase II Lands, and the Phase III Lands, all as more fully described in the Developer Master Wastewater Plan and this Agreement. The Wastewater Treatment Plant shall qualify as "Developer Facilities" for purposes of this Agreement.

II. WASTEWATER SERVICE

2.1 **Service Commitment**. CLWSC shall provide retail wastewater service to residential customers in the Development Property as development progresses in a total quantity not to exceed the Service Commitment in accordance with the Tariff and the terms and conditions set forth in this Agreement. One hundred nineteen (119) LUEs of the Service Commitment shall be allocated to the Phase I Lands, an additional one hundred nineteen (119) LUEs of the Service Commitment shall be allocated to the Phase II Lands, and the remaining two hundred two (202) LUEs of the Service Commitment shall be allocated to the Phase III Lands.

2.2 **Phasing**. CLWSC shall make wastewater service available within the Development Property on a phased basis as follows:

(i) Upon Completion of construction of the Phase I facilities by Developer, as more fully described on Exhibit B, and conveyance thereof to CLWSC, and subject to all other terms and conditions of this Agreement, CLWSC shall make retail wastewater service available to the Phase I Lands in a quantity not to exceed 119 LUEs; and

(ii) Upon Completion of construction of the Phase II facilities by Developer and conveyance thereof to CLWSC and subject to all other terms and conditions of this Agreement, CLWSC shall make retail wastewater service available to the Phase I Lands and the Phase II Lands in a quantity not to exceed a cumulative total 238 LUE's; and

(iii) Upon Completion of construction of the Phase III facilities by Developer and conveyance thereof to CLWSC and subject to all other terms and conditions of this Agreement, CLWSC shall make retail wastewater service available to the all of Phase I Lands, the Phase II Lands and the Phase III Lands in a quantity not to exceed a cumulative total 440 LUE's.

CLWSC agrees that Developer shall be under no obligation to construct the Expansion Facilities, and at Developer's sole election, it may elect for all lots within the Phase II Lands and

the Phase III Lands to utilize on-site septic systems for the disposal of domestic wastewater. Any such election by Developer must be made prior to final subdivision platting of lots within the Phase II Lands and the Phase III Lands.

2.3 **Service Conditions**. CLWSC's obligation to provide wastewater service within the Development Property, or any respective portion thereof, as appropriate, shall be subject to the completion of all of the following conditions precedent:

a. The approval by PUCT of CLWSC's application for an amendment to its CCN to include the Development Property within the Service Area under its existing Tariff;

b. The approval by TCEQ of the transfer of the Permit from Developer to CLWSC;

c. The final platting of the unit or phase of the development of the Development Property that will receive retail wastewater service, to the extent applicable, and the approval of same by all governmental entities with jurisdiction;

d. For service to Phase I Lands, construction by Developer in accordance with the terms of this Agreement, and written acceptance by CLWSC, of the Phase I Facilities required for service to the Phase I Lands, which Phase I Facilities must be constructed per plans and specifications approved in writing and advance by CLWSC; and

e. For service to the Phase II Lands and the Phase III Lands, approval from the TCEQ of the respective phase of expansion of the Expansion Facilities, construction by Developer in accordance with the terms of this Agreement of the respective phase of the Expansion Facilities required for service to those respective phases of development on the Phase II Lands and the Phase III Lands, and written acceptance of the same by CLWSC, which phases of the Expansion Facilities must be constructed per plans and specifications approved in writing in advance by CLWSC; and

f. Dedication from, or conveyance by, the Developer or the current owner of the Development Property and acceptance by CLWSC of all Real Property that CLWSC deems necessary to serve the respective phase of Development Property with retail wastewater service per the terms of this Agreement, which fee title real property interests and easements are more particularly identified on Exhibit "D" of this Agreement, attached hereto. The forms of easement and special warranty deeds for any Real Property conveyance to be made hereunder and for which another instrument is not specified are attached hereto as Exhibit "E". Developer shall convey the Plant Site and the Effluent Disposal Lands by the special warranty deed. Developer shall convey an easement to CLWSC for the remaining real property interests described in Exhibit D, attached hereto. The forms of easement and special warranty deeds for any Real Property conveyance to be made hereunder and for which another instrument is not specified are attached hereto as Exhibit E.

g. Conveyance from the Developer, or the then current owner of the Development Property, of all right, title and interest to all personal property that is a part of the Developer Facilities required for service to the Phase II Lands and the Phase III Lands within the

Development Property, for which service is sought, to CLWSC by the Bill of Sale in the form attached hereto as Exhibit "E";

h. Payment by Developer in full, without any conditions or liens, of all payments, fees and deposits required by this Agreement and all costs and expenses of materials and construction of the Developer Facilities to be conveyed to CLWSC subject to 2.3(i), below; and

i. Written subordination to the rights and title of CLWSC of all third-party claims, rights, liens or encumbrances that in any way affect, diminish or are superior to the title of CLWSC in the Developer Facilities or Real Property that Developer dedicates, conveys, or assigns to CLWSC, which subordination must be in a form that is reasonably acceptable to CLWSC and that is legally recordable in the Official Public Records of Comal County, Texas.

2.4 **Drainage, Water and Other Services**. CLWSC agrees that the "Developer's Water Utility Service Agreement" dated May 11, 2006, as amended, remains in effect according to its terms, that Developer is in good standing thereunder, and that CLWSC shall provide retail water service to the Development Property in accordance with the terms and conditions set forth in said agreement. CLWSC acknowledges and agrees that the Developer may provide or cause to be provided drainage and other services to the Development Property that are authorized by law. CLWSC does not provide drainage services.

2.5 **CLWSC Operations**. After its acceptance of the Developer's Facilities and the conveyance of the title to same and to the real property associated therewith, Developer shall have no further responsibility to fund any costs of the CLWSC System and CLWSC will be responsible for owning, operating and maintaining the Developer Facilities in good working order; for making all needed replacements and improvements as required for the operation of the CLWSC System; for complying with all applicable governmental and regulatory requirements of an operator of such system; for billing and collecting from all customers within the Service Area; and for performing all other usual and customary services and administrative functions associated with retail wastewater utility systems. CLWSC and Developer may also enter into an interim operations agreement on terms and conditions mutually agreeable to both parties pursuant to which CLWSC will operate and maintain the Developer Facilities prior to conveyance.

2.6 **Permitting and Regulatory Approvals.**

a. Within thirty (30) days of the issuance of the Permit, CLWSC shall prepare and file an application with the TCEQ to transfer the Permit to CLWSC (the "Regulatory Application") and will diligently prosecute the Regulatory Application to completion at CLWSC's own cost and expense. Developer expressly consents to transfer of the Permit to CLWSC and agrees to fully cooperate with CLWSC to obtain the TCEQ approval of the transfer and to provide all information required or necessary for such transfer.

b. Within sixty (60) days of the Effective Date, CLWSC, at the sole cost and expense of Developer, will apply to the PUCT for a CCN amendment to authorize it to provide

wastewater services to the Development Property and will diligently prosecute the application to completion. Developer expressly consents to inclusion of the Development Property within the CCN and the Service Area and agrees to fully cooperate with CLWSC to obtain the PUCT approval of the CCN amendment and to provide all information required or necessary for such approval.

c. In the event that CLWSC is unable to obtain the CCN amendment within one (1) year from the date that the application is submitted, Developer may terminate this Agreement and seek wastewater service from another source, subject to the obligation to reimburse CLWSC for all of its expenses incurred up to that termination date or payable as a result of commercially reasonable commitments made by CLWSC before that termination date.

d. In the event CLWSC's application to amend its CCN is contested, CLWSC may, in its sole discretion but in consultation with Developer, modify or amend such application and may compromise, settle or withdraw the application so long as any such change does not negatively impact the ability of CLWSC to provide the service contemplated herein. In the event CLWSC elects, in its sole discretion, to withdraw the application to amend its CCN, CLWSC shall give notice to Developer, and this Agreement shall automatically terminate 10 days after such notice, but CLWSC will be responsible for any unpaid costs if it unilaterally terminates this Agreement.

e. In the event that Developer elects to not construct the Expansion Facilities for Phase II Lands and the Phase III Lands and utilizes on-site septic systems or other similar treatment systems for such lands before January 1, 2018, CLWSC agrees that Developer may seek to decertify the Phase II Lands and the Phase III Lands from the CCN Service Area, at Developer's sole cost and expense, and CLWSC agrees to notify the PUCT in writing that it agrees with and supports Developer's decertification application and not to oppose such decertification or to seek any damages or compensation in connection with the decertification.

III. RATES, FEES, AND CHARGES

3.1 **Rates and Fees.** All wastewater customers within the Service Area will pay CLWSC's standard fees, charges and rates for wastewater service to residential or commercial customers, as set forth in the Tariff. In this regard, CLSWSC represents and warrants that the fees for wastewater services are separate and distinct from any charges or fees for water service provided to the Vintage Oaks at Vineyard development pursuant to that certain Water Services Agreement dated May 11, 2006, as amended. CLWSC specifically reserves the right to amend the Tariff from time to time pursuant to PUCT regulations. Notwithstanding the foregoing, CLSWS agrees that it will not raise any of its standard fees, charges and rates for wastewater service to the Development Property for a period of two years from the Effective Date.

3.2 **Administrative Deposit for CLWSC Costs.** Developer agrees to reimburse CLWSC's actual and reasonable legal, accounting, engineering review and construction inspection costs directly associated with provision of service to the Development Property, in a total amount not to exceed CLWSC's reasonable actual costs. Developer shall pay an initial Administrative

Deposit of $25,000 concurrently with its execution of this Agreement for payment of costs for which it is responsible hereunder, including CLWSC's cost to amend its CCN. In the event that CLWSC's total costs exceed this $25,000, then CLWSC shall provide a written invoice for payment to Developer requesting additional payment. Developer shall provide such payment within thirty (30) days after receipt of the invoice. If Developer fails to timely make such payments, CLWSC may terminate this Agreement without any payment or liability to Developer. In the event that CLWSC does not incur all costs for which payment is tendered by Developer, either for the deposit or subsequent payment invoices, CLWSC shall promptly reimburse such excess payment. For purposes of this Agreement, CLWSC's cost will include actual costs for expenses, legal fees, labor, labor burden, equipment and materials directly attributable to the Development Property or the Developer Facilities, plus up to 7% of that total for overhead and indirect costs. Upon request by Developer, CLWSC shall furnish an itemized statement identifying all costs and expenses for which the deposit is utilized for payment. All costs paid by Developer to CLWSC shall qualify as Developer Facilities Costs for purposes of this Agreement.

IV. DEVELOPER FACILITIES

4.1 **General**. The Developer will design all Developer Facilities required for CLWSC to provide retail wastewater service to the customers within the Development Property in accordance with this Agreement. The Developer may construct the Developer Facilities in phases, and all Developer Facilities shall be constructed in accordance with the plans and specifications approved in writing by CLWSC before construction begins and shall be in compliance with all rules and regulations of governmental and regulatory agencies with jurisdiction over such facilities. Upon completion of construction of each phase of the Developer Facilities to the satisfaction of CLWSC, CLWSC and the Developer will agree upon a date to conduct the Closing for that phase in accordance with the procedures set forth in Article VIII, at which time the Developer will convey, or cause the conveyance of, such Developer's Facilities to CLWSC.

4.2 **Design of the Developer Facilities**. All physical facilities to be constructed or acquired as a part of the Developer Facilities will be designed by a qualified engineer selected by the Developer and approved in writing in advance by CLWSC. The design will be subject to the approval of CLWSC and all governmental agencies with jurisdiction. The design shall comply with the criteria of all governmental entities with jurisdiction over the wastewater system. CLWSC agrees to use its best efforts to review all plans and specifications and to either approve the plans and specifications or to provide written comments specifically identifying the required changes within twenty-one (21) working days of submittal to CLWSC by Developer's engineer. As discussed in the Developer Master Wastewater Plan, Developer may design and construct the Wastewater Treatment Plant and other portions of the Developer Facilities in phases. Developer agrees that no material changes will be made to approved plans without the prior written consent of CLWSC.

4.3 **Engineering Reviews.** At the time of submittal of the design of each subsequent phase of the Developer Facilities, the Developer shall submit, or cause to be submitted, a payment to CLWSC for the purpose of compensating CLWSC for the cost of its review of the same. The amount of the fee shall be One Thousand Dollars ($1,000.00). Developer must submit plans and specifications for CLWSC's review and written approval before it enters into any contracts for

construction of the Developer Facilities. Developer agrees that the engineering review or approval by CLWSC shall in no way relieve Developer of its responsibilities under this Agreement. That review and any lack of objection upon the completion of the review will not establish any liability of CLWSC for the engineering or design of the Facilities. Once approved by CLWSC, the plans for the Facilities shall not be materially changed without the prior written consent of CLWSC. If applicable, Developer must obtain TCEQ approval of its plans and specifications before beginning construction.

4.4 **Construction of Developer Facilities.**

a. Notwithstanding anything to the contrary herein, construction of the Wastewater Treatment Plant shall not commence before TCEQ authorizes construction and the Permit has been issued.

b. The Developer Facilities will be constructed, and all related easements, equipment, materials and supplies will be acquired by the Developer, in the name of the Developer, and all construction contracts and other agreements will contain provisions that any contractor, material supplier or other party thereto will look solely to the Developer for payment of all sums coming due thereunder and that CLWSC will have no obligation whatsoever to any such party. Contractors used to construct the Developer Facilities shall be experienced in such construction and shall be approved by CLWSC in advance, which approval will not be unreasonably withheld or delayed. Developer shall submit to CLWSC a copy of all such contracts and agreements within three (3) business days of their execution.

c. The Developer may construct the Wastewater Treatment Plant and Wastewater Effluent Disposal System in phases as the development within the Development Property progresses, but all such phases must be capable of working together as a unified facility.

d. The Developer warrants to CLWSC that the Developer Facilities will be constructed in a good and workmanlike manner and that all material used in such construction will be new, not used, will be free from defects and will be fit for their intended purpose, and will be paid for in full before they are conveyed to CLWSC.

e. CLWSC and the Developer agree to use one mutually agreeable firm or individual to conduct on-site inspections of the Developer Facilities, at the Developer's cost, to inspect and approve the construction, which approval will not be unreasonably withheld or delayed. CLWSC may also conduct its independent inspections at its sole cost and expense, which will be coordinated with the Developer and will not unduly impede or interfere with construction. Inspections will be conducted in a timely manner and will not unreasonably delay or interfere with the construction. CLWSC will notify the Developer of any construction defects coming to its attention as soon as practicable. Upon written notice from Developer that construction is completed, CLWSC will conduct a final inspection, testing and operation of the constructed Developer Facilities to assure itself that they have been constructed to the approved standards and specifications, but that inspection shall in no way relieve Developer of

its responsibilities under this Agreement. Developer shall remedy any construction defects identified by CLWSC in the Developer Facilities prior to conveyance of the Developer Facilities to CLWSC.

f. Developer shall provide CLWSC at least five (5) business days advance written notice of a Pre-Construction Conference, which must be held by Developer at the site prior to beginning the construction of the wastewater facilities on the Development Property.

g. Three Phase Power. Developer shall deliver adequate three phase power to the Wastewater Treatment Plant and to all lift station sites, if needed for proper operation in the opinion of CLWSC. The improvements required for such electricity service shall be deemed "Developer Facilities" for purposes of this Agreement.

4.5 **Cost of Developer Facilities**. The Developer will promptly pay in full, or cause to be paid, (i) the costs of the Developer Facilities as they become due, including, without limitation, all costs of design, engineering, engineering review, materials, labor, construction and inspection arising in connection with the Developer Facilities; (ii) all payments arising under any contracts entered into by the Developer for the construction of the Developer Facilities; (iii) all costs incurred by the Developer in connection with obtaining governmental approvals, certificates, permits, easements, rights-of-way, or sites required as a part of the construction of the Developer Facilities; and (iv) all out-of-pocket expenses incurred in connection with the construction of the Developer Facilities. CLWSC will not be liable to any contractor, engineer, attorney, material supplier or other party employed or contracted with in connection with the construction of the Developer Facilities.

4.6 **Oversizing of Facilities**.

a. At CLWSC's option. Except as provided below, CLWSC may opt to require Developer to increase the size or capacity of any of the Developer Facilities, provided that CLWSC notifies Developer in writing that it is exercising this option at least thirty (30) days prior to the time Developer completes preparation of the construction plans for the Developer Facilities and provided CLWSC pays all incremental costs associated with the oversizing as hereinafter provided. Notwithstanding the foregoing, CLWSC agrees that it will not expand the capacity of the Wastewater Treatment Plant to be in excess of 130,000 gallons per day without Developer's written consent; however, that restriction on expansion of the Wastewater Treatment Plant expires on January 1, 2020.

b. Cost. CLWSC shall pay Developer for the incremental increase in costs of construction attributable to the additional size or capacity, as determined by the alternate bids to be solicited by Developer for the two sizes of the Developer Facilities in question; i.e., the difference in total bid costs with and without the additional size or capacity (including equipment costs). All costs, expenses and charges for the original size of the Developer Facilities prior to oversizing will remain the responsibility of Developer. Reimbursement by CLWSC for oversizing costs shall be made by CLWSC immediately upon acceptance by CLWSC of construction of the Developer Facilities. Each such invoice from Developer must include the contractor's pay application,

include a copy of a recommendation for payment of the pay application from the project engineer, and identify the portion of the payment for which CLWSC is responsible.

4.7 **Record Drawings.** Prior to acceptance of the Developer Facilities from its contractor(s) and prior to its final payment to its contractor(s), Developer will provide accurate record drawings of the constructed Developer Facilities to CLWSC in an electronic format and paper copy format acceptable to CLWSC as specified in its standards and specifications.

4.8 **Training and Operations Manual.** At Developer's sole cost, Developer shall cause the Wastewater Treatment Plant contractor and/or manufacturer to provide CLWSC treatment plant operations personnel with a minimum of one (1) week of training by the contractor or manufacturer of the Wastewater Treatment Plant and Wastewater Effluent Disposal System, along with an Operations and Maintenance (O&M) manual for such facilities. All costs incurred by the Developer in connection therewith shall be deemed "Developer Facilities Costs" for purposes of this Agreement.

4.9 **Acceptance of the Developer Facilities.**

a. Within thirty (30) days after substantial completion of construction of the Developer Facilities, and CLWSC's approval based on final inspections, tests and system facility operations, the Developer will provide to CLWSC the Developer Facilities Costs associated with the completed Developer Facilities, and a concurrence letter from Developer's engineers certifying that the construction of such facilities has been completed in accordance with the approved plans and specifications and change orders thereto approved by CLWSC, that the facilities have been tested and approved for use in accordance with the approved contract documents and contract specifications, the TCEQ regulations, and the laws, rules or regulations of any other governmental entity with jurisdiction, and that such Developer Facilities are properly located within proper and acceptable fee tracts, utility easements or public rights-of-way as provided for herein. CLWSC will not unreasonably withhold acceptance and shall issue a letter of acceptance within ten (10) days of a request by Developer, provided all such conditions are met.

b. Upon the written acceptance of the completed Developer Facilities by CLWSC, CLWSC's receipt of the record drawings in the formats noted above, and receipt of the engineer's concurrence letter, the Developer will convey to CLWSC full and complete title, free and clear of any and all liens, third-party claims or encumbrances, to the Developer Facilities and all easements and other Real Property interests that are reasonably required for the operation of the Developer Facilities, including any access easements reasonably required to provide access to and from public roads to the Developer Facilities, in a form of assignment reasonably acceptable to CLWSC.

c. After conveyance of the Developer Facilities to CLWSC and subject to the conditions of service in Section 2.3, CLWSC will operate, maintain and provide wastewater service in accordance with CLWSC's Tariff and this Agreement.

4.10 **Ownership of Developer Facilities.** After the conveyance of same by Developer to CLWSC, CLWSC will own all the Developer Facilities. CLWSC will take possession and ownership from Developer of Service Laterals serving retail customer lots within the Development Property upon CLWSC's receipt from a retail customer of a request for service necessitating use of the Service Lateral serving that customer's lot. Upon receiving the aforementioned request, CLWSC will take automatic possession and control from the Developer of the Service Lateral serving that retail customer's lot without prior notice to the Developer. The retail customer requesting service will construct and own the Customer Premises Equipment. As set forth in the Tariff, the customer shall be responsible for the installation, maintenance and operation of the Customer Premises Equipment and may have a service and maintenance agreement with CLWSC to provide such maintenance and operation.

4.11 Force Majeure. If, for any reason of Force Majeure, either CLWSC or Developer shall be rendered unable, wholly or in part, to carry out their respective obligations under this Agreement, other than the obligation of the Parties to make the payments required under the terms of this Agreement, then if such Party shall give notice of the reasons in writing to the other Party within a reasonable time after the occurrence of the event or cause relied on, the obligation of the Party giving the notice, so far as it is affected by the Force Majeure, shall be suspended during the continuance of the inability then claimed, but for no longer period on the condition that the Party giving notice will use its best efforts to remove that Force Majeure as soon as possible.

4.12 **INDEMNITY. TO THE FULLEST EXTENT AUTHORIZED BY APPLICABLE LAWS, DEVELOPER SHALL INDEMNIFY, DEFEND AND HOLD HARMLESS CLWSC, ITS OFFICERS, DIRECTORS, EMPLOYEES, CONSULTANTS, ATTORNEYS AND AGENTS FROM AND AGAINST ANY AND ALL CLAIMS, DEMAND, DEBTS, SUITS, CAUSES OF ACTION, LOSSES, DAMAGES, JUDGMENTS, FINES, PENALTIES, LIABILITIES, AND COSTS, INCLUDING REASONABLE ATTORNEY FEES AND DEFENSE COSTS ARISING OUT OF: A) THE BREACH OF ANY OBLIGATION, WARRANTY OR REPRESENTATION OF DEVELOPER UNDER THIS AGREEMENT; B) DEVELOPER'S NON-COMPLIANCE WITH APPLICABLE LAWS, ORDINANCES AND REGULATIONS; OR C) THE DEVELOPER'S FAILURE TO OBTAIN ANY REQUIRED PERMIT OR APPROVAL REGARDING THIS AGREEMENT OR ANY TERM OF THIS AGREEMENT.**

This Indemnity shall equally apply to any permitted successor or assigns of CLWSC, and Developer and shall survive the termination of this Agreement.

V. REIMBURSEMENT OF SERVICE LATERALS

5.1 The Developer shall receive no reimbursement from CLWSC for the Developer Facilities Costs of the Developer Facilities except for the below-specified payment related to the construction of Service Laterals to each lot to be served within the Development Property.

a. CLWSC shall pay Developer a sum of One Thousand Dollars ($1000.00) per Sewer Lateral installed by Developer (the "Sewer Lateral Reimbursement Payment") in the Phase I Lands within seven months of CLWSC receiving a completed service application and payment of tap fees from the retail customer at each lot.

b. The payment to the Developer for Service Laterals it constructed in the Phase II Lands and the Phase III Lands shall be set at the greater of One Thousand Dollars ($1,000.00) or Two Hundred Dollars ($200.00) less than the Residential Sewer Service Connection Fee set forth in CLWSC's Wastewater Utility Tariff in effect at the time the wastewater facilities for Phase II Lands and the Phase III Lands are constructed.

5.2 CLWSC shall tender the Sewer Lateral reimbursement payment to the Developer two times per year, on or before the last day of April and October of each year, for the total number of the new connections to the CLWSC System within the Development Property during the previous two (2) calendar quarters. Each payment shall identify the addresses for new service connections during the preceding two (2) calendar quarters for which payment is tendered.

5.3 CLWSC shall tender the Service Lateral reimbursement payment to Developer for a period of 10 years after the acceptance by CLWSC of all Developer Facilities. CLWSC's obligation to pay such Service Lateral reimbursement payments shall expire at that time.

5.4 The reimbursement of the Developer Facilities Costs for the Service Laterals shall be made by CLWSC to Developer without interest.

VI. WARRANTY AND MAINTENANCE BONDS

6.1 Bonds. The Developer shall be required to post maintenance bonds in forms and by a surety reasonably acceptable to CLWSC for each phase of the Developer Facilities prior to acceptance of the same by CLWSC. The form of the bonds shall be submitted to and approved by CLWSC prior to the initiation of construction and installation of each phase of the Developer Facilities and shall designate CLWSC as a beneficiary. Alternatively, upon prior approval of CLWSC, the Developer may assign to CLWSC bonds posted by the contractor for the phases of the Developer Facilities. The maintenance bonds shall be issued in the amount of twenty five percent (25%) of the construction contract amount. The bonds shall provide that CLWSC may utilize the bond to repair or replace the Developer Facilities during the Warranty Period (as defined below). The bonds must be issued by an approved surety company holding a permit from the State of Texas, indicating it is authorized and admitted to write surety bonds in this State. One original copy of the maintenance bonds shall be provided to CLWSC, and one shall be retained by the Developer and Developer's contractor.

6.2 Warranty. The Developer shall require its contractors to remain responsible for defects in materials, construction or installation which occur within one (1) year from the date of substantial completion of the Developer Facilities (the "Warranty Period"). The Developer and its contractor shall be responsible for replacement, or pay for the replacement by CLWSC and, to the reasonable satisfaction of CLWSC, all materials and work involving any part of the Developer Facilities that is defective and found by CLWSC's consulting engineer to be reasonably necessary for continued operation of the Developer Facilities. This obligation is in addition to the maintenance obligation in Paragraph 6.1 and is limited to fifty percent (50%) of the construction amount. Developer shall obtain this warranty from its contractors prior to the initiation of construction. Upon receipt of written notice from CLWSC within the Warranty Period of the discovery of defects in the Developer Facilities, the Developer's contractor shall thereafter have

seven (7) calendar days to replace or pay for the replacement of the necessary materials and work. In case of emergency where delay in such replacement would cause serious risk of loss or damage to CLWSC or its customers, CLWSC may have the defects corrected, and the contractor shall be liable for all expenses incurred. If contractor fails to timely fulfill the warranty, CLWSC may call upon the bond to pay for such work needed to fulfill the warranty. After the Warranty Period, operation, maintenance and administration of the Developer Facilities shall be at CLWSC's sole cost and responsibility.

VII. REAL PROPERTY ACQUISITION

7.1 **Easements**. Easements for all Developer Facilities not constructed within public rights-of-way shall be conveyed by the Developer to CLWSC at no cost to CLWSC and pursuant to instruments reasonably acceptable to CLWSC, as provided for herein. The location of all Developer Facilities and the terms of all real property conveyances, including easements, shall be subject to CLWSC's review and approval. Notwithstanding the foregoing, the form of the Effluent Disposal Easement shall be substantially in the form attached hereto as Exhibit "C" and other easement instruments shall in the form attached hereto as Exhibit "E".

7.2 **Wastewater Treatment Plant.** The Wastewater Treatment Plant and corresponding improvements shall be constructed on and within the Plant Site. Following completion of construction, in conjunction with CLWSC's acceptance of the Wastewater Treatment Plant, the Plant Site shall be conveyed to CLWSC by a special warranty deed, at no cost to CLWSC, which will convey full and unencumbered title to CLWSC, and shall be in the form attached hereto as Exhibit "E" and in accordance with Paragraph 8.2 of this Agreement.

7.3 **Effluent Disposal Lands.** Following completion of the construction of the Effluent Disposal Facilities and upon acceptance of the same by CLWSC, Developer shall convey the Effluent Disposal Land to CLWSC by special warrant deed, at no cost to CLWSC, which will convey full and unencumbered title to CLWSC, shall be in the form attached hereto and incorporated herein as Exhibit "E" and in accordance with Paragraph 8.2 of this Agreement and shall provide for the following:

a. The special warranty deed shall contain a clause providing for the ownership of the Effluent Disposal Lands to revert to Developer in the event that CLWSC ceases to use them for the irrigation of effluent from the Wastewater Treatment Plant.

b. Simultaneously with the execution of the special warranty deed referenced above, CLWSC shall grant Developer an easement in the form shown on Exhibit E-3 attached hereto and incorporated herein over the Effluent Disposal Lands for the purpose of allowing Developer to use the Effluent Disposal lands for the construction and maintenance of trails and other parkland purposes.

7.4 **Offsite Property**. CLWSC is responsible for securing, at its sole cost and expense, all off-site real property interests required for improvements to the CLWSC System. If CLWSC desires to acquire additional off-site easements or real property, the Developer agrees to reasonably cooperate and to assist CLWSC in connection with its efforts to secure all necessary off-site real property interests required for the construction of facilities to assist CLWSC in the

operation of the CLWSC System, but Developer shall be under no obligation to incur any costs or expenses in connection therewith.

VIII. CLOSING

8.1 **Closing.** Subject to CLWSC amending the CCN to include the Development Property within the Service Area and subject to prior completion of construction of the Developer Facilities by the Developer and acceptance of the same by CLWSC, the Developer and CLWSC shall agree upon a date to conduct a Closing for each phase of the Developer Facilities as they are completed in accordance with the procedures set forth in this **Article VIII** and subject to the requirements of Section 4.9 above, at which time the Developer shall convey ownership of such phase of the Developer Facilities to CLWSC.

8.2 **Manner of Transfer.**

a. Transfer by the Developer to CLWSC of title to all Real Property that constitutes the Interests to be Acquired will be by a special warranty deed and/or easement, as provided for herein, and shall be free of all liens and encumbrances. Title to such real property in the name of CLWSC will be insured by a title company acceptable to CLWSC, with no exceptions, conditions or restrictions that are not reasonably acceptable to CLWSC, and the policy will be of the amount reasonably specified by CLWSC and shall include all endorsements as may be reasonably requested by CLWSC. Developer will be responsible for all costs attributable to the title policy and endorsements. Presidio Title Company in San Antonio, Texas, will be the issuing agent of the title polices and endorsements.

b. Transfer by the Developer to CLWSC of all personal property that constitutes Interests to be Acquired will be by Bill of Sale and Assignment in the form attached hereto as Exhibit "E" and shall be free of all security interests, liens and encumbrances. Developer will furnish a UCC search or other assurance acceptable to CLWSC to assure it that there are no such outstanding security interests, liens and encumbrances.

c. The Developer shall pay any ad valorem taxes of the Plant Site for the period of time prior to Closing.

8.3 **Possession.** Possession of the applicable component of the Interests to be Acquired at a particular Closing will be delivered to CLWSC at the Closing.

8.4 **Costs and Expenses.** All costs and expenses in connection with the Closing under this Agreement will, except as otherwise expressly provided in this Agreement, be borne by the Developer and CLWSC in the manner in which such costs and expenses are customarily allocated between the parties at closings of the purchase and sale of real property in Comal County, Texas.

8.5 **Risks Pending Closing.**

a. The Developer agrees that, from the date of this Agreement to the final Closing Date under this Agreement, it will not, except as otherwise authorized by this Agreement or as approved by CLWSC in writing, enter into contracts in connection with operation of the Interests to be Acquired unless such contracts can be terminated upon ninety (90) days written notice and without liability to CLWSC or encumbrance on the Real Property, personal property conveyed to CLWSC, or the Developer Facilities.

b. If, on the Closing Date, any proceeding is pending before any court or administrative agency of competent jurisdiction, challenging the legal right of either the Developer or CLWSC to make and perform this Agreement or to operate the wastewater collection system, the Wastewater Treatment Plant or the Wastewater Effluent Disposal System, the Developer or CLWSC will have the right, at any time prior to the Closing Date, to suspend and postpone the Closing until such right will have been sustained by a final judgment of a court of competent jurisdiction, but the right to suspend and postpone will not affect any duty to pay.

c. The Developer agrees that, until the Closing, it will maintain, or cause to be maintained, insurance in such amounts as are reasonable and prudent, based on the nature of the Developer Facilities, on those components of the Interests to be Acquired that have not already been conveyed to CLWSC. If, between the Effective Date and the Closing, any part, whether substantial or minor, of the Interests to be Acquired to be conveyed is destroyed or rendered useless by fire, flood, wind, or other casualty, CLWSC will not be released from its obligations hereunder, but any delay in performance by CLWSC shall be excused during the period of time required by Developer to remedy the loss caused by the casualty; however, as to any portion of the Interests to be Acquired so damaged or destroyed, the Developer will make repairs and replacements to restore the Interests to be Acquired to their prior condition, regardless of whether the insurance obtained by the Developer covers such repair or replacement, at its expense.

IX. REPRESENTATIONS AND WARRANTIES

9.1 **Representations of Developer**. With respect to each of the Interests to be Acquired to be conveyed by it, the Developer acknowledges, represents and agrees that, except as provided in this Agreement:

a. It is in all respects qualified, authorized, and in good standing to conduct business within the State of Texas;

b. The contemplated transfer of the Interests to be Acquired to CLWSC will not violate any term, condition or covenant of any agreement to which the Developer is a party;

c. Execution of this Agreement and the consummation of the transactions contemplated hereunder will not constitute an event of default under any contract, covenant or agreement binding upon it;

d. The contemplated transfer of the Interests to be Acquired to CLWSC will not violate the provisions of any federal, state, county or local law, ordinance or regulation;

e. Except as provided herein, it has not previously entered into any agreement or caused or otherwise authorized any action that would diminish, eliminate or adversely affect CLWSC's contemplated ownership or use of the Interests to be Acquired or the value of same;

f. It has been notified of the terms of Texas Water Code and understands its duties to comply therewith;

g. The execution, delivery and performance of this Agreement have been duly authorized by all necessary action on the part of Developer and the person executing this Agreement on behalf of Developer has been fully authorized and empowered to bind Developer to the terms and provisions of this Agreement;

h. All facilities proposed or required by CLWSC under this Agreement are reasonable and necessary to provide for expected local demand requirements and to comply with TCEQ minimum design criteria for facilities used in the collection, transmission, pumping, treatment or disposal of wastewater or other TCEQ minimum requirements;

i. All costs to Developer under this Agreement are reasonable and necessary under the expected circumstances in regard to the provision of service contemplated by this Agreement;

j. The wastewater service to the Development Property is expressly conditioned upon the conditions of service set forth in Section 2.3 and the Developer's compliance with its obligations in this Agreement;

k. Developer will use its best efforts to assist and support CLWSC in all of its efforts to expand its CCN to include the Development Property, if not already included; and

l. Each purchaser of any interest in any portion of the Development Property has been, or will be, made aware, in writing, before its purchase of that portion of the Development Property of its obligations regarding the Customer Premises Equipment and has made, or will make, a written acceptance of those obligations enforceable by CLWSC.

CLWSC is executing this Agreement in reliance on each of the warranties and representations set forth above, and each such representation and warranty will survive the execution and delivery of this Agreement and the consummation of the transactions contemplated by this Agreement.

9.2 **Representations of CLWSC.** CLWSC represents and warrants to the Developer that:

a. CLWSC is an investor-owned utility operating under the authority of Chapter 13 of the Texas Water Code, and it has the requisite power and authority

to take all necessary action to obtain the Interests to be Acquired from the Developer and to execute and deliver this Agreement and, subject to the satisfaction of each of the Service Conditions in Section 2.3, to perform all obligations hereunder;

b. It is in all respects qualified, authorized, and in good standing to conduct business within the State of Texas;

c. To the best of its actual knowledge, the contemplated transfer of the Interests to be Acquired to CLWSC will not violate any term, condition or covenant of any agreement to which the CLWSC is a party;

d. Execution of this Agreement and the consummation of the transactions contemplated hereunder will not constitute an event of default under any contract, covenant or agreement binding upon CLWSC;

e. To the best of its actual knowledge, the contemplated transfer of the Interests to be Acquired to CLWSC will not violate the provisions of any federal, state, county or local law, ordinance or regulation;

f. Except as provided herein, CLWSC has not previously entered into any agreement or caused or otherwise authorized any action that would diminish, eliminate or adversely affect CLWSC's contemplated ownership or use of the Interests to be Acquired or the value of same;

g. The execution, delivery and performance of this Agreement have been duly authorized by all necessary action on the part of CLWSC and the person executing this Agreement on behalf of CLWSC has been fully authorized and empowered to bind CLWSC to the terms and provisions of this Agreement.

h. The wastewater service to the Development Property is expressly conditioned upon the conditions of service set forth in Section 2.3 and the CLWSC's compliance with its obligations in this Agreement; and

i. CLWSC will use all reasonable efforts to expand Developer's CCN to include the Development Property, if not already included.

The Developer is executing this Agreement in reliance on each of the warranties and representations set forth above, and each such representation and warranty of CLWSC will survive the execution and delivery of this Agreement and the consummation of each of the transactions contemplated by this Agreement.

9.3 **Survival of Covenants.** The covenants contained in this Article will survive the conveyance, transfer and assignment of the Interests to be Acquired at all Closings and will continue to bind the CLWSC and the Developer as provided herein.

X. REMEDIES

10.1 **CLWSC's Remedies.**

a. If the Developer fails or refuses to timely comply with its material obligations hereunder, or if, prior to a Closing, the Developer's representations, warranties or covenants contained herein are not true or have been breached, CLWSC will have the right, along with any other remedy at law or in equity, to (i) enforce this Agreement by specific performance, injunction, or any other remedy available at law or in equity in a court of competent jurisdiction including but not limited to an action for damages; or (ii) waive prior to or at Closing as applicable, the applicable objection or condition and to proceed to close their transaction in accordance with the remaining terms.

b. If, after a Closing, CLWSC determines that any of the Developer's representations, warranties or covenants that applied to the Closing is not true, then CLWSC may avail itself of any remedy at law or in equity to which it may be entitled.

10.2 **Default in Payments.**

a. All amounts due and owing by the Developer to CLWSC shall, if not paid when due, bear interest at the Texas post-judgment interest rate as set out in V.T.C.A., Finance Code §304.002, or any successor statute, from the date when due until paid, provided that such rate shall never be usurious or exceed the maximum rate as permitted by law. If any amount due and owing by the Developer to CLWSC is placed with an attorney for collection, the prevailing party in any litigation or arbitration involving the collection shall be paid its costs and attorneys' fees by the non-prevailing party, and such payments shall be in addition to all other payments provided for by this Agreement, including interest.

For so long as there is any failure to provide a required payment hereunder by Developer and that failure remains uncured by the Developer, Developer agrees that CLWSC shall not be obligated to do anything under this Agreement with respect to the lots or real property for which full payment has not been made, including, without limitation, to sign or to approve any additional final plats of the units of the subdivision within the Development Property, until payment in full is made to CLWSC. In such an event, Developer shall not take any actions to proceed with or to have any such plat approved by the county with jurisdiction, and CLWSC shall not be obligated to provide wastewater service to any such units of the subdivisions within the Development Property until the monetary default is cured. Notwithstanding any provision hereunder to the contrary, any alleged default by Developer shall not authorize CLWSC to refuse or discontinue wastewater service to any residential customers or lots within the Development Property for which all fees and charges have been paid in full.

10.3 **Disputed Payment.** If the Developer at any time disputes the amount to be paid by it to CLWSC, the Developer shall nevertheless promptly make the disputed payment or payments, but the Developer shall thereafter have the right to seek a determination of whether the amount charged by CLWSC is in accordance with the terms of this Agreement and to seek a refund.

10.4 **Developer's Remedies.**

a. If CLWSC fails or refuses to timely comply with CLWSC's material obligations to the Developer under this Agreement or is unable to do so as a result of CLWSC's acts or failure to act, the Developer will have the following remedies: (i) to enforce this Agreement by specific performance, injunction, or any other remedy available at law or in equity in a court of competent jurisdiction including but not limited to an action for damages, or (ii) to waive prior to or at Closing, as applicable, the applicable objection or condition and proceed to carry out this transaction in accordance with the remaining terms.

b. If, after Closing, the Developer determines that any of CLWSC's representations, warranties or covenants which applied to the Closing was not true, then the Developer may avail itself of any remedy at law or in equity to which it may be entitled.

10.5 **Notice and Opportunity to Cure.** If either Party (referred to herein as the "Defaulting Party") fails to comply with its obligations under this Agreement or is otherwise in breach or default under this Agreement (collectively, a "Default") then the other Party (referred to herein as the "Non-Defaulting Party") shall not have any right to invoke any rights or remedies with respect to any Default until and unless: (i) the Non-Defaulting Party delivers to the Defaulting Party a written notice (the "Default Notice") which specifies the particulars of the Default and specifies the actions necessary to cure the Default; and (ii) the Defaulting Party fails to cure, within ten (10) days after the Defaulting Party's receipt of the Default Notice, any matters specified in the Default Notice which may be cured solely by the payment of money or the Defaulting Party fails to commence the cure of any matters specified in the Default Notice which cannot be cured solely by the payment of money within ten (10) days after the Defaulting Party's receipt of the Default Notice or fails to thereafter pursue curative action with reasonable diligence to completion.

10.6 **Transfers that are Unauthorized by CLWSC.** Under no circumstances will CLWSC be responsible to provide wastewater service of any kind to Developer or to any third party beyond the total Service Commitment identified in this Agreement for the Development Property.

XI. APPROVALS

Whenever the term "approve" or "approval" is used in this Agreement, the Party whose approval is required will not unreasonably withhold or delay it. Where approval is necessary, the Party seeking approval may request approval in writing, and the approving Party will have ten (10) business days to provide approval or request modification for the matter subject to approval.

XII. NOTICES

All notices hereunder by either party to the other will be sufficient if sent in writing by certified mail, recognized courier or delivery service, e-mail, or facsimile transmission with confirmation of delivery, addressed and delivered to the following:

to CLWSC: Canyon Lake Water Service Company
ATTN: Thomas Hodge, General Manager
P.O. Box 1742
Canyon Lake, Texas 78130
Facsimile: (830) 964-2779
E-mail: tom.hodge@clwsc.com

with copy to: Suzy Papazian
SJWTX, Inc.
110 W. Taylor Street
San Jose, CA 95110
E-mail: Suzy_Papazian@sjwater.com
Facsimile: (408) 279-7934

To Developer: Southstar at Vintage Oaks, LLC
Thad Rutherford
1114 Lost Creek Blvd., Suite 270
Austin, TX 78746
(512) 865-5901 - office
(512) 942-4359 – mobile
E-mail: thad@southstarcommunities.com

with copy to: Matthew Bradley
MATTHEW BRADLEY, PC
750 E. Mulberry, Suite 510
San Antonio, Texas 78212
Telephone: (210) 738-8750
Facsimile: (210) 738-8788
Email: mbradley@mattbradleylaw.com

All notices will be deemed to have been given on the date of mailing or sending of such notice. Any Party may change its address upon five days' written notice to the other Party.

XIII. ASSIGNABILITY

13.1 **Assignment by the Developer**. Developer may not assign this Agreement without the prior written consent of CLWSC. Developer acknowledges that, as a condition of any such consent to assignment, CLWSC may require that: (i) the assignee assume all rights, duties and obligations of Developer under this Agreement; (ii) the assignee establish to CLWSC's reasonable satisfaction that the assignee has and will have the financial capacity to fulfill the Developer's duties and obligations under this Agreement; and (iii) the Developer provide a financial guarantee in a form approved by CLWSC to secure the performance of Developer's duties and obligations under this Agreement. No assignment will be effective until after any outstanding payment due to CLWSC is paid in full. Notwithstanding the foregoing, any such assignment shall not relieve Developer from (i) any liability arising out of Developer's default under the Agreement occurring prior to the date of such assignment, except to the extent CLWSC consents to the assumption

thereof to the assignee; or (ii) Developer's obligations under this Agreement hereof resulting from acts or omissions occurring prior to the date of such assignment, except to the extent CLWSC consents to the assumption thereof to the assignee. The agreement of CLWSC to provide wastewater service to the Property is specific to the Property, and Developer may not assign, transfer or convey LUEs, rights created hereunder, or any other burden on CLWSC for use in another location other than the Property without the express written agreement of CLWSC, which agreement may be withheld by CLWSC for any or no reason. Notwithstanding the foregoing, Developer may assign this Agreement to an affiliate of Developer without the prior written consent of CLWSC.

13.2 **Assignment by CLWSC.** CLWSC may not assign this Agreement without the prior written consent of Developer. CLWSC acknowledges that, as a condition of any such consent to assignment, Developer may require that: (i) the assignee assume all rights, duties and obligations of CLWSC under this Agreement; (ii) the assignee establish to Developer's reasonable satisfaction that the assignee has and will have the financial capacity to fulfill CLWSC's duties and obligations under this Agreement; and (iii) CLWSC provide a financial guarantee in a form approved by Developer to secure the performance of CLWSC's duties and obligations under this Agreement. No assignment will be effective until after any outstanding payment due to Developer is paid in full. Notwithstanding the foregoing, any such assignment shall not relieve CLWSC from (i) any liability arising out of CLWSC's default under the Agreement occurring prior to the date of such assignment, except to the extent Developer consents to the assumption thereof to the assignee; or (ii) CLWSC's obligations under this Agreement hereof resulting from acts or omissions occurring prior to the date of such assignment, except to the extent Developer consents to the assumption thereof to the assignee. Notwithstanding the foregoing, Developer may assign this Agreement

XIV. MISCELLANEOUS

14.1 **Execution.** This Agreement may be simultaneously executed in any number of counterparts, each of which will serve as an original and will constitute one and the same instrument.

14.2 **Costs and Expenses.** Except as otherwise expressly provided herein, each Party will be responsible for all costs and expenses incurred by such Party in connection with the transaction contemplated by this Agreement.

14.3 **Governing Law.** This Agreement will be governed by the Constitution and laws of the State of Texas, except as to matters exclusively controlled by the Constitution and statutes of the United States of America.

14.4 **Successors and Assigns.** Except as provided in Article XIII, the assignment of this Agreement by either Party is prohibited without the prior written consent of the other Party, which consent will not be unreasonably withheld. All of the respective covenants, undertakings, and obligations of each of the Parties will bind that Party and will apply to and bind any successors or assigns of that Party.

14.5 **Headings.** The captions and headings appearing in this Agreement are inserted merely to facilitate reference and will have no bearing upon its interpretation.

14.6 **Partial Invalidity**. If any of the terms, covenants or conditions of this Agreement, or the application of any term, covenant, or condition, is held invalid as to any person or circumstance by any court with jurisdiction, the remainder of this Agreement, and the application of its terms, covenants, or conditions to other persons or circumstances, will not be affected.

14.7 **Waiver**. Any waiver by any Party of its rights with respect to a default or requirement under this Agreement will not be deemed a waiver of any subsequent default or other matter.

14.8 **Amendments**. This Agreement may be amended or modified only by written agreement duly authorized by CLWSC and executed by the duly authorized representatives of both Parties.

14.9 **Cooperation**. Each Party agrees to execute and deliver all such other and further instruments and undertake such actions as are or may become necessary or convenient to effectuate the purposes and intent of this Agreement.

14.10 **Venue**. All obligations of the Parties are performable in Comal County, Texas, and venue for any action arising hereunder will be in Comal County, Texas.

14.11 **Third Party Beneficiaries**. Except as otherwise expressly provided herein and except with respect to the Contracts assumed by the CLWSC, nothing in this Agreement, express or implied, is intended to confer upon any person, other than the Parties, any rights, benefits, or remedies under or by reason of this Agreement.

14.12 **Representations**. Unless otherwise expressly provided, the representations, warranties, covenants, and other agreements will be deemed to be material and continuing, will not be merged, and will survive the Closing and the conveyance and transfer of the Interests to be Acquired to CLWSC.

14.13 **Exhibits**. All exhibits attached to this Agreement are hereby incorporated in this Agreement as if the same were set forth in full in the body of this Agreement.

14.14 **Entire Agreement.** This Agreement, including the attached exhibits, contains the entire agreement between the Parties with respect to the Interests to be Acquired and supersedes all previous and contemporaneous communications, representations, or agreements, either verbal or written, between the Parties with respect to such matters, and all such matters are merged into this Agreement.

14.15 **Time of the Essence**. Time is of the essence in all matters related to this Agreement.

14.16 **Interpretation**. The singular form of any word used herein shall include the plural, and vice-versa, unless the context requires otherwise. The use of a word of any gender herein shall include all other genders, unless the context requires otherwise. This Agreement and all of the

terms and provisions hereof shall be construed so as to effectuate the purposes contemplated hereby and to sustain the validity hereof.

14.17 **No Partnership**. The relationship between Developer and CLWSC at all times shall remain solely that of an owner and independent contractor and shall not be deemed a partnership or joint venture.

IN WITNESS WHEREOF, the Parties hereto have caused this instrument to be signed, sealed and attested in duplicate by their duly authorized officers, on the dates set forth below and is effective as of the Effective Date set forth above.

CLWSC: **SJWTX, INC. DBA CANYON LAKE WATER SERVICE COMPANY**

By:_____
Name:_____
Title:_____

DEVELOPER: Southstar at Vintage Oaks, LLC

By: _____
Thad Rutherford, COO

EXHIBIT "A"

(Legal Description of the Development Property)

DRAFT

EXHIBIT "B"

Preliminary Land Use Plan
and Developer Master Wastewater Plan

(*Including Depictions of Initial and Final Service Lands and Effluent Disposal Lands for Each Phase Development*)

DRAFT

EXHIBIT "C"

(Legal Description of the Effluent Disposal Lands)

DRAFT

EXHIBIT "D"

(Description of Real Property and Easements to be conveyed
to CLWSC, including Plant Site and Effluent Disposal Land descriptions)

Easements for:

Sewer Laterals
Collection Lines

Fee title to:

Wastewater Treatment Plant Site
Effluent Disposal Lands

DRAFT

EXHIBIT "E"

Form of Conveyance Instruments

DOCUMENTS ATTACHED ON FOLLOWING PAGES

DRAFT

Exhibit E-1

BILL OF SALE

THE STATE OF TEXAS	§	
	§	KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF COMAL	§	

ASSIGNOR: SOUTHSTAR AT VINTAGE OAKS, LLC
P. O. Box 630105
(a) Irving, Texas 75063-0105

ASSIGNEE: SJWTX, Inc. d/b/a CANYON LAKE WATER SERVICE COMPANY
P. O. Box 1742
Canyon Lake, Comal County, Texas 78133

For and in consideration of Ten Dollars ($10.00) and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Southstar at Vintage Oaks, LLC, a Texas limited liability company, whose address is P.O. Box 630105, Irving, TX 75063-0105 ("***Assignor***"), has TRANSFERRED, ASSIGNED, CONVEYED AND DELIVERED, and by these presents does hereby TRANSFER, ASSIGN, CONVEY AND DELIVER, unto SJWTX, Inc., a Texas corporation, d/b/a Canyon Lake Water Service Company ("***Assignee***"), all personal property and fixtures located on or within the real property and easements described on Exhibit A, attached hereto and made apart hereof, used or useful in the operation, maintenance, or repair of the wastewater facilities located thereon and therein, including, without limitation, the property described on Exhibit B, which is also attached hereto and made a part hereof, (all together, the "property").

TO HAVE AND TO HOLD the property unto Assignee, Assignee's successors and assigns forever, and Assignor does hereby bind Assignor, Assignor's successors and assigns, to warrant and forever defend the title to the property unto Assignee, Assignee's successors and assigns, against any person whomsoever lawfully claiming or to claim the same, or any part thereof.

Assignor grants, sells and conveys to Assignee full and complete title to the property, free and clear of any and all security interests, liens, third-party claims or encumbrances.

EXECUTED effective as of this the ____ day of _____, 2015.

ASSIGNOR:

SOUTHSTAR AT VINTAGE OAKS, LLC

By: _____
Laura Ficco, Assistant Vice President

ACKNOWLEDGMENT

STATE OF TEXAS §
§
COUNTY OF DALLAS §

This instrument was acknowledged before me on the _____ day of _____, 2015, by Laura Ficco, Assistant Vice President of SOUTHSTAR AT VINTAGE OAKS, LLC, Assignor in above Bill of Sale.

_____
W. NOTARY PUBLIC, STATE OF TEXAS

After Recording, Return to:

The Jones Law Firm
1703 West Avenue
Austin, Texas 78701

BILL OF SALE
EXHIBIT A
Legal Description of Real Property
and Easements

[*INSERT PROPERTY DESCRIPTIONS*]

DRAFT

BILL OF SALE
EXHIBIT B
Personal Property

All right, title and interest to all tangible and intangible personal property used or useful by Assignor in connection with the operation, maintenance or repair of the wastewater facilities, including, but not limited to, all of the following:

1. All wastewater collection, treatment and disposal equipment and facilities, buildings, fixtures, equipment, supplies, records, work product, effluent (treated or untreated), potable water, water and wastewater pipelines (above ground and buried), electric and natural gas transmission, collection and distribution lines and conduits, communication buildings and structures, communication towers, pumps, irrigation lines, variable width spray irrigation areas, discharge facilities, water storage tanks, lift stations, pump station facilities, pumping plant facilities, valves, meters, tangible personal property, erosion control structures, fences, and all other necessary appurtenances, facilities, and structures related in any way to the operation, maintenance and repair of the wastewater facilities located on or within the real property described on the foregoing exhibit;

2. All applicable permits, licenses and certifications, if any, necessary for the operation of the wastewater facilities;

3. Without limitation, included in the above described assets, all assets and property described as follows:

[*INSERT SPECIFIC PROPERTY, IF ANY*]

Exhibit E-2

NOTICE OF CONFIDENTIALITY RIGHTS: IF YOU ARE A NATURAL PERSON, YOU MAY REMOVE OR STRIKE ANY OR ALL OF THE FOLLOWING INFORMATION FROM ANY INSTRUMENT THAT TRANSFERS AN INTEREST IN REAL PROPERTY BEFORE IT IS FILED FOR RECORD IN THE PUBLIC RECORDS: YOUR SOCIAL SECURITY NUMBER OR YOUR DRIVER'S LICENSE NUMBER.

THE STATE OF TEXAS §
§
COUNTY OF COMAL §

SPECIAL WARRANTY DEED
(Wastewater Plant Site and Effluent Disposal Lands)

NOTICE OF CONFIDENTIALITY RIGHTS: IF YOU ARE A NATURAL PERSON, YOU MAY REMOVE OR STRIKE ANY OR ALL OF THE FOLLOWING INFORMATION FROM ANY INSTRUMENT THAT TRANSFERS AN INTEREST IN REAL PROPERTY BEFORE IT IS FILED FOR RECORD IN THE PUBLIC RECORDS: YOUR SOCIAL SECURITY NUMBER OR YOUR DRIVER'S LICENSE NUMBER.

SPECIAL WARRANTY DEED
(WASTEWATER PLANT SITE AND WASTEWATER EFFLUENT DISPOSAL LANDS)

THE STATE OF TEXAS §
§ KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF COMAL §

GRANTOR: SOUTHSTAR AT VINTAGE OAKS, LLC
P. O. Box 630105
(a) Irving, Texas 75063-0105

GRANTEE: SJWTX, Inc. d/b/a CANYON LAKE WATER SERVICE COMPANY
P. O. Box 1742
Canyon Lake, Comal County, Texas 78133

That Grantor, for and in consideration of the sum of TEN AND NO/100 DOLLARS ($10.00) cash and other good and valuable consideration to it in hand paid by Grantee, the receipt of which is hereby acknowledged and confessed, has GRANTED, SOLD and CONVEYED, and by these presents does GRANT, SELL and CONVEY, unto the Grantee, the Property described herein to wit:

_____, THE HILLS AT VINTAGE OAKS, UNIT ____, Comal County, Texas, according to plat thereof recorded in Document #_____, Map and Plat Records of Comal County, Texas (hereinafter referred to as the "Property").

TO HAVE AND TO HOLD the Property, together with all and singular the rights and appurtenances thereto in anyway belonging, unto Grantee, its successors and assigns forever; and Grantor does hereby bind itself, its heirs, successors and assigns, to WARRANT AND FOREVER DEFEND all and singular the Property unto the Grantee, its successors and assigns, against every person whomsoever lawfully claiming or to claim the same or any part thereof, when the claim is by, through or under Grantor, but not otherwise.

Under this conveyance, Grantor shall not be liable or responsible in the future for rollback taxes, if any, that become due as a result of a change in use occurring after the date of this deed.

IT IS expressly UNDERSTOOD, ACKNOWLEDGED and AGREED that Grantor hereby RESERVES and EXCEPTS from this conveyance all oil, gas and other minerals of any type or form including all rights to ingress and egress as well as other rights appurtenant to the minerals and the mineral estate owned by Grantor, and does not transfer the minerals and the appurtenant rights thereto to Grantee.

THIS CONVEYANCE IS MADE AND ACCEPTED by Grantee SUBJECT TO (i) taxes for the current year, which have been prorated as of the date of closing, the payment of which Grantee assumes; (ii) all subsequent tax assessments for the current year the payment of which Grantee assumes; (iii) the Declaration of Conditions, Covenants and Restrictions for The Hills at Vintage Oaks filed in the Official Real Property Records, Comal County, Texas, all other restrictions, covenants, conditions, easements, reservations, leases, mineral severances, and other instruments that affect the Property and as may or may not be shown in the public records of Comal County, Texas; (iv) all zoning laws, regulations and ordinances of municipal and/or other governmental authorities that affect the Property and (v) the items listed below as Permitted Exceptions:

1. Subject to the Declaration of Conditions, Covenants and Restrictions for The Hills at Vintage Oaks, recorded at Clerk's Document #_____, annexed by Document #_____, amended or supplemented by Document #_____, Official Real Property Records, Comal County, Texas.
2. Subject to items listed in a commitment of title
3. Seller hereby RESERVES and EXCEPTS all oil, gas and other minerals of every kind and character in, on and under the Property together with all rights appurtenant thereto.
4. The Property is for use as a facilities site for wastewater disposal, treatment storage, and wastewater facilities to run, operate and manage a public wastewater system of the Grantee, any and all restrictions, declarations, covenants including the Declaration of Conditions, Covenants and Restrictions for The Hills at Vintage Oaks stated in #1 above that are inconsistent with Grantee's operation, running and managing of a public wastewater facility for the benefit of The Hills at Vintage Oaks are hereby superseded and/or canceled by this grant to Grantee.

When the context requires, singular nouns and pronouns include the plural.

EXECUTED on the _____ day of _____, 2015.

SOUTHSTAR AT VINTAGE OAKS, LLC

By: _____
Laura Ficco, Assistant Vice President

ACKNOWLEDGMENT

STATE OF TEXAS §
§
COUNTY OF DALLAS §

This instrument was acknowledged before me on the _____ day of _____, 2015, by Laura Ficco, Assistant Vice President of SOUTHSTAR AT VINTAGE OAKS, LLC, Grantor in above Warranty Deed.

_____
NOTARY PUBLIC, STATE OF TEXAS

AFTER RECORDING RETURN TO:

CANYON LAKE WATER SERVICE COMPANY
P. O. Box 1742
Canyon Lake, Comal County, Texas 78133

After Recording, Return to:

The Jones Law Firm
1703 West Avenue
Austin, Texas 78701

WARRANTY DEED
EXHIBIT A
PROPERTY DESCRIPTION

{*INSERT PLANT SITE PROPERTY DESCRIPTION*}

Exhibit E-3

Trail Easement

DRAFT

Appendix E: TANK SIZE AND CALCULATION

E S C, Inc.

Engineers and Architects

July 5, 2001

Mr. David Beach
Ellison Concrete Products
5203 I-45 North
Ennis, Texas 75119

Re: **STRUCTURAL CALCULATIONS FOR TANKS**

Dear David:

Enclosed please find structural calculations for a range of tank sizes and configurations manufactured at your facility. The tanks covered by these calculations are listed below.

1. 350 Gallon Round Tank
2. 400 Gallon Round Tank
3. 500 Gallon Round Tank
4. 750 Gallon Single Compartment Rectangular
5. 1000 Gallon Single/Dual Compartment Rectangular
6. 1500 Gallon Single/Dual Compartment Rectangular

The calculations for the above tanks comply with the requirements of ASTM C1227-93a Section 6. There are individual calculation sheets for each of the round tanks and a "Worst Case" scenario design to cover the range of sizes and configurations of the rectangular tanks.

All tanks are manufactured with 4,500 psi concrete and grade 40, 6"X6"X10 gauge Welded Wire Fabric (WWF) throughout. All reinforcing steel shall be placed such that the minimum concrete cover is maintained per the ACI 318 latest edition, but not less than one (1) inch. Material certifications submitted for the aggregate, admixtures, and mix design conform to the requirements in Section 5 of ASTM C1227-93a. All manufacturing methods and processes should continue to incorporate the requirements in these design calculations and any deviations from said calculations should have calculations modified and/or updated.

If you have any questions regarding these calculations or this letter please call me at 417-831-5500.

Sincerely,

Mark A. Logan, P.E.

cc: Mr. Marvin Smith – Suhor Industries

1922 N. BROADWAY AVENUE SPRINGFIELD, MO 65803 PHONE (417) 831-5500 FAX (417) 831-4533

Circular Concrete Tanks (PCA Thin Shell Method)

ESC, Inc Engineers and Architects
04-Jul-01

Wall with Hinged base and Free Top

Diameter Inside (D, inches)	53		f_c' (psi)	4,500
Depth Inside (H, inches)	52		f_c (allow Conc.Ten.,psi)	450
Wall Thickness (t, inches)	2		($0.10f_c'$)	
Capacity (Gallons)	350		f_s (allow Steel Stress,psi)	14,500
H^2 / Dt (unitless)	26		E_s (psi)	29,000,000
R = D / 2 (inches)	26.5		E_c (psi)	3,823,676
w (1.7 LL factor per ACI 318)	106.1	pcf	n	7.6
wHR (lb per foot)	1,015.13		C (shrinkage Coef.)	0.0003
Ring Tension = wHR * Table Coef.			A_c = 12t (in.^{2})	24.00

A_s(actual,horiz&vert)= 0.029 in^2 (6"X6", 10 gauge wire)

Calculate Horizontal Ring Tension:

Point	0.75 H	0.80 H	0.85 H	0.90 H	0.95 H
Table Coefficient	0.814	0.861	0.847	0.721	0.436
Ring Tension (T, pounds)	826	874	860	732	443

A_s (max) = T_{max} / f_s 0.060 in^2 A_s(actual,horiz&vert)= 0.029 in^2

f_c = $(CE_sA_s+T_{max})/(A_c+nA_s)$ (psi) 46.50 psi < 450 okay

Shear at Base of Wall = V = Coef.*wH^2 95.61 lb per foot
(Coef. = 0.048)

Unit Shear Stress (psi) = V / 0.875bd 7.97 psi
(b=12", d=t/2=1")

Calculate Vertical Bending Moment: M = Coef. * wH^3

Point	0.75 H	0.80 H	0.85 H	0.90 H	0.95 H
Table Coefficient	0.0000	0.0005	0.0009	0.0014	0.0013
Vertical Moment M (ft-lb)	0	4	8	12	11

A_s (min) = M(ft-kips) / ad = 0.008 in^2 okay
(a = 1.44(*), d = t/2)
* "a" is taken from "Reinforced Concrete Design Handbook" from P.C.I.

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Circular Concrete Tanks (PCA Thin Shell Method)

ESC, Inc Engineers and Architects
04-Jul-01

Wall with Hinged base and Free Top

Diameter Inside (D, inches)	57		f_c' (psi)	4,500
Depth Inside (H, inches)	52		f_c (allow.Conc.Ten.,psi)	450
Wall Thickness (t, inches)	2		($0.10f_c'$)	
Capacity (Gallons)	400		f_s (allow.Steel Stress,psi)	14,500
H^2 / Dt (unitless)	24		E_s (psi)	29,000,000
R = D / 2 (inches)	28.5		E_c (psi)	3,823,676
w (1.7 LL factor per ACI 318)	106.1	pcf	n	7.6
wHR (lb per foot)	1,091.74		C (shrinkage Coef.)	0.0003
Ring Tension = wHR * Table Coef.			A_c = 12t (in.^{2})	24.00

A_s(actual,horiz&vert)= 0.029 in^2 (6"X6", 10 gauge wire)

Calculate Horizontal Ring Tension:

Point	0.75 H	0.80 H	0.85 H	0.90 H	0.95 H
Table Coefficient	0.816	0.839	0.793	0.647	0.377
Ring Tension (T, pounds)	891	916	866	706	412

A_s (max) = T_{max} / f_s 0.063 in^2 A_s(actual,horiz&vert)= 0.029 in^2

f_c = $(CE_sA_s+T_{max})/(A_c+nA_s)$ (psi) 48.24 psi < 450 okay

Shear at Base of Wall = V = Coef.*wH^2 109.56 lb per foot
(Coef. = 0.055)

Unit Shear Stress (psi) = V / 0.875bd 9.13 psi
(b=12", d=t/2=1")

Calculate Vertical Bending Moment: M = Coef. * wH^3

Point	0.75 H	0.80 H	0.85 H	0.90 H	0.95 H
Table Coefficient	0.0005	0.0010	0.0015	0.0020	0.0017
Vertical Moment M (ft-lb)	4	9	13	17	15

A_s (min) = M(ft-kips) / ad = 0.012 in^2 okay
(a = 1.44(*), d = t/2)
* "a" is taken from "Reinforced Concrete Design Handbook" from P.C.I.

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Circular Concrete Tanks (PCA Thin Shell Method)

ESC, Inc Engineers and Architects
04-Jul-01

Wall with Hinged base and Free Top

Diameter Inside (D, inches)	62	f_c' (psi)	4,500
Depth Inside (H, inches)	52	f_c (allow.Conc.Ten.,psi) ($0.10f_c'$)	450
Wall Thickness (t, inches)	2		
Capacity (Gallons)	500	f_s (allow.Steel Stress,psi)	14,500
H^2 / Dt (unitless)	22	E_s (psi)	29,000,000
R = D / 2 (inches)	31.0	E_c (psi)	3,823,676
w (1.7 LL factor per ACI 318)	106.1 pcf	n	7.6
wHR (lb per foot)	1,187.51	C (shrinkage Coef.)	0.0003
Ring Tension = wHR * Table Coef.		A_c = 12t ($in.^2$)	24.00
A_s(actual,horiz&vert)=	0.029 in^2 (6"X6", 10 gauge wire)		

Calculate Horizontal Ring Tension:

Point	0.75 H	0.80 H	0.85 H	0.90 H	0.95 H
Table Coefficient	0.814	0.828	0.774	0.625	0.361
Ring Tension (T, pounds)	967	983	919	742	428

A_s (max) = T_{max} / f_s 0.068 in^2 A_s(actual,horiz&vert) = 0.029 in^2

$f_c = (CE_sA_s+T_{max})/(A_c+nA_s)$ (psi) 51.01 psi < 450 okay

Shear at Base of Wall = V = Coef.*wH^2 (Coef. = 0.059) 117.52 lb per foot

Unit Shear Stress (psi) = V / 0.875bd (b=12", d=t/2=1") 9.79 psi

Calculate Vertical Bending Moment: M = Coef. * wH^3

Point	0.75 H	0.80 H	0.85 H	0.90 H	0.95 H
Table Coefficient	0.0007	0.0012	0.0018	0.0022	0.0019
Vertical Moment M (ft-lb)	6	10	15	19	16

A_s (min) = M(ft-kips) / ad = 0.013 in^2 okay
(a = 1.44(*), d = t/2)
* "a" is taken from "Reinforced Concrete Design Handbook" from P.C.I.

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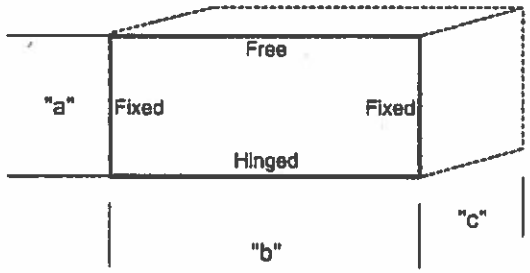
File M:/Aproj/01-175/tankdesign.xls

Rectangular Concrete Tanks (PCA Thin Shell Method)

ESC, Inc Engineers and Architects
04-Jul-01

* Dimensions shown are interior.



Wall with Hinged base and Free Top:

* All reinforcing is to be 6"X6"X10ga Welded Wire Fabric (WWF).

The following calculations apply to the Tank Designs listed below from the Ennis and El Paso, Texas plants

Tank Capacity	Height 'a'	Length 'b'	Width 'c'	b/a	c/a	Wall Thk.	Plant
750 Gallon	51.00	90.00	51.00	1.76	1.00	2.50	Ennis, TX
1000 Gallon	54.25	96.00	57.00	1.77	1.05	2.50	Ennis, TX
1500 Gallon	54.25	144.00	62.00	2.65	1.14	2.50	Ennis, TX
1000 Gal. Grease	60.00	96.50	52.50	1.61	0.88	2.75	El Paso, TX
1000 Gal. Sand	60.00	96.50	52.50	1.61	0.88	2.75	El Paso, TX
1000 Gal. Septic	52.00	96.00	63.00	1.85	1.21	2.50	El Paso, TX
1250 Gal. Septic	59.50	92.75	57.00	1.56	0.96	2.50	El Paso, TX

Table dimensions are in inches or ratios unless otherwise noted

*** Due to similar wall thickness and reinforcing, evaluate the 1500 Gal. Tank (single cell) as worst case.**

**** Assume single cell tanks for worst case design. Interior walls for multi-cell tanks must be 2.5" thick and reinforced with 6X6X10 gauge WWF.**

Moment Design in Wall Sections:

Use Table 5 (attached), chart b/a=3.0 and c/a=1.00; these values are conservative.

Reinforcing is the same in the X, Y, and Z planes, so maximum moment in any of the three planes will govern.

Maximum coefficient occurs at x/a=0 and y=b/2; M_y coef.= -0.118

w (submerged condition) = 106.08 pcf (includes 1.7 LL factor per ACI 318)

a (ft) = 4.52 ft

Maximum Moment in walls = coef. X wa^3 = **1,156.57 ft-lb/ft**

Calculate moment capacity of wall section: f_c' = 4,500 psi
f_y' = 40,000 psi

A_s (6"X6"X10 gauge WWF) = 0.029 in^2

d = t/2 = 1.25 inches

$a = A_s f_y / 0.85 f_c' b$ = 0.025 inches

$M_u = 0.9 A_s f_y (d - a/2)$ = **1,291.81 ft-lbs** > **1,156.57 ft-lbs** **okay**

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Shear Design in Wall Sections:

Use Table 8 (attached) with b/a=3.0; this value is conservative.

Maximum coefficient is -0.590 $w a^2$

w (submerged conditon) = 106.08 pcf (includes 1.7 LL factor per ACI 318)

a (ft) = 4.52 ft

Maximum Shear in walls = coef. X wa^2 = **1,279.15 lbs**

Calculate shear capacity of wall section:

$v_c = 2(f_c')^{0.5}bd$ = **2,012.46 lbs**

2,012.46 > 1,279.15 okay

Top Slab Design:

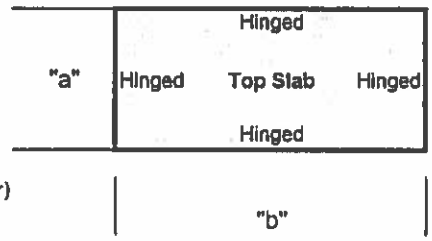
Moment Coefficient taken from Table 4 (attached)

b / a ("c" above) = 2.32 (Use 2.50 in Table)

Maximum coefficient from Table 8 is 0.112

w = uniform load above slab = 424.32 psf (assumes 4' cover)

Maximum moment = coef. X $w a^2$ = **1,268.62 ft-lb**



Calculate moment capacity of wall section:

f_c' = 4,500 psi
fy' = 40,000 psi

A_s (6"X6"X10 gauge WWF) = 0.029 in^2

d = t/2 = 2 inches (minimum thickness of all top slabs is 4 inches)

$a = A_s f_y / 0.85 f_c' b$ = 0.025 inches

$M_u = 0.9 A_s f_y (d - a/2)$ = **2,074.81 ft-lbs > 1,268.62 ft-lbs okay**

Note : Since shear in a 2 inch thick wall section was adequate to resist similar loads, by reason, the top slab will resist shear loads imposed by the overburden.

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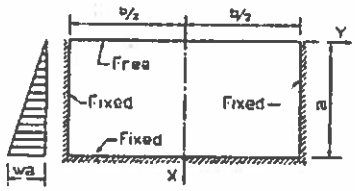
Table 3

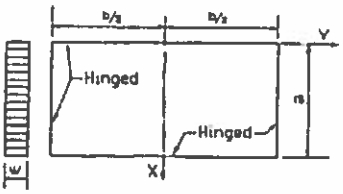
Moment = Coef. × wa^2



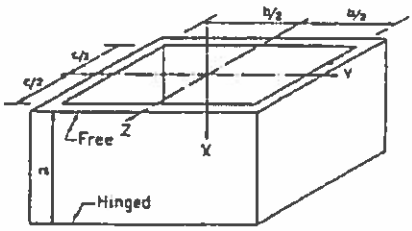
b/a	x/a	y = 0		y = b/4		y = b/2	
		M_x	M_y	M_x	M_y	M_x	M_y
	0	0	+0.025	0	+0.014	0	-0.082
	¼	+0.010	+0.019	+0.007	+0.013	-0.014	-0.071
3.00	½	+0.005	+0.010	+0.008	+0.010	-0.011	-0.055
	¾	-0.033	-0.004	-0.018	-0.000	-0.006	-0.028
	1	-0.128	-0.025	-0.092	-0.018	0	0
	0	0	+0.027	0	+0.013	0	-0.074
	¼	+0.012	+0.022	+0.007	+0.013	-0.013	-0.066
2.50	½	+0.011	+0.014	+0.008	+0.010	-0.011	-0.053
	¾	-0.021	-0.001	-0.010	+0.001	-0.005	-0.027
	1	-0.108	-0.022	-0.077	-0.015	0	0
	0	0	+0.027	0	+0.009	0	-0.060
	¼	+0.013	+0.023	+0.006	+0.010	-0.012	-0.059
2.00	½	+0.015	+0.016	+0.010	+0.010	-0.010	-0.049
	¾	-0.008	+0.003	-0.002	+0.003	-0.005	-0.027
	1	-0.086	-0.017	-0.059	-0.012	0	0
	0	0	+0.025	0	+0.007	0	-0.050
	¼	+0.012	+0.022	+0.005	+0.008	-0.010	-0.052
1.75	½	+0.016	+0.016	+0.010	+0.009	-0.009	-0.046
	¾	-0.002	+0.005	+0.001	+0.004	-0.005	-0.027
	1	-0.074	-0.015	-0.050	-0.010	0	0
	0	0	+0.021	0	+0.005	0	-0.040
	¼	+0.008	+0.020	+0.004	+0.007	-0.009	-0.044
1.50	½	+0.016	+0.016	+0.010	+0.008	-0.008	-0.042
	¾	+0.003	+0.006	+0.003	+0.004	-0.005	-0.026
	1	-0.060	-0.012	-0.041	-0.008	0	0
	0	0	+0.015	0	+0.003	0	-0.029
	¼	+0.005	+0.015	+0.002	+0.005	-0.007	-0.034
1.25	½	+0.014	+0.015	+0.008	+0.007	-0.007	-0.037
	¾	+0.006	+0.007	+0.005	+0.005	-0.005	-0.024
	1	-0.047	-0.009	-0.031	-0.006	0	0
	0	0	+0.009	0	+0.002	0	-0.018
	¼	+0.002	+0.011	0	+0.003	-0.005	-0.023
1.00	½	+0.009	+0.013	+0.005	+0.005	-0.006	-0.029
	¾	+0.008	+0.008	+0.005	+0.004	-0.004	-0.020
	1	-0.035	-0.007	-0.022	-0.005	0	0
	0	0	+0.004	0	+0.001	0	-0.007
	¼	+0.001	+0.008	0	+0.002	-0.002	-0.011
0.75	½	+0.005	+0.010	+0.002	+0.003	-0.003	-0.017
	¾	+0.007	+0.007	+0.003	+0.003	-0.003	-0.013
	1	-0.024	-0.005	-0.015	-0.003	0	0
	0	0	+0.001	0	0	0	-0.002
	¼	0	+0.005	0	+0.001	-0.001	-0.004
0.50	½	+0.002	+0.006	+0.001	+0.001	-0.002	-0.009
	¾	+0.004	+0.006	+0.001	+0.001	-0.001	-0.007
	1	-0.015	-0.003	-0.008	-0.002	0	0

Table 4

Moment = Coef. × wa^2



b/a	x/a	y = 0		y = b/4	
		M_x	M_y	M_x	M_y
3.00	¼	+0.089	+0.022	+0.077	+0.025
	½	+0.118	+0.029	+0.101	+0.034
2.50	¼	+0.085	+0.024	+0.070	+0.027
	½	+0.112	+0.032	+0.092	+0.037
2.00	¼	+0.076	+0.027	+0.061	+0.028
	½	+0.100	+0.037	+0.078	+0.038
1.75	¼	+0.070	+0.029	+0.054	+0.029
	½	+0.091	+0.040	+0.070	+0.039
1.50	¼	+0.061	+0.031	+0.047	+0.029
	½	+0.078	+0.043	+0.059	+0.040
1.25	¼	+0.049	+0.033	+0.038	+0.029
	½	+0.063	+0.044	+0.047	+0.039
1.00	¼	+0.036	+0.033	+0.027	+0.027
	½	+0.044	+0.044	+0.033	+0.036
0.75	¼	+0.022	+0.029	+0.016	+0.023
	½	+0.025	+0.038	+0.018	+0.030
0.50	¼	+0.010	+0.020	+0.007	+0.015
	½	+0.009	+0.025	+0.007	+0.019



Moment = Coef. × wa^2

$b \geq c$

b/a = 3.0

c/a	x/a	y = 0		y = b/4		y = b/2		z = c/4		z = 0	
		M_x	M_y	M_x	M_y	M_x	M_y	M_x	M_z	M_x	M_z
3.00	0	0	+0.070	0	+0.027	0	-0.196	0	+0.027	0	+0.070
	¼	+0.028	+0.061	+0.015	+0.028	-0.034	-0.170	+0.015	+0.028	+0.028	+0.061
	½	+0.049	+0.049	+0.032	+0.026	-0.027	-0.137	+0.032	+0.026	+0.049	+0.049
	¾	+0.046	+0.030	+0.034	+0.018	-0.017	-0.087	+0.034	+0.018	+0.046	+0.030
2.50	0	0	+0.073	0	+0.033	0	-0.169	0	+0.013	0	+0.057
	¼	+0.028	+0.063	+0.016	+0.033	-0.030	-0.151	+0.009	+0.014	+0.022	+0.050
	½	+0.049	+0.050	+0.033	+0.029	-0.025	-0.126	+0.023	+0.017	+0.041	+0.043
	¾	+0.046	+0.030	+0.037	+0.020	-0.017	-0.084	+0.029	+0.014	+0.040	+0.027
2.00	0	0	+0.075	0	+0.039	0	-0.146	0	-0.005	0	+0.031
	¼	+0.029	+0.065	+0.017	+0.038	-0.027	-0.133	+0.002	-0.002	+0.013	+0.032
	½	+0.050	+0.051	+0.035	+0.032	-0.023	-0.113	+0.016	+0.005	+0.030	+0.029
	¾	+0.046	+0.031	+0.037	+0.021	-0.016	-0.078	+0.022	+0.008	+0.034	+0.020
1.75	0	0	+0.076	0	+0.041	0	-0.137	0	-0.018	0	+0.014
	¼	+0.029	+0.065	+0.018	+0.038	-0.025	-0.125	-0.003	-0.012	+0.007	+0.018
	½	+0.050	+0.052	+0.036	+0.033	-0.021	-0.106	+0.011	-0.003	+0.023	+0.020
	¾	+0.046	+0.031	+0.037	+0.021	-0.015	-0.074	+0.018	+0.004	+0.027	+0.015
1.50	0	0	+0.077	0	+0.043	0	-0.129	0	-0.033	0	-0.006
	¼	+0.030	+0.066	+0.018	+0.039	-0.024	-0.118	-0.007	-0.024	+0.002	+0.004
	½	+0.050	+0.053	+0.037	+0.034	-0.020	-0.100	+0.005	-0.012	+0.015	+0.010
	¾	+0.046	+0.031	+0.038	+0.022	-0.014	-0.070	+0.013	0	+0.021	+0.010
1.25	0	0	+0.078	0	+0.045	0	-0.122	0	-0.052	0	-0.031
	¼	+0.030	+0.067	+0.019	+0.041	-0.022	-0.111	-0.011	-0.039	-0.004	-0.018
	½	+0.050	+0.054	+0.038	+0.035	-0.019	-0.095	0	-0.022	+0.008	-0.005
	¾	+0.047	+0.032	+0.038	+0.023	-0.014	-0.068	+0.008	-0.006	+0.016	+0.001
1.00	0	0	+0.079	0	+0.047	0	-0.118	0	-0.074	0	-0.060
	¼	+0.030	+0.067	+0.020	+0.043	-0.021	-0.105	-0.015	-0.056	-0.010	-0.042
	½	+0.051	+0.054	+0.036	+0.036	-0.018	-0.090	-0.005	-0.034	+0.001	-0.022
	¾	+0.047	+0.032	+0.038	+0.023	-0.013	-0.065	+0.003	-0.014	+0.009	-0.009
0.75	0	0	+0.079	0	+0.047	0	-0.120	0	-0.098	0	-0.092
	¼	+0.029	+0.066	+0.020	+0.042	-0.021	-0.107	-0.020	-0.079	-0.016	-0.070
	½	+0.051	+0.053	+0.037	+0.036	-0.018	-0.090	-0.011	-0.051	-0.008	-0.045
	¾	+0.047	+0.031	+0.037	+0.022	-0.013	-0.068	-0.002	-0.025	+0.003	-0.024
0.50	0	0	+0.078	0	+0.047	0	-0.130	0	-0.126	0	-0.123
	¼	+0.029	+0.065	+0.019	+0.042	-0.023	-0.115	-0.024	-0.105	-0.022	-0.101
	½	+0.050	+0.053	+0.035	+0.035	-0.019	-0.095	-0.016	-0.073	-0.013	-0.071
	¾	+0.046	+0.031	+0.036	+0.021	-0.014	-0.068	-0.007	-0.040	-0.004	-0.042

b/a = 2.5

c/a	x/a	y = 0		y = b/4		y = b/2		z = c/4		z = 0	
		M_x	M_y	M_x	M_y	M_x	M_y	M_x	M_z	M_x	M_z
2.50	0	0	+0.061	0	+0.019	0	-0.138	0	+0.019	0	+0.061
	¼	+0.024	+0.053	+0.010	+0.022	-0.026	-0.132	+0.010	+0.022	+0.024	+0.053
	½	+0.042	+0.044	+0.025	+0.022	-0.023	-0.115	+0.025	+0.022	+0.042	+0.044
	¾	+0.041	+0.027	+0.030	+0.016	-0.016	-0.078	+0.030	+0.016	+0.041	+0.027
2.00	0	0	+0.065	0	+0.026	0	-0.118	0	+0.003	0	+0.038
	¼	+0.025	+0.055	+0.012	+0.027	-0.023	-0.113	+0.005	+0.006	+0.015	+0.037
	½	+0.043	+0.046	+0.028	+0.025	-0.020	-0.102	+0.018	+0.011	+0.032	+0.033
	¾	+0.042	+0.028	+0.031	+0.018	-0.014	-0.070	+0.023	+0.011	+0.034	+0.022
1.75	0	0	[illegible]	0	+0.030	0	-0.108	0	-0.006	0	+0.025
	¼	+0.025	+0.057	+0.013	+0.030	-0.021	-0.104	+0.001	-0.002	+0.010	+0.026
	½	+0.044	+0.047	+0.029	+0.027	-0.019	-0.098	+0.013	+0.004	+0.025	+0.025
	¾	+0.043	+0.028	+0.033	+0.019	-0.013	-0.066	+0.019	+0.008	+0.029	+0.019
1.50	0	0	+0.068	0	+0.033	0	-0.100	0	-0.018	0	+0.008
	¼	+0.026	+0.058	+0.014	+0.032	-0.019	-0.097	-0.003	-0.012	+0.004	+0.013
	½	+0.045	+0.047	+0.030	+0.029	-0.018	-0.089	+0.008	-0.002	+0.017	+0.017
	¾	+0.043	+0.029	+0.034	+0.019	-0.013	-0.063	+0.015	+0.004	+0.024	+0.015
1.25	0	0	+0.069	0	+0.035	0	-0.092	0	-0.030	0	-0.010
	¼	+0.026	+0.059	+0.015	+0.034	-0.018	-0.089	-0.006	-0.024	-0.002	-0.003
	½	+0.045	+0.048	+0.031	+0.031	-0.016	-0.082	+0.003	-0.012	+0.008	+0.007
	¾	+0.044	+0.029	+0.034	+0.020	-0.012	-0.059	+0.011	-0.002	+0.018	+0.008
1.00	0	0	+0.070	0	+0.037	0	-0.087	0	-0.045	0	-0.032
	¼	+0.026	+0.060	+0.015	+0.036	-0.017	-0.083	-0.010	-0.036	-0.008	-0.021
	½	+0.046	+0.048	+0.031	+0.032	-0.015	-0.077	-0.003	-0.021	-0.001	-0.008
	¾	+0.044	+0.029	+0.033	+0.021	-0.011	-0.056	+0.006	-0.008	+0.011	0
0.75	0	0	+0.070	0	+0.038	0	-0.082	0	-0.062	0	-0.055
	¼	+0.025	+0.060	+0.015	+0.037	-0.016	-0.078	-0.014	-0.053	-0.014	-0.042
	½	+0.045	+0.047	+0.030	+0.032	-0.014	-0.071	-0.008	-0.035	-0.009	-0.025
	¾	+0.043	+0.029	+0.033	+0.020	-0.011	-0.054	+0.002	-0.016	+0.005	-0.011
0.50	0	0	+0.069	0	+0.039	0	-0.080	0	-0.081	0	-0.080
	¼	+0.025	+0.059	+0.014	+0.038	-0.015	-0.075	-0.019	-0.072	-0.019	-0.068
	½	+0.044	+0.046	+0.028	+0.032	-0.014	-0.068	-0.014	-0.056	-0.017	-0.048
	¾	+0.042	+0.028	+0.032	+0.019	-0.010	-0.052	-0.003	-0.030	-0.002	-0.025

c/a	x/a	y = 0		y = b/4		y = b/2		z = c/4		z = 0	
		M_x	M_y	M_x	M_y	M_x	M_y	M_x	M_z	M_x	M_z
2.00	0	0	+0.045	0	+0.011	0	-0.091	0	+0.011	0	+0.045
	¼	+0.016	+0.042	+0.006	+0.014	-0.019	-0.094	+0.006	+0.014	+0.016	+0.042
	½	+0.033	+0.036	+0.020	+0.016	-0.018	-0.089	+0.020	+0.016	+0.033	+0.036
	¾	+0.036	+0.024	+0.025	+0.014	-0.013	-0.065	+0.025	+0.014	+0.036	+0.024
1.75	0	0	+0.048	0	+0.015	0	-0.081	0	-0.001	0	+0.032
	¼	+0.017	+0.044	+0.007	+0.017	-0.017	-0.085	+0.003	+0.006	+0.012	+0.032
	½	+0.034	+0.038	+0.021	+0.019	-0.017	-0.083	+0.015	+0.011	+0.027	+0.029
	¾	+0.036	+0.024	+0.025	+0.015	-0.012	-0.061	+0.020	+0.012	+0.031	+0.021
1.50	0	0	+0.050	0	+0.019	0	-0.072	0	-0.010	0	+0.018
	¼	+0.018	+0.046	+0.008	+0.021	-0.015	-0.077	0	-0.002	+0.007	+0.020
	½	+0.035	+0.039	+0.022	+0.021	-0.015	-0.076	+0.009	+0.004	+0.020	+0.022
	¾	+0.036	+0.025	+0.026	+0.016	-0.012	-0.058	+0.016	+0.008	+0.025	+0.017
1.25	0	0	+0.052	0	+0.023	0	-0.064	0	-0.021	0	0
	¼	+0.019	+0.048	+0.009	+0.024	-0.014	-0.068	-0.002	-0.013	+0.001	+0.005
	½	+0.036	+0.041	+0.023	+0.023	-0.014	-0.069	+0.005	-0.004	+0.011	+0.012
	¾	+0.037	+0.025	+0.026	+0.017	-0.011	-0.054	+0.011	+0.002	+0.016	+0.011
1.00	0	0	+0.054	0	+0.027	0	-0.058	0	-0.037	0	-0.023
	¼	+0.019	+0.050	+0.010	+0.027	-0.012	-0.062	-0.005	-0.025	-0.005	-0.013
	½	+0.037	+0.042	+0.024	+0.025	-0.013	-0.064	0	-0.015	+0.001	0
	¾	+0.037	+0.026	+0.027	+0.018	-0.010	-0.051	+0.006	-0.006	+0.008	+0.004
0.75	0	0	+0.055	0	+0.030	0	-0.058	0	-0.049	0	-0.044
	¼	+0.018	+0.051	+0.011	+0.029	-0.012	-0.062	-0.009	-0.040	-0.010	-0.031
	½	+0.038	+0.043	+0.025	+0.026	-0.012	-0.062	-0.005	-0.029	-0.007	-0.015
	¾	+0.037	+0.026	+0.027	+0.018	-0.010	-0.049	+0.002	-0.015	+0.001	-0.004
0.50	0	0	+0.054	0	+0.030	0	-0.065	0	-0.064	0	-0.061
	¼	+0.018	+0.052	+0.011	+0.029	-0.014	-0.068	-0.012	-0.056	-0.014	-0.051
	½	+0.038	+0.044	+0.025	+0.025	-0.013	-0.064	-0.010	-0.045	-0.012	-0.034
	¾	+0.037	+0.026	+0.026	+0.017	-0.010	-0.050	-0.003	-0.026	-0.004	-0.018

b/a = 1.5

c/a	x/a	y = 0		y = b/4		y = b/2		z = c/4		z = 0	
		M_x	M_y	M_x	M_y	M_x	M_y	M_x	M_z	M_x	M_z
1.50	0	0	+0.027	0	+0.005	0	-0.052	0	+0.005	0	+0.027
	¼	+0.009	+0.028	+0.003	+0.008	-0.012	-0.059	+0.003	+0.008	+0.009	+0.028
	½	+0.022	+0.027	+0.012	+0.011	-0.013	-0.063	+0.012	+0.011	+0.022	+0.027
	¾	+0.027	+0.020	+0.017	+0.011	-0.010	-0.052	+0.017	+0.011	+0.027	+0.020
1.25	0	0	+0.031	0	+0.008	0	-0.045	0	-0.005	0	+0.011
	¼	+0.010	+0.031	+0.005	+0.012	-0.010	-0.050	+0.001	-0.001	+0.004	+0.015
	½	+0.024	+0.030	+0.014	+0.014	-0.011	-0.056	+0.007	+0.006	+0.014	+0.020
	¾	+0.027	+0.021	+0.018	+0.012	-0.010	-0.048	+0.013	+0.006	+0.018	+0.016
1.00	0	0	+0.035	0	+0.013	0	-0.038	0	-0.016	0	-0.006
	¼	+0.011	+0.034	+0.006	+0.016	-0.008	-0.042	-0.002	-0.010	-0.001	+0.001
	½	+0.025	+0.032	+0.015	+0.017	-0.010	-0.049	+0.002	-0.003	+0.006	+0.010
	¾	+0.028	+0.022	+0.019	+0.014	-0.009	-0.045	+0.008	+0.002	+0.009	+0.010
0.75	0	0	+0.038	0	+0.016	0	-0.034	0	-0.024	0	-0.019
	¼	+0.011	+0.036	+0.007	+0.018	-0.008	-0.038	-0.005	-0.020	-0.004	-0.013
	½	+0.025	+0.033	+0.016	+0.019	-0.008	-0.042	-0.002	-0.014	-0.001	-0.004
	¾	+0.028	+0.022	+0.019	+0.015	-0.008	-0.041	+0.003	-0.007	+0.002	+0.001
0.50	0	0	+0.040	0	+0.017	0	-0.036	0	-0.030	0	-0.028
	¼	+0.010	+0.037	+0.007	+0.019	-0.008	-0.040	-0.008	-0.031	-0.007	-0.027
	½	+0.024	+0.034	+0.017	+0.020	-0.009	-0.044	-0.006	-0.027	-0.006	-0.020
	¾	+0.028	+0.022	+0.018	+0.016	-0.008	-0.040	-0.002	-0.018	-0.004	-0.010

b/a = 1.0

c/a	x/a	y = 0		y = b/4		y = b/2		z = c/4		z = 0	
		M_x	M_y	M_x	M_y	M_x	M_y	M_x	M_z	M_x	M_z
1.00	0	0	+0.010	0	+0.002	0	-0.019	0	+0.002	0	+0.010
	¼	+0.002	+0.013	0	+0.003	-0.005	-0.025	0	+0.003	+0.002	+0.013
	½	+0.010	+0.017	+0.005	+0.006	-0.007	-0.036	+0.005	+0.006	+0.010	+0.017
	¾	+0.015	+0.015	+0.009	+0.007	-0.007	-0.036	+0.009	+0.007	+0.015	+0.015
0.75	0	0	+0.016	0	+0.007	0	-0.013	0	-0.004	0	+0.003
	¼	+0.003	+0.017	+0.001	+0.008	-0.004	-0.020	-0.001	-0.005	-0.001	+0.003
	½	+0.011	+0.020	+0.006	+0.009	-0.007	-0.033	+0.002	-0.001	+0.005	+0.007
	¾	+0.016	+0.014	+0.009	+0.009	-0.006	-0.032	+0.004	+0.002	+0.009	+0.008
0.50	0	0	+0.020	0	+0.011	0	-0.011	0	-0.007	0	-0.005
	¼	+0.003	+0.018	+0.001	+0.010	-0.004	-0.018	-0.002	-0.012	-0.003	-0.007
	½	+0.012	+0.021	+0.008	+0.010	-0.006	-0.032	+0.001	-0.009	+0.002	-0.005
	¾	+0.017	+0.013	+0.010	+0.009	-0.006	-0.031	+0.002	-0.005	+0.006	+0.001

edge is supported, not when it is free.

At the corner, shear at the bottom edge is negative and numerically greater than shear at midpoint. The change from positive to negative shear occurs approximately at the outer tenth points of the bottom edge. These high negative values at the corners arise because deformations in the planes of the supporting slabs are neglected in the basic equations and are therefore of only theoretical significance. These shears can be disregarded in checking shear and development stresses.

Unit shears at the fixed edge in Table 7 were used for plotting the curves in Fig. 1. There is practically no change in shear curves beyond b/a = 2.0. Maximum value occurs at a depth below the top somewhere between 0.6a and 0.8a. Fig. 1 is useful for determination of shear or axial tension for any ratio of b/a and at any point of a fixed side edge.

Total shear from top to bottom of one fixed edge in Table 7 must equal the area within the corresponding curve in Fig. 1, and this relationship was used for checking the curves. Total shears computed and tabulated for a hinged top were also used in making certain adjustments to determine approximate values of shear for walls with free top—recorded in Table 8.

For b/a = ½ in Table 7, total shear at the top edge is so small as to be practically zero, and for b/a = 1.0 total shear, 0.0052, is only 1% of total hydrostatic pressure, 0.5000.* Therefore, it is reasonable to assume that removing the top support will not materially change total shears at any of the other three edges when b/a = ½ and 1. At b/a = 2.0, there is a substantial shear at the top

*Loading term is omitted here

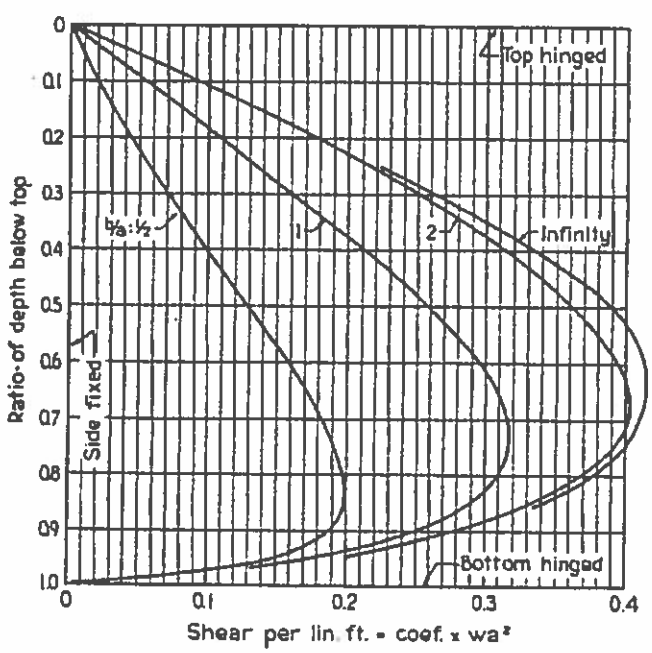
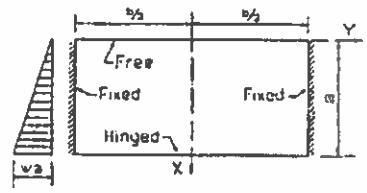


Fig. 1.

Table 8. Shear at Edges of Slabs Free at Top and Hinged at Bottom*



b/a	½	1	2	3
Midpoint of bottom edge	+0.141wa²	+0.242wa²	+0.38wa²†	+0.45wa²†
Corner at bottom edge	-0.258wa²‡	-0.440wa²	-0.583wa²	-0.590wa²
Top of fixed side edge	0.000wa²	+0.010wa²	+0.100wa²	+0.165wa²
Midpoint of fixed side edge	+0.128wa²	+0.258wa²	+0.375wa²	+0.406wa²
Lower third-point of side edge	+0.174wa²	+0.311wa²	+0.406wa²	+0.416wa²
Lower quarter-point of side edge	+0.192wa²	+0.315wa²	+0.390wa²	+0.395wa²
Total at bottom edge	0.048wa²b	0.096wa²b	0.204wa²b	0.286wa²b
Total at one fixed side edge	0.226wa²b	0.202wa²b	0.148wa²b	0.107wa²b
Total at all four edges	0.500wa²b	0.500wa²b	0.500wa²b	0.500wa²b

*Data derived by modifying values computed for walls hinged top and bottom.
†This value could not be estimated accurately beyond two decimal places.
‡Negative sign indicates reaction acts in direction of load.

edge when hinged, 0.0538, so that the sum of total shears on the other three sides is only 0.4462. If the top support is removed, the other three sides must carry a total of 0.5000. A reasonable adjustment is to multiply each of the three remaining total shears by 0.5000/0.4462 = 1.12, an increase of 12%. This was done in preparing Table 8 for b/a = 2.0. A similar adjustment was made for b/a = 3.0, where the increase is 22%.

Total shears recorded in Table 8 were used to determine unit shears also recorded in that table. Consider for illustration the shear curves in Fig. 1 and imagine the top is changed from hinged to free. As already stated, for b/a = ½ and 1 it makes little difference in total shear—the area within shear curves—whether the top is supported or not. Consequently, curves for b/a = ½ and 1 remain practically unchanged. They were transferred almost without modification to Fig. 2, which covers the case with top free. For b/a = 2 an adjustment was made. A change in the support at the top has little effect upon shear at the bottom of the fixed edge. Consequently, the curves in Figs. 1 and 2 are nearly identical at the bottom. Gradually, as the top is approached curves for the free top deviate more and more from those for the hinged top, as in Fig. 2. By trial, curve for b/a = 2 was so adjusted that its area equals the total shear for one fixed edge for b/a = 2.0 in Table 8. A similar adjustment was made for b/a = 3.0, which is the limit of moment coefficients given.

One point of interest stands out in a comparison of Figs. 1 and 2. Whereas for b/a = 2.0 and 3.0 total shear is increased 12% and 22%, respectively, when top is free instead of hinged, maximum shear is increased but slightly, 2% at most. The reason is that most of the increase in shear is near the top where shears are relatively small.

The same general procedure was applied, but not illustrated, for adjustment of unit shear at midpoint of bottom, but in this case the greatest change resulting from making the top free is at midpoint where shear is

Shear at base of cylindrical wall

$V = \text{coef.} \times \begin{cases} wH^2 \text{ lb. (triangular)} \\ pH \text{ lb. (rectangular)} \\ M/H \text{ lb. (mom. at base)} \end{cases}$

Positive sign indicates shear acting inward

$\frac{H^2}{Dt}$	Triangular load, fixed base	Rectangular load, fixed base	Triangular or rectangular load, hinged base	Moment at edge
0.4	+0.436	+0.755	+0.245	−1.58
0.8	+0.374	+0.552	+0.234	−1.75
1.2	+0.339	+0.460	+0.220	−2.00
1.6	+0.317	+0.407	+0.204	−2.28
2.0	+0.299	+0.370	+0.189	−2.57
3.0	+0.262	+0.310	+0.158	−3.18
4.0	+0.236	+0.271	+0.137	−3.68
5.0	+0.213	+0.243	+0.121	−4.10
6.0	+0.197	+0.222	+0.110	−4.49
8.0	+0.174	+0.193	+0.096	−5.18
10.0	+0.158	+0.172	+0.087	−5.81
12.0	+0.145	+0.158	+0.079	−6.38
14.0	+0.135	+0.147	+0.073	−6.88
16.0	+0.127	+0.137	+0.068	−7.36

Stiffness of cylindrical wall
Near edge hinged, far edge free
$k = \text{coef.} \times Et^3/H$

$\frac{H^2}{Dt}$	Coefficient	$\frac{H^2}{Dt}$	Coefficient
0.4	0.139	5	0.713
0.8	0.270	6	0.783
1.2	0.345	8	0.903
1.6	0.399	10	1.010
2.0	0.445	12	1.108
3.0	0.548	14	1.198
4.0	0.635	16	1.281

Table XVII

Load on center support for circular slab

$\text{Load} = \text{coef.} \times \begin{cases} pR^2 \text{ (hinged and fixed)} \\ M \text{ (moment at edge)} \end{cases}$

c/D	0.05	0.10	0.15	0.20	0.25
Hinged	1.320	1.387	1.463	1.542	1.625
Fixed	0.839	0.919	1.007	1.101	1.200
M at edge	8.16	8.66	9.29	9.99	10.81

Table XIX

Stiffness of circular plates
With center support
$k = \text{coef.} \times Et^3/R$

c/D	0.05	0.10	0.15	0.20	0.25
Coef.	0.290	0.309	0.332	0.358	0.387

Without center support
Coef. = 0.104

Table XX. Supplementary Coefficients for Values of H^2/Dt Greater than 16 (*Extension of Tables I to XI, XVI and XVIII*)*

$\frac{H^2}{Dt}$	TABLE I Coefficients at point .75H	.80H	.85H	.90H	.95H	TABLE II Coefficients at point .75H	.80H	.85H	.90H	.95H	TABLE III Coefficients at point .75H	.80H	.85H	.90H	.95H	TABLE IV Coefficients at point .75H	.80H	.85H	.90H	.95H
20	+0.716	+0.654	+0.520	+0.325	+0.115	+0.812	+0.817	+0.756	+0.603	+0.344	+0.949	+0.825	+0.629	+0.379	+0.128	+1.062	+1.017	+0.906	+0.703	+0.394
24	+0.746	+0.702	+0.577	+0.372	+0.137	+0.816	+0.839	+0.793	+0.647	+0.377	+0.986	+0.879	+0.694	+0.430	+0.149	+1.056	+1.039	+0.943	+0.747	+0.427
32	+0.782	+0.768	+0.663	+0.459	+0.182	+0.814	+0.861	+0.847	+0.721	+0.436	+1.025	+0.953	+0.788	+0.519	+0.189	+1.064	+1.061	+0.997	+0.821	+0.486
40	+0.800	+0.805	+0.731	+0.530	+0.217	+0.802	+0.866	+0.880	+0.778	+0.483	+1.040	+0.996	+0.859	+0.591	+0.226	+1.052	+1.066	+1.030	+0.878	+0.533
48	+0.791	+0.828	+0.785	+0.593	+0.254	+0.791	+0.864	+0.900	+0.820	+0.527	+1.043	+1.022	+0.911	+0.652	+0.262	+1.041	+1.064	+1.050	+0.920	+0.577
56	+0.763	+0.838	+0.824	+0.636	+0.285	+0.781	+0.859	+0.911	+0.852	+0.563	+1.040	+1.035	+0.949	+0.705	+0.294	+1.021	+1.059	+1.061	+0.952	+0.613

$\frac{H^2}{Dt}$	TABLE V Coefficients at point .00H	.05H	.10H	.15H	.20H	TABLE VI Coefficients at point .75H	.80H	.85H	.90H	.95H	TABLE VII Coefficients at point .80H	.85H	.90H	.95H	1.00H	TABLE VIII Coefficients at point .75H	.80H	.85H	.90H	.95H
20	−18.44	− 9.98	− 4.90	− 1.59	+ 0.22	+15.30	+ 25.9	+ 35.9	+ 43.3	+ 35.3	+.0015	+.0014	+.0005	−.0018	−.0063	+.0008	+.0014	+.0020	+.0024	+.0020
24	−18.04	−10.34	− 4.54	− 1.00	+ 0.68	+13.20	+ 25.9	+ 40.7	+ 51.8	+ 45.3	+.0012	+.0012	+.0007	−.0013	−.0053	+.0005	+.0010	+.0015	+.0020	+.0017
32	−20.84	−10.72	− 3.70	− 0.04	+ 1.26	+ 8.10	+ 23.2	+ 45.9	+ 65.4	+ 63.6	+.0007	+.0009	+.0007	−.0008	−.0040	.0000	+.0005	+.0009	+.0014	+.0013
40	−23.34	−10.88	− 2.86	+ 0.72	+ 1.56	+ 3.28	+ 19.2	+ 46.5	+ 77.9	+ 83.5	+.0002	+.0005	+.0006	−.0005	−.0032	.0000	+.0003	+.0006	+.0011	+.0011
48	−25.52	−10.82	− 2.06	+ 1.26	+ 1.65	− 0.70	+ 14.1	+ 45.1	+ 87.2	+103.0	.0000	+.0001	+.0006	−.0003	−.0026	.0000	+.0001	+.0004	+.0008	+.0010
56	−27.54	−10.58	− 1.36	+ 1.60	+ 1.62	− 3.40	+ 9.2	+ 42.2	+ 94.0	+121.0	.0000	.0000	+.0004	−.0001	−.0023	.0000	− .0000	+.0003	+.0007	+.0008

$\frac{H^2}{Dt}$	TABLE IX Coefficients at point .80H	.85H	.90H	.95H	1.00H	TABLE X Coefficients at point .05H	.10H	.15H	.20H	.25H	TABLE XI Coefficients at point .80H	.85H	.90H	.95H	1.00H	TABLE XVI Tri. Fixed	Rect. Fixed	T. or R. Hinged	Mom. at Edge	TABLE XVIII Stiffness
20	+.0015	+.0013	+.0002	−.0024	−.0073	+0.032	+0.039	+0.033	+0.023	+0.014	−0.015	+0.095	+0.296	+0.606	+1.000	+0.114	+0.122	+0.062	− 8.20	1.430
24	+.0012	+.0012	+.0004	−.0018	−.0061	+0.031	+0.035	+0.028	+0.018	+0.009	−0.037	+0.057	+0.250	+0.572	+1.000	+0.102	+0.111	+0.055	− 8.94	1.566
32	+.0008	+.0009	+.0006	−.0010	−.0046	+0.028	+0.029	+0.020	+0.011	+0.004	−0.062	+0.002	+0.178	+0.515	+1.000	+0.089	+0.098	+0.048	−10.36	1.810
40	+.0005	+.0007	+.0007	−.0005	−.0037	+0.026	+0.025	+0.015	+0.006	+0.001	−0.067	−0.031	+0.123	+0.467	+1.000	+0.080	+0.086	+0.043	−11.62	2.025
48	+.0004	+.0006	+.0006	−.0003	−.0031	+0.024	+0.021	+0.011	+0.003	0.000	−0.064	−0.049	+0.081	+0.424	+1.000	+0.072	+0.079	+0.039	−12.76	2.220
56	+.0002	+.0004	+.0005	−.0001	−.0026	+0.023	+0.018	+0.008	+0.002	0.000	−0.059	−0.060	+0.048	+0.387	+1.000	+0.067	+0.074	+0.036	−13.76	2.400

*For points not shown in the supplementary tables, ring tension and moment may be determined approximately by sketching curves similar to those in the text.

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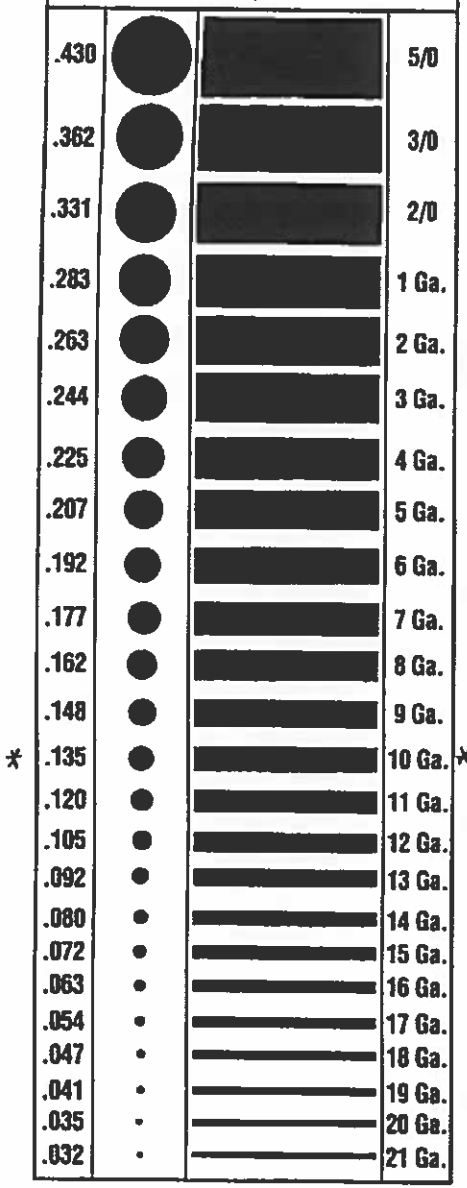
Wire Cloth

Square Opening Space Screens

list from 4" to 1/16" square openings. Larger opening screens up to 8" are [illegible]able special order. For information on less than 1/16" openings, please ask for assistance.

Wire Size Diameters and Washburn & Moen Gauge Equivalents



WIRE DIAMETER INCHES	% OF OPEN AREA	WEIGHT LBS. PER SQ. FT.
4" SQUARE OPENING		
1.	64.0	13.06
3/4	70.9	7.88
5/8	74.8	5.46
1/2	79.0	3.58
7/16	81.3	2.77
3/8	83.6	2.07
5/16	86.0	1.45
.283	87.2	1.20
.263	88.0	1.04
.250	88.6	.94
3-3/4" SQUARE OPENING		
1.	62.3	13.77
3/4	69.4	8.11
5/8	73.5	5.77
1/2	77.9	3.79
7/16	80.2	2.94
3/8	82.6	2.19
5/16	85.2	1.54
.283	86.5	1.27
.263	87.3	1.11
.250	87.9	1.00
3-1/2" SQUARE OPENING		
1.	60.5	14.57
3/4	67.8	8.60
5/8	72.0	6.13
1/2	76.6	4.03
7/16	79.0	3.13
3/8	81.5	2.33
5/16	84.3	1.65
.283	85.6	1.36
.263	86.5	1.18
.250	87.1	1.07
.225	88.3	.87
.207	89.1	.74
3-1/4" SQUARE OPENING		
1.	58.5	15.47
3/4	66.0	9.16
5/8	70.3	6.54
1/2	75.0	4.31
7/16	77.5	3.35
3/8	80.4	2.50
5/16	83.2	1.76
.283	84.6	1.46
.263	85.6	1.26
.250	86.2	1.15
.225	87.5	.93
.207	88.4	.79
3" SQUARE OPENING		
1.	56.3	16.50
3/4	64.0	9.79
5/8	68.5	7.00
1/2	73.5	4.62
7/16	76.2	3.59
3/8	79.0	2.68
5/16	82.0	1.90
.283	83.5	1.57
.263	84.5	1.36
.250	85.2	1.23
.225	86.5	1.01
.207	87.5	.86
.192	88.3	.74
.177	89.2	.63
.162	90.0	.53
2-3/4" SQUARE OPENING		
1.	53.7	17.87
3/4	61.7	10.62
5/8	66.4	7.54
1/2	71.5	4.98

WIRE DIAMETER INCHES	% OF OPEN AREA	WEIGHT LBS. PER SQ. FT.
2-3/4" CONT'D.		
7/16	74.4	3.86
3/8	77.4	2.90
5/16	80.6	2.05
.283	82.2	1.70
.263	83.3	1.48
.250	84.0	1.34
.225	85.4	1.09
.207	86.5	.93
.192	87.4	.80
.177	88.3	.69
.162	89.2	.58
.148	90.0	.48
2-1/2" SQUARE OPENING		
1.	51.0	19.02
3/4	59.2	11.37
5/8	64.0	8.16
1/2	69.4	5.41
7/16	72.4	4.22
3/8	75.6	3.16
5/16	79.0	2.24
.283	80.7	1.85
.263	81.9	1.61
.250	82.6	1.46
.225	84.2	1.19
.207	85.3	1.02
.192	86.2	.86
.177	87.2	.75
.162	88.2	.63
.148	89.1	.53
2-1/4" SQUARE OPENING		
1.	47.9	20.61
3/4	56.2	12.37
5/8	61.2	8.90
1/2	66.9	5.91
7/16	70.1	4.62
3/8	73.4	3.46
5/16	77.1	2.46
.283	78.9	2.04
.263	80.2	1.77
.250	81.0	1.61
.225	82.6	1.31
.207	83.9	1.12
.192	84.9	.97
.177	85.9	.83
.162	87.0	.70
.148	88.0	.59
.135	89.0	.48
2" SQUARE OPENING		
1.	44.4	22.49
3/4	52.9	13.57
5/8	58.0	9.79
1/2	64.0	6.53
7/16	67.3	5.11
3/8	70.9	3.84
5/16	74.8	2.73
.283	76.7	2.26
.263	78.1	1.97
.250	79.0	1.79
.225	80.8	1.46
.207	82.1	1.25
.192	83.2	1.08
.177	84.4	.92
.162	85.6	.78
.148	86.7	.65
.135	87.8	.55
.120	89.0	.44
1-3/4" SQUARE OPENING		
1.	40.5	24.78
3/4	49.0	15.03
5/8	54.3	10.88

WIRE DIAMETER INCHES	% OF OPEN AREA	WEIGHT LBS. PER SQ. FT.
1-3/4" CONT'D.		
1/2	60.5	7.29
7/16	64.0	5.71
3/8	67.8	4.30
5/16	71.9	3.07
.283	74.1	2.56
.263	75.6	2.22
.250	76.6	2.02
.225	78.5	1.65
.207	80.0	1.41
.192	81.2	1.22
.177	82.5	1.04
.162	83.8	.88
.148	85.0	.74
.135	86.2	.62
.120	87.6	.49
1-1/2" SQUARE OPENING		
1.	36.0	27.67
3/4	44.4	16.86
5/8	49.0	12.27
1/2	56.3	8.25
7/16	59.9	6.48
3/8	64.0	4.90
5/16	68.5	3.50
.283	70.8	2.91
.263	72.4	2.54
.250	73.4	2.31
.225	75.6	1.89
.207	77.2	1.62
.192	78.6	1.40
.177	80.0	1.20
.162	81.5	1.02
.148	82.8	.85
.135	84.2	.72
.120	85.7	.57
1-3/8" SQUARE OPENING		
3/4	41.9	17.97
5/8	47.3	13.10
1/2	53.8	8.83
7/16	57.5	6.95
3/8	61.6	5.26
5/16	66.5	3.77
.283	68.8	3.14
.263	70.5	2.74
.250	71.5	2.49
.225	73.9	2.04
.207	75.6	1.75
.192	77.0	1.52
.177	78.5	1.30
.162	80.0	1.10
.148	81.5	.92
.135	82.9	.76
.120	84.6	.62
1-1/4" SQUARE OPENING		
3/4	39.1	19.22
5/8	44.4	14.06
1/2	51.0	9.51
7/16	54.8	7.50
3/8	59.2	5.69
5/16	64.0	4.08
.283	66.5	3.40
.263	68.3	2.97
.250	69.4	2.70
.225	71.8	2.22
.207	73.6	1.90
.192	75.1	1.65
.177	76.7	1.42
.162	78.4	1.20
.148	79.9	1.01
.135	81.5	.85
.120	83.2	.68
.105	85.1	.52

WIRE DIAMETER INCHES	% OF OPEN AREA	WEIGHT LBS. PER SQ. FT.
1-1/8" SQUARE OPENING		
3/4	36.0	20.68
5/8	41.3	16.17
1/2	47.9	10.30
7/16	51.6	8.14
3/8	55.0	6.19
5/16	61.0	4.45
.283	63.8	3.71
.263	65.7	3.25
.250	67.0	2.96
.225	69.6	2.43
.207	71.3	2.08
.192	73.0	1.81
.177	74.7	1.56
.162	76.4	1.32
.148	78.1	1.11
.135	79.7	.93
.120	81.7	.74
.105	83.7	.58
.092	85.5	.45
1" SQUARE OPENING		
3/4	32.6	22.38
5/8	37.9	16.49
1/2	44.4	11.25
7/16	48.4	8.91
3/8	52.9	6.79
5/16	58.0	4.90
.283	60.8	4.09
.263	62.7	3.58
.250	64.0	3.26
.225	66.6	2.69
.207	68.6	2.31
.192	70.4	2.01
.177	72.2	1.72
.162	74.0	1.46
.148	75.9	1.23
.135	77.6	1.04
.120	79.7	.83
.105	81.9	.64
.092	83.9	.50
.080	85.7	.38
7/8" SQUARE OPENING		
5/8	34.0	18.06
1/2	40.6	12.38
7/16	44.4	9.84
3/8	49.0	7.52
5/16	54.3	5.44
.283	57.1	4.55
.263	59.1	3.99
.250	60.5	3.64
.225	63.3	3.01
.207	65.3	2.58
.192	67.2	2.25
.177	69.2	1.93
.162	71.2	1.64

WIRE DIAMETER INCHES	% OF OPEN AREA	WEIGHT LBS. PER SQ. FT.
7/8" CONT'D.		
.148	73.5	1.38
.135	75.1	1.17
.120	77.3	.93
.105	79.7	.72
.092	81.9	.56
.080	83.9	.43
3/4" SQUARE OPENING		
5/8	29.7	19.98
1/2	36.0	13.79
7/16	39.9	11.00
3/8	44.4	8.44
5/16	49.8	6.13
.283	52.7	5.15
.263	54.8	4.52
.250	56.3	4.12
.225	59.2	3.41
.207	61.4	2.93
.192	63.4	2.56
.177	65.5	2.20
.162	67.6	1.87
.148	69.8	1.58
.135	71.8	1.33
.120	74.3	1.07
.105	76.9	.83
.092	79.3	.65
.080	81.7	.50
5/8" SQUARE OPENING		
1/2	30.9	15.57
7/16	34.6	12.47
3/8	39.1	9.61
5/16	44.4	7.03
.283	47.4	5.91
.263	49.5	5.20
.250	51.0	4.76
.225	54.0	3.94
.207	56.4	3.40
.192	58.5	2.97
.177	60.7	2.56
.162	63.1	2.18
.148	65.4	1.85
.135	67.6	1.56
.120	70.3	1.25
.105	73.4	.96
.092	76.0	.76
.080	78.6	.58
.072	80.4	.48
.063	82.6	.37
9/16" SQUARE OPENING		
7/16	31.8	13.46
3/8	36.6	10.40
5/16	41.3	7.64
.283	44.2	6.44
.263	46.4	5.67
.250	47.9	5.19
.225	50.7	4.31
.207	53.4	3.72
.192	55.0	3.26
.177	57.5	2.81
.162	61.0	2.40
.148	62.7	2.04
.135	65.0	1.72
.120	67.9	1.39
.105	71.0	1.08
.092	73.8	.85
.080	76.6	.65
.072	78.5	.53
.063	80.9	.41
1/2" SQUARE OPENING		
7/16	28.4	14.42
3/8	32.7	11.19

WIRE DIAMETER INCHES	% OF OPEN AREA	WEIGHT LBS. PER SQ. FT.
1/2" CONT'D.		
5/16	37.9	8.24
.283	40.8	6.96
.263	42.9	6.14
.250	44.4	5.62
.225	47.5	4.68
.207	49.8	4.04
.192	52.2	3.54
.177	54.5	3.06
.162	57.1	2.61
.148	59.5	2.22
.135	62.0	1.88
.120	65.0	1.51
.105	68.3	1.18
.092	71.3	.93
.080	74.3	.71
.072	76.4	.58
.063	78.9	.45
7/16" SQUARE OPENING		
3/8	29.0	12.20
5/16	34.0	9.03
.283	36.9	7.84
.263	39.0	6.75
.250	40.5	6.19
.225	43.6	5.16
.207	46.0	4.47
.192	48.3	3.92
.177	50.7	3.40
.162	53.2	2.90
.148	55.8	2.47
.135	58.4	2.09
.120	61.5	1.69
.105	65.0	1.33
.092	68.3	1.04
.080	71.5	.80
.072	73.7	.66
.063	76.4	.51
3/8" SQUARE OPENING		
5/16	29.7	9.99
.283	32.5	8.48
.263	34.5	7.51
.250	36.0	6.89
.225	39.0	5.77
.207	41.5	5.00
.192	43.8	4.39
.177	46.1	3.82
.162	48.7	3.27
.148	51.4	2.79
.135	54.1	2.37
.120	57.4	1.92
.105	61.0	1.51
.092	64.5	1.18
.080	67.9	.91
.072	70.4	.75
.063	73.3	.59
.054	76.4	.44
5/16" SQUARE OPENING		
.283	29.5	8.45
.250	30.9	7.78
.225	33.8	6.53
.207	36.2	5.68
.192	38.4	5.00
.177	40.8	4.36
.162	43.4	3.74
.148	46.0	3.20
.135	48.8	2.72
.120	52.2	2.21
.105	56.0	1.74
.092	59.6	1.37
.080	63.4	1.07
.072	66.1	.88
.063	69.3	.69
.054	72.7	.51

WIRE DIAMETER INCHES	% OF OPEN AREA	WEIGHT LBS. PER SQ. FT.
1/4" SQUARE OPENI		
.250	25.0	8.
.225	27.7	7.
.207	29.9	6.
.192	32.0	5.
.177	34.3	5.
.162	36.8	4.
.148	39.4	3.
.135	42.2	3.
.120	45.6	2.
.105	49.6	2.
.092	53.4	1.
.080	57.4	1.
.072	60.3	1.
.063	63.8	.
.054	67.8	.
.047	70.9	.
3/16" SQUARE OPENI		
.192	24.4	6.
.177	26.5	6.
.162	28.8	5.
.148	31.3	4.
.135	33.8	3.
.120	37.2	3.
.105	41.1	2.
.092	45.1	2.
.080	48.1	1.
.072	52.2	1.
.063	56.0	1.
.054	60.3	.
.047	63.9	.
.041	67.3	.
5/32" SQUARE OPENI		
.120	32.2	3.
.105	36.9	2.
.092	39.9	2.
.080	43.5	1.
.072	46.1	1.
.063	51.2	1.
.054	53.3	.
.047	58.5	.
.041	63.2	.
1/8" SQUARE OPENI		
.120	26.0	4.
.105	29.5	3.
.092	33.4	2.
.080	37.2	2.
.072	40.2	1.
.063	44.2	1.
.054	48.7	1.
.047	52.8	.
.041	56.7	.
.035	61.0	.
3/32" SQUARE OPENI		
.105	22.6	3.
.092	24.5	3.
.080	29.8	2.
.072	32.5	2.
.063	35.0	1.
.054	38.8	1.
.047	45.2	1.
.041	47.6	.
1/16" SQUARE OPENI		
.080	19.5	3.
.072	20.9	2.
.063	24.6	2.
.054	29.6	1.
.047	33.2	1.
.041	37.0	1.
.035	42.3	.

The Hole Story

See Stocklist p.43

Circular Concrete Tanks (PCA Thin Shell Method)

ESC, Inc Engineers and Architects
04-Jul-01

Wall with Hinged base and Free Top

Diameter Inside (D, inches)	62		f_c' (psi)	4,500
Depth Inside (H, inches)	52		f_c (allow.Conc.Ten.,psi)	450
Wall Thickness (t, inches)	2		($0.10f_c'$)	
Capacity (Gallons)	500		f_s (allow.Steel Stress,psi)	14,500
H^2 / Dt (unitless)	22		E_s (psi)	29,000,000
R = D / 2 (inches)	31.0		E_c (psi)	3,823,676
w (1.7 LL factor per ACI 318)	106.1	pcf	n	7.6
wHR (lb per foot)	1,187.51		C (shrinkage Coef.)	0.0003
Ring Tension = wHR * Table Coef.			A_c = 12t ($in.^2$)	24.00

A_s(actual,horiz&vert)= 0.029 in^2 (6"X6", 10 gauge wire)

Calculate Horizontal Ring Tension:

Point	0.75 H	0.80 H	0.85 H	0.90 H	0.95 H
Table Coefficient	0.814	0.828	0.774	0.625	0.361
Ring Tension (T, pounds)	967	983	919	742	428

A_s (max) = T_{max} / f_s 0.068 in^2 A_s(actual,horiz&vert) = 0.029 in^2

f_c = $(CE_sA_s+T_{max})/(A_c+nA_s)$ (psi) 51.01 psi < 450 okay

Shear at Base of Wall = V = Coef.*wH^2 117.52 lb per foot
(Coef. = 0.059)

Unit Shear Stress (psi) = V / 0.875bd 9.79 psi
(b=12", d=t/2=1")

Calculate Vertical Bending Moment: M = Coef. * wH^3

Point	0.75 H	0.80 H	0.85 H	0.90 H	0.95 H
Table Coefficient	0.0007	0.0012	0.0018	0.0022	0.0019
Vertical Moment M (ft-lb)	6	10	15	19	16

A_s (min) = M(ft-kips) / ad = 0.013 in^2 okay
(a = 1.44(*), d = t/2)
* "a" is taken from "Reinforced Concrete Design Handbook" from P.C.I.

STATE OF TEXAS
EUGENE C. BYBEE
LICENSED
PROFESSIONAL ENGINEER

Ellison Concrete Products

Division of Suhor Industries
5203 I-45 N.
Ennis, Texas 75119
(972) 875-9605 • 1-800-395-9605 • fax (972) 875-9607

June 29, 2001

Dear Sir or Madam:

Attached is an engineering report that shows compliance with ASTM standards as set forth in Chapter 285 Site Sewage Facilities. This report shows that the materials and manufacturer as well as the structural design requirements comply with ASTM Section C1227, Section 5 and Section 6.

Please note that all of our tanks have been properly labeled and clearly stamped with the manufacturers name, address and tank capacity near with outlet along with the direction of flow indicated. If you have any questions concerning this matter, please contact me at 972.875.9605.

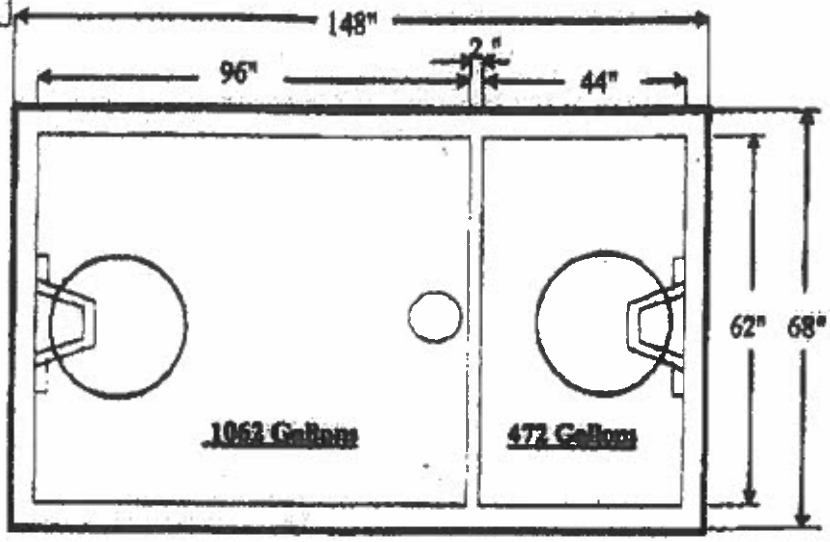
Sincerely.

David Beach

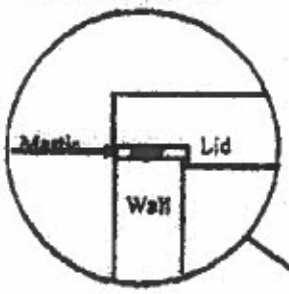
David Beach
Regional Vice President

1500 – Gallon 2-Compartment Septic Tank

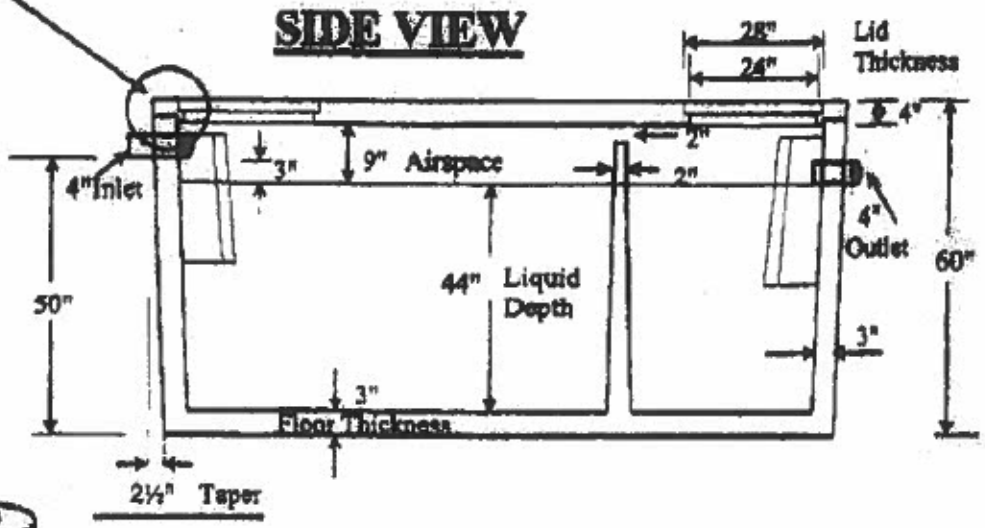
TOP VIEW

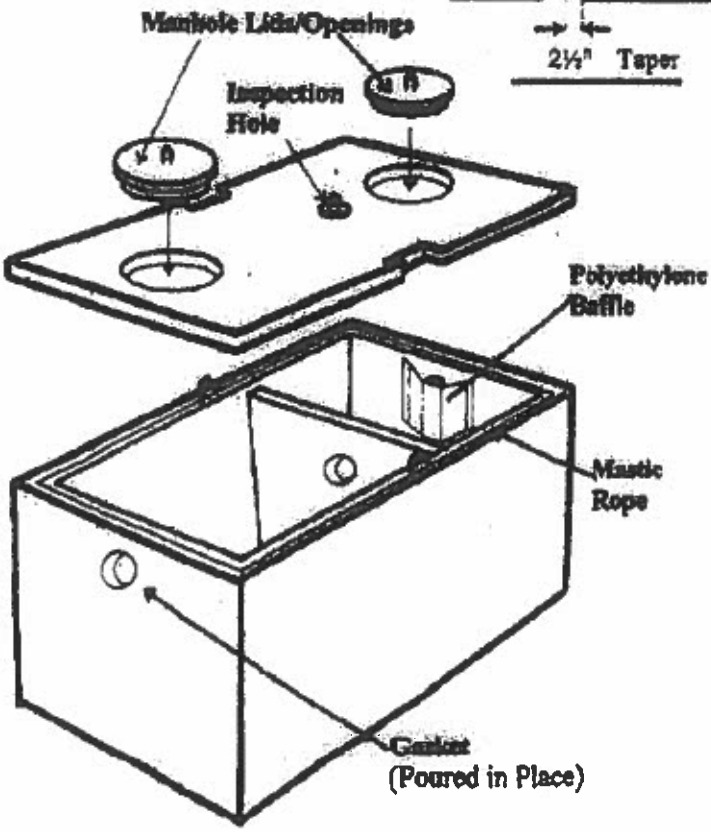


Enlarged Detail



SIDE VIEW





Bouyancy Calculation

Project :Vintage Oaks Unit 15
Location: Comal County
By:JFM
Checked: CLR

M&S ENGINEERING
CIVIL | ELECTRICAL | STRUCTURAL | MEP
Firm F-1394

STEP TANK

Known Dimensions	
Length (L) =	12.33 FT.
Width (W) =	5.67 FT.
Height (H)=	5.00 FT.
Thickness (T)=	.25 FT.
Inner Volume (V)=	205.07 C.F. (1534 Gallons)
Depth (D)=	2.00 FT.

Known Densities	
Density Water (ρ_W) =	62.4 LB/ C.F.
Density Concrete (ρ_C) =	120. LB/ C.F.
Density Soil (ρ_S) =	110. LB/ C.F.
Density Dry Soil (ρ'_S) =	47.6 LB/ C.F.

Assumptions:

1. STEP Tank is assumed to be watertight and empty.
2. STEP Tank is Square.
3. STEP Tank is not placed under pavement.
4. STEP Tank is buried at maximum depth.

Volume Calculations

$V_{Tank} = LxWxT - V$

$V_{Disp} = LxWxT$

$V_{soil} = LxWxD$

Volume Tank (V_{Tank}) =	349.39 C.F.
Volume Displaced (V_{Disp}) =	349.39 C.F.
Inner Volume (V)=	205.07 C.F.
Volume Soil (V_{soil}) =	139.76 C.F.

Forces = Sum (VOLUME * DENSITY)

Force STEP Tank (F_S) =	23,971.81 LB
Forece Water (F_W) =	21,802.18 LB

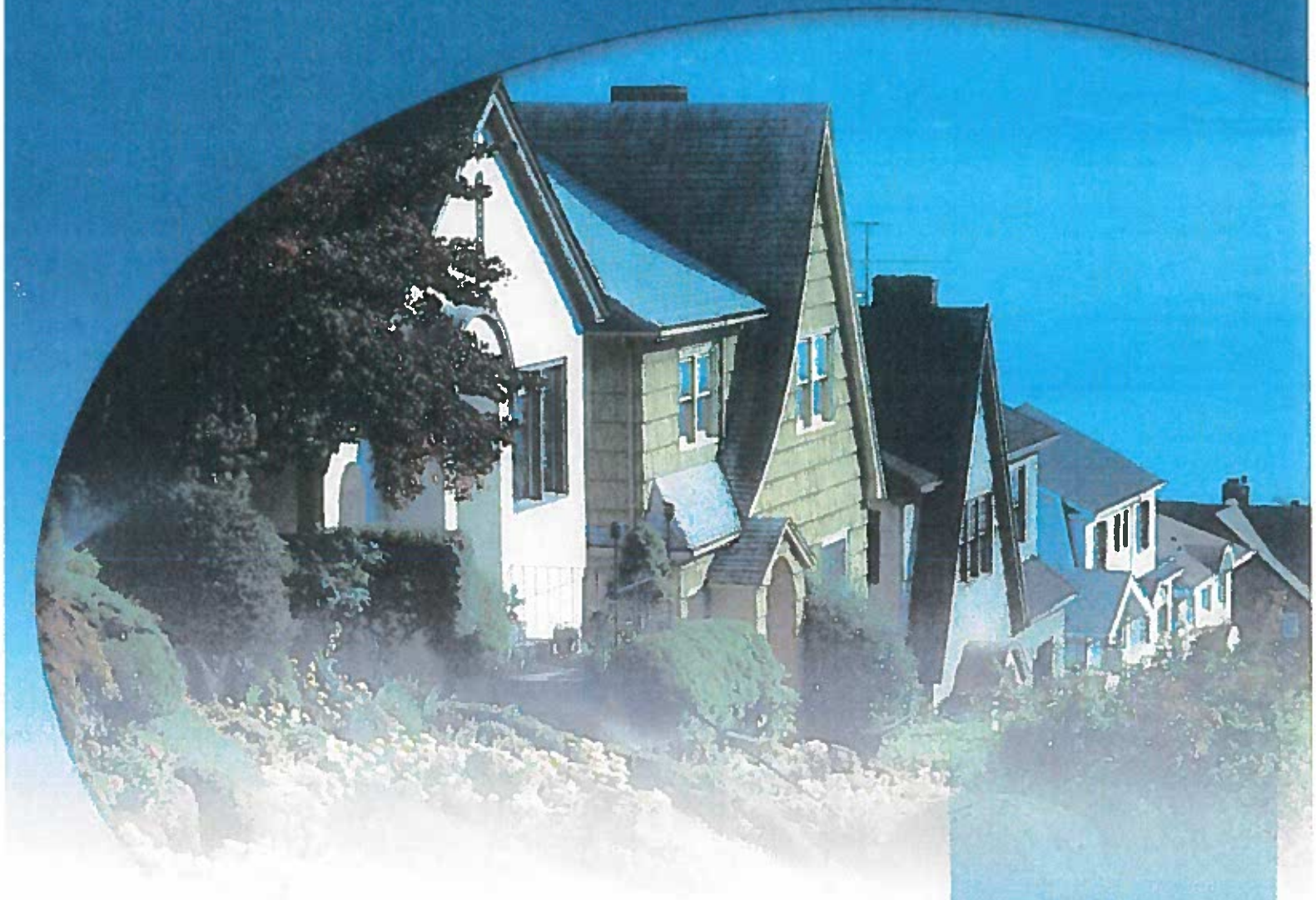
Force Bouyancy Check = ($F_M > F_W$)
STEP Tank will not float

STATE OF TEXAS
CHRISTOPHER L. ROSENBOOM
121131
LICENSED
PROFESSIONAL ENGINEER

6/17/2016

Appendix F: ORENCO INFORMATIONAL PACKET

Orenco® EffluentSewers



Cost-Effective, Environmentally Sound Wastewater Collection System

IDEAL FOR COMMUNITIES OF ALL SIZES

- New Subdivisions
- Neighborhood clusters
- Commercial properties
- Sewer expansions
- Septic tank abatement
- Ecologically sensitive areas
- Any site conditions

Orenco Systems®, Inc.
814 Airway Avenue, Sutherlin, Oregon, USA 97479
Toll-Free: 800-348-9843 • +1-541-459-4449 • www.orenco.com

Orenco EffluentSewers

Choose the Superior Wastewater Solution: Orenco Effluent Sewers

Communities and developers throughout the world are struggling with wastewater collection and treatment issues. For many areas, conventional gravity sewer systems are too costly. Moreover, conventional sewers are not watertight, so their overflows contaminate our rivers, bays, and oceans.

"Given the diversity of the new technology that is now being developed, it is reasonable to speculate that, in the future, the continued use of conventional gravity flow systems will be a thing of the past."

Dr. George Tchobanoglous, UC Davis, Author of *Wastewater Engineering: Treatment, Disposal, Reuse* and *Small and Decentralized Wastewater Management Systems*

"Managed decentralized wastewater systems . . . ment serious consideration in any evaluation of wastewater management options for small and mid-sized communities and new development."

EPA, *Response to Congress on Use of Decentralized Wastewater Systems*, April 1997

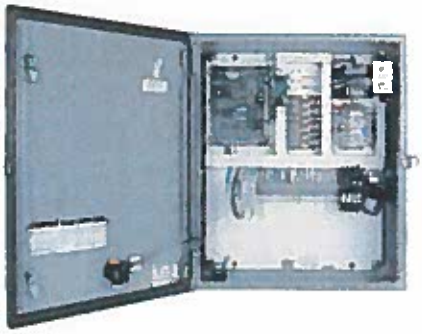
Watertight effluent sewer systems are becoming recognized as one of the best solutions for collecting waste and transporting it to a treatment facility.

Orenco has helped hundreds of communities throughout the world to design, build, and maintain low-cost, watertight, reliable effluent sewers. Depending on terrain, effluent sewers are often half the cost of conventional sewers, or less.

Orenco effluent sewers are compatible with existing wastewater infrastructure. They take the burden off maxed-out municipal systems and allow sustainable service area expansion. For monitoring and control, Orenco offers telemetry panels that provide the power of SCADA at an affordable price.

There are other alternative sewer technologies – grinder systems, for example. However, because the effluent from an Orenco Effluent Sewer is relatively free of grease, oil, and solids, the pumps and collection lines require less maintenance. And the high-quality filtered effluent from an Orenco Effluent Sewer requires less costly treatment.

For all these reasons, communities that purchase our effluent sewers enjoy system-wide, long-term savings.

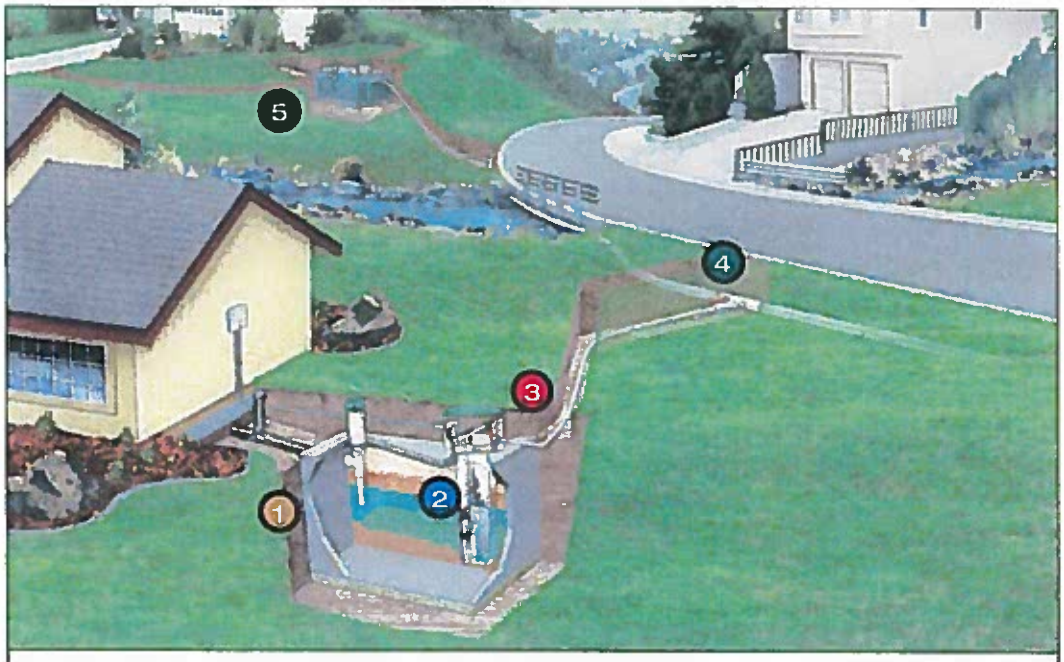


Orenco EffluentSewers

How an Orenco Effluent Sewer Works

With an Orenco Effluent Sewer, raw sewage flows from the house or business to a watertight underground tank, where it is pretreated. Only the filtered liquid is discharged (by either pump or gravity) through the service lines, to shallow, small-diameter collection lines that follow the contour of the land. Solids remain in the underground tank, for passive, natural treatment. Tanks typically need pumping only once every 10–12 years.

Orenco Effluent Sewers are designed as a totally integrated package, and system components are compatible and preassembled. Each item is fully warrantied, and components are corrosion-resistant, durable, and lightweight.



1. *Watertight tanks provide primary treatment, so only liquids are conveyed to the treatment plant.*
2. *Our patented Biotube® Pump Vault filters out solids, and our lightweight, non-corroding pumps last more than 25 years.*
3. *One-inch (25-mm) diameter service lines can be easily installed with a trencher.*
4. *Small-diameter main lines follow the contour of the ground, saving excavation costs. No expensive manholes or lift stations are required.*
5. *Filtered effluent is conveyed by gravity from homes at higher elevations, so no pump is typically required.*

From Sewer to Treatment

The high-quality, filtered effluent from an effluent sewer is ideal for use with a low-cost, low-maintenance treatment system, such as Orenco's AdvanTex® AX100 textile filter. From there, it can be reused for irrigation or other kinds of beneficial re-use. With no infiltration or solids to contend with, the treatment plant can be sized up to 90% smaller than with other collection technologies, saving money in equipment, installation, and operation.

This photo shows Phase 1 and 2 of Orenco's modular AdvanTex AX100 Wastewater Treatment System, located in Bethel Heights, Arkansas. Bethel Heights now has 45 AX100 filter modules that are designed to handle 225,000 gpd (850 m^3/day) of wastewater. Multiple Orenco telemetry panels control the small, low-energy pumps that move wastewater through the filters and out to the drip irrigation fields.

Orenco EffluentSewers

A Fraction of the Cost of Conventional Sewers

Orenco Effluent Sewers dramatically reduce short-term and long-term wastewater treatment costs for communities and developers. In fact, effluent sewers are often one-half the cost of conventional gravity sewers or less. Here are the many ways you save:

Save On Equipment And Labor

- Collection lines are shallowly buried, just below the frost line, reducing excavation costs.
- Inexpensive, small-diameter collection lines are used.
- Expensive manholes and lift stations are eliminated.
- Installation time is reduced by one-half or more, compared to conventional sewers.
- Ease of installation causes less disruption to communities, allowing businesses to operate normally during construction.
- Ease of installation makes system well-suited for community "self-help" programs.
- Most equipment isn't purchased until lots are developed, deferring costs.

Save On Operation And Maintenance

- Low maintenance has been documented with Orenco Effluent Sewers.
- 24-hour back-up storage in on-lot tanks reduces emergency calls and overtime costs.
- Homeowners pay less than $1/mo. in energy costs for pumps.
- Residential tanks typically need pumping just once every 10–12 years.

Save On Treatment Costs

- Because of high effluent quality, low-cost treatment systems, such as packed bed filters and sub-surface disposal, are ideal.
- Less costly permitting and testing are required when not discharging into waterways.
- Treatment facilities can be sized economically, since the whole system is watertight. There's no need to allow for the infiltration and inflow from high stormwater flows or groundwater.

"In general, alternative collection systems should be considered for smaller rural communities with low population density and site specific environmental conditions . . . Shallow bedrock, high groundwater conditions, extremely flat or very hilly terrain and limited room for construction make alternative collection systems more cost-effective than conventional systems."

Illinois Community Action Association
Alternative Wastewater Systems in Illinois

Orenco Effluent Sewer Systems are ideal for new subdivisions, whether on flat ground or on the most difficult terrain.

Community Case Studies

Hundreds of communities throughout North America are successfully collecting and treating their wastewater with Orenco Effluent Sewer Systems. For more detailed case studies, go to www.orenco.com/systems and click on "Markets."

Diamond Lake, Washington

In 1986–87, an Orenco Effluent Sewer system serving 500 homes was installed in this Washington lakeside community. Half the properties are seasonally occupied, with sudden start-ups and prolonged shut-downs. And the winters are very cold. Even so, operator Larry Garwood said, "The systems are simple, dependable, and easy to maintain."

New Minden, Illinois

The small farming community of New Minden, Illinois (pop. 228) is attracting nationwide attention for its Orenco Effluent Sewer and recirculating gravel filter. Built for little more than $1 million — half the cost of the gravity sewer bid — the system produces such clean effluent (BOD and TSS below 3.0 mg/L) that it discharges to a stream. Cost per dwelling? Less than $8,000 for collection and treatment.

Elkton, Oregon

In 1989, an Orenco Effluent Sewer system was installed to serve more than 100 homes and businesses in Elkton, Oregon, at an average cost of less than $7,000 per home for both collection and treatment. Ten years after installation, maintenance on the entire collection system averaged less than one hour per month, and not a single residential septic tank needed pumping.

Steamboat, Oregon

In 1999, an Orenco Effluent Sewer, followed by an innovative textile filter treatment system, was installed in Steamboat, Oregon, to replace a leaking gravity system along a wild and scenic river. Annual operating costs have been reduced by a factor of 12!

Mobile, Alabama

In the 1990's, South Alabama Utilities realized they needed to provide wastewater services to new subdivisions or risk losing customer share. Since then, SAU has installed Orenco effluent sewer systems serving 47 subdivisions. When all the developments are built out, SAU's collection systems will handle more than 2,000 homes.

SW Barry County, Michigan

To preserve water quality, this Michigan lake county has had an effluent sewer system since 1993. The system includes more than 1200 Orenco units. Orenco's units have worked so dependably that hundreds more have since been ordered.

"Progressive AE has been designing and observing the installation of STEP systems for small Michigan communities for over 15 years. And we've used the Orenco Systems STEP unit exclusively for more than 10 years."

William J. Parker, P.E.
Progressive AE

Orenco EffluentSewers

Frequently Asked Questions

Effluent Sewer Systems have been in use for several decades. During that time, the technology has improved so dramatically that effluent sewers are highly recommended by the U.S. Environmental Protection Agency, as well as by engineers, academics, and public agencies.

Who takes care of the system?

The community or a utility will own the system and provide centralized maintenance. Orenco's VeriComm Monitoring System can provide automated, round-the-clock, computerized supervision. Orenco provides training for system operators and engineers.

Will there be lots of service personnel on people's property?

No. Service time per home averages less than 1 hour every 5 years. Utility meter readers come by far more frequently.

Do pumps have to be repaired or replaced frequently?

No. With normal maintenance and cleaning, our pumps last more than 25 years. Plus the electricity to run them averages less than $1 per month.

Will the system smell?

No. Not if properly designed and installed. Any wastewater collection system will smell if not properly designed and installed.

I've heard stories about these systems failing. Are they true?

Orenco Effluent Sewers work well. Solid engineering, proper equipment, and attention to detail ensure that. With any type of sewer system, poor engineering, substandard equipment, or sloppy installation can cause problems. Orenco Effluent Sewers have a well-documented track record of success.

Is the underground tank hard to take care of?

No. We require watertight tanks, and most need pumping only once every 10–12 years. Otherwise, they're underground, out of sight and out of mind.

What happens to the solids that accumulate in the tank?

Accumulation of solids occurs slowly because of the digestion process that takes place in a watertight tank. In fact, the tank digests more than 80% of the biosolids. Remaining solids are easily managed through planned pumping schedules.

What if something goes wrong with my tank?

Each property has a control panel with an alarm function. Your system's operator will be automatically notified of any alarms. And the 24-hour reserve space in your tank gives the operator time to have a problem checked.

If I have more questions, whom can I call?

Call Orenco at 541-459-4449 or toll-free at 800-348-9843.

Rely on Orenco for System Support

Orenco's innovative solutions to wastewater problems have become state-of-the-art. Our designs appear regularly in engineering textbooks and professional journals, and our engineers are invited to speak around the world. We routinely offer our expertise in the following ways:

Project Delivery

On the front-end of a project, we offer design/build options for community systems. On the back-end, we provide a variety of asset management services, including O&M protocols and optimization of financial performance.

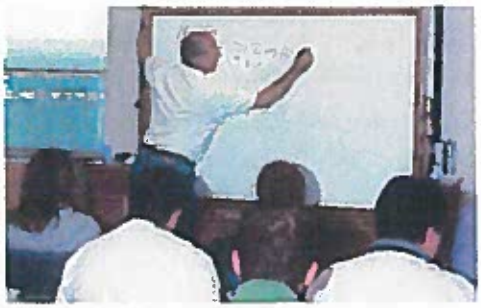
Engineering and Technical Support

We can provide referrals to engineers who have successfully designed effluent sewers. And we offer a wide range of engineering and technical support services, from permitting assistance, plan reviews, hydraulic analyses, and CD-ROMs to complete plan preparation, bid documents, material specifications, O&M support, and tech support for advanced controls, including telemetry and SCADA.

Training

We offer installation and operation trainings, and we sponsor forums that give operators the chance to share tips and information.

Because our team of civil, environmental, mechanical, and electrical engineers work exclusively in the onsite and effluent sewer industries, we're able to offer unmatched technical assistance. When you choose an Orenco system, you'll have the industry leader behind you.



We provide training at our Oregon headquarters and around the country.

Orenco maintains an environmental lab and invests heavily in research.

Our engineers offer unmatched technical assistance. Orenco's engineers and scientists have more than 500 years' experience in the water/wastewater industry.

Orenco EffluentSewers

Orenco Systems is owned and managed by engineers who develop wastewater systems that work — systems based on sound science. From left to right: Eric Ball, P.E., Jeff Ball, P.E., Hal Ball, P.E., (front) Terry Bounds, P.E.

Defining Sustainable Solutions Since 1981

Orenco Systems has been researching, designing, manufacturing, and selling leading-edge products for wastewater treatment systems since 1981. The company has grown to become an industry leader, with about 300 employees and 300 points of distribution in North America, Australasia, Europe, Africa, and Southwest Asia. Our products and technologies have been installed in more than 70 countries around the world.

Orenco is headquartered at a 26-acre (10.5 ha) site in Oregon, a state that's known for its environmentally sustainable practices.

Orenco maintains an environmental lab and employs dozens of engineers, scientists, and wastewater treatment operators. Orenco's systems are based on sound scientific principles of chemistry, biology, mechanical structure, and hydraulics. As a result, our research appears in numerous publications and our engineers are regularly asked to give workshops and offer trainings.

Distributed by:

Orenco®

Orenco Systems®, Incorporated

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ABR-EFS-1
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Orenco®

Orenco® Effluent Sewers FAQ

Overview & Economics

Are effluent sewers an experimental technology?

No. About 600 Orenco Effluent Sewers have been installed for municipal and commercial applications throughout the U.S. and Canada. The first effluent sewers were installed in the early 1980's and Orenco has designed effluent sewer equipment and tracked many of its effluent sewer communities for more than 30 years.

How do effluent sewer costs compare to those of other collection systems?

The following tables provide a cost summary of capital, installation, and operational costs for effluent, grinder, gravity, and vacuum sewers, according to *WERF's Wastewater Planning Model, Version 1.0*, www.werf.org/.../c/DecentralizedCost/Decentralized_Cost.aspx. Model output is based on a 200-unit example.

Table 1. WERF Wastewater Planning Model: Effluent and Grinder Sewers

Cost Description	Effluent Sewer			Grinder Sewer		
Cost of Collection Network	$516,179	to	$774,268	$525,950	to	$788,925
Installation Cost of On-Lot	$2,625	to	$3,938	$4,291	to	$6,436
Total Installation Cost	$1,041,232	to	$1,561,848	$1,384,090	to	$2,076,135
Total System Cost / Connection	$5,206	to	$7,809	$6,920	to	$10,381
Annual On-Lot O&M	$63	to	$78	$224	to	$336

Table 2. WERF Wastewater Planning Model: Vacuum and Gravity Sewers

Cost Description	Vacuum Collection			Gravity Sewer		
Cost of Collection Network	$2,120,188	to	$3,180,283	$3,092,330	to	$4,638,494
Installation Cost of On-Lot	$3,761	to	$5,641	$726	to	$1,088
Total Installation Cost	$2,120,188	to	$3,180,283	$4,638,494	to	$5,001,322
Total System Cost / Connection	$10,601	to	$15,901	$23,192	to	$25,007
Annual On-Lot O&M	Maintained by Utility			$16	to	$24

Do effluent sewers require mandatory connections?

Not if the funding agency doesn't require it. Residents with approved onsite systems can defer connection because up to 85% of the total cost of Orenco Effluent Sewers is associated with the on-lot equipment packages, not the sewer lines.

Can effluent sewers be upsized affordably?

Yes. Orenco Effluent Sewers are easily oversized to accommodate future connections, at relatively low up-front and ongoing costs. This is not only because 85% of the costs is for the on-lot equipment packages, as noted above, but also because the lack of solids in the mainlines allows the use of low-cost, small-diameter PVC or polyethylene pipe for the mains. The cost to oversize such an inexpensive conveyance system is minimal. Gravity sewers, on the other hand, require expensive, large-diameter mains that comprise most of the costs of the system and are costly to oversize and maintain. Grinder sewer mainlines are difficult to oversize due to scouring velocity requirements.

Can effluent sewers be integrated into existing municipal infrastructure?

Yes. Countless effluent sewers convey primary treated effluent to existing gravity collection systems, lagoons, package plants, and other secondary treatment processes. (Note: When discharging wastewater into gravity mains from either effluent or grinder pressure sewer mains, engineers must design for control of odor and corrosion.)

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Are lift stations required?

Generally not, even when the point of discharge is miles away from the point of wastewater generation. Regardless of the point of discharge, mainlines are normally sized to allow communities to standardize on a single high-head effluent pump for their on-lot STEP systems ... typically 10 gpm and ½ hp, throughout.

What are typical user rates?

User rates depend on system configuration and financing. Here's a sampling of 2013 user rates from a number of the Orenco Effluent Sewer communities that we track:

$35/month or less for Bethel Heights, AR; South Alabama Utilities, AL; Amesville, OH; Diamond Lake, WA; Elkton, OR; and Glide, OR.

$43/month for Yelm, WA and for Victoria, PEI.

Septic Tanks & Components

Can existing septic tanks be re-used for the effluent sewer system?

Not typically. Existing septic tanks require thorough evaluation to confirm watertightness and structural integrity before they can be used as interceptor tanks in a new STEP/STEG sewer system. That's because most U.S. septic tanks that are already in the ground are structurally unsound and almost never watertight. While recently installed tanks are sometimes acceptable, we've seen tank failure rates in older communities as high as 95%. This leads to increased infiltration, less efficient solids digestion, compromised secondary treatment processes, and higher maintenance costs.

Does every lot require a STEP (Septic Tank Effluent Pumping) system?

Not necessarily. Depending on elevations and mainline pressures, some connections can gravity-flow into the mainlines. (These are referred to as STEG systems: Septic Tank Effluent Gravity.) Systems can be all STEP, all STEG, or a combination. Simple hydraulic analyses can determine what is required.

How often does the tank need to be pumped out?

Assuming a 1000 gallon watertight tank and 3 people per residence, the pump-out interval is about 11 years calculated at a 95% confidence level. That's because the tank digests more than 80% of the solids. Average pump-out intervals are even longer.[3]

How often do the pumps need to be repaired/replaced?

Orenco's high-head effluent pumps typically last 20 years or more.

What happens during a power outage? How much emergency storage is in a tank?

The reserve storage in the on-lot tanks is normally about 150 gallons. This allows for 24 hours of normal water usage during a power outage, although during an outage, most residents reduce their water usage dramatically. That's because they are not washing dishes and clothes or taking baths and showers. In addition, most power disruptions last no longer than a couple of hours; power outages of 9-12 hours are infrequent and generally considered the worst condition to allow for. In regions of the country with extended power outages, 1,500-gallon tanks can be substituted for the standard 1,000-gallon tanks and a generator receptacle can be incorporated into the control panel.

What happens with system abusers?

All residents need to know what can and can't go down their sewer, regardless of sewer technology. Dangerous and damaging substances such as chemicals, pharmaceuticals, grease, oil, non biodegradable "flushable" wipes, diapers, and condoms should not go down any sewer drain. One of the benefits of effluent sewers is that system abuses can be identified and controlled. Effluent sewers trap most harmful discharges at the source, in the property owner's on-lot tank. This gives operators the ability to provide homeowner education at the first offense and to charge for excessive service calls and/or pumping, with subsequent offenses.

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Design & Installation

Can you serve commercial properties or commercial areas, as well as residential areas?

Yes.

Does the system smell?

No, not if properly designed, installed, and operated. That's because on-lot tanks vent naturally through building stacks, and mainlines are completely enclosed and watertight. However, when discharging an effluent sewer line into an existing gravity sewer, hydrogen sulfide can be generated and odor control measures may be necessary. These include aeration, carbon filtration, or chemical addition. Orenco's Sales Department can provide guidance.

Do you design with I/I allowances?

The tanks and collection lines in effluent sewer systems are designed to be watertight and largely immune to I/I.

Are there any cold weather design considerations?

Collection lines are buried below the frost line. Lids are insulated, and hose and valve assemblies are provided with pitless adapters.

Are road closures common during installation?

No. Orenco Effluent Sewer mains are small diameter and are generally installed in the right-of-way next to the road, at shallow burial depths below the frost level, much like water lines. Open trench installation and directional boring reduces the trauma and costs of removal, replacement, and closures of roads, as well as damage to utilities and driveways.

Operation & Maintenance

Do effluent sewers require full-time operation and maintenance?

Not for smaller systems. According to engineer Mike Saunders, an expert in asset management of wastewater systems, "a single technician with a pick-up truck" can maintain 2,000 STEP connections in an effluent sewer system, as long as the system was correctly installed with high-quality products.

Do Effluent Sewers have higher O&M costs compared to gravity sewers?

No. Fact Sheets developed by the Water Environment Research Foundation show that O&M for effluent sewers is slightly less than for gravity sewers.[1] A 20-year life cycle analysis of an Orenco Effluent Sewer system for Lacey, Washington, which was presented at WEFTEC 2013, concluded that, "... a well-managed program for STEP O&M has annualized costs that run closely in line with typical annualized costs for gravity sewer O&M."[5]

Although gravity sewers have a low initial O&M cost, as they age, substantial costs accrue from I&I (inflow and infiltration), SSO's (sanitary sewer overflows), expensive R&R (renewal and replacement), expensive system failures, and replacement of on-site laterals. Growing communities can offset these O&M costs with new low-maintenance gravity connections. However, small communities with aging systems generally lack the new connections that help fund these capital improvements.

[1] *WERF Fact Sheets C1, C2, C3, "Performance & Cost of Decentralized Unit Processes," 2010.*

[2] *"Orenco Effluent Sewer Systems: Operational Cost-On-Lot Components," 2013.*

[3] *ibid.*

[4] *op cit.*

[5] *Cagle, Bill; Cargil, Terry; Dickinson, Roger, "20-Year Life Cycle Analysis of an Effluent Sewer (STEP) System — City of Lacey, Washington," 2013.*

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Attachment B

Justification and Calculations for Deviation in Straight Alignment Without Manholes

Attachment B

Justification and Calculations for Deviations in Straight Alignment Without Manholes

Not Applicable

Attachment C

Justification for Variance from Manhole Spacing

<u>Attachment C</u>

Justification for Variance from Manhole Spacing

Not Applicable

Attachment D

Explanation for Slopes for Flows Greater Than 10.0 Feet per Seconds

Attachment D

Explanation for Slopes for Flows Greater Than 10.0 Feet Per Second

Not Applicable

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STATE OF TEXAS
CHRISTOPHER B. ALLISON
131240
LICENSED PROFESSIONAL ENGINEER
10/13/2020

VINTAGE OAKS AT THE VINEYARD
UNIT 29
SCS PROPOSED SITE PLAN

JOB: 19BSW004	
DATE: 2020-09-30	
DRAWN: TJN	PM: BA
DESIGN: DL	DM:
PEER:	OTHER:

REVISIONS:

DELTA	DESCRIPTION	DATE

SHEET:

C10.2

Date: Oct 09, 2020, 11:34am, User ID: trewton
File: S:\active projects_2019\70 new braunfels general civil\70196sw\00004 - vintage oaks grove phase 5\dwg\19BSW004-SCS-PSITE-PLN-001.dwg

Texas Commission on Environmental Quality
Organized Sewage Collection System
General Construction Notes

Edwards Aquifer Protection Program Construction Notes – Legal Disclaimer

The following/listed "construction notes" are intended to be advisory in nature only and do not constitute an approval or conditional approval by the Executive Director, nor do they constitute a comprehensive listing of rules or conditions to be followed during construction. Further actions may be required to achieve compliance with TCEQ regulations found in Title 30, Texas Administrative Code, Chapters 213 and 217, as well as local ordinances and regulations providing for the protection of water quality. Additionally, nothing contained in the following/listed "construction notes" restricts the powers of the Executive Director, the commission or any other governmental entity to prevent, correct, or curtail activities that result or may result in pollution of the Edwards Aquifer or hydrologically connected surface waters. The holder of any Edwards Aquifer Protection Plan containing "construction notes" is still responsible for compliance with Title 30, Texas Administrative Code, Chapters 213 or any other applicable TCEQ regulation, as well as all conditions of an Edwards Aquifer Protection Plan through all phases of plan implementation. Failure to comply with any condition of the Executive Director's approval, whether or not in contradiction of any "construction notes," is a violation of TCEQ regulations and any violation is subject to administrative rules, orders, and penalties as provided under Title 30, Texas Administrative Code § 213.10 (relating to Enforcement). Such violations may also be subject to civil penalties and injunction. The following/listed "construction notes" in no way represent an approved exception by the Executive Director to any part of Title 30 Texas Administrative Code, Chapters 213 and 217, or any other TCEQ applicable regulation.

1. This Organized Sewage Collection System (SCS) must be constructed in accordance with 30 Texas Administrative Code (TAC) §213.5(c), the Texas Commission on Environmental Quality's (TCEQ) Edwards Aquifer Rules and any local government standard specifications.

2. All contractors conducting regulated activities associated with this proposed regulated project must be provided with copies of the SCS plan and the TCEQ letter indicating the specific conditions of its approval. During the course of these regulated activities, the contractors must be required to keep on-site copies of the plan and the approval letter.

3. A written notice of construction must be submitted to the presiding TCEQ regional office at least 48 hours prior to the start of any regulated activities. This notice must include:
   - the name of the approved project;
   - the activity start date; and
   - the contact information of the prime contractor.

4. Any modification to the activities described in the referenced SCS application following the date of approval may require the submittal of an SCS application to modify this approval, including the payment of appropriate fees and all information necessary for its review and approval.

5. Prior to beginning any construction activity, all temporary erosion and sedimentation (E&S) control measures must be properly installed and maintained in accordance with the manufacturers specifications. These controls must remain in place until the disturbed areas have been permanently stabilized.

6. If any sensitive features are discovered during the wastewater line trenching activities, all regulated activities near the sensitive feature must be suspended immediately. The applicant must immediately notify the appropriate regional office of the TCEQ of the feature discovered. A geologist's assessment of the location and extent of the feature discovered must be reported to that regional office in writing and the applicant must submit a plan for ensuring the structural integrity of the sewer line or for modifying the proposed collection system alignment around the feature. The regulated activities near the sensitive feature may not proceed until the

executive director has reviewed and approved the methods proposed to protect the sensitive feature and the Edwards Aquifer from any potentially adverse impacts to water quality while maintaining the structural integrity of the line.

7. Sewer lines located within or crossing the 5-year floodplain of a drainage way will be protected from inundation and stream velocities which could cause erosion and scouring of backfill. The trench must be capped with concrete to prevent scouring of backfill, or the sewer lines must be encased in concrete. All concrete shall have a minimum thickness of 6 inches.

8. Blasting procedures for protection of existing sewer lines and other utilities will be in accordance with the National Fire Protection Association criteria. Sand is not allowed as bedding or backfill in trenches that have been blasted. If any existing sewer lines are damaged, the lines must be repaired and retested.

9. All manholes constructed or rehabilitated on this project must have watertight size on size resilient connectors allowing for differential settlement. If manholes are constructed within the 100-year floodplain, the cover must have a gasket and be bolted to the ring. Where gasketed manhole covers are required for more than three manholes in sequence or for more than 1500 feet, alternate means of venting will be provided. Bricks are not an acceptable construction material for any portion of the manhole.

   The diameter of the manholes must be a minimum of four feet and the manhole for entry must have a minimum clear opening diameter of 30 inches. These dimensions and other details showing compliance with the commission's rules concerning manholes and sewer line/manhole inverts described in 30 TAC §217.55 are included on Plan Sheet __ of __.

   It is suggested that entrance into manholes in excess of four feet deep be accomplished by means of a portable ladder. The inclusion of steps in a manhole is prohibited.

10. Where water lines and new sewer line are installed with a separation distance closer than nine feet (i.e., water lines crossing wastewater lines, water lines paralleling wastewater lines, or water lines next to manholes) the installation must meet the requirements of 30 TAC §217.53(d) (Pipe Design) and 30 TAC §290.44(e) (Water Distribution).

11. Where sewers lines deviate from straight alignment and uniform grade all curvature of sewer pipe must be achieved by the following procedure which is recommended by the pipe manufacturer: _____.

    If pipe flexure is proposed, the following method of preventing deflection of the joint must be used: _____.

    Specific care must be taken to ensure that the joint is placed in the center of the trench and properly bedded in accordance with 30 TAC §217.54.

12. New sewage collection system lines must be constructed with stub outs for the connection of anticipated extensions. The location of such stub outs must be marked on the ground such that their location can be easily determined at the time of connection of the extensions. Such stub outs must be manufactured wyes or tees that are compatible in size and material with both the sewer line and the extension. At the time of original construction, new stub-outs must be constructed sufficiently to extend beyond the end of the street pavement. All stub-outs must be sealed with a manufactured cap to prevent leakage. Extensions that were not anticipated at the time of original construction or that are to be connected to an existing sewer line not furnished with stub outs must be connected using a manufactured saddle and in accordance with accepted plumbing techniques.

    If no stub-out is present an alternate method of joining laterals is shown in the detail on Plan Sheet __ of __. (For potential future laterals).

    The private service lateral stub-outs must be installed as shown on the plan and profile sheets on Plan Sheet __ of __ and marked after backfilling as shown in the detail on Plan Sheet __ of __.

13. Trenching, bedding and backfill must conform with 30 TAC §217.54. The bedding and backfill for flexible pipe must comply with the standards of ASTM D-2321, Classes IA, IB, II or III. Rigid pipe bedding must comply with the requirements of ASTM C 12 (ANSI A 106.2) classes A, B or C.

14. Sewer lines must be tested from manhole to manhole. When a new sewer line is connected to an existing stub or clean-out, it must be tested from existing manhole to new manhole. If a stub or clean-out is used at the end of the proposed sewer line, no private service attachments may be connected between the last manhole and the cleanout unless it can be certified as conforming with the provisions of 30 TAC §213.5(c)(3)(E).

15. All sewer lines must be tested in accordance with 30 TAC §217.57. The engineer must retain copies of all test results which must be made available to the executive director upon request. The engineer must certify in writing that all wastewater lines have passed all required testing to the appropriate regional office within 30 days of test completion and prior to use of the new collection system. Testing method will be:
    (a) For a collection system pipe that will transport wastewater by gravity flow, the design must specify an infiltration and exfiltration test or a low-pressure air test. A test must conform to the following requirements:
        (1) *Low Pressure Air Test.*
            (A) A low pressure air test must follow the procedures described in American Society For Testing And Materials (ASTM) C-828, ASTM C-924, or ASTM F-1417 or other procedure approved by the executive director, except as to testing times as required in Table C.3 in subparagraph (C) of this paragraph or Equation C.3 in subparagraph (B)(ii) of this paragraph.
            (B) For sections of collection system pipe less than 36 inch average inside diameter, the following procedure must apply, unless a pipe is to be tested as required by paragraph (2) of this subsection.
                (i) A pipe must be pressurized to 3.5 pounds per square inch (psi) greater than the pressure exerted by groundwater above the pipe.
                (ii) Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 psi gauge to 2.5 psi gauge is computed from the following equation:

Equation C.3
$$T = \frac{0.085 \times D \times K}{Q}$$

Where:

T = time for pressure to drop 1.0 pound per square inch gauge in seconds
K = 0.000419 X D X L, but not less than 1.0
D = average inside pipe diameter in inches

L = length of line of same size being tested, in feet
Q = rate of loss, 0.0015 cubic feet per minute per square foot internal surface

(C) Since a K value of less than 1.0 may not be used, the minimum testing time for each pipe diameter is shown in the following Table C.3:

Pipe Diameter *(inches)*	**Minimum Time** *(seconds)*	**Maximum Length for Minimum Time** *(feet)*	**Time for Longer Length** *(seconds/foot)*
6	340	398	0.855
8	454	298	1.520
10	567	239	2.374
12	680	199	3.419
15	850	159	5.342
18	1020	133	7.693
21	1190	114	10.471
24	1360	100	13.676
27	1530	88	17.309
30	1700	80	21.369
33	1870	72	25.856

(D) An owner may stop a test if no pressure loss has occurred during the first 25% of the calculated testing time.
(E) If any pressure loss or leakage has occurred during the first 25% of a testing period, then the test must continue for the entire test duration as outlined above or until failure.
(F) Wastewater collection system pipes with a 27 inch or larger average inside diameter may be air tested at each joint instead of following the procedure outlined in this section.
(G) A testing procedure for pipe with an inside diameter greater than 33 inches must be approved by the executive director.

(2) *Infiltration/Exfiltration Test.*
(A) The total exfiltration, as determined by a hydrostatic head test, must not exceed 50 gallons per inch of diameter per mile of pipe per 24 hours at a minimum test head of 2.0 feet above the crown of a pipe at an upstream manhole.
(B) An owner shall use an infiltration test in lieu of an exfiltration test when pipes are installed below the groundwater level.
(C) The total exfiltration, as determined by a hydrostatic head test, must not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of a pipe at an upstream manhole, or at least two feet above existing groundwater level, whichever is greater.
(D) For construction within a 25-year flood plain, the infiltration or exfiltration must not exceed 10 gallons per inch diameter per mile of pipe per 24 hours at the same minimum test head as in subparagraph (C) of this paragraph.
(E) If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, an owner shall undertake remedial action in order to reduce

the infiltration or exfiltration to an amount within the limits specified. An owner shall retest a pipe following a remediation action.

(b) If a gravity collection pipe is composed of flexible pipe, deflection testing is also required. The following procedures must be followed:
(1) For a collection pipe with inside diameter less than 27 inches, deflection measurement requires a rigid mandrel.
(A) *Mandrel Sizing.*
(i) A rigid mandrel must have an outside diameter (OD) not less than 95% of the base inside diameter (ID) or average ID of a pipe, as specified in the appropriate standard by the ASTMs, American Water Works Association, UNI-BELL, or American National Standards Institute, or any related appendix.
(ii) If a mandrel sizing diameter is not specified in the appropriate standard, the mandrel must have an OD equal to 95% of the ID of a pipe. In this case, the ID of the pipe, for the purpose of determining the OD of the mandrel, must equal be the average outside diameter minus two minimum wall thicknesses for OD controlled pipe and the average inside diameter for ID controlled pipe.
(iii) All dimensions must meet the appropriate standard.
(B) *Mandrel Design.*
(i) A rigid mandrel must be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed.
(ii) A mandrel must have nine or more odd number of runners or legs.
(iii) A barrel section length must equal at least 75% of the inside diameter of a pipe.
(iv) Each size mandrel must use a separate proving ring.
(C) *Method Options.*
(i) An adjustable or flexible mandrel is prohibited.
(ii) A test may not use television inspection as a substitute for a deflection test.
(iii) If requested, the executive director may approve the use of a deflectometer or a mandrel with removable legs or runners on a case-by-case basis.
(2) For a gravity collection system pipe with an inside diameter 27 inches and greater, other test methods may be used to determine vertical deflection.
(3) A deflection test method must be accurate to within plus or minus 0.2% deflection.
(4) An owner shall not conduct a deflection test until at least 30 days after the final backfill.
(5) Gravity collection system pipe deflection must not exceed five percent (5%).
(6) If a pipe section fails a deflection test, an owner shall correct the problem and conduct a second test after the final backfill has been in place at least 30 days.

16. All manholes must be tested to meet or exceed the requirements of 30 TAC §217.58.
(a) All manholes must pass a leakage test.
(b) An owner shall test each manhole (after assembly and backfilling) for leakage, separate and independent of the collection system pipes, by hydrostatic exfiltration testing, vacuum testing, or other method approved by the executive director.
(1) Hydrostatic Testing.

(A) The maximum leakage for hydrostatic testing or any alternative test methods is 0.025 gallons per foot diameter per foot of manhole depth per hour.
(B) To perform a hydrostatic exfiltration test, an owner shall seal all wastewater pipes coming into a manhole with an internal pipe plug, fill the manhole with water, and maintain the test for at least one hour.
(C) A test for concrete manholes may use a 24-hour wetting period before testing to allow saturation of the concrete.
(2) Vacuum Testing.
(A) To perform a vacuum test, an owner shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering a manhole.
(B) No grout must be placed in horizontal joints before testing.
(C) Stub-outs, manhole boots, and pipe plugs must be secured to prevent movement while a vacuum is drawn.
(D) An owner shall use a minimum 60 inch/lb torque wrench to tighten the external clamps that secure a test cover to the top of a manhole.
(E) A test head must be placed at the inside of the top of a cone section, and the seal inflated in accordance with the manufacturer's recommendations.
(F) There must be a vacuum of 10 inches of mercury inside a manhole to perform a valid test.
(G) A test does not begin until after the vacuum pump is off.
(H) A manhole passes the test if after 2.0 minutes and with all valves closed, the vacuum is at least 9.0 inches of mercury.

17. All private service laterals must be inspected and certified in accordance with 30 TAC §213.5(c)(3)(I). After installation of and, prior to covering and connecting a private service lateral to an existing organized sewage collection system, a Texas Licensed Professional Engineer, Texas Registered Sanitarian, or appropriate city inspector must visually inspect the private service lateral and the connection to the sewage collection system, and certify that it is constructed in conformity with the applicable provisions of this section. The owner of the collection system must maintain such certifications for five years and forward copies to the appropriate regional office upon request. Connections may only be made to an approved sewage collection system.

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THESE GENERAL CONSTRUCTION NOTES MUST BE INCLUDED ON THE CONSTRUCTION PLANS PROVIDED TO THE CONTRACTOR AND ALL SUBCONTRACTORS.

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STATE OF TEXAS
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LICENSED
PROFESSIONAL ENGINEER
10/13/2020

VINTAGE OAKS AT THE VINEYARD
UNIT 29
SCS GENERAL NOTES 1

JOB: 19BSW004
DATE: 2020-09-30
DRAWN: TJN PM: BA
DESIGN: DL DM:
PEER: OTHER:
REVISIONS:

DELTA	DESCRIPTION	DATE

SHEET:
C10.0

Texas 811

Date: Oct 09, 2020, 11:33am User ID: brewton
File: S:\active projects_201970 new braunfels general civil\7019bsw\00004 - vintage oaks grove phase 5\dwg\19BSW004-SCS-GNS-001.dwg

Texas Commission on Environmental Quality
Lift Station and Force Main
General Construction Notes

Edwards Aquifer Protection Program Construction Notes – Legal Disclaimer

The following/listed "construction notes" are intended to be advisory in nature only and do not constitute an approval or conditional approval by the Executive Director (ED), nor do they constitute a comprehensive listing of rules or conditions to be followed during construction. Further actions may be required to achieve compliance with TCEQ regulations found in Title 30, Texas Administrative Code (TAC), Chapters 213 and 217, as well as local ordinances and regulations providing for the protection of water quality. Additionally, nothing contained in the following/listed "construction notes" restricts the powers of the ED, the commission or any other governmental entity to prevent, correct, or curtail activities that result or may result in pollution of the Edwards Aquifer or hydrologically connected surface waters. The holder of any Edwards Aquifer Protection Plan containing "construction notes" is still responsible for compliance with Title 30, TAC, Chapters 213 or any other applicable TCEQ regulation, as well as all conditions of an Edwards Aquifer Protection Plan through all phases of plan implementation. Failure to comply with any condition of the ED's approval, whether or not in contradiction of any "construction notes," is a violation of TCEQ regulations and any violation is subject to administrative rules, orders, and penalties as provided under Title 30, TAC § 213.10 (relating to Enforcement). Such violations may also be subject to civil penalties and injunction. The following/listed "construction notes" in no way represent an approved exception by the ED to any part of Title 30 TAC, Chapters 213 and 217, or any other TCEQ applicable regulation

1. This lift station and/or force main must be constructed in accordance with 30 Texas Administrative Code (TAC) §213.5(c), the Texas Commission on Environmental Quality (TCEQ) Edwards Aquifer Rules, and any local government standard specifications.

2. Any modification to the activities described in the referenced Lift Station/Force Main (LSFM) System application following the date of approval may require the submittal of a LSFM System application to modify this approval, including the payment of appropriate fees and all information necessary for its review and approval.

3. A written notice of construction must be submitted to the presiding TCEQ regional office at least 48 hours prior to the start of any regulated activities. This notice must include:
   - the name of the approved project;
   - the activity start date; and
   - the contact information of the prime contractor.

4. Upon completion of any lift station excavation, a geologist must certify that the excavation has been inspected for the presence of sensitive features. The certification must be signed, sealed, and dated by the geologist preparing the certification. Certification that the excavation has been inspected must be submitted to the appropriate regional office.
   - If sensitive feature(s) are identified, all regulated activities near the sensitive feature must be suspended immediately and may not proceed until the executive director has reviewed and approved the methods proposed to protect any sensitive feature and the Edwards Aquifer from potentially adverse impacts to water quality from the lift station.
   - Construction may continue if the geologist certifies that no sensitive feature or features were present.

5. If any sensitive features are discovered during the wastewater line trenching activities, all regulated activities near the sensitive feature must be suspended immediately. The applicant must immediately notify the appropriate regional office of the TCEQ of the feature discovery. A geologist's assessment of the location and extent of the feature discovered must be reported to that regional office in writing within two working days. The applicant must submit a plan for ensuring the structural integrity of the sewer line or for modifying the proposed collection system alignment around the feature. The regulated activities near the sensitive feature may not proceed until the executive director has reviewed and approved the methods proposed to protect the sensitive feature and the Edwards Aquifer from any potentially

adverse impacts to water quality while maintaining the structural integrity of the line.

6. All force main lines must be tested in accordance with 30 TAC §217.68. Testing method will be:
   - A pressure test must use 50 pounds per square inch above the normal operating pressure of a force main.
   - A temporary valve for pressure testing may be installed near the discharge point of a force main and removed after a test is successfully completed.
   - A pump isolation valve may be used as an opposite termination point.
   - A test must involve filling a force main with water.
   - A pipe must hold the designated test pressure for a minimum of 4.0 hours.
   - The leakage rate must not exceed 10.0 gallons per inch diameter per mile of pipe per day.

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THESE LIFT STATION AND FORCE MAINS CONSTRUCTION NOTES MUST BE INCLUDED ON THE CONSTRUCTION PLANS PROVIDED TO THE CONTRACTOR AND ALL SUBCONTRACTORS.

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10/13/2020

VINTAGE OAKS AT THE VINEYARD
UNIT 29
SCS GENERAL NOTES 2

JOB: 19BSW004	
DATE: 2020-09-30	
DRAWN: TJN	PM: BA
DESIGN: DL	DM:
PEER:	OTHER:

REVISIONS:

DELTA	DESCRIPTION	DATE

SHEET:
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Date: Oct 09, 2020, 11:33am User ID: brewton
File: S:\active projects_2019\70 new braunfels general civil\70196sw\00004 - vintage oaks grove phase 5\dwg\19BSW004-SCS-GNS-001.dwg

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STATE OF TEXAS
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10/13/2020

VINTAGE OAKS AT THE VINEYARD
UNIT 29
SCS PROPOSED SITE PLAN

JOB: 19BSW004	
DATE: 2020-09-30	
DRAWN: TJN	PM: BA
DESIGN: DL	DM:
PEER:	OTHER:

REVISIONS:

DELTA	DESCRIPTION	DATE

SHEET:

C10.2

Date: Oct 09, 2020, 11:34am, User ID: trewton
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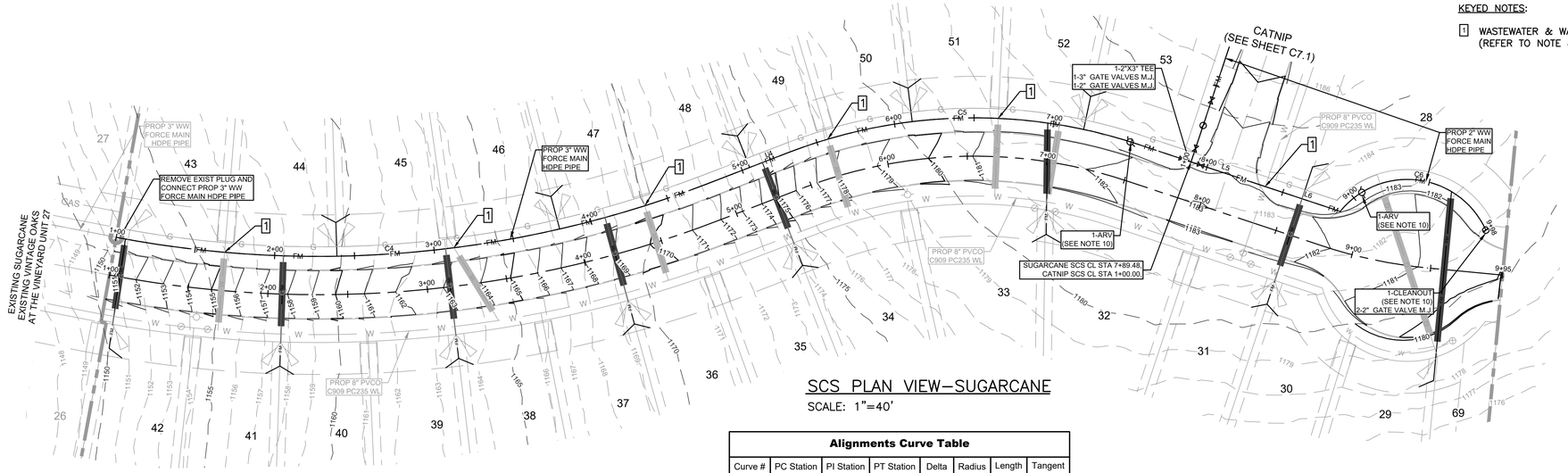


SCS PLAN VIEW–SUGARCANE

SCALE: 1"=40'

KEYED NOTES:

1. WASTEWATER & WATER LINE CROSSINGS (REFER TO NOTE 8, THIS SHEET)

0 20 40 80
SCALE (FEET)

LEGEND:

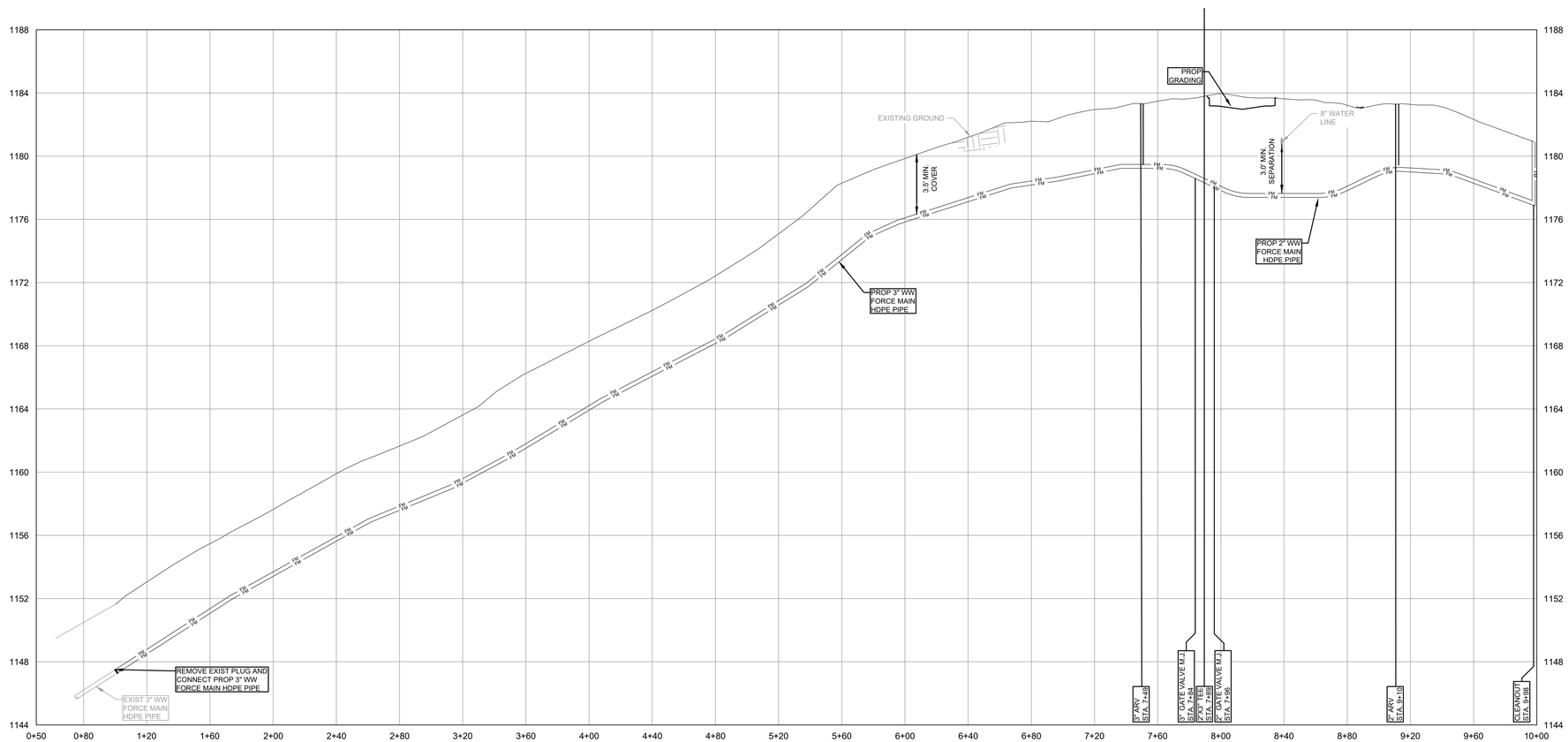
- EXIST 1/2" IRON PIN FOUND
- 1130 EXIST CONTOUR
- EXIST LOT LINE
- EXIST EDGE OF PAVEMENT
- PROP BOUNDARY LINE
- EXIST UNIT BOUNDARY
- EXIST RIGHT-OF-WAY
- EXIST LOT LINE
- PROP BLDG SETBACK
- PROP DRAINAGE ESMT
- PROP RIGHT-OF-WAY
- PROP LOT LINE
- PROP BACK OF CURB
- PROP FACE OF CURB
- 62 PROP LOT NUMBER
- PROP WATER FLOW DIRECTION
- G PROP GAS MAIN
- FM PROP FORCE MAIN
- W PROP WATER LINE
- IRR PROP IRRIGATION LINE
- PROP GAS SERVICE
- PROP FORCE MAIN SERVICE
- PROP DUAL WATER SERVICE
- PROP SINGLE WATER SERVICE
- PROP CLEANOUT W/GATE VALVE
- PROP GATE VALVE
- PROP FIRE HYDRANT
- PROP COMBINATION AIR/ VACUUM RELEASE VALVE
- LONG SERVICE PVC PIPE ENCASEMENT
- IRRIGATION SPRAY FIELDS

Alignments Curve Table

Curve #	PC Station	PI Station	PT Station	Delta	Radius	Length	Tangent
C4	1+00.00	2+92.84	4+75.70	31.84°	676.00'	375.70'	192.84'
C5	5+31.28	6+47.43	7+54.33	39.44°	324.00'	223.05'	116.15'
C6	8+87.91	9+75.70	9+98.00	116.80°	54.00'	110.09'	87.78'

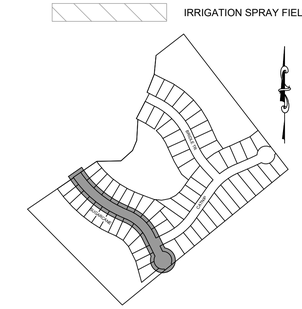
Alignments Line Table

Line #	Length	Direction	Start Station
L4	55.58'	S65°46'40.36"E	4+75.70
L5	89.15'	S26°19'59.38"E	7+54.33
L6	44.44'	S26°19'59.38"E	8+43.48



SCS PROFILE VIEW–SUGARCANE

SCALE: H:1"=40' V: 1"=4'



LOCATION MAP

NOT TO SCALE

NOTES:

1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE TEXAS ONE CALL CENTER PRIOR TO THE START OF ANY CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE EXACT LOCATION AND DEPTH OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK.
2. ALL UTILITY SYMBOLS SHOWN REPRESENT APPROXIMATE LOCATIONS UNLESS OTHERWISE NOTED. CONTRACTOR SHALL REFER TO THE APPROPRIATE AGENCY'S STANDARD SPECIFICATIONS AND INSTALLATION DETAILS FOR ACTUAL LOCATIONS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
3. SURVEY PROVIDED BY SHERWOOD SURVEYING.
4. ALL FITTINGS SHALL BE PRESSURE RATED FOR 200 PSI HDPE SDR 11 UNLESS OTHERWISE SPECIFIED.
5. ALL FORCE MAINS SHALL BE PRESSURE RATED FOR 200 PSI HDPE SDR 11 PE 3408 UNLESS OTHERWISE SPECIFIED.
6. SECTIONS OF PIPE THAT FALL INTO THE 5-YR. AND 100-YR. FLOOD PLAIN ARE TO BE ENCASED IN 6" OF CONCRETE.
7. ALL LINES SHALL BE INSTALLED WITH TRACER WIRE.
8. ALL SEWER MAIN/LATERAL CROSSING WITH POTABLE WATER SHALL BE PER DETAILS ON SHEET C10.6
9. ALL FORCE MAINS THAT ARE AT A ROADWAY CROSSING OR LOCATED UNDER PAVED AREAS SHALL BE ENCASED IN SCHEDULE 40 PVC OR BETTER. CASING SHALL BE MINIMUM OF 2 TIMES DIAMETER OF CARRIER PIPE AND EXTEND 5' BEYOND THE BACK OF CURB. EXACT LENGTH REQUIRED AT EACH CROSSING SHALL BE DETERMINED BY CLWSC REPRESENTATIVE IN THE FIELD.
10. ALL ABOVE GROUND APPURTENANCES (ARVS, CLEANOUTS, ETC.) SHALL BE INSTALLED AS CLOSE TO THE PROPERTY LINE AS POSSIBLE WHILE MAINTAINING THE 9 FOOT SEPARATION BETWEEN THE WASTEWATER LINE AND THE WATER LINE. EXACT LOCATION SHALL BE DETERMINED BY CLWSC REPRESENTATIVE IN THE FIELD.

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STATE OF TEXAS
CHRISTOPHER B. ALLISON
131240
LICENSED PROFESSIONAL ENGINEER
10/13/2020

VINTAGE OAKS AT THE VINEYARD
UNIT 29
SCS PLAN AND PROFILE - SUGARCANE

JOB: 19BSW004
DATE: 2020-09-30
DRAWN: TJN | PM: BA
DESIGN: DL | DM:
PEER: | OTHER:

REVISIONS:

DELTA	DESCRIPTION	DATE

SHEET:
C10.3

Date: Oct 09, 2020, 11:34am User ID: bnewton
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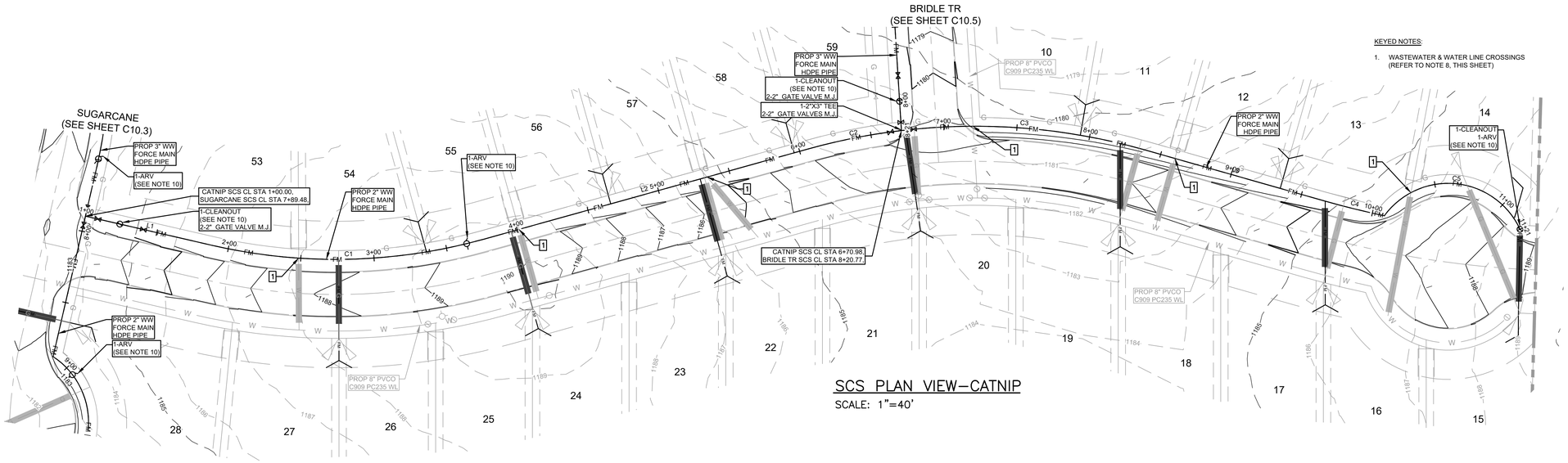

SCS PLAN VIEW–CATNIP

SCALE: 1"=40'

KEYED NOTES:

1. WASTEWATER & WATER LINE CROSSINGS (REFER TO NOTE 8, THIS SHEET)

0 20 40 80

SCALE (FEET)

LEGEND:

- EXIST 1/2" IRON PIN FOUND
- 1130 EXIST CONTOUR
- EXIST LOT LINE
- EXIST EDGE OF PAVEMENT
- PROP BOUNDARY LINE
- EXIST UNIT BOUNDARY
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NOTES:

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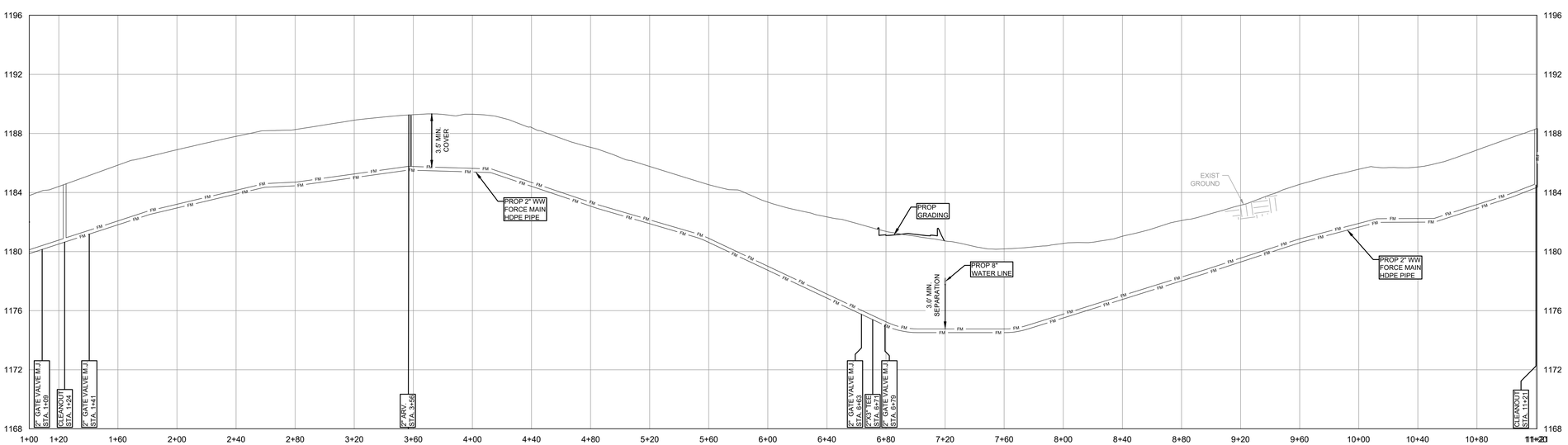
Alignments Curve Table

Curve #	PC Station	PI Station	PT Station	Delta	Radius	Length	Tangent
C1	1+88.87	2+84.45	3+76.06	28.52°	376.00'	187.19'	95.57'
C2	6+06.05	6+38.58	6+70.98	8.77°	424.00'	64.94'	32.53'
C3	6+70.98	7+55.95	8+38.70	22.66°	424.00'	167.71'	84.97'
C4	9+65.50	9+86.95	10+08.37	3.92°	626.00'	42.87'	21.44'
C5	10+08.37	11+00.31	11+20.66	119.14°	54.00'	112.29'	91.93'

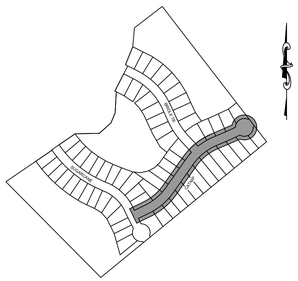
Alignments Line Table

Line #	Length	Direction	Start Station
L1	88.87'	N63°40'00.62"E	1+00.00
L2	229.99'	N35°08'34.94"E	3+76.06
L3	126.81'	N66°34'52.03"E	8+38.70



SCS PROFILE VIEW–CATNIP

SCALE: H:1"=40' V: 1"=4'



LOCATION MAP

NOT TO SCALE

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STATE OF TEXAS
CHRISTOPHER B. ALLISON
131240
LICENSED PROFESSIONAL ENGINEER
10/13/2020

VINTAGE OAKS AT THE VINEYARD

UNIT 29

SCS PLAN AND PROFILE - CATNIP

JOB: 19BSW004

DATE: 2020-09-30

DRAWN: TJN | PM: BA

DESIGN: DL | DM:

PEER: | OTHER:

REVISIONS:

DELTA	DESCRIPTION	DATE

SHEET:

C10.4

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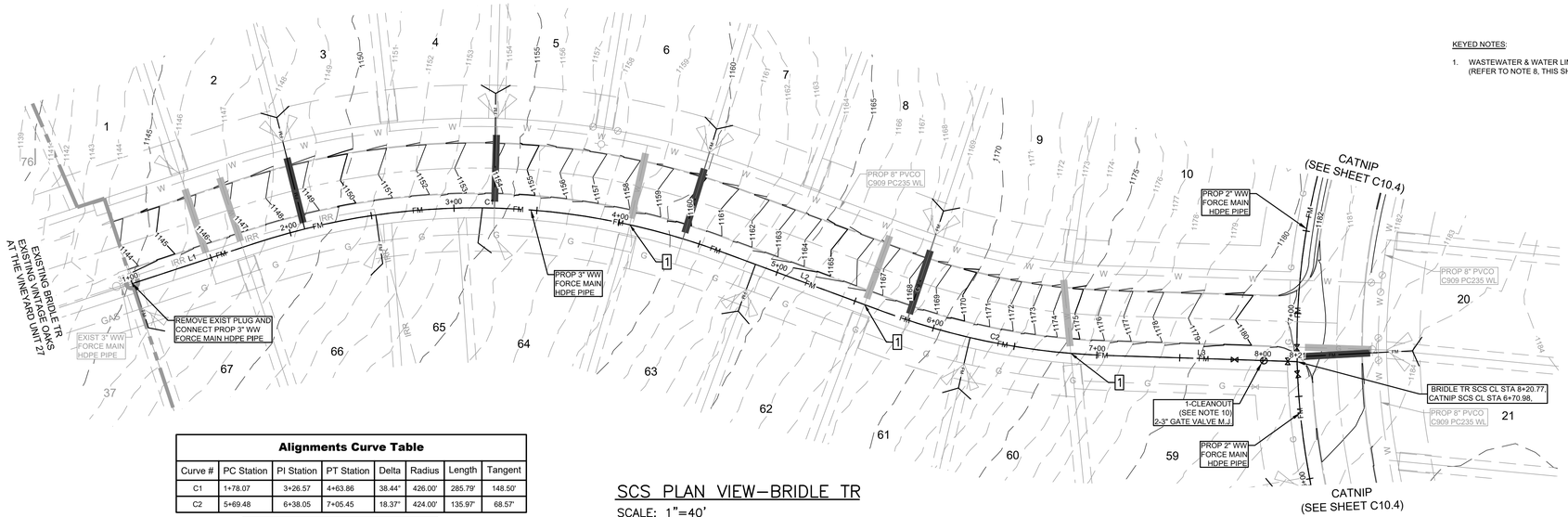


KEYED NOTES:

1. WASTEWATER & WATER LINE CROSSINGS (REFER TO NOTE 8, THIS SHEET)

SCS PLAN VIEW–BRIDLE TR

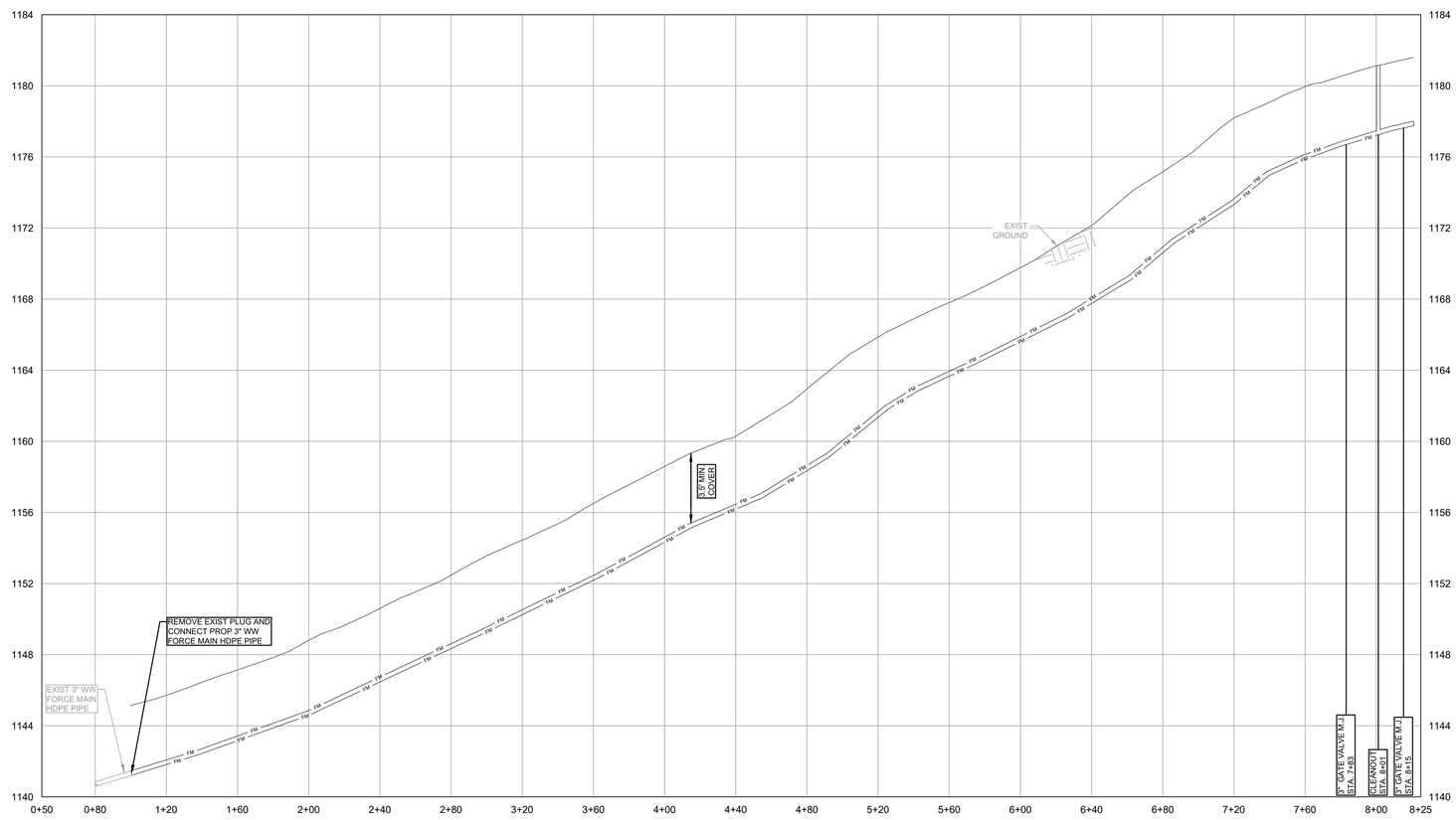
SCALE: 1"=40'

Alignments Curve Table

Curve #	PC Station	PI Station	PT Station	Delta	Radius	Length	Tangent
C1	1+78.07	3+26.57	4+63.86	38.44°	426.00'	285.79'	148.50'
C2	5+69.48	6+38.05	7+05.45	18.37°	424.00'	135.97'	68.57'

Alignments Line Table

Line #	Length	Direction	Start Station
L1	78.07'	S62°54'02.15"E	1+00.00
L2	105.63'	S24°27'47.92"E	4+63.86
L3	115.32'	S42°50'12.70"E	7+05.45



SCS PROFILE VIEW–BRIDLE TR

SCALE: H:1"=40' V: 1"=4'

0 20 40 80
SCALE (FEET)

LEGEND:

- EXIST 1/2" IRON PIN FOUND
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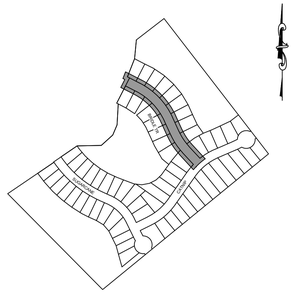

LOCATION MAP

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NOTES:

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STATE OF TEXAS
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131240
LICENSED PROFESSIONAL ENGINEER
10/13/2020

VINTAGE OAKS AT THE VINEYARD
UNIT 29
SCS PLAN AND PROFILE - BRIDLE TR

JOB: 19BSW004
DATE: 2020-09-30
DRAWN: TJN PM: BA
DESIGN: DL DM:
PEER: OTHER:

REVISIONS:

DELTA	DESCRIPTION	DATE

SHEET:
C10.5

Date: Oct 09, 2020, 11:35am User ID: bnewton
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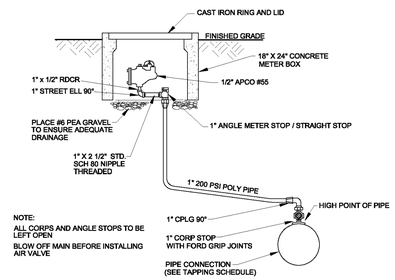


NOTE:
ALL CORPS AND ANGLE STOPS TO BE LEFT OPEN
BLOW OFF MAIN BEFORE INSTALLING AIR VALVE

GENERAL NOTES:
(1) FOR ADDITIONAL INFORMATION, SEE CANYON LAKE WATER SERVICE COMPANY'S STANDARD SPECIFICATIONS.

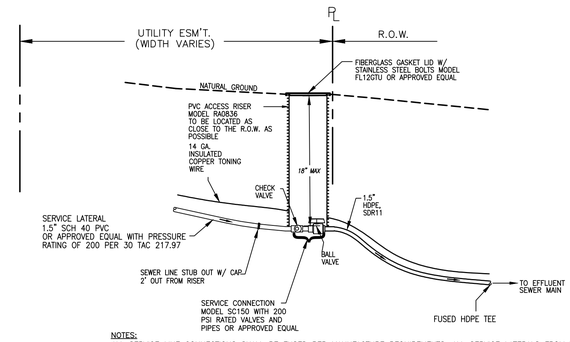
BY	REVISION	DATE	CK	AP	OPS

CLWSC
CANYON LAKE WATER SERVICE COMPANY
1399 Sattler Road
Canyon Lake, Texas 78133
(830) 964-3854

STANDARD 1/2" AIR VALVE INSTALLATION

BY: JW / M.HOMER
DATE: 02-11-09
OK:
SCALE: NONE
OPERATIONS / DATE
ENGINEERING / DATE
DIRECTOR OF ENGINEERING / DATE

REF. NOS.
DWG. NO. MAIN-AV
SHEET: 1 OF 1



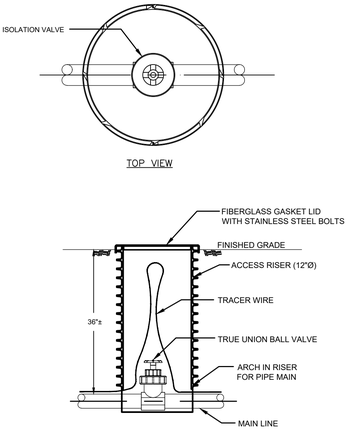
NOTES:
ALL SERVICE LINE CONNECTIONS SHALL BE FUSED PER MANUFACTURE REQUIREMENTS. ALL SERVICE LATERALS FROM THE EFFLUENT SEWER MAIN TO THE PROPERTY LINE SHALL BE PRESSURE TESTED PRIOR TO ANY BACKFILLING.

SEE TYPICAL SUBDIVISION UTILITY ASSIGNMENT FOR THE LOCATION OF OTHER UTILITIES (SHEET C10.7).

ALL MATERIALS AND FITTINGS SHALL BE PRESSURE RATED FOR 200 PSI.

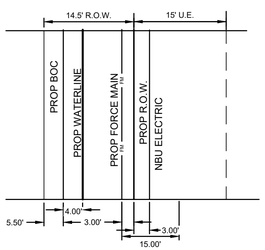
IF THE WATERLINE IS LOCATED WITHIN THE PROPERTY LINE, THE SEWER LINE SERVICE LATERAL MUST GO UNDER THE WATERMAIN AND MAINTAIN A 1 FOOT SEPARATION AS SHOWN IN THE TYPICAL SUBDIVISION SANITARY SEWER SERVICE CROSSING DETAIL LOCATED ON THIS SHEET.

SERVICE CONNECTION W/ LATERAL DETAIL - LEFT
NOT TO SCALE

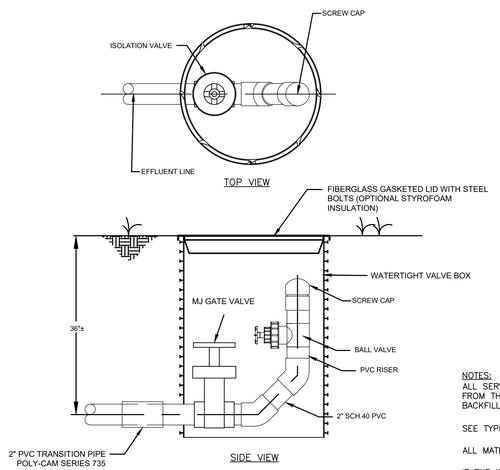


NOTES:
1. ALL MATERIALS AND FITTINGS SHALL BE PRESSURE RATED FOR 200 PSI.
2. ISOLATION VALVES ARE CONSTRUCTED OF CORROSION–RESISTANT MATERIALS

ISOLATION VALVE DETAIL
NOT TO SCALE

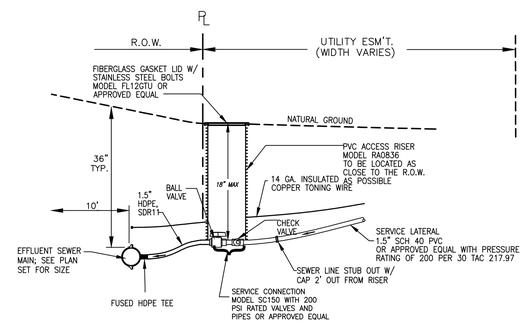


TYPICAL CUL-DE-SAC UTILITY ASSIGNMENT
N.T.S.



NOTES:
ALL MATERIALS AND FITTINGS SHALL BE PRESSURE RATED FOR 200 PSI.

END OF EFFLUENT LINE CLEAN-OUT W/ ISOLATION VALVE DETAIL
NOT TO SCALE



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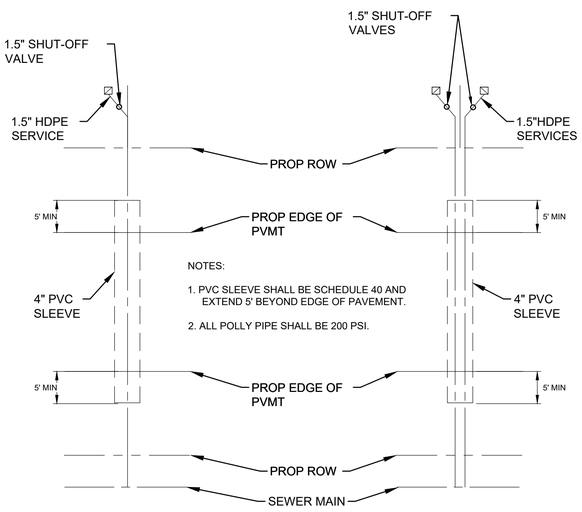
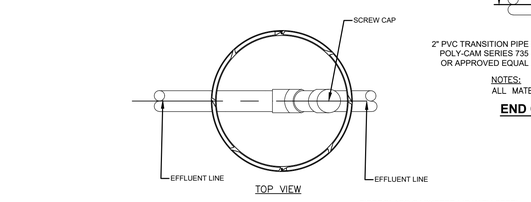
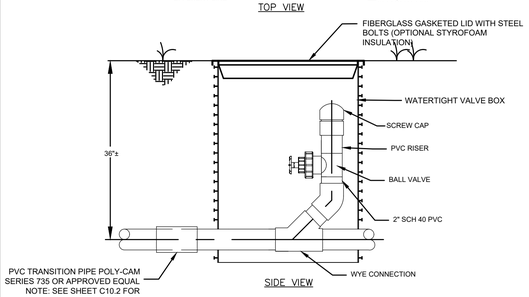
SERVICE CONNECTION W/ LATERAL DETAIL - RIGHT
NOT TO SCALE



NOTES:
1. PVC SLEEVE SHALL BE SCHEDULE 40 AND EXTEND 5' BEYOND EDGE OF PAVEMENT.
2. ALL POLLY PIPE SHALL BE 200 PSI.

LONG-SIDE SEWER SERVICE
NOT TO SCALE





NOTES:
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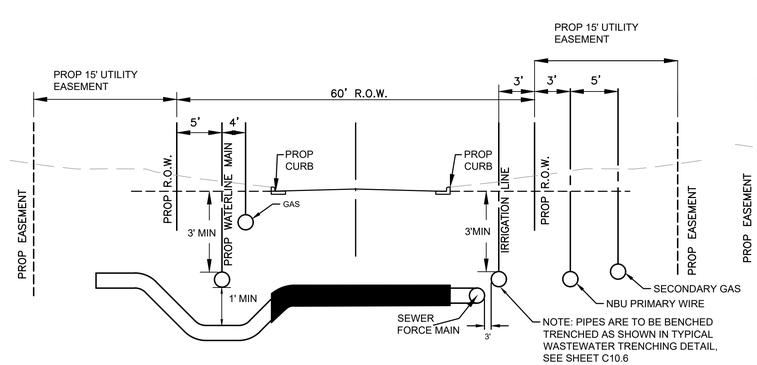
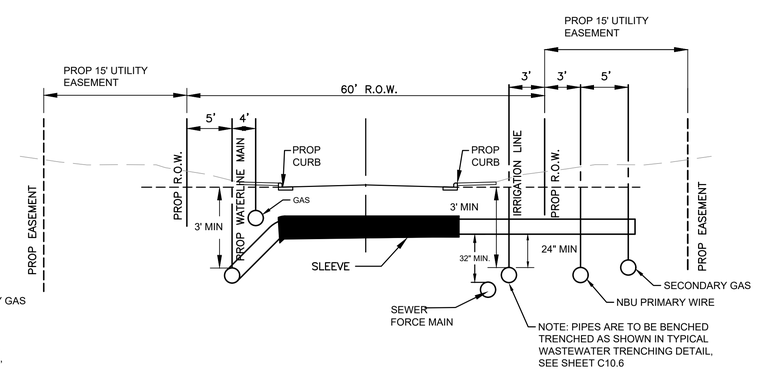
INLINE EFFLUENT CLEAN-OUT W/ ISOLATION VALVE DETAIL
NOT TO SCALE



TYPICAL SUBDIVISION SANITARY SEWER SERVICE CROSSING DETAIL
N.T.S.



TYPICAL SUBDIVISION WATER SERVICE CROSSING DETAIL
N.T.S.

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STATE OF TEXAS
CHRISTOPHER B. ALLISON
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LICENSED PROFESSIONAL ENGINEER
10/13/2020

VINTAGE OAKS AT THE VINEYARD
UNIT 29
SCS DETAILS 1

JOB: 19BSW004	
DATE: 2020-09-30	
DRAWN: TJN	PM: BA
DESIGN: DL	DM:
PEER:	OTHER:
REVISIONS:	
DELTA / DESCRIPTION	DATE

SHEET:
C10.6

Date: Oct 09, 2020, 11:36am User ID: trewton
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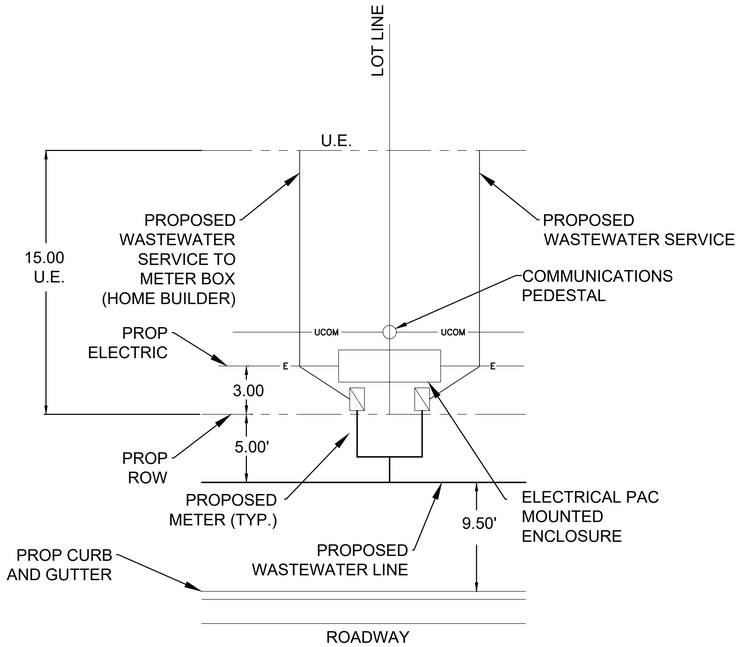
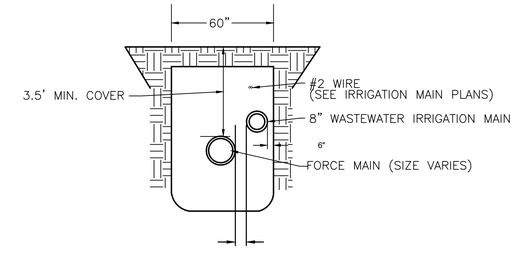


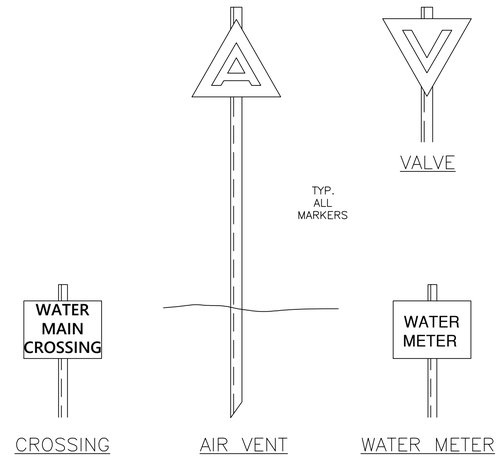
WASTEWATER METER LOCATION
(N.T.S.)



TYPICAL WASTEWATER TRENCH DETAIL
NOT TO SCALE

NOTE:

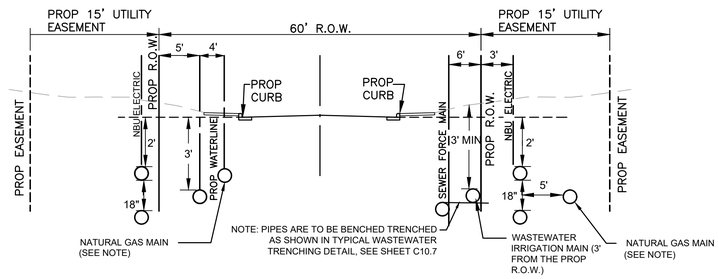
1. IRRIGATION MAIN SHALL BE INSTALLED SUCH THAT THE LOWEST ELEVATION OF THE PIPE SHALL BE AT OR ABOVE THE HIGHEST ELEVATION OF THE CROWN FOR THE FORCE MAIN.



NOTE:

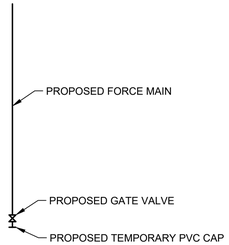
1. MARKERS SHALL BE MADE OF 20GA. STEEL w/BAKED ENAMEL FINISH SIMILAR TO THOSE MANUFACTURED BY RURAL WATER SPECIALTY CO., TULSA OK., MODEL 1002 FOR WATER LINE MARKERS & MODEL 1001 FOR AIR RELEASE MARKERS & MODEL 1000 FOR VALVE MARKERS.
2. MARKERS SHALL BE PLACED AT ALL GATE VALVES, FLUSHING VALVES, AIR RELEASE VALUES, & WATER METERS.
3. PIPELINE MARKERS SHALL BE PLACED ON R.O.W./FENCE LINE AT ALL ROAD CROSSINGS.
4. PLASTIC OR PLEXIGLASS MARKERS MAY NOT BE SUBSTITUTED FOR STEEL.

MARKER DETAILS
NOT TO SCALE

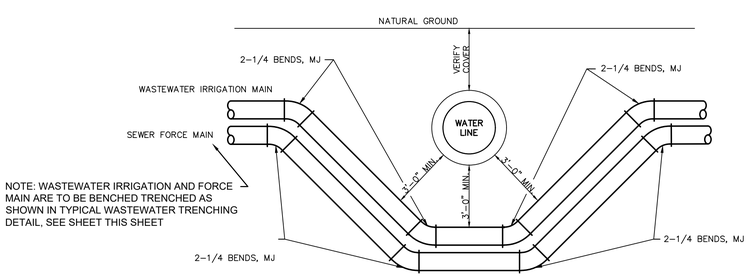


TYPICAL SUBDIVISION UTILITY ASSIGNMENT
N.T.S.

GAS LINE NOTE:
REFER TO GAS LINE PLANS FOR THE POSITION OF THE GAS LINE WITH OTHER UTILITIES.

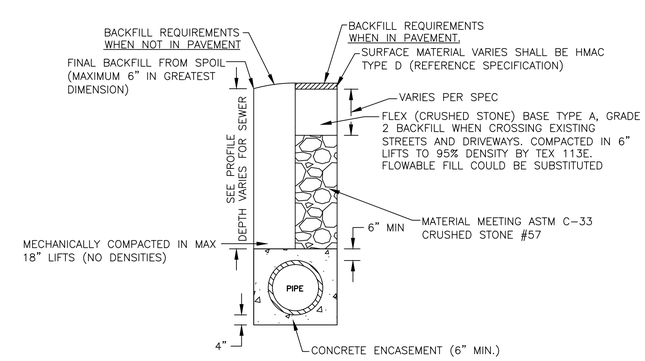


TYPICAL FORCE MAIN END FOR FUTURE CONNECTION
NOT TO SCALE



NOTE:
1. CONTRACTOR TO MAINTAIN 3' MINIMUM CLEARANCE BETWEEN WASTEWATER LINE MAIN AND WATER LINE MAIN AT ALL TIMES.
2. ALL BENDS SHALL BE RODDED TOGETHER.
3. WATERLINE TO BE ENCASED BY STEEL PIPE.
4. THE WATER LINE MAIN SHALL MAINTAIN A 9' SEPARATION OF THE WASTEWATER LINE MAIN.

WASTEWATER/ WASTEWATER MAIN CROSSING
NOT TO SCALE



SEWER CONCRETE ENCASEMENT DETAIL

M&S ENGINEERING
ELECTRICAL | CIVIL | STRUCTURAL | MEP
TXENG FIRM # F-1394 | TBPELS FIRM #10169800
WWW.MSENGR.COM | (830) 228-5446

STATE OF TEXAS
CHRISTOPHER B. ALLISON
131240
LICENSED
PROFESSIONAL ENGINEER
10/13/2020

VINTAGE OAKS AT THE VINEYARD
UNIT 29
SCS DETAILS 2

JOB: 19BSW004	
DATE: 2020-09-30	
DRAWN: TJN	PM: BA
DESIGN: DL	DM:
PEER:	OTHER:
REVISIONS:	
DELTA | DESCRIPTION | DATE	

SHEET:
C10.7

Date: Oct 09, 2020, 11:36am, User ID: trewton
File: S:\active projects_2019\70 new braunfels general civil\70195sw\00004 - vintage oaks grove phase 5\dwg\19BSW004-SCS-DTL-001.dwg

In This Section

TCEQ-0624
Lift Station/Force Main System Application

Attachment A
Engineering Design Report

Site Plan

Final Plan and Profiles Sheets

Lift Station/Force Main System Application

Texas Commission on Environmental Quality

for Regulated Activities On the Edwards Aquifer Recharge Zone and Relating to 30 TAC §213.5(c)(3)(B)and(c), Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

Regulated Entity Name: Vintage Oaks at the Vineyard, The Grove-Unit 29

Customer Information

(If different than customer information provided on core data form)

1. The person(s) responsible for providing the engineering certification to the TCEQ pursuant to 30 TAC §213.5(f)(2)(C) during construction and 30 TAC §213.5 (c)(3)(D) upon completion of construction is:

   Contact Person: Jim Vater
   Entity: SouthStar Communities
   Mailing Address: 1114 Lost Creek Blvd., Suite #270
   City, State: Austin, Texas Zip: 78746
   Telephone: 512-865-5898 Fax: N/A
   Email Address: jim@southstarcommunities.com

2. The engineer responsible for the design of this lift station and force main:

   Contact Person: Blake Allison, P.E.
   Entity: M&S Engineering
   Mailing Address: 376 Landa St.
   City, State: New Braunfels, Texas Zip: 78130
   Telephone: 830-629-2988 Fax: 830-228-4197
   Email Address: ballison@msengr.com
   Texas Licensed Professional Engineer's Serial Number: 131240

Project Information

3. This project is for the construction or replacement of:

   ☒ Lift Station only.

☐ Lift Station and Force Main system.
☐ Lift Station, Force Main, and Gravity system.

4. The sewage collection system will convey the wastewater to the Ovivo Micro BLOX MBR (name) Treatment Plant. The treatment facility is:

   ☒ Existing
   ☐ Proposed

5. All components of this lift station/force main system will comply with:

   ☒ The City of New Braunfels standard specifications.
   ☐ Other. Specifications are attached.

Site Plan Requirements

Items 6-14 must be included on the Site Plan.

6. ☒ The Site Plan must have a minimum scale of 1" = 400'.

   Site Plan Scale: 1" = 200'.

7. ☒ Lift station/force main system layout meets all requirements of 30 TAC Chapter 217.

8. Geologic or Manmade Features:

   ☒ No geologic or manmade features were identified in the Geologic Assessment.
   ☐ All geologic or manmade features identified in the Geologic Assessment (caves, solution openings, sinkholes, fractures, joints, porous zones, etc.) which exist at the site of the proposed lift station and along the path(s) or within **50 feet of each side** of a proposed force main line are shown on the Site Plan and are listed in the table below. Designs used to protect the integrity of the sewer line crossing each feature are described and labeled on the attached page. A detailed design drawing for each feature is shown on Plan Sheet _____ of _____.
   ☐ No Geologic Assessment is required for this project.

Table 1 - Geologic or Manmade Features

Line	*Station to Station*	*Type of Feature*
N/A	N/A to N/A	N/A
	to	
	to	
	to	
	to	
	to	
	to	
	to	

9. ☒ Existing topographic contours are shown and labeled. The contour interval is 5 feet. (Contour interval must not be greater than 5 feet).

10. ☒ Finished topographic contours are shown and labeled. The contour interval is 1 feet. (Contour interval must not be greater than 5 feet).

☐ Finished topographic contours will not differ from the existing topographic configuration and are not shown.

11. 100-year floodplain boundaries

☐ Some part(s) of the project site is located within the 100-year floodplain. The floodplain is shown and labeled.
☒ No part of the project site is located within the 100-year floodplain.

The 100-year floodplain boundaries are based on the following specific (including date of material) sources(s): FEMA MAP 48091C0245F (eff. 9/2/2009)

12. 5-year floodplain:

☒ After construction is complete, no part of this project will be in or cross a 5-year floodplain, either naturally occurring or manmade. (Do not include streets or concrete-lined channels constructed above sewer lines.)
☐ After construction is complete, all sections of the force main located within the 5-year floodplain will be encased in concrete or capped with concrete. These locations are listed in the table below and are shown and labeled on the Site Plan. (Do not include streets or concrete-lined channels constructed above sewer lines.)

Table 2 - 5-Year Floodplain

Line	***Sheet***	***Station to Station***
	of	to
	of	to
	of	to
	of	to

13. All known wells (oil, water, unplugged, capped and/or abandoned, test holes, etc.):

If applicable, this must agree with Item No. 15 on the Geologic Assessment Form.

☐ There are _____ (#) wells present on the project site and the locations are shown and labeled. (Check all of the following that apply)

☐ The wells are not in use and have been properly plugged.
☐ The wells are not in use and will be properly plugged.
☐ The wells are in use and comply with 16 TAC Chapter 76.

☒ There are no wells or test holes of any kind known to exist on the project site.

14. ☒ Legal boundaries of the site are shown.

Plan and Profile Sheets

*The construction drawings and technical specifications will not be considered for review unless they are the **final plans and technical specifications** which will be used by the contractor for bidding and construction.*

Items 15 – 18 must be included on the Plan and Profile sheets.

15. ☒ The equipment installation construction plans must have a minimum scale of 1" = 10'.

    Plan sheet scale: 1" = 40 '.

16. ☒ Locations, descriptions and elevations of all required equipment and piping for the lift station and force main are shown and labeled.

17. ☒ Air Release/Vacuum Valves will be provided at all peaks in elevation of the proposed force main. These locations are listed in the table below and labeled on the appropriate plan and profile sheets.

Table 3 - Air Release/Vacuum Valves

Line	*Station*	*Sheet*
Sugarcane	7+49	C10.3 of N/A
Sugarcane	9+10	C10.3 of N/A
Catnip	3+56	C10.4 of N/A
		of
		of
		of

18. ☒ The **final plans and technical specifications** are submitted for the TCEQ's review. Each sheet of the construction plans and specifications are dated, signed, and sealed by the Texas Licensed Professional Engineer responsible for the design on each sheet.

19. ☒ **Attachment A - Engineering Design Report**. An engineering design report with the following required items is attached:

    - ☒ The report is dated, signed, and sealed by a Texas Licensed Professional Engineer.
    - ☒ Calculations for sizing system.
    - ☒ Pump head calculations, including, but not limited to, system head and pump capacity curves, head loss calculations, and minimum and maximum static head C values for normal and peak operational conditions.
    - ☒ 100-year and 25-year flood considerations.
    - ☐ Total lift station pumping capacity with the largest pump out of service.
    - ☐ Type of pumps, including standby units.
    - ☐ Type of pump controllers, including standby air supply for bubbler controllers, as applicable.

- ☐ Pump cycle time.
- ☐ Type of wet well ventilation; include number of air changes for mechanical ventilation.
- ☒ Minimum and maximum flow velocities for the force main.
- ☐ Lift station security.
- ☐ Lift station emergency provisions and reliability.

Administrative Information

20. ☒ Upon completion of the wet well excavation, a geologist must certify that the excavation was inspected for the presence of sensitive features and submit the signed, sealed, and dated certification to the appropriate regional office.

21. ☒ The TCEQ Lift Stations and Force Mains General Construction Notes (TCEQ-0591) are included on the General Notes Sheet of the Final Construction Plans for this lift station and/or force main system.

22. ☒ Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions. The copies must be submitted to the appropriate regional office.

23. ☒ Any modification of this lift station/force main system application will require TCEQ approval, prior to construction, and may require submission of a revised application, with appropriate fees.

Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **Lift Station/Force Main System Application** is hereby submitted for TCEQ review and executive director approval. The system was designed in accordance with the requirements of 30 TAC §213.5(c)(3)(C) and 30 TAC Chapter 217, and prepared by:

Print Name of Licensed Professional Engineer: Blake Allison, P.E.

Place engineer's seal here:

Date: 10/6/2020

Signature of Licensed Professional Engineer:

Attachment A

Engineering Design Report

Site Plan

See Organized Sewage Collection System Plan Section for Site Plan

<u>Attachment A</u>

Engineering Design Report

See Organized Sewage Collection System Plan Section for Engineering Design Report

Final Plan and Profile Sheets

See Organized Sewage Collection System Plan Section for Final Plan and Profile Sheets

Temporary Stormwater

In This Section

TCEQ-0602
Temporary Stormwater Section

Attachment A
Spill Response Actions

Attachment B
Potential Sources of Contamination

Attachment C
Sequence of Major Activities

Attachment D
Temporary Best management Practices and Measures

Attachment E
Request to Temporarily Seal a Feature

Attachment F
Structural Practices

Attachment G
Drainage Area Map

Attachment H
Temporary Sediment Pond(s) Plans and Calculations

Attachment I
Inspection and Maintenance of BMPs

Attachment J
Schedule of Interim and Permanent Soil Stabilization Practices

Temporary Stormwater Section

Texas Commission on Environmental Quality

for Regulated Activities on the Edwards Aquifer Recharge Zone and Relating to 30 TAC §213.5(b)(4)(A), (B), (D)(I) and (G); Effective June 1, 1999

To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.

Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.

Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **Temporary Stormwater Section** is hereby submitted for TCEQ review and executive director approval. The application was prepared by:

Print Name of Customer/Agent: Blake Allison, P.E.

Date: 10/6/2020

Signature of Customer/Agent:

Regulated Entity Name: Vintage Oaks at the Vineyard, The Grove- Unit 29

Project Information

Potential Sources of Contamination

Examples: Fuel storage and use, chemical storage and use, use of asphaltic products, construction vehicles tracking onto public roads, and existing solid waste.

1. Fuels for construction equipment and hazardous substances which will be used during construction:

   ☐ The following fuels and/or hazardous substances will be stored on the site: _____

   These fuels and/or hazardous substances will be stored in:

   ☐ Aboveground storage tanks with a cumulative storage capacity of less than 250 gallons will be stored on the site for less than one (1) year.

- ☐ Aboveground storage tanks with a cumulative storage capacity between 250 gallons and 499 gallons will be stored on the site for less than one (1) year.
- ☐ Aboveground storage tanks with a cumulative storage capacity of 500 gallons or more will be stored on the site. An Aboveground Storage Tank Facility Plan application must be submitted to the appropriate regional office of the TCEQ prior to moving the tanks onto the project.

☒ Fuels and hazardous substances will not be stored on the site.

2. ☒ **Attachment A - Spill Response Actions**. A site specific description of the measures to be taken to contain any spill of hydrocarbons or hazardous substances is attached.
3. ☒ Temporary aboveground storage tank systems of 250 gallons or more cumulative storage capacity must be located a minimum horizontal distance of 150 feet from any domestic, industrial, irrigation, or public water supply well, or other sensitive feature.
4. ☒ **Attachment B - Potential Sources of Contamination**. A description of any activities or processes which may be a potential source of contamination affecting surface water quality is attached.

Sequence of Construction

5. ☒ **Attachment C - Sequence of Major Activities**. A description of the sequence of major activities which will disturb soils for major portions of the site (grubbing, excavation, grading, utilities, and infrastructure installation) is attached.
   - ☒ For each activity described, an estimate (in acres) of the total area of the site to be disturbed by each activity is given.
   - ☐ For each activity described, include a description of appropriate temporary control measures and the general timing (or sequence) during the construction process that the measures will be implemented.
6. ☒ Name the receiving water(s) at or near the site which will be disturbed or which will receive discharges from disturbed areas of the project: Dry Comal Creek

Temporary Best Management Practices (TBMPs)

Erosion control examples: tree protection, interceptor swales, level spreaders, outlet stabilization, blankets or matting, mulch, and sod. Sediment control examples: stabilized construction exit, silt fence, filter dikes, rock berms, buffer strips, sediment traps, and sediment basins. Please refer to the Technical Guidance Manual for guidelines and specifications. All structural BMPs must be shown on the site plan.

7. ☒ **Attachment D – Temporary Best Management Practices and Measures**. TBMPs and measures will prevent pollution of surface water, groundwater, and stormwater. The construction-phase BMPs for erosion and sediment controls have been designed to retain sediment on site to the extent practicable. The following information is attached:

- ☒ A description of how BMPs and measures will prevent pollution of surface water, groundwater or stormwater that originates upgradient from the site and flows across the site.
- ☒ A description of how BMPs and measures will prevent pollution of surface water or groundwater that originates on-site or flows off site, including pollution caused by contaminated stormwater runoff from the site.
- ☒ A description of how BMPs and measures will prevent pollutants from entering surface streams, sensitive features, or the aquifer.
- ☒ A description of how, to the maximum extent practicable, BMPs and measures will maintain flow to naturally-occurring sensitive features identified in either the geologic assessment, TCEQ inspections, or during excavation, blasting, or construction.

8. ☒ The temporary sealing of a naturally-occurring sensitive feature which accepts recharge to the Edwards Aquifer as a temporary pollution abatement measure during active construction should be avoided.

   - ☐ **Attachment E - Request to Temporarily Seal a Feature**. A request to temporarily seal a feature is attached. The request includes justification as to why no reasonable and practicable alternative exists for each feature.
   - ☒ There will be no temporary sealing of naturally-occurring sensitive features on the site.

9. ☒ **Attachment F - Structural Practices**. A description of the structural practices that will be used to divert flows away from exposed soils, to store flows, or to otherwise limit runoff discharge of pollutants from exposed areas of the site is attached. Placement of structural practices in floodplains has been avoided.

10. ☒ **Attachment G - Drainage Area Map**. A drainage area map supporting the following requirements is attached:

    - ☐ For areas that will have more than 10 acres within a common drainage area disturbed at one time, a sediment basin will be provided.
    - ☐ For areas that will have more than 10 acres within a common drainage area disturbed at one time, a smaller sediment basin and/or sediment trap(s) will be used.
    - ☐ For areas that will have more than 10 acres within a common drainage area disturbed at one time, a sediment basin or other equivalent controls are not attainable, but other TBMPs and measures will be used in combination to protect down slope and side slope boundaries of the construction area.
    - ☐ There are no areas greater than 10 acres within a common drainage area that will be disturbed at one time. A smaller sediment basin and/or sediment trap(s) will be used in combination with other erosion and sediment controls within each disturbed drainage area.

☒ There are no areas greater than 10 acres within a common drainage area that will be disturbed at one time. Erosion and sediment controls other than sediment basins or sediment traps within each disturbed drainage area will be used.

11. ☐ **Attachment H - Temporary Sediment Pond(s) Plans and Calculations**. Temporary sediment pond or basin construction plans and design calculations for a proposed temporary BMP or measure have been prepared by or under the direct supervision of a Texas Licensed Professional Engineer. All construction plans and design information must be signed, sealed, and dated by the Texas Licensed Professional Engineer. Construction plans for the proposed temporary BMPs and measures are attached.

☒ N/A

12. ☒ **Attachment I - Inspection and Maintenance for BMPs.** A plan for the inspection of each temporary BMP(s) and measure(s) and for their timely maintenance, repairs, and, if necessary, retrofit is attached. A description of the documentation procedures, recordkeeping practices, and inspection frequency are included in the plan and are specific to the site and/or BMP.

13. ☒ All control measures must be properly selected, installed, and maintained in accordance with the manufacturer's specifications and good engineering practices. If periodic inspections by the applicant or the executive director, or other information indicate a control has been used inappropriately, or incorrectly, the applicant must replace or modify the control for site situations.

14. ☒ If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize offsite impacts to water quality (e.g., fugitive sediment in street being washed into surface streams or sensitive features by the next rain).

15. ☒ Sediment must be removed from sediment traps or sedimentation ponds not later than when design capacity has been reduced by 50%. A permanent stake will be provided that can indicate when the sediment occupies 50% of the basin volume.

16. ☒ Litter, construction debris, and construction chemicals exposed to stormwater shall be prevented from becoming a pollutant source for stormwater discharges (e.g., screening outfalls, picked up daily).

Soil Stabilization Practices

Examples: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, or preservation of mature vegetation.

17. ☒ **Attachment J - Schedule of Interim and Permanent Soil Stabilization Practices**. A schedule of the interim and permanent soil stabilization practices for the site is attached.

18. ☒ Records must be kept at the site of the dates when major grading activities occur, the dates when construction activities temporarily or permanently cease on a portion of the site, and the dates when stabilization measures are initiated.

19. ☒ Stabilization practices must be initiated as soon as practicable where construction activities have temporarily or permanently ceased.

Administrative Information

20. ☒ All structural controls will be inspected and maintained according to the submitted and approved operation and maintenance plan for the project.

21. ☒ If any geologic or manmade features, such as caves, faults, sinkholes, etc., are discovered, all regulated activities near the feature will be immediately suspended. The appropriate TCEQ Regional Office shall be immediately notified. Regulated activities must cease and not continue until the TCEQ has reviewed and approved the methods proposed to protect the aquifer from any adverse impacts.

22. ☒ Silt fences, diversion berms, and other temporary erosion and sediment controls will be constructed and maintained as appropriate to prevent pollutants from entering sensitive features discovered during construction.

Attachment A

Spill Response Actions

Attachment A

Spill Response Action

Spill Prevention and Control

The objective of this section is to describe measures to prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

(1) Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is an appropriate response for "significant" and "insignificant" spills. Employees should also be aware of when spill must be reported to the TCEQ. Information available in 30 TAC 327.4 and 40 CFR 302.4.

(2) Educate employees and subcontractors on potential dangers to humans and the environment fro spills and leaks.

(3) Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).

(4) Establish a continuing education program to indoctrinate new employees.

(5) Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

(1) To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110, 117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.

(2) Store hazardous materials and wastes in covered containers and protect form vandalism.

(3) Place a stockpile of spill cleanup materials where it will be readily accessible.

(4) Train employees in spill prevention and cleanup.

(5) Designate responsible individuals to oversee and enforce control measures.

(6) Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.

(7) Do not bury or wash spills with water.

(8) Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.

(9) Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with applicable regulations.

(10) Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.

(11) Place Material Safety Data Sheets (MSDS), as well as proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.

(12) Keep waste storage areas clean, well organized, and equipment with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

(1) Clean up leaks and spills immediately.

(2) Use a rag for small spills on paved surfaces, a damp mop for general mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be disposed of as hazardous waste.

(3) Never hose down or bury dry material spills. Clean up as much as the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

(1) Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.

(2) Use absorbent material on small spills rather than hosing down or burying the spill.

(3) Absorbent material should be promptly removed and disposed of properly.

(4) Follow the practice below for a minor spill:

(5) Contain the spread of the spill.

(6) Recover spilled material.

(7) Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

Spills should be cleaned up immediately:

(1) Contain spread of the spill

(2) Notify the project foreman immediately.

(3) If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.

(4) If the spill occurs in dirt areas, immediately contain the spill be constructing an earthen dike. Dig up and properly dispose of contaminated soil.

(5) If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

For significant or hazardous spills that are in reportable quantities:

(1) Notify the TCEQ by telephone as soon as possible and within 24 hours at 512-339-2929 (Austin) or 210-490-3096 (San Antonio) between 8 AM and 5 PM. After hours, contact the Environmental Release Hotline at 1-800-832-8224. It is the contractor's responsibility to have all emergency phone numbers at the construction site.

(2) For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110, 119, and 302, the contractor should notify the National Response Center at (800) 424-8802.

(3) Notification should first be made by telephone and followed up with a written report.

(4) He services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.

(5) Other agencies which may need to be consulted include, but are not limited to, the County Sheriff Office, Fire Departments, etc.

More information on spill rules and appropriate responses is available on the TCEQ website at http://www.tnrcc.state.tx.us/enforcement/emergency_response.html

Vehicle and Equipment Fueling

(1) If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.

(2) Regularly inspect onsite vehicles and equipment for leaks and repair immediately.

(3) Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.

(4) Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.

(5) Place drip pans or absorbent materials under paving equipment when not in use.

(6) Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.

(7) Promptly transfer used fluids to the proper waste or recycle drums. Don't leave full drip pans or other open containers lying around.

(8) Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.

(9) Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

(1) If fueling must occur on site, use designated areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.

(2) Discourage "topping off" of fuel tanks.

(3) Always use secondary containment, such as a drain pan, when fueling to catch spills/leaks.

Attachment B

Potential Sources of Contamination

Attachment B

Potential Sources of Contamination

1. Oil, grease, fuel and hydraulic contamination from construction equipment and vehicle leakage.
   Remedy: Lubrication and fueling will be preformed in a designated area. This area will be monitored daily for contamination.

2. Miscellaneous trash and litter form construction workers.
   Remedy: Designated receptacles will be strategically located and workers will be directed to deposit trash there.

3. Construction debris.
   Remedy: Debris will be collected weekly and deposited in bins for offsite disposal. Situations requiring immediate attention will be handled on a case by case basis.

4. Asphalt products.
   Remedy: After placement of asphalt, emulsion or coatings, the contractor will be responsible for immediate cleanup should an unexpected rain occur. For the duration of the asphalt product curing time, the contractor will maintain standby personnel and equipment to maintain and asphalt wash-off should and unexpected rain occurs. The contractor will be instructed not to place asphalt products on the ground within 48 hours of a forecasted rain.

5. Tar, fertilizers, cleaning solvents, detergents, and petroleum based products.
   Remedy: The contractor will be responsible for immediate cleanup should an unexpected rain occur. Debris will be collected weekly and deposited in bins for offsite disposal. Situations requiring immediate attention will be handled on a case by case basis.

Attachment C

Sequence of Major Activities

<u>Attachment C</u>

Sequence of Major Activities

1. Install erosion and sedimentation controls (i.e. Silt Fences and Stabilized Construction Entrances) as indicated on the approved construction plans (Shown in the Approved WPAP for Vintage Oaks at the Vineyard- The Hills)
2. Construct Organized Sewage Collection System for Vintage Oaks at The Vineyard, The Grove- Unit 29

   Organized Sewage Collection System: 2640 LF

   - *1410 LF of 3 inch pipe*
   - *1230 LF of 2 inch pipe*
3. Install landscaping or hydromulch to disturbed areas
4. Re-vegetate disturbed areas
5. Remove temporary erosion and sedimentation controls

Attachment D

Temporary Best Management Practices and Measures

Attachment D

Temporary Best Management Practices and Measures

All TBMPs will be installed prior to the beginning of site preparation and construction activities as per the Storm Water Pollution Prevention Plan. The TBMPs will remain in place and will be maintained until all construction has ceased and a perennial vegetative cover with a density of 70 percent has been established.

a. Stabilized Construction Entrance, Silt fences and rock berms will be used to protect disturbed soils during construction in order to prevent pollution of surface water, groundwater or stormwater that originates upgradient from the site and flows across the site.

b. Stabilized Construction Entrance, Silt fences and rock berms will be used to protect disturbed soils during construction in order to prevent pollution of surface water or groundwater that originates on-site or flows off site, including pollution caused by contaminated stormwater runoff from the site.

c. A 50-foot radius natural buffer zone adjacent to and upgradient of any sensitive features will remain undisturbed so that rainfall may continue to enter the feature. The natural vegetated areas will ensure that pre-development stormwater quantity and quality will continue to recharge the aquifer via the feature. Rock berms will be placed downgradient of all construction activities so that potentially contaminated stormwater may be treated before leaving the sited and entering downstream surface water.

d. No construction will occur within a 50-foot radius of naturally-occurring sensitive features. The vegetative buffer zone will serve as both TMBP and BMP for the sensitive features. In the case that construction activities occur upgradient of a sensitive feature (greater than the 50-foot radius) the disturbed soils will be protected from erosion by silt fences as outlined above.

Attachment E

Request to Temporarily Seal a Feature

<u>Attachment E</u>

Request to Temporarily Seal a Feature

NOT APPLICABLE

Attachment F

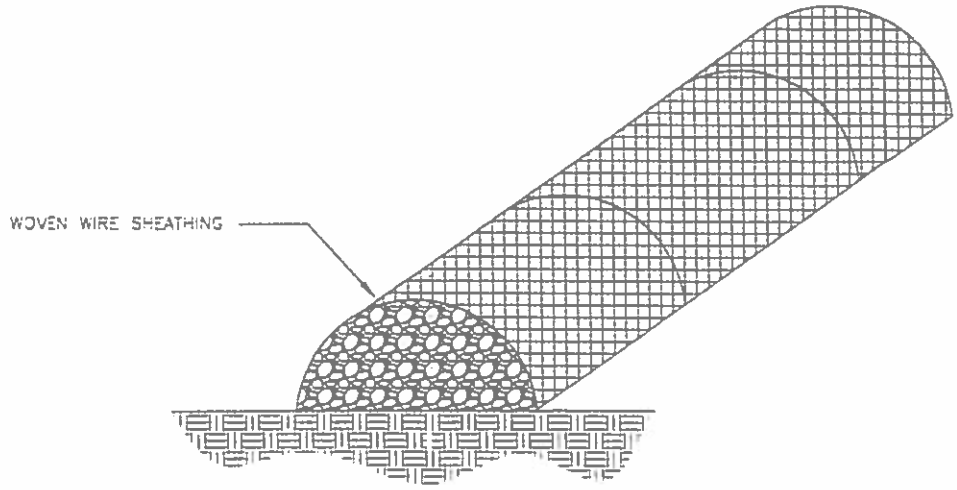
Structural Practices

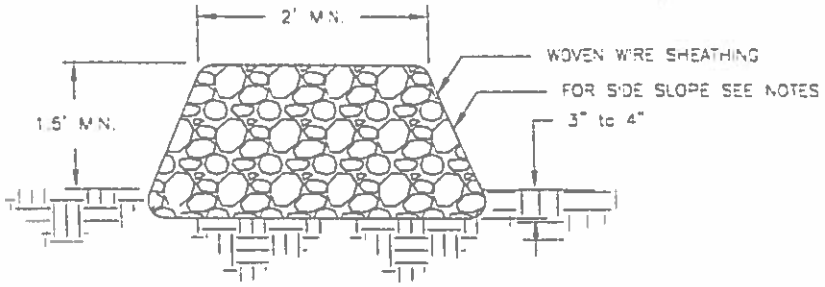
<u>Attachment F</u>

Structural Practices

The structural practices that will limit runoff discharge of pollutants form exposed areas of the site will be the use of a stabilized construction entrance, rock berms and silt fences to prevent the excavated material from leaving the site.

Placement of these temporary best management practices will be placed as shown on “The Hills” WPAP.





NOTES:

1. USE ONLY CLEAN, OPEN GRADED ROCK 5–8 INCH DIAMETER FOR STREAM FLOW CONDITIONS; USE OPEN GRADED ROCK 3–5 INCHES DIAMETER FOR OTHER CONDITIONS.

2. THE ROCK BERM SHALL BE SECURED WITH A WOVEN WIRE SHEATHING HAVING MAXIMUM 1 INCH OPENINGS AND MINIMUM WIRE DIAMETER OF 20 GAUGE GALVANIZED.

3. THE BERM SHOULD BE BURIED IN A TRENCH APPROXIMATELY 3 TO 4 INCHES DEEP.

4. FOR INSTALLATIONS IN ACTIVE STREAMBEDS, ADDITIONAL DAILY INSPECTIONS SHOULD BE MADE.

5. ROCK BERMS PLACED IN STATE RIGHT OF WAY WILL BE INSTALLED WITH A MAXIMUM SLOPE OF 6:1 OR FLATTER FOR ALL SLOPES PARALLEL TO THE FRONTAGE ROAD EDGE OF PAVEMENT.

MAINTENANCE AND REMOVAL:

6. REPAIR ANY LOOSE WIRE SHEATHING.

7. THE BERM SHOULD BE RESHAPED AS NEEDED DURING INSPECTION.

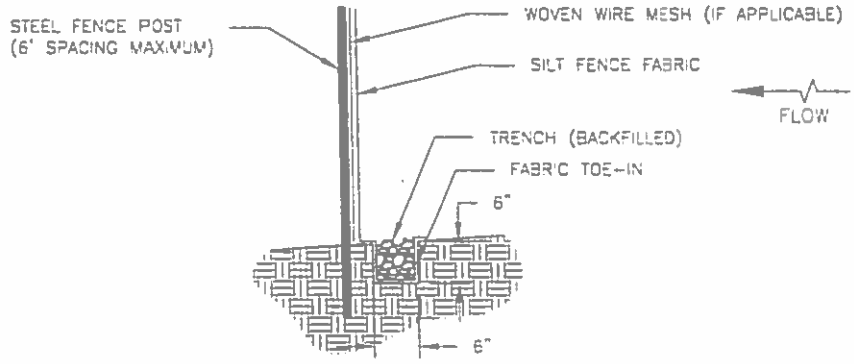
8. THE STONE AND/OR FABRIC CORE – WOVEN WIRE SHEATHING, SHALL BE REPLACED WHEN THE STRUCTURE CEASES TO FUNCTION AS INTENDED, DUE TO SILT ACCUMULATION AMONG THE ROCKS, WASHOUT, CONSTRUCTION TRAFFIC DAMAGE, ETC.

9. WHEN SILT REACHES A DEPTH EQUAL TO ONE–THIRD THE HEIGHT OF THE BERM OR ONE FOOT, WHICHEVER IS LESS, THE SILT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED MANNER THAT WILL NOT CAUSE ANY ADDITIONAL SILTATION.

10. WHEN THE SITE IS COMPLETELY STABILIZED, THE BERM AND ACCUMULATED SILT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED MANNER.

ROCK BERM

EXHIBIT 1



NOTES:

1. TRIANGULAR SEDIMENT FILTER DIKES MAY BE SUBSTITUTED FOR SILT FENCE IN AREAS WHERE INSTALLATION OF SILT FENCE IS NOT POSSIBLE OR WHERE VEHICLE ACCESS MUST BE MAINTAINED PROVIDED THE CONTRIBUTING DRAINAGE AREA IS LESS THAN ONE ACRE.

2. SILT FENCE MATERIAL SHOULD BE POLYPROPYLENE, POLYETHYLENE OR POLYAMIDE WOVEN OR NONWOVEN FABRIC. THE FABRIC WIDTH SHOULD BE 36 INCHES, WITH A MINIMUM UNIT WEIGHT OF 4.5 OZ/YD, MULLEN BURST STRENGTH EXCEEDING 190 LB/IN^2, ULTRAVIOLET STABILITY EXCEEDING 70%, AND A MINIMUM APPARENT OPENING SIZE OF U.S. SIEVE NO. 30.

3. FENCE POSTS SHOULD BE MADE OF HOT ROLLED STEEL, AT LEAST 4 FEET LONG WITH TEE OR Y-BAR CROSS SECTION, SURFACE PAINTED OR GALVANIZED, MINIMUM NOMINAL WEIGHT 1.25 LB/FT^2, AND BRINDELL HARDNESS EXCEEDING 140.

4. WOVEN WIRE BACKING IS REQUIRED IN THE EDWARDS AQUIFER RECHARGE AND CONTRIBUTING ZONE; OPTIONAL ELSEWHERE. WOVEN WIRE BACKING TO SUPPORT THE FABRIC SHOULD BE GALVANIZED 2"X4" WELDED WIRE, 12 GAUGE MINIMUM.

5. SILT FENCE SHOULD BE INSTALLED FOLLOWING THE CONTOURS AS CLOSE AS POSSIBLE. THE ENDS SHOULD BE CURVED UPSTREAM TO CREATE AN AREA OF WATER IMPOUNDMENT AND PREVENT FLOW FROM ESCAPING AROUND THE FENCE.

6. STEEL POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF ONE FOOT AND SPACED NOT MORE THAN 6 FEET ON CENTER.

7. THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW. WHERE FENCE CAN NOT BE TREATED IN (E.G., PAVEMENT OR ROCK OUTCROP) WEIGHT FABRIC FLAP WITH 3" OF WASHED GRAVEL ON UPHILL SIDE TO PREVENT FLOW UNDER FENCE.

8. THE TRENCH MUST BE A MINIMUM OF 6 INCHES DEEP AND 6 INCHES WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.

9. SILT FENCE SHOULD BE SECURELY FASTENED TO EACH STEEL SUPPORT POSTS OR TO WOVEN WIRE, WHICH IS IN TURN ATTACHED TO THE STEEL FENCE POST. WHERE ENDS MEET, OVERLAP FABRIC 3-FEET AND SECURELY FASTEN.

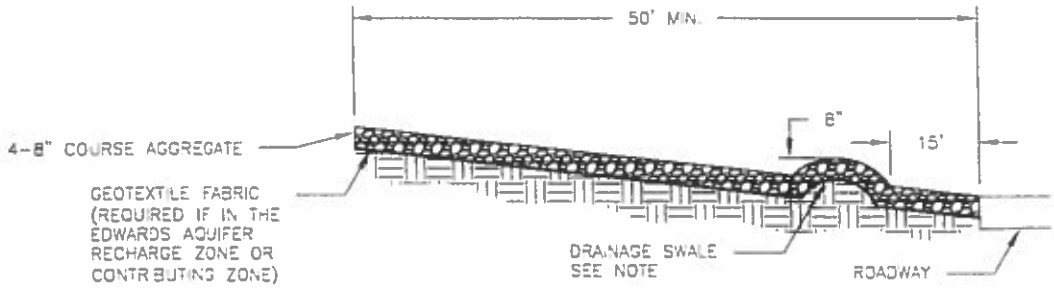
MAINTENANCE AND REMOVAL:

12. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 6 INCHES. THE SILT SHALL BE DISPOSED OF IN AN APPROVED SITE AND IN SUCH A MANNER AS TO NOT CONTRIBUTE TO ADDITIONAL SILTATION.

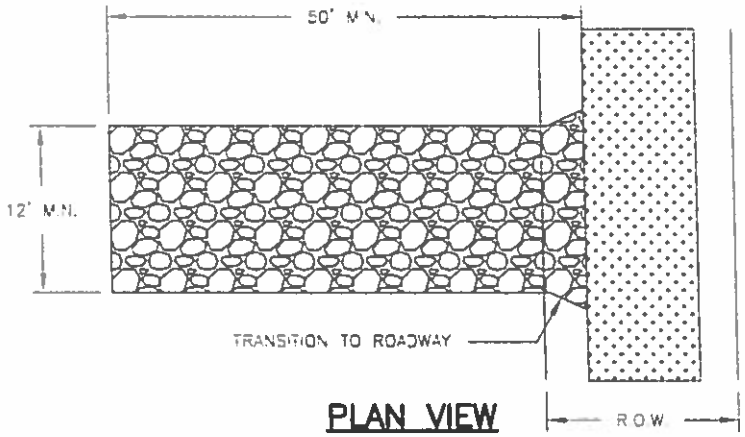
13. SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE. THE SEDIMENT SHOULD BE DISPOSED OF IN A MANNER THAT WILL NOT CAUSE ADDITIONAL SILTATION AND THE PRIOR LOCATION OF THE SILT FENCE SHOULD BE REVEGETATED. THE FENCE ITSELF SHOULD BE DISPOSED OF IN AN APPROVED LANDFILL.

SILT FENCE

EXHIBIT 2



PROFILE
N.T.S.



PLAN VIEW
N.T.S.

NOTES:

1. THE AGGREGATE SHOULD CONSIST OF 4 TO 8 INCH WASHED STONE OVER A STABLE FOUNDATION WITH A MINIMUM THICKNESS OF 8 INCHES.

2. IF THE SLOPE TOWARDS THE ROAD EXCEEDS 2%, CONSTRUCT A RIDGE 8 INCHES HIGH WITH 3:1 (H:V) SIDESLOPES ACROSS THE FOUNDATION APPROXIMATELY 15 FEET FROM THE ENTRANCE TO DIVERT RUNOFF AWAY FROM THE PUBLIC ROAD.

3. THE GEOTEXTILE FABRIC SHOULD BE DESIGNED SPECIFICALLY FOR USE AS A SOIL FILTRATION MEDIA WITH AN APPROXIMATE WEIGHT OF 6 OX/YD^2, A MULLEN BURST RATING OF 140 LB/IN^2, AND AN EQUIVALENT OPENING SIZE GREATER THAN A NUMBER 50 SIEVE.

4. THE MINIMUM WIDTH OF THE ENTRANCE SHOULD BE 12 FT OR THE FULL WIDTH OF THE EXIT ROADWAY, WHICHEVER IS GREATER.

5. INSTALL PIPE UNDER PAD AS NEEDED TO MAINTAIN PROPER PUBLIC ROAD DRAINAGE.

6. WHEN NECESSARY, WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC ROADWAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH 4 INCH MINIMUM CRUSHED STONE OR COMMERCIAL RACK WHICH DRAINS TO A SEDIMENT TRAP OR BASIN.

MAINTENANCE:

7. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC ROADWAYS. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND, AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC ROADWAY MUST BE REMOVED IMMEDIATELY.

8. ALL SEDIMENT SHOULD BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH OR WATER COURSE BY USING APPROVED METHODS.

STABILIZED CONSTRUCTION ENTRANCE

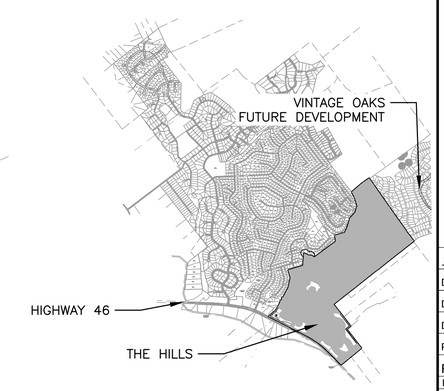
EXHIBIT 3

Attachment G

Drainage Area Map

LEGEND:

- EXIST UNIT BOUNDARY
- EXIST RIGHT-OF-WAY
- EXIST LOT LINE
- EXIST EDGE OF PAVEMENT
- 300 EXIST CONTOUR
- PROP DRAINAGE AREA
- PROP LOT LINE



VINTAGE OAKS AT THE VINEYARD
DRAINAGE OVERVIEW MAP
1" = 4000'

M&S ENGINEERING
CIVIL | ELECTRICAL | STRUCTURAL | MEP | SURVEYING
TEXAS REGISTERED ENGINEERING FIRM F-1704 SURVEYING FIRM # 10064200

CONTACT
WWW.MSENGR.COM
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6477 FM 311
SPRING BRANCH, TX 78070

BRANCH OFFICE
376 LANDA ST.
NEW BRAUNFELS, TX 78130
PHONE: (830) 629-2988

STATE OF TEXAS
CHRISTOPHER B. ALLISON
131240
LICENSED
PROFESSIONAL ENGINEER
10/06/2020

VINTAGE OAKS AT THE VINEYARD
THE HILLS
DRAINAGE AREAS PLAN

JOB: 7019BSW00004
DATE: OCTOBER 2020

DRAWN:	PM: BA
DESIGN:	DM: BA
PEER:	OTHER:

REVISIONS:

DELTA	DESCRIPTION

SHEET:

Date: Sep 06, 2018, 8:06am User ID: jmore
File: S:\Active Projects_2018\70 New Braunfels General Civil\7018BSW00.006 - VOV Unit 24.dwg\18BSW006-WPAP-DA-001.dwg

Attachment H

Temporary Sediment Pond(s) Plans and Calcualtions

Attachment H

Temporary Sediment Pond(s) Plans and Calculations

NOT APPLICABLE

Attachment I

Inspection and Maintenance of BMPs

<u>Attachment I</u>

Inspection and Maintenance for BMPs

The BMPs for the construction of this project will be the use of rock berms and silt fencing. The following inspection and maintenance procedures will be implemented:

1. Stabilized Construction Entrance/Exit, Silt fencing and rock berms must be in place prior to the start of construction and will remain in place until construction has been complete and the site stabilized from further erosion.

2. The contractor will inspect the rock berms and silt fencing at least once a week and within 24 hours of a storm of 0.5 inches or more in depth. The contractor will repair or replace any damaged TBMPs. The contractor shall correct damage or deficiencies as soon as practical after the inspection but no later than 7 days after the inspection.
   a. For Rock Berms:
      1. Contractor shall remove sediment and other debris when buildup reaches 6 inches and dispose of the accumulated silt in an approval manner that will not cause any additional siltation.
      2. The berm should be replaced when the structures ceases to function as intended due to silt accumulation among the rocks, washout, construction traffic damage, etc.
   b. For Temporary Construction Entrance/Exit:
      1. All sediment spilled, dropped, washed or tracked onto public right-of-way should be removed immediately by contractor.
      2. When necessary, wheels should be cleaned to remove sediment prior to entrance onto right-of-way.
      3. When washing is required, it should be done on an area stabilized with crushed stone that drains into an approved sediment trap or sediment basin.
   c. For Silt Fence:
      1. Remove sediment when buildup reaches 6 inches.
      2. When construction is complete, the sediment should be disposed of in a manner that will not cause additional siltation and the prior location if the silt fence should be revegetated. The fence itself should be disposed of in an approved landfill.

3. Contractor will place trench excavation on the upgradient side of the trench.

4. All soil, sand, gravel, and excavated material stockpiled on-site will have appropriately sized silt fencing placed upgradient and down gradient.

5. The contractor will keep a record of the weekly inspections, noting the condition of the rock berms, silt fencing and construction entrance and any corrective action taken to maintain the erosion control structures. In addition to the inspection and maintenance reports, the operator should keep records of the construction activity on-site, in particular, the following information should be kept.

   a. The dates when major grading activities occur in a particular area.

b. The dates when construction activities cease in an area, temporarily or permanently.

c. The dates when an area is stabilized, temporarily or permanently.

d. Records to be maintained in SWPPP.

Attachment J

Schedule of Interim and Permanent Soil Stabilization Practices

Attachment J

Schedule of Interim and Permanent Soil Stabilization Practices

The schedule of interim and permanent soil stabilization will be as follows:

1. Once construction of the project has commenced, the construction activity is planned to continue until the project is complete. The water, electrical, cable TV and telephone trenches will be excavated. The trenches will then be re-excavated and the water, electrical, cable TV and telephone lines will be installed. This work is intended to continue until all the lines are installed. The utility lines are located within the project boundaries as shown on the site plan. As soon as the underground utilities are installed, the road base will be installed and compacted providing the interim soil stabilization for the paved area and the permanent soil stabilization for the parking areas. Once the individual residential buildings are built and landscaped this will provide permanent soil stabilization for the building areas.

2. Much of the excavation for this project will be in solid rock, helping to minimize the amount of loose soil which has the potential to become suspended in runoff and washed downstream.

3. Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporary or permanently ceased. Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently cease in precluded by weather conditions, stabilization measures shall be initiated as soon as practicable. Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 21 days, temporary stabilization measures do not have to be initiated on that portion of site. In areas experiencing droughts where the initiation of stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonal arid conditions, stabilization measures shall be initiated as soon as practicable.

Agent Authorization

In This Section

TCEQ-0599
Agent Authorization Form

Agent Authorization Form
For Required Signature
Edwards Aquifer Protection Program
Relating to 30 TAC Chapter 213
Effective June 1, 1999

I Thad Rutherford,
Print Name

Chief Operating Officer,
Title - Owner/President/Other

of Southstar at Vintage Oaks, LLC,
Corporation/Partnership/Entity Name

have authorized Blake Allison, P.E.
Print Name of Agent/Engineer

of M & S Engineering
Print Name of Firm

to represent and act on the behalf of the above named Corporation, Partnership, or Entity for the purpose of preparing and submitting this plan application to the Texas Commission on Environmental Quality (TCEQ) for the review and approval consideration of regulated activities.

I also understand that:

1. The applicant is responsible for compliance with 30 Texas Administrative Code Chapter 213 and any condition of the TCEQ's approval letter. The TCEQ is authorized to assess administrative penalties of up to $10,000 per day per violation.

2. For those submitting an application who are not the property owner, but who have the right to control and possess the property, additional authorization is required from the owner.

3. Application fees are due and payable at the time the application is submitted. The application fee must be sent to the TCEQ cashier or to the appropriate regional office. The application will not be considered until the correct fee is received by the commission.

4. A notarized copy of the Agent Authorization Form must be provided for the person preparing the application, and this form must accompany the completed application.

5. No person shall commence any regulated activity on the Edwards Aquifer Recharge Zone, Contributing Zone or Transition Zone until the appropriate application for the activity has been filed with and approved by the Executive Director.

SIGNATURE PAGE:

Applicant's Signature

9/30/2020
Date

THE STATE OF Texas §

County of Comal §

BEFORE ME, the undersigned authority, on this day personally appeared Thad Rutherford known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that (s)he executed same for the purpose and consideration therein expressed.

GIVEN under my hand and seal of office on this 30 day of September, 2020.

TERRY L. COLE
Notary Public, State of Texas
Comm. Expires 05-19-2023
Notary ID 128620161

NOTARY PUBLIC

Terry L. Cole
Typed or Printed Name of Notary

MY COMMISSION EXPIRES: May 19, 2023

Fee Form

In This Section

TCEQ-0574
Application Fee Form

Application Fee Form

Texas Commission on Environmental Quality

Name of Proposed Regulated Entity: Vintage Oaks at The Vineyard, The Grove- Unit 29

Regulated Entity Location: This site is located in the Vintage Oaks at the Vineyard Subdivision off Hwy 46 in the New Braunfels ETJ; within " The Hills" Unit. The site entrance is 1 miles northwest of Hwy 46 and Herbelin Rd. intersection.

Name of Customer: Thad Rutherford, Southstar at Vintage Oaks, LLC

Contact Person: Blake Allison, P.E. Phone: (830) 629-2988

Customer Reference Number (if issued):CN 604123554

Regulated Entity Reference Number (if issued):RN _____

Austin Regional Office (3373)

☐ Hays ☐ Travis ☐ Williamson

San Antonio Regional Office (3362)

☐ Bexar ☐ Medina ☐ Uvalde

☒ Comal ☐ Kinney

Application fees must be paid by check, certified check, or money order, payable to the **Texas Commission on Environmental Quality**. Your canceled check will serve as your receipt. **This form must be submitted with your fee payment.** This payment is being submitted to:

☐ Austin Regional Office

☐ Mailed to: TCEQ - Cashier
Revenues Section
Mail Code 214
P.O. Box 13088
Austin, TX 78711-3088

☒ San Antonio Regional Office

☐ Overnight Delivery to: TCEQ - Cashier
12100 Park 35 Circle
Building A, 3rd Floor
Austin, TX 78753
(512)239-0357

Site Location (Check All That Apply):

☒ Recharge Zone ☐ Contributing Zone ☐ Transition Zone

Type of Plan	*Size*	*Fee Due*
Water Pollution Abatement Plan, Contributing Zone Plan: One Single Family Residential Dwelling	Acres	$
Water Pollution Abatement Plan, Contributing Zone Plan: Multiple Single Family Residential and Parks	Acres	$
Water Pollution Abatement Plan, Contributing Zone Plan: Non-residential	Acres	$
Sewage Collection System	2640 L.F.	$ 1320.00
Lift Stations without sewer lines	Acres	$
Underground or Aboveground Storage Tank Facility	Tanks	$
Piping System(s)(only)	Each	$
Exception	Each	$
Extension of Time	Each	$

Signature: _____ Date: 9/30/2020

Application Fee Schedule

Texas Commission on Environmental Quality

Edwards Aquifer Protection Program 30 TAC Chapter 213 (effective 05/01/2008)

Water Pollution Abatement Plans and Modifications

Contributing Zone Plans and Modifications

Project	*Project Area in Acres*	*Fee*
One Single Family Residential Dwelling	< 5	$650
Multiple Single Family Residential and Parks	< 5 5 < 10 10 < 40 40 < 100 100 < 500 ≥ 500	$1,500 $3,000 $4,000 $6,500 $8,000 $10,000
Non-residential (Commercial, industrial, institutional, multi-family residential, schools, and other sites where regulated activities will occur)	< 1 1 < 5 5 < 10 10 < 40 40 < 100 ≥ 100	$3,000 $4,000 $5,000 $6,500 $8,000 $10,000

Organized Sewage Collection Systems and Modifications

Project	*Cost per Linear Foot*	*Minimum Fee-Maximum Fee*
Sewage Collection Systems	$0.50	$650 - $6,500

Underground and Aboveground Storage Tank System Facility Plans and Modifications

Project	*Cost per Tank or Piping System*	*Minimum Fee-Maximum Fee*
Underground and Aboveground Storage Tank Facility	$650	$650 - $6,500

Exception Requests

Project	*Fee*
Exception Request	$500

Extension of Time Requests

Project	***Fee***
Extension of Time Request	$150

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (*If other is checked please describe in space provided.*)

☒ New Permit, Registration or Authorization (*Core Data Form should be submitted with the program application.*)

☐ Renewal (*Core Data Form should be submitted with the renewal form*) ☐ Other

2. Customer Reference Number *(if issued)*		3. Regulated Entity Reference Number *(if issued)*
CN 604123554	Follow this link to search for CN or RN numbers in Central Registry**	RN 110698420

SECTION II: Customer Information

4. General Customer Information | **5. Effective Date for Customer Information Updates** (mm/dd/yyyy)

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership
☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name (*If an individual, print last name first: eg: Doe, John*) | *If new Customer, enter previous Customer below:*

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*

11. Type of Customer: ☒ Corporation ☐ Individual Partnership: ☐ General ☐ Limited
Government: ☐ City ☐ County ☐ Federal ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees
☐ 0-20 ☒ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

13. Independently Owned and Operated?
☐ **Yes** ☐ **No**

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following*

☒ Owner ☐ Operator ☐ Owner & Operator
☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address:							
	1114 LOST CREEK BLVD						
	SUITE 270						
	City	AUSTIN	State	TX	ZIP	78746	ZIP + 4	6376

16. Country Mailing Information *(if outside USA)*	17. E-Mail Address *(if applicable)*

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*
(305) 476-1515		(512) 436-9507

SECTION III: Regulated Entity Information

21. General Regulated Entity Information (*If 'New Regulated Entity" is selected below this form should be accompanied by a permit application*)

☒ New Regulated Entity ☐ Update to Regulated Entity Name ☐ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC).

22. Regulated Entity Name (*Enter name of the site where the regulated action is taking place.*)

Vintage Oaks at the Vinyard, The Grove - Unit 29

23. Street Address of the Regulated Entity: *(No PO Boxes)*								
	City	New Braunfels	State	TX	ZIP	78132	ZIP + 4	
24. County	Comal							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	This site is located in the Vintage Oaks at the Vineyard Subdivision off Hwy 46 in the New Braunfels ETJ; within " The Hills" Unit. The site entrance is 1 miles northwest of Hwy 46 and Herbelin Rd. intersection.

26. Nearest City	State	Nearest ZIP Code
New Braunfels	TX	78132

27. Latitude (N) In Decimal:	29.765370		28. Longitude (W) In Decimal:	98.247380	
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
29	45	55	98	14	50

29. Primary SIC Code (4 digits)	30. Secondary SIC Code (4 digits)	31. Primary NAICS Code (5 or 6 digits)	32. Secondary NAICS Code (5 or 6 digits)
1521	6552	236115	237210

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

RESIDENTIAL SUBDIVISION

34. Mailing Address:	1114 LOST CREEK BLVD.							
	SUITE 270							
	City	AUSTIN	State	TX	ZIP	78746	ZIP + 4	6376

35. E-Mail Address:	

36. Telephone Number	37. Extension or Code	38. Fax Number *(if applicable)*
(305) 476-1515		(512) 436-9507

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☒ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
		SCS		
☐ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	BLAKE ALLISON, P.E.	41. Title:	PROJECT MANAGER

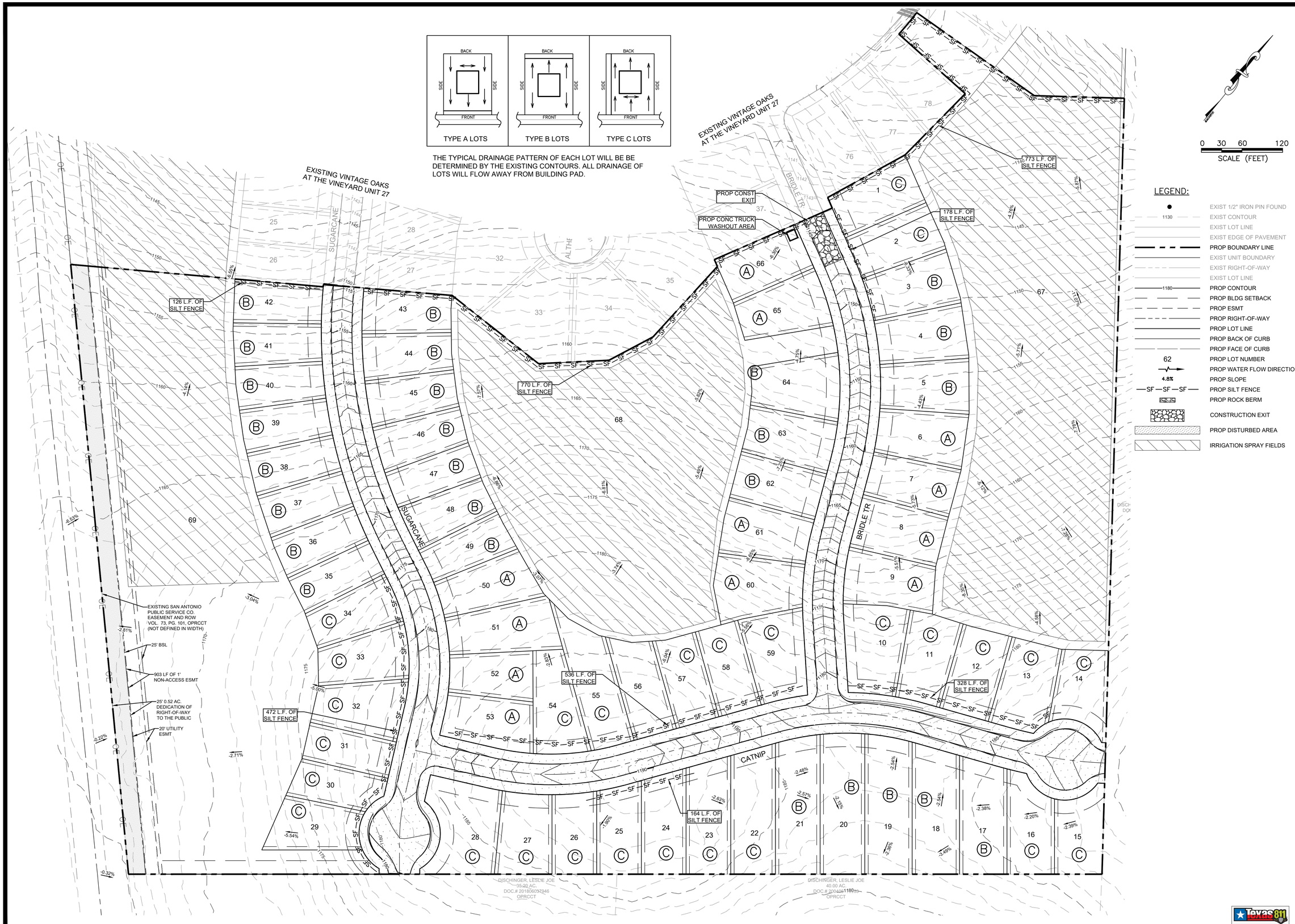
42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address
(830) 629-2988		(830) 228-4197	BALLISON@MSENGR.COM

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	M&S ENGINEERING	Job Title:	PROJECT MANAGER
Name *(In Print)*:	BLAKE ALLISON	Phone:	(830) 629- 2988

Signature:		Date:	10/13/2020



M&S ENGINEERING
ELECTRICAL | CIVIL | STRUCTURAL | MEP
TXENG FIRM # F-1394 | TBPELS FIRM #10169800
WWW.MSENGR.COM | (830) 228-5446

STATE OF TEXAS
CHRISTOPHER B. ALLISON
131240
LICENSED
PROFESSIONAL ENGINEER
10/13/2020

VINTAGE OAKS AT THE VINEYARD
UNIT 29
STORM WATER POLLUTION PREVENTION PLAN

JOB: 19BSW004	
DATE: 2020-09-30	
DRAWN: TJN	PM: BA
DESIGN: DL	DM:
PEER:	OTHER:

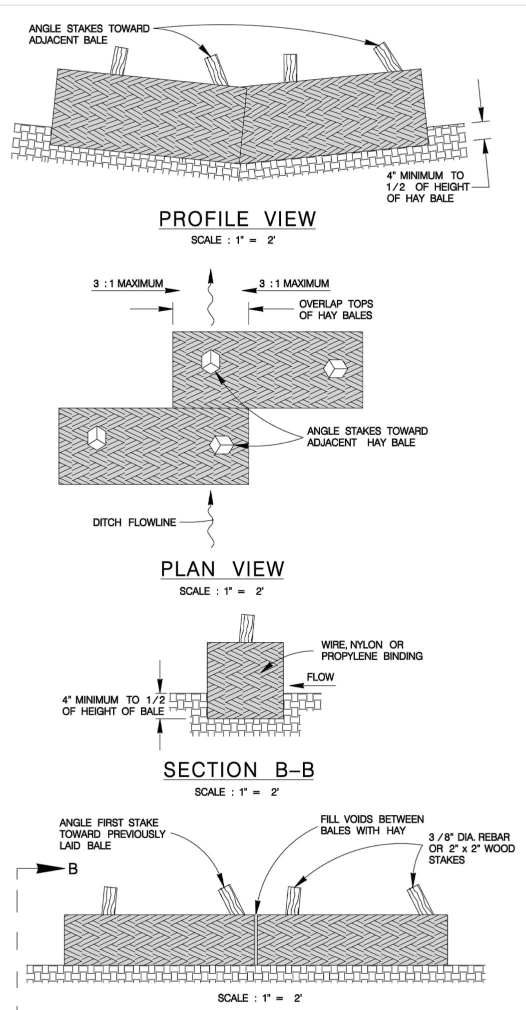
REVISIONS:

DELTA	DESCRIPTION	DATE

SHEET:

C9.0

Date: Oct 09, 2020, 11:08am, User ID: trevwton
File: S:\active projects_2019\70 new braunfels general civil\70195swv00004 - vintage oaks grove phase 5\dwg\19BSW004-ECP-PLN-001.dwg



BALED HAY USAGE GUIDELINES

A BAILED HAY INSTALLATION MAY BE CONSTRUCTED NEAR THE DOWNSTREAM PERIMETER OF A DISTURBED AREA ALONG A CONTOUR TO INTERCEPT SEDIMENT FROM OVERLAND RUNOFF. A TWO YEAR STORM FREQUENCY MAY BE USED TO CALCULATE THE FLOW RATE TO BE FILTERED. THE INSTALLATION SHOULD BE SIZED TO FILTER A MAXIMUM FLOW THRU RATE OF 5 GPM /FT SQUARED OF CROSS SECTIONAL AREA. BALED HAY MAY BE USED AT THE FOLLOWING LOCATIONS:

1. WHERE THE RUNOFF APPROACHING THE BALED HAY FLOWS OVER DISTURBED SOIL FOR LESS THAN 100'. IF THE SLOPE OF THE DISTURBED SOIL EXCEEDS 10 %, THE LENGTH OF SLOPE UPSTREAM OF THE BAILED HAY SHOULD BE LESS THAN 50'.
2. WHERE THE INSTALLATION WILL BE REQUIRED FOR LESS THAN 3 MONTHS.
3. WHERE THE CONTRIBUTING DRAINAGE AREA IS LESS THAN 1/2 ACRE.

FOR BALED HAY INSTALLATIONS IN SMALL DITCHES, THE FOLLOWING ADDITIONAL CONDITIONAL CONSIDERATIONS APPLY:

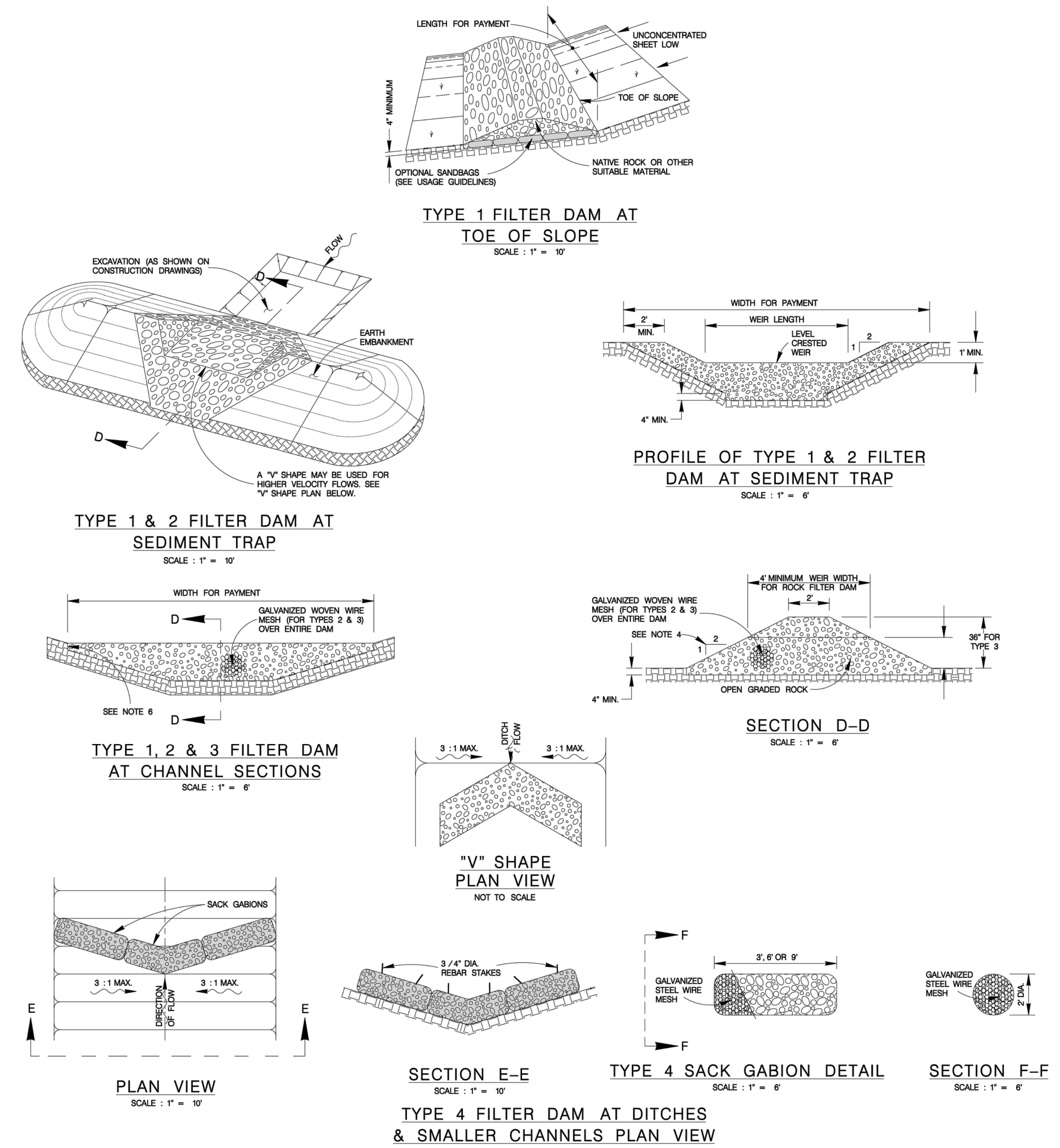
1. THE DITCH SIDESLOPES SHOULD BE GRADED AS FLAT AS POSSIBLE TO MAXIMIZE THE DRAINAGE FLOW RATE THRU THE HAY.
2. THE DITCH SHOULD BE GRADED LARGE ENOUGH TO CONTAIN THE OVERLAPPING DRAINAGE WHEN SEDIMENT HAS FILLED TO THE TOP OF THE BAILED HAY.

BALES SHOULD BE REPLACED USUALLY EVERY 2 MONTHS OR MORE OFTEN DURING WET WEATHER WHEN LOSS OF STRUCTURAL INTERGRITY IS ACCELERATED.

GENERAL NOTES

1. HAY BALES SHALL BE A MINIMUM OF 30" IN LENGTH AND WEIGH A MINIMUM OF 50 LBS.
2. HAY BALES SHALL BE BOUND BY EITHER WIRE OR NYLON OR POLYPROPYLENE STRING. THE BALES SHALL BE COMPOSED ENTIRELY OF VEGETABLE MATTER.
3. HAY BALES SHALL BE EMBEDDED IN THE SOIL A MININMUM OF 4" AND, WHERE POSSIBLE, ONE–HALF THE HEIGHT OF THE BALE.
4. HAY BALES SHALL BE PLACED IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES. THE BALES SHALL BE PLACED WITH BINDINGS PARALLEL TO THE GROUND.
5. HAY BALES SHALL BE SECURELY ANCHORED IN PLACE WITH 3/8" DIA. REBAR OR 2" x 2" WOOD STAKES DRIVEN THROUGH THE BALES. THE FIRST STAKE SHALL BE ANGLED TOWARDS THE PREVIOUSLY LAID BALE TO FORCE THE BALES TOGETHER.
6. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

BALED HAY FOR EROSION CONTROL



ROCK FILTER DAMS

ROCK FILTER DAM USAGE GUIDELINES

ROCK FILTER DAMS SHOULD BE CONSTRUCTED DOWNSTREAM FROM DISTURBED AREAS TO INTERCEPT SEDIMENT FROM OVERLOAD RUNOFF AND /OR CONCENTRATED FLOW. THE DAMS SHOULD BE SIZED TO FILTER A MAXIMUM FLOW THRU RATE OF 60 GPM /FT SQUARED OF CROSS SECTIONAL AREA.. A 2 YEAR STORM FREQUENCY MAY BE USED TO CALCULATE THE FLOW RATE.

TYPE 1 (18" HIGH WITH NO WIRE MESH) :

TYPE 1 MAY BE USED AT THE TOE OF SLOPES, AROUND INLETS, IN SMALL DITCHES AND AT DIKE OR SWALE OUTLETS. THIS TYPE OF DAM IS RECOMMENDED TO CONTROL EROSION FROM A DRAINAGE AREA OF 5 ACRES OR LESS. TYPE 1 MAY NOT BE USED IN CONCENTRATED HIGH VELOCITY FLOWS (APPROXIMATELY 8 FT./SEC. OR MORE) IN WHICH AGGREGATE WASH OUT MAY OCCUR. SANDBAGS MAY BE USED AT THE EMBEDDED FOUNDATION (4" DEEP MIN.) FOR BETTER FILTERING EFFICIENCY OF LOW FLOWS IF CALLED FOR ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

TYPE 2 (18" HIGH WITH WIRE MESH) :

TYPE 2 MAY BE USED IN DITCHES AND AT DIKE OR SWALE OUTLETS.

TYPE 3 (36" HIGH WITH WIRE MESH) :

TYPE 3 MAY BE USED IN STREAM FLOW AND SHOULD BE SECURED TO THE STREAM BED.

TYPE 4 (SACK GABIONS) :

TYPE 4 MAY BE USED IN DITCHES AND SMALLER CHANNELS TO FORM AN EROSION CONTROL DAM.

GENERAL NOTES

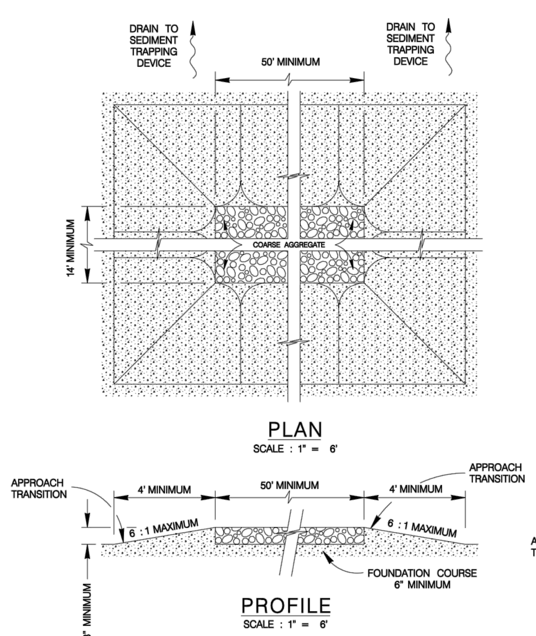
1. IF SHOWN ON THE PLANS OR DIRECTED BY THE ENGINEER, FILTER DAMS SHOULD BE PLACED NEAR THE TOE OF SLOPES WHERE EROSION IS ANTICIPATED, UPSTREAM AND / OR DOWNSTREAM AT DRAINAGE STRUCTURES, AND IN ROADWAY DITCHES AND CHANNELS TO COLLECT SEDIMENT.
2. MATERIALS (AGGREGATE, WIRE MESH, SANDBAGS, ETC.) SHALL BE AS INDICATED BY THE SPECIFICATION FOR ROCK FILTER DAMS FOR EROSION AND SEDIMENTATION CONTROL.
3. THE ROCK FILTER DAM DIMENSIONS SHALL BE AS INDICATED ON THE STORM WATER POLLUTION PREVENTION PLANS.
4. SIDE SLOPES SHOULD BE 2 : 1 OR FLATTER. DAMS WITHIN THE SAFETY ZONE SHALL HAVE SIDE SLOPES OF 6 : 1 OR FLATTER.
5. MAINTAIN A MINIMUM OF 1' BETWEEN TOP OF ROCK FILTER DAM WEIR AND TOP OF EMBANKMENT FOR FILTER DAMS AT SEDIMENT TRAPS.
6. FILTER DAMS SHOULD BE EMBEDDED A MINIMUM OF 4" INTO THE EXISTING GROUND.
7. THE SEDIMENT TRAP FOR PONDING OF SEDIMENT LADEN RUNOFF SHALL BE OF THE DIMENSIONS SHOWN ON THE PLANS.
8. ROCK FILTER DAM TYPES 2 & 3 SHALL BE SECURED WITH 20 GAUGE GALVANIZED WOVEN WIRE MESH WITH 1" DIAMETER HEXAGONAL OPENINGS. THE AGGREGATE SHALL BE PLACED ON THE MESH TO THE HEIGHT AND SLOPES SPECIFIED. THE MESH SHALL BE FOLDED AT THE UPSTREAM SIDE OVER THE AGGREGATE AND TIGHTLY SECURED TO ITSELF ON THE DOWNSTREAM SIDE USING WIRE TIES OR HOG RINGS. IN STREAM USE, THE MESH SHOULD BE SECURED OR STAKED TO THE STREAM BED PRIOR TO AGGREGATE PLACEMENT.
9. SACK GABIONS SHOULD BE STAKED DOWN WITH 3/4" DIA. REBAR STAKES.
10. FLOW OUTLET SHOULD BE ONTO A STABILIZED AREA (VEGETATION, ROCK, ETC.).
11. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

JANUARY 2005

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

TEMPORARY EROSION, SEDIMENT & WATER POLLUTION CONTROL MEASURES STANDARDS 2

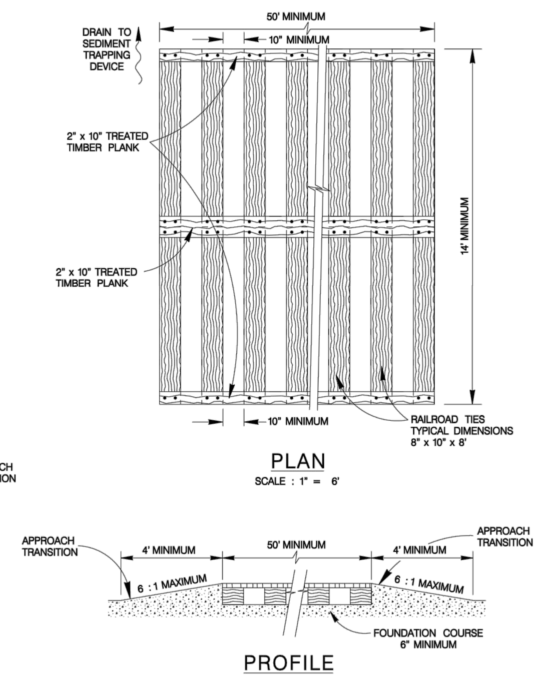
___% SUBMITTAL	PROJECT NO.:		DATE:
DRWN. BY: V. VASQUEZ	DSGN. BY:	CHKD. BY:	SHEET NO.:___OF___



GENERAL NOTES

1. THE LENGTH OF THE TYPE 1 CONSTRUCTION EXIT SHALL BE AS INDICATED ON THE PLANS, BUT NOT LESS THAN 50'.
2. THE COARSE AGGREGATE SHOULD BE OPEN GRADED WITH A SIZE OF 4" TO 8".
3. THE APPROACH TRANSITIONS SHOULD BE NO STEEPER THAN 6 : 1 AND CONSTRUCTED AS DIRECTED BY THE ENGINEER.
4. THE CONSTRUCTION EXIT FOUNDATION COURSE SHALL BE FLEXIBLE BASE, BITUMINOUS CONCRETE, PORTLAND CEMENT CONCRETE OR OTHER MATERIAL AS APPROVED BY THE ENGINEER.
5. THE CONSTRUCTION EXIT SHALL BE GRADED TO ALLOW DRAINAGE TO A SEDIMENT TRAPPING DEVICE.
6. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

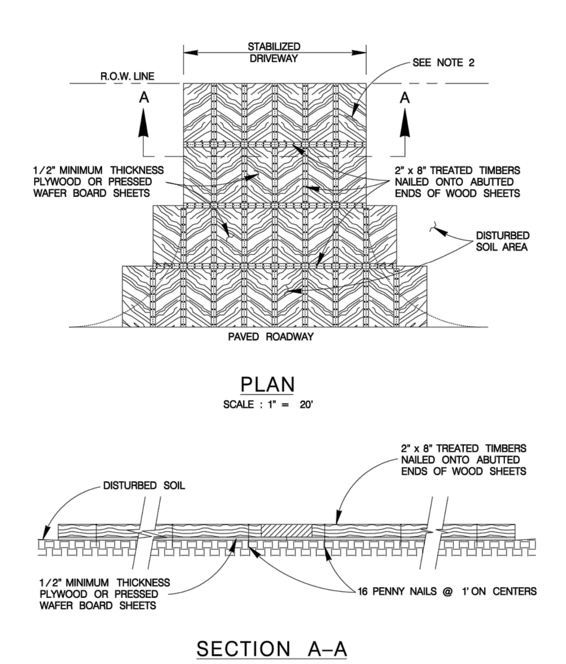
CONSTRUCTION EXIT – TYPE 1



GENERAL NOTES

1. THE LENGTH OF THE TYPE 2 CONSTRUCTION EXIT SHALL BE AS INDICATED ON THE PLANS, BUT NOT LESS THAN 50'.
2. THE TREATED TIMBER PLANKS SHALL BE ATTACHED TO THE RAILROAD TIES WITH 1/2" x 6" MIN. LAG BOLTS. OTHER FASTENERS MAY BE USED AS APPROVED BY THE ENGINEER.
3. THE TREATED TIMBER PLANKS SHALL BE #2 GRADE MIN., AND SHOULD BE FREE FROM LARGE AND LOOSE KNOTS.
4. THE APPROACH TRANSITIONS SHOULD BE NO STEEPER THAN 6 : 1 AND CONSTRUCTED AS DIRECTED BY THE ENGINEER.
5. THE CONSTRUCTION EXIT FOUNDATION COURSE SHALL BE FLEXIBLE BASE, BITUMINOUS CONCRETE, PORTLAND CEMENT CONCRETE OR OTHER MATERIAL AS APPROVED BY THE ENGINEER.
6. THE CONSTRUCTION EXIT SHOULD BE GRADED TO ALLOW DRAINAGE TO A SEDIMENT TRAPPING DEVICE.
7. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

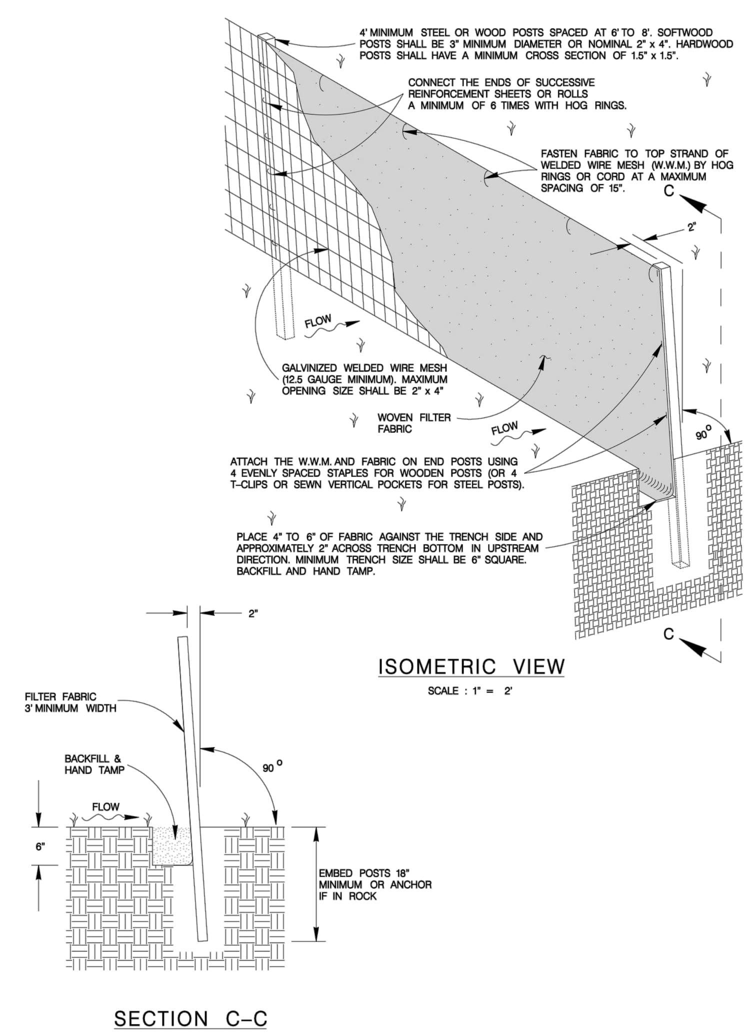
CONSTRUCTION EXIT – TYPE 2



GENERAL NOTES

1. THE LENGTH OF THE TYPE 3 CONSTRUCTION EXIT SHALL BE AS INDICATED ON THE PLANS, OR AS DIRECTED BY THE ENGINEER.
2. THE TYPE 3 CONSTRUCTION EXIT MAY BE CONSTRUCTED FROM OPEN GRADED CRUSHED STONE WITH A SIZE OF 2 TO 4 INCHES SPREAD A MINIMUM OF 4 INCHES THICK TO THE LIMITS SHOWN ON THE PLANS.
3. THE TREATED TIMBER PLANKS SHALL BE #2 GRADE MIN., AND SHOULD BE FREE FROM LARGE AND LOOSE KNOTS.
4. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

CONSTRUCTION EXIT – TYPE 3



SEDIMENT CONTROL FENCE USAGE GUIDELINES

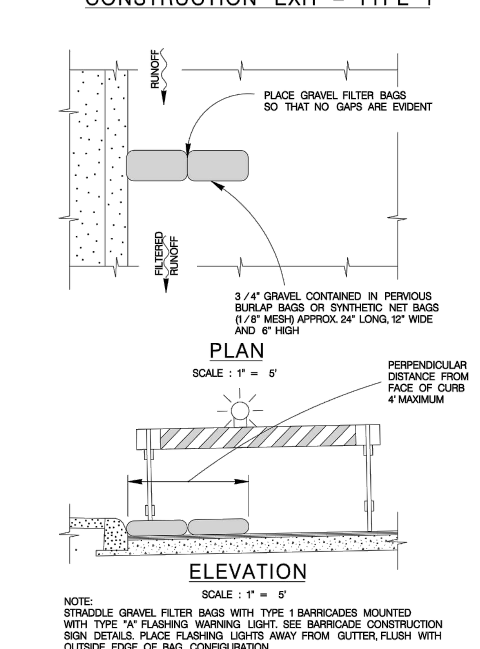
A SEDIMENT CONTROL FENCE MAY BE CONSTRUCTED NEAR THE DOWNSTREAM PERIMETER OF A DISTURBED AREA ALONG A CONTOUR TO INTERCEPT SEDIMENT FROM OVERLAND RUN–OFF. A 2 YEAR STORM FREQUENCY MAY BE USED TO CALCULATE THE FLOW RATE TO BE FILTERED.

SEDIMENT CONTROL FENCE SHOULD BE SIZED TO FILTER A MAXIMUM FLOW THRU RATE OF 100 GPM /FT SQUARED. SEDIMENT CONTROL FENCE IS NOT RECOMMENDED TO CONTROL EROSION FROM A DRAINAGE AREA LARGER THAN 2 ACRES.

GENERAL NOTES

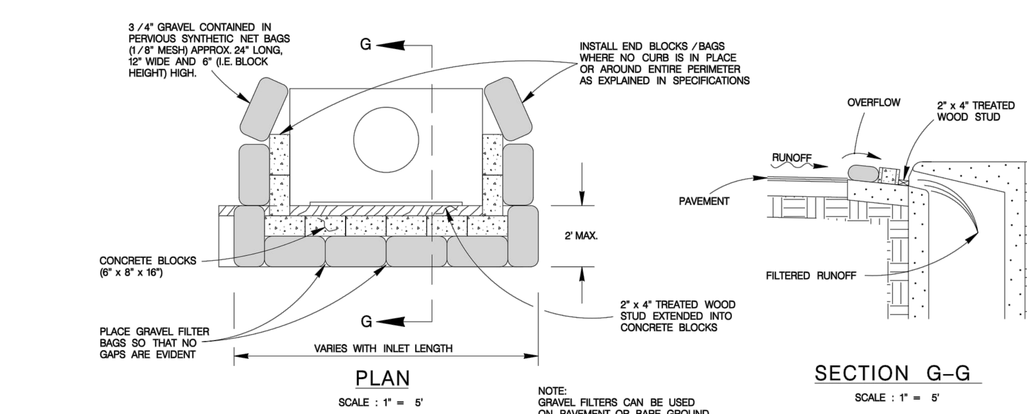
1. THE GUIDELINES SHOWN HEREON ARE SUGGESTIONS ONLY AND MAY BE MODIFIED BY THE ENGINEER.

TEMPORARY SEDIMENT CONTROL FENCE



NOTE:
STRADDLE GRAVEL FILTER BAGS WITH TYPE 1 BARRICADES MOUNTED WITH TYPE "A" FLASHING WARNING LIGHT. SEE BARRICADE CONSTRUCTION SIGN DETAILS. PLACE FLASHING LIGHTS AWAY FROM GUTTER, FLUSH WITH OUTSIDE EDGE OF BAG CONFIGURATION.

GRAVEL FILTER BAGS



NOTE:
GRAVEL FILTERS CAN BE USED ON PAVEMENT OR BARE GROUND.

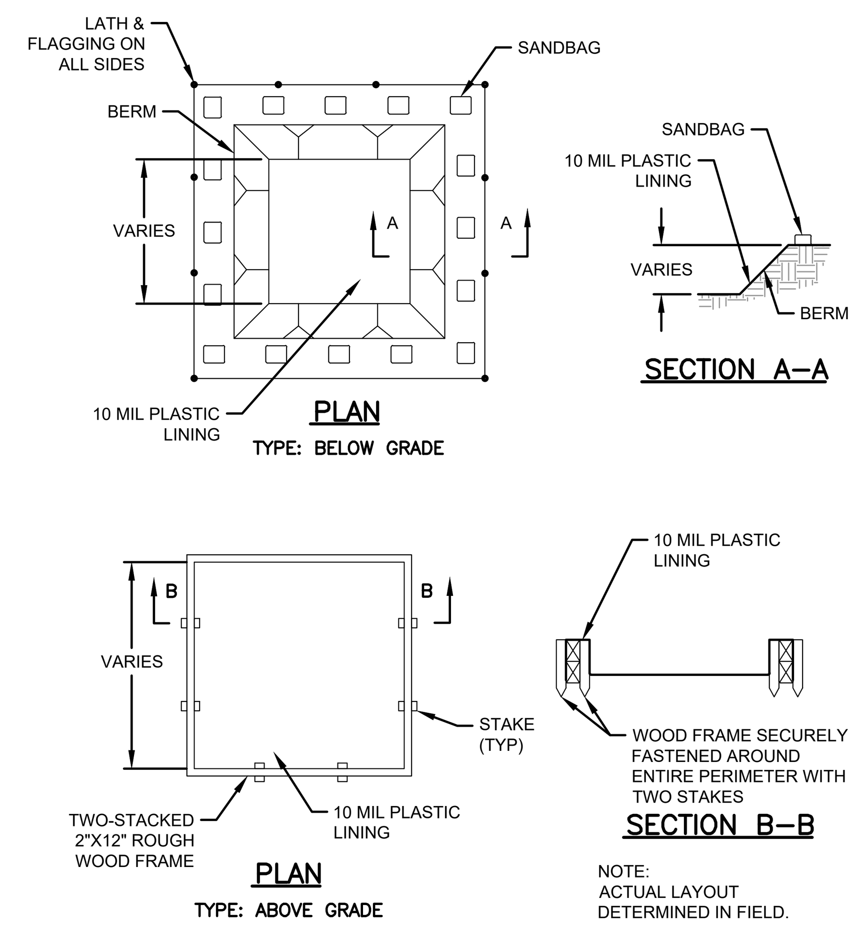
CURB INLET GRAVEL FILTER

JANUARY 2005

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

TEMPORARY EROSION, SEDIMENT & WATER POLLUTION CONTROL MEASURES STANDARDS 1

___% SUBMITTAL	PROJECT NO.:		DATE:
DRWN. BY: V. VASQUEZ	DSGN. BY:	CHKD. BY:	SHEET NO.:___OF___



CONCRETE WASHOUT DETAIL

SCALE: NTS

CONCRETE WASHOUT AREAS

THE PURPOSE OF CONCRETE WASHOUT AREAS IS TO PREVENT OR REDUCE THE DISCHARGE OF POLLUTANTS TO STORMWATER FROM CONCRETE WASTE BY CONDUCTING WASHOUT OFFSITE, PERFORMING ONSITE WASHOUT IN A DESIGNATED AREA, AND TRAINING EMPLOYEES AND SUBCONTRACTORS.

THE FOLLOWING STEPS WILL HELP REDUCE STORMWATER POLLUTION FROM CONCRETE WASTES:

- INCORPORATE REQUIREMENTS FOR CONCRETE WASTE MANAGEMENT INTO MATERIAL SUPPLIER AND SUBCONTRACTOR AGREEMENTS.
- AVOID MIXING EXCESS AMOUNTS OF FRESH CONCRETE.
- PERFORM WASHOUT OF CONCRETE TRUCKS IN DESIGNATED AREAS ONLY.
- DO NOT WASH OUT CONCRETE TRUCKS INTO STORM DRAINS, OPEN DITCHES, STREETS, OR STREAMS.
- DO NOT ALLOW EXCESS CONCRETE TO BE DUMPED ONSITE, EXCEPT IN DESIGNATED AREAS. FOR ONSITE WASHOUT:
- LOCATE WASHOUT AREA AT LEAST 50 FEET FROM SENSITIVE FEATURES, STORM DRAINS, OPEN DITCHES, OR WATER BODIES. DO NOT ALLOW RUNOFF FROM THIS AREA BY CONSTRUCTING A TEMPORARY PIT OR BERMED AREA LARGE ENOUGH FOR LIQUID AND SOLID WASTE.
- WASH OUT WASTES INTO THE TEMPORARY PIT WHERE THE CONCRETE CAN SET, BE BROKEN UP, AND THEN DISPOSED PROPERLY.

BELOW GRADE CONCRETE WASHOUT FACILITIES ARE TYPICAL. THESE CONSIST OF A LINED EXCAVATION SUFFICIENTLY LARGE TO HOLD EXPECTED VOLUME OF WASHOUT MATERIAL. ABOVE GRADE FACILITIES ARE USED IF EXCAVATION IS NOT PRACTICAL. TEMPORARY CONCRETE WASHOUT FACILITY (TYPE ABOVE GRADE) SHOULD BE CONSTRUCTED AS SHOWN ON THE DETAILS AT THE END OF THIS SECTION, WITH SUFFICIENT QUANTITY AND VOLUME TO CONTAIN ALL LIQUID AND CONCRETE WASTE GENERATED BY WASHOUT OPERATIONS. PLASTIC LINING MATERIAL SHOULD BE A MINIMUM OF 10 MIL IN POLYETHYLENE SHEETING AND SHOULD BE FREE OF HOLES, TEARS, OR OTHER DEFECTS THAT COMPROMISE THE IMPERMEABILITY OF THE MATERIAL.

WHEN TEMPORARY CONCRETE WASHOUT FACILITIES ARE NO LONGER REQUIRED FOR THE WORK, THE HARDENED CONCRETE SHOULD BE REMOVED AND DISPOSED OF. MATERIALS USED TO CONSTRUCT TEMPORARY CONCRETE WASHOUT FACILITIES SHOULD BE REMOVED FROM THE SITE OF THE WORK AND DISPOSED OF. HOLES, DEPRESSIONS OR OTHER GROUND DISTURBANCE CAUSED BY THE REMOVAL OF THE TEMPORARY CONCRETE WASHOUT FACILITIES SHOULD BE BACKFILLED AND REPAIRED.

TEMPORARY BMP NOTE:
SEE ATTACHED SHEETS FOR TEMPORARY BMP DETAILS. ADDITIONAL BMP DETAILS PROVIDED BUT NOT CALLED OUT ON PLANS MAY BE USED AT CONTRACTOR'S DISCRETION.

SOIL DISTURBANCE NOTE

SOIL DISTURBANCES WILL OCCUR TO CLEARING, GRUBBING, AND GRADING OF AREAS TO BE USED FOR THE RESIDENTIAL LOTS, ROADS, ROAD RIGHT-OF-WAY, AND DETENTION POND. THESE DISTURBANCES CAN BE ATTRIBUTED TO, BUT NOT LIMITED TO, CLEARING AND GRUBBING RELATED TO BUILDING PAD, DRIVEWAY, UTILITY INSTALLATION, AND LANDSCAPE PREPARATION. THE REMAINING PORTIONS OF THE SITE NOT INVOLVED IN ANY OF THESE ACTIVITIES WILL REMAIN UNDISTURBED.

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE SHALL BE INSTALLED TO PROVIDE A STABLE ENTRANCE/EXIT CONDITION FROM THE CONSTRUCTION SITE TO KEEP MUD AND SEDIMENT OFF PUBLIC ROADWAYS (REFER TO THE EDWARDS AQUIFER TECHNICAL GUIDANCE MANUAL FOR CONSTRUCTION INFORMATION).

SOIL STABILIZATION NOTE

TEMPORARY EROSION CONTROL MEASURES WILL BE USED TO STABILIZE DISTURBED AREAS (REFER TO EDWARDS AQUIFER TECHNICAL GUIDANCE MANUAL FOR CONSTRUCTION OF EROSION CONTROL MEASURES). TRAFFIC WILL BE ROUTED AROUND THESE AREAS TO REDUCE THE EXTENT OF DISTURBED AREAS BY REDUCING SEDIMENT LOADS TO SURFACE WATER.

BARE SOILS SHOULD BE SEEDED OR OTHERWISE STABILIZED WITHIN 14 CALENDAR DAYS AFTER FINAL GRADING OR WHERE CONSTRUCTION ACTIVITY HAS TEMPORARILY CEASED FOR MORE THAN 21 DAYS.

MULCHING/MATS CAN BE USED TO PROTECT THE DISTURBED AREAS WHILE VEGETATION BECOMES ESTABLISHED.

SILT FENCE NOTE:
SILT FENCE WILL BE SITED SO THAT THE MAXIMUM DRAINAGE AREA IS ¼ ACRE/100 FT OF FENCE. (AS REQUIRED BY TCEQ RG-348, INSTALLATION: ITEM 2)

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
WATER POLLUTION ABATEMENT PLAN
GENERAL CONSTRUCTION NOTES

1. WRITTEN CONSTRUCTION NOTIFICATION MUST BE GIVEN TO THE APPROPRIATE TCEQ REGIONAL OFFICE NO LATER THAN 48 HOURS PRIOR TO COMMENCEMENT OF THE REGULATED ACTIVITY. INFORMATION MUST INCLUDE THE DATE ON WHICH THE REGULATED ACTIVITY WILL COMMENCE, THE NAME OF THE APPROVED PLAN FOR THE REGULATED ACTIVITY, AND THE NAME OF THE PRIME CONTRACTOR AND THE NAME AND TELEPHONE NUMBER OF THE CONTACT PERSON.

2. ALL CONTRACTORS CONDUCTING REGULATED ACTIVITIES ASSOCIATED WITH THIS PROJECT MUST BE PROVIDED WITH COMPLETE COPIES OF THE APPROVED WATER POLLUTION ABATEMENT PLAN AND THE TCEQ LETTER INDICATING THE SPECIFIC CONDITIONS OF ITS APPROVAL. DURING THE COURSE OF THESE REGULATED ACTIVITIES, THE CONTRACTORS ARE REQUIRED TO KEEP ON-SITE COPIES OF THE APPROVED PLAN AND APPROVAL LETTER.

3. IF ANY SENSITIVE FEATURE IS DISCOVERED DURING CONSTRUCTION, ALL REGULATED ACTIVITIES NEAR THE SENSITIVE FEATURE MUST BE SUSPENDED IMMEDIATELY. THE APPROPRIATE TCEQ REGIONAL OFFICE MUST BE IMMEDIATELY NOTIFIED OF ANY SENSITIVE FEATURES ENCOUNTERED DURING CONSTRUCTION. THE REGULATED ACTIVITIES NEAR THE SENSITIVE FEATURE MAY NOT PROCEED UNTIL THE TCEQ HAS REVIEWED AND APPROVED THE METHODS PROPOSED TO PROTECT THE SENSITIVE FEATURE AND THE EDWARDS AQUIFER FROM ANY POTENTIALLY ADVERSE IMPACTS TO WATER QUALITY.

4. NO TEMPORARY ABOVEGROUND HYDROCARBON AND HAZARDOUS SUBSTANCE STORAGE TANK SYSTEM IS INSTALLED WITHIN 150 FEET OF A DOMESTIC, INDUSTRIAL, IRRIGATION, OR PUBLIC WATER SUPPLY WELL, OR OTHER SENSITIVE FEATURE.

5. PRIOR TO COMMENCEMENT OF CONSTRUCTION, ALL TEMPORARY EROSION AND SEDIMENTATION (E&S) CONTROL MEASURES MUST BE PROPERLY SELECTED, INSTALLED, AND MAINTAINED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS AND GOOD ENGINEERING PRACTICES. CONTROLS SPECIFIED IN THE TEMPORARY STORM WATER SECTION OF THE APPROVED EDWARDS AQUIFER PROTECTION PLAN ARE REQUIRED DURING CONSTRUCTION. IF INSPECTIONS INDICATE A CONTROL HAS BEEN USED INAPPROPRIATELY, OR INCORRECTLY, THE APPLICANT MUST REPLACE OR MODIFY THE CONTROL FOR SITE SITUATIONS. THE CONTROLS MUST REMAIN IN PLACE UNTIL DISTURBED AREAS ARE REVEGETATED AND THE AREAS HAVE BECOME PERMANENTLY STABILIZED.

6. IF SEDIMENT ESCAPES THE CONSTRUCTION SITE, OFF-SITE ACCUMULATIONS OF SEDIMENT MUST BE REMOVED AT A FREQUENCY SUFFICIENT TO MINIMIZE OFFSITE IMPACTS TO WATER QUALITY (E.G., FUGITIVE SEDIMENT IN STREET BEING WASHED INTO SURFACE STREAMS OR SENSITIVE FEATURES BY THE NEXT RAIN).

7. SEDIMENT MUST BE REMOVED FROM SEDIMENT TRAPS OR SEDIMENTATION PONDS NOT LATER THAN WHEN DESIGN CAPACITY HAS BEEN REDUCED BY 50%. A PERMANENT STAKE MUST BE PROVIDED THAT CAN INDICATE WHEN THE SEDIMENT OCCUPIES 50% OF THE BASIN VOLUME.

8. LITTER, CONSTRUCTION DEBRIS, AND CONSTRUCTION CHEMICALS EXPOSED TO STORMWATER SHALL BE PREVENTED FROM BECOMING A POLLUTANT SOURCE FOR STORMWATER DISCHARGES (E.G., SCREENING OUTFALLS, PICKED UP DAILY).

9. ALL SPOILS (EXCAVATED MATERIAL) GENERATED FROM THE PROJECT SITE MUST BE STORED ON-SITE WITH PROPER E&S CONTROLS. FOR STORAGE OR DISPOSAL OF SPOILS AT ANOTHER SITE ON THE EDWARDS AQUIFER RECHARGE ZONE, THE OWNER OF THE SITE MUST RECEIVE APPROVAL OF A WATER POLLUTION ABATEMENT PLAN FOR THE PLACEMENT OF FILL MATERIAL OR MASS GRADING PRIOR TO THE PLACEMENT OF SPOILS AT THE OTHER SITE.

10. STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICABLE IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED, BUT IN NO CASE MORE THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. WHERE THE INITIATION OF STABILIZATION MEASURES BY THE 14TH DAY AFTER CONSTRUCTION ACTIVITY TEMPORARY OR PERMANENTLY CEASE IS PRECLUDED BY WEATHER CONDITIONS, STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICABLE. WHERE CONSTRUCTION ACTIVITY ON A PORTION OF THE SITE IS TEMPORARILY CEASED, AND EARTH DISTURBING ACTIVITIES WILL BE RESUMED WITHIN 21 DAYS, TEMPORARY STABILIZATION MEASURES DO NOT HAVE TO BE INITIATED ON THAT PORTION OF SITE. IN AREAS EXPERIENCING DROUGHTS WHERE THE INITIATION OF STABILIZATION MEASURES BY THE 14TH DAY AFTER CONSTRUCTION ACTIVITY HAS TEMPORARILY OR PERMANENTLY CEASED IS PRECLUDED BY SEASONAL ARID CONDITIONS, STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICABLE.

11. THE FOLLOWING RECORDS SHALL BE MAINTAINED AND MADE AVAILABLE TO THE TCEQ UPON REQUEST: THE DATES WHEN MAJOR GRADING ACTIVITIES OCCUR; THE DATES WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON A PORTION OF THE SITE; AND THE DATES WHEN STABILIZATION MEASURES ARE INITIATED.

12. THE HOLDER OF ANY APPROVED EDWARD AQUIFER PROTECTION PLAN MUST NOTIFY THE APPROPRIATE REGIONAL OFFICE IN WRITING AND OBTAIN APPROVAL FROM THE EXECUTIVE DIRECTOR PRIOR TO INITIATING ANY OF THE FOLLOWING:

A. ANY PHYSICAL OR OPERATIONAL MODIFICATION OF ANY WATER POLLUTION ABATEMENT STRUCTURE(S), INCLUDING BUT NOT LIMITED TO PONDS, DAMS, BERMS, SEWAGE TREATMENT PLANTS, AND DIVERSIONARY STRUCTURES;
B. ANY CHANGE IN THE NATURE OR CHARACTER OF THE REGULATED ACTIVITY FROM THAT WHICH WAS ORIGINALLY APPROVED OR A CHANGE WHICH WOULD SIGNIFICANTLY IMPACT THE ABILITY OF THE PLAN TO PREVENT POLLUTION OF THE EDWARDS AQUIFER;
C. ANY DEVELOPMENT OF LAND PREVIOUSLY IDENTIFIED AS UNDEVELOPED IN THE ORIGINAL WATER POLLUTION ABATEMENT PLAN.

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THESE GENERAL CONSTRUCTION NOTES MUST BE INCLUDED ON THE CONSTRUCTION PLANS PROVIDED TO THE CONTRACTOR AND ALL SUBCONTRACTORS.

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STATE OF TEXAS
CHRISTOPHER B. ALLISON
131240
LICENSED
PROFESSIONAL ENGINEER
10/13/2020

VINTAGE OAKS AT THE VINEYARD
UNIT 29
STORM WATER POLLUTION PREVENTION PLAN DETAILS

JOB: 19BSW004	
DATE: 2020-09-30	
DRAWN: TJN	PM: BA
DESIGN: DL	DM:
PEER:	OTHER:
REVISIONS:	

DELTA	DESCRIPTION	DATE

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Date: Oct 09, 2020, 11:08am User ID: tnewton
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