c. Sludge transportation method

Provide the method of transportation (truck, train, pipe, other): Truck

Name of the hauler: Not known at this time, however a TCEQ permitted hauler will be used

Hauler registration number: Not known at this time, however a TCEQ permitted hauler will be used

Transported as: ☐ liquid ☐ semi-liquid ■ semi-solid ☐ solid

Land application for: ☐ reclamation ☐ soil conditioning

11. Permit Authorization for Sewage Sludge Disposal

(Instructions, Page 58)

a. Beneficial use authorization

Does the existing permit include authorization for land application of sewage sludge for beneficial use?

☐ Yes ■ No No Existing Permit

If yes, are you requesting to continue this authorization to land apply sewage sludge for beneficial use?

☐ Yes ■ No No Existing Permit

If yes, is the completed **Application for Permit for Beneficial Land Use of Sewage Sludge (TCEQ Form No. 10451)** attached to this permit application (see the instructions for details)?

☐ Yes ☐ No

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
DOMESTIC WASTEWATER PERMIT APPLICATION

DOMESTIC TECHNICAL REPORT 1.0

The Following Is Required For All Applications

Renewal, New, And Amendment

1. Permitted or Proposed Flows

(Instructions, Page 49)

Table 1.0(1) - Existing/Interim I Phase

Design Flow (MGD)	0.25
2-Hr Peak Flow (MGD)	0.75
Estimated construction start date	01/2016
Estimated waste disposal start date	08/2016

Table 1.0(2) - Interim II Phase

Design Flow (MGD)	2.5
2-Hr Peak Flow (MGD)	7.5
Estimated construction start date	01/2019
Estimated waste disposal start date	01/2020

Table 1.0(3) - Final Phase

Design Flow (MGD)	5.0
2-Hr Peak Flow (MGD)	15.0
Estimated construction start date	01/2044
Estimated waste disposal start date	01/2045

Current operating phase: N/A

Provide the startup date of the current phase: N/A

Provide the startup date of the facility: Pending Permit Approval

GREEN VALLEY SPECIAL UTILITY DISTRICT (GVSUD) PROJECTED FLOWS

Green Valley Special Utility District (GV5UD) has a wastewater CCN area of approximately 73,175 acres. GVSUD CCN boundary generally overlaps their water CCN boundary, except for the Northeast & Northwest parts of their water CCN area. This was helpful in identifying land use and estimating EDU/connection's per year to help size the capacity and loading of the proposed plant. To project future plant capacity and EDU's/connections per year, a 10% growth rate was used. This growth rate is similar to the growth rates of nearby municipalities that provide wastewater service. This growth rate is also similar to the growth rate of GVSUD's water system in areas where wastewater service is available over the past 10 to 15 years. This growth rate, along with land use maps, was used to determine EDU/ connections per year on a continuing basis. The Santa Clara Creek Watershed map provided in the permit provides locations of existing city limits and extraterritorial jurisdictions of surrounding municipalities.

The proposed initial phase is 0.25 MGD. GVSUD currently has an application for wastewater service for a proposed development on a tract of land to the west and up gradient of the proposed wastewater plant within the Santa Clara Creek Watershed. The proposed development is seeking capacity for an average flow 130,000-gpd (approx. 530 EDU's). The development of this tract is anticipated to take four years. The initial phase includes commercial/industrial developments along with other anticipated initial connections, and is anticipated to have approximately 950 EDU's (228,000-gpd).

The proposed Interim phase is for 2.5 MGD, and the Final Phase is for 5 MGD. As mentioned above, a 10% growth rate was used to determine EDU/connections to the plant on a per year basis and the results are provided below.

Green Valley Special Utility District
Santa Clara Creek WWTP No. 1

Year	Land Use	Projected EDU's	Projected Volumes (GPD)
Initial Phase: 0.25 MGD			
2016	Residential/Commercial Land Use	205	49,200
2017	Residential/Commercial Land Use	430	103,200
2018	Residential/Commercial Land Use	660	158,400
2019	Residential/Commercial Land Use	952	228,360
Phase II: 2.5 MGD			
2020	Residential/Commercial Land Use	1,047	251,196
2021	Residential/Commercial Land Use	1,151	276,316
2022	Residential/Commercial Land Use	1,266	303,947
2023	Residential/Commercial Land Use	1,393	334,342
2024	Residential/Commercial Land Use	1,532	367,776
2025	Residential/Commercial Land Use	1,686	404,554
2026	Residential/Commercial Land Use	1,854	445,009
2027	Residential/Commercial Land Use	2,040	489,510
2028	Residential/Commercial Land Use	2,244	538,461
2029	Residential/Commercial Land Use	2,468	592,307
2030	Residential/Commercial Land Use	2,715	651,538
2031	Residential/Commercial Land Use	2,986	716,692
2032	Residential/Commercial Land Use	3,285	788,361
2033	Residential/Commercial Land Use	3,613	867,197
2034	Residential/Commercial Land Use	3,975	953,916
2035	Residential/Commercial Land Use	4,372	1,049,308
2036	Residential/Commercial Land Use	4,809	1,154,239
2037	Residential/Commercial Land Use	5,290	1,269,663
2038	Residential/Commercial Land Use	5,819	1,396,629
2039	Residential/Commercial Land Use	6,401	1,536,292
2040	Residential/Commercial Land Use	7,041	1,689,921
2041	Residential/Commercial Land Use	7,745	1,858,913
2042	Residential/Commercial Land Use	8,520	2,044,805
2043	Residential/Commercial Land Use	9,372	2,249,285
2044	Residential/Commercial Land Use	10,309	2,474,213
Phase III: 5 MGD			
2045	Residential/Commercial Land Use	11,340	2,721,635
2046	Residential/Commercial Land Use	12,474	2,993,798
2047	Residential/Commercial Land Use	13,722	3,293,178
2048	Residential/Commercial Land Use	15,094	3,622,496
2049	Residential/Commercial Land Use	16,603	3,984,746
2050	Residential/Commercial Land Use	18,263	4,383,220
2051	Residential/Commercial Land Use	20,090	4,821,542
2052	Residential/Commercial Land Use	22,099	5,303,696

Average Influent Loading (lbs/day = total average flow x average BOD_5 conc. X 8.34)

730 #/D Initial Flow

Provide the source of the average organic strength or BOD_5 concentration.

Engineer opinion and experience of comparable facilities.

If the increased flow will impact the existing organic strength, the following table must be completed.

c. Proposed organic loading

This table must be completed if applying for a new permit or if increased flow will impact organic loading.

Table 1.1(4) – Design Organic Loading SEE ATTACHED TABLES

Source	Total Average Flow (MGD)	Influent BOD_5 Concentration (mg/l)
Municipality	See Attached Tables	
Subdivision (Residential)		
Trailer park – transient		
Mobile home park		
School with cafeteria and showers		
School with cafeteria, no showers		
Recreational park, overnight use		
Recreational park, day use		
Office building or factory		
Motel		
Restaurant		
Hospital		
Nursing home		
Other		
TOTAL FLOW		
AVERAGE BOD_5		

DESIGN ORGANIC LOADING - INITIAL PHASE

Source	Total Average Flow (MGD)	Influent BOD_5 Concentration (mg/L)
Municipality		
Subdivision (Residential)	0.05	350
Trail Park - transient		
Mobile Home Park		
School with cafeteria and shower		
School with cafeteria and no shower		
Recreational park, overnight use		
Recreational Park, day use		
Office building or factory		
Motel		
Restaurant		
Hospital		
Nursing Home		
Other	0.20	350
TOTAL FLOW	***0.25***	
AVERAGE BOD_5		***350***

DESIGN ORGANIC LOADING - INTERIM PHASE

Source	Total Average Flow (MGD)	Influent BOD_5 Concentration (mg/L)
Municipality		
Subdivision (Residential)	1.75	350
Trail Park - transient		
Mobile Home Park		
School with cafeteria and shower	0.25	350
School with cafeteria and no shower		
Recreational park, overnight use		
Recreational Park, day use	0.01	
Office building or factory	0.05	350
Motel		
Restaurant	0.05	
Hospital		
Nursing Home		
Other	0.39	350
TOTAL FLOW	***2.50***	
AVERAGE BOD_5		***350***

DESIGN ORGANIC LOADING - FINAL PHASE

Source	Total Average Flow (MGD)	Influent BOD_5 Concentration (mg/L)
Municipality		
Subdivision (Residential)	3.90	350
Trail Park - transient		
Mobile Home Park		
School with cafeteria and shower	0.25	350
School with cafeteria and no shower		
Recreational park, overnight use		
Recreational Park, day use	0.01	350
Office building or factory	0.05	350
Motel		
Restaurant	0.05	350
Hospital		
Nursing Home		
Other	0.74	350
TOTAL FLOW	***5.00***	
AVERAGE BOD_5		***350***

b. Wind rose

☒ Indicate by a check mark that a wind rose has been submitted.

6. Permit Authorization for Sewage Sludge Disposal

(Instructions, Page 67)

a. Beneficial use authorization

Are you requesting to include authorization to land apply sewage sludge for beneficial use on property located adjacent to the wastewater treatment facility under the wastewater permit:

☐Yes ☒No

If yes, is the completed Application for Permit for Beneficial Land Use of Sewage Sludge (TCEQ Form No. 10451) attached to this permit application (see the instructions for details):

☐Yes ☒No

b. Sludge processing authorization

Are you requesting to include authorization for any of the following sludge processing, storage or disposal options at the wastewater treatment facility:

☐Yes ☒No Sludge Composting

☐Yes ☒No Marketing and Distribution of sludge

☐Yes ☒No Sludge Surface Disposal or Sludge Monofill

If yes to any of the above sludge options and if the applicant is requesting to continue this authorization, is the completed **DOMESTIC WASTEWATER PERMIT APPLICATION: SEWAGE SLUDGE TECHNICAL REPORT (TCEQ Form No. 10056)** attached to this permit application?

☐Yes ☐No

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Initial Phase

GIVEN

Influent:			*Effluent:*		
Q =	250,000	gpd	BOD_5 =	20	mg/l
Peaking Factor =	3		TSSeff =	20	mg/l
Qp =	750,000	gpd (Influent to Plant)	NH3N =	3	mg/l
BOD_5 =	350	mg/l			
TSS =	300	mg/l			
Chemical Oxygen Demand (COD) =	700	mg/l (.3-.8 (BOD/COD), used 0.55)	Chlorine Residual =	1	mg/l @ 20 min det
TKN =	50	mg/l			
NH3N =	26	mg/l			
Organic $N_{14^{\circ}C}$ =	24	mg/l			
Alkalinity =	200	mg/l			
Winter Temp. Min. =	15	°C			
Summer Temp. Max. =	30	°C			

ASSUME

θc =	10	days, mean cell residence time
Y =	0.6	maximum yield coefficient, range: 0.4 - 0.8 (Metcalf & Eddy Table 8-7)
k_d =	0.06	day^-1, endogenous decay coefficient, range: 0.025 - 0.075 (Metcalf & Eddy Table 8-7)
a =	0.95	growth constant, range: 0.8 - 1.10
b =	0.08	growth constant
MLSS =	3000	mg/l, conc. Of suspended solids in aeration tank
MLVSS =	70%	of MLSS
MLVSS (X) =	2100	mg/l, conc. Of volatile suspended solids in aeration tank

DESIGN CALCULATIONS

A. BOD_5 Loading

$$F = \frac{8.34 \times Q \times (S_o - S)}{10^6}$$

F = **688.1** lb BOD_5 /day

B. TSS Loading

$$TSS = \frac{8.34 \times Q \times (TSS_{inf} - TSS_{eff})}{10^6}$$

TSS = **583.8** lb TSS /day

C. Aeration Basin Volume

1. $$V = \frac{\theta c \times Q \times Y \times (So - S)}{MLVSS(1 + kd \times \theta c)}$$

Minimum Aeration Basin Volume = 147,321 gal = 19,694 ft^3

2. TCEQ Criteria

25 lbs BOD5/day/1,000 ft^3 (Conventional Activated Sludge w/ Nitrification)

Minimum Aeration Basin Volume = 27,522 ft^3

Minimum Required Aeration Basin Volume= 27,522 ft^3

Proposed Aeration Basin Volume = 31,500 ft^3

***Volumetric* BOD Loading = 21.8 lbs/1000 ft^3 - day**

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Initial Phase

D. Hydraulic Retention Time (θ)

Hydraulic Retention Time = V/Q

Hydraulic Retention Time = 22.62 hrs

E. Food to Mass Ratio

$$F / M = \frac{So}{\theta \times MLVSS}$$

F/M = 0.177 lb/lb-day

F. Micro-Organism Mass in Aeration Basin

$$Mv = F \times \frac{\theta c \times Y}{1 + (kd \times \theta c)}$$

Mv = 2,580 lbs

G. Sludge Residence Time (SRT)

$$SRT = \frac{1}{a \times \left(F/Mv\right) - b}$$

SRT = 6.8 days

H. Clarifier

1. Weir Loading

	20,000	gpd/lf max at peak flow
Minimum Length =	37.5	lf
Proposed Length =	50.0	lf

2. Surface Area

	1,200	gpd/sf max overflow rate at peak flow
Minimum Surface Area =	625.0	ft^2
Proposed Surface Area =	1,964.0	ft^2

3. Volume/Detention Time

	1.8	hours minimum detention time at peak flow
Minimum Volume =	7,519.6	ft^3
Proposed Volume =	35,352.0	ft^3

1. Return Activated Sludge (RAS)

1. Ratio

r = $MLVSS_{AER}$ / ($MLVSS_{SLDG}$ - $MLVSS_{AER}$)

Assume Clarifier concentrates to 1.5% solids = 15,000 mg/L

r= 16%

2. RAS

RAS = r x Q = 28.3 gpm

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Initial Phase

J. Sludge Yield

$$Volatile = Mv \times \left[(a)\left(F/Mv\right) - b \right]$$

Volatile = 447.2 lbs/day
Sludge Yield = 638.9 lbs/day

Assume Percent Solids = 1.5 %

Qsludge = 5,107 gal/day

K. Digester

Minimum Retention Time = 15 days

Required Digester Volume = 76,607 gal = 10,241 ft³
Proposed Digester Volume = 95,000 gal = 12,700 ft³

L. Oxygen Requirements

1. Aeration Basins

Minimum oxygen requirement = 3,200 scf per lb BOD_5 per day @ 12' submergence and 20 deg C
Minimum oxygen requirement = 1,529 scfm @ 12' submergence and 20 deg C

Diffuser Submergence Depth (ft)	Airflow Correction Factor
8	1.82
10	1.56
12	1.00
15	0.91
18	0.73
20	0.64

Diffuser Submergence Depth = 18 ft
Correction Factor = 0.73

Minimum oxygen requirement = 1,116 scfm @ 20 deg C

2. Digester

Oxygen Requirement = 30 scfm per 1,000 ft³

Minimum oxygen requirement = 381 scfm

M. Disinfection

Chlorine Contact Basin Minimum Detention Time = 20 minutes
Minimum Required Volume = 1,392.5 ft³
Proposed Volume = 2,250 ft³

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Interim Phase

INFLUENT

Flow:

Average:	2.5	MGD
Peak:	7.5	MGD

Site Elevation: 550 ft MSEL

Composition:

	Design Values	
Assumed Values		
Peak Biological Oxygen Demand 5-day (BOD_5):	350	mg/l
Total Suspended Solids (TSS):	300	mg/l
Ammonia (NH3-N):	26	mg/l
Chemical Oxygen Demand (COD):	700	mg/l
Alkalinity	200	mg/l
Total Dissolved Solids (TDS):	550	mg/l
Total Nitrogen (N):	50	*mg/l*
Phosphorus (P):	9	mg/l

Temperatures:

Winter Temp (Min.):	15	°C
Summer Temp (Max.):	30	°C

EFFLUENT

Composition:

Biological Oxygen *Demand 5-day (BOD_5):*	10	*mg/l*
Total Suspended Solids (TSS):	15	mg/l
Ammonia (NH3-N):	3	*mg/l*
Dissolved Oxygen:	4	mg/l

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Interim Phase

CHARACTERISTICS & COEFFICIENTS

MLSS =	3000	mg/l at normal operating level
Volatile Suspended Solids =	70	% of Total Suspended Solids
Minimum DO during aeration =	2.0	mg/l

Kinetic Coefficients for heterotrophic bacteria

Y=	0.40	g VSS / g bCOD
k_d =	0.12	g VSS / g VSS*d
k_d =	1.04	unitless
$k_{d,\ 15°C}$ =	0.099	g / g*d
f_d =	0.15	unitless

Kinetic Coefficients for nitrification

Y_n =	0.12	g VSS / g NH4-N
K_o =	0.50	g / m^3
Kn =	0.74	g NH4-N / m^3
Kn =	1.053	unitless
$K_{n,\ 15°C}$ =	0.572	g / m^3
kdn =	0.080	g VSS / g VSS*d
kdn =	1.040	unitless
$k_{dn,\ 15°C}$ =	0.066	g / g*d
μ_{mn} =	0.75	g VSS / g VSS*d
μ_n =	1.07	unitless
$\mu_{m,15°C}$ =	0.535	g / g*d

a: *Metcalf & Eddy, Wastewater Engineering Treatment & Reuse, 4th Ed., Tables 8-10 & 8-11, Pgs 704-705*

LOADING

BOD5 Loading:

BOD5 Removed = $\dfrac{8.34 x Q(BOD_5\ \text{inf} - BOD_5 eff)}{10^6}$

BOD5 Removed = 7,089 lbs/day

TSS Loading:

TSS Removed = $\dfrac{8.34\ xQx\ (TSS\ \ \text{inf}\ -\ TSSeff\ )}{10^{\ 6}}$

TSS Removed = 5,942 lbs/day

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Interim Phase

FINE SCREEN

Bar Spacing:	0.25	in
Average Flow Rate:	2.5	MGD
Approximate Volume of Screenings:	13	cf/MG
Anticipated Volume of Screenings:	32.5	cf per day

COARSE SCREEN (BYPASS/OVERFLOW BAR SCREEN)

INFLUENT FLOW RATE:

Average Influent Flow Rate:	2.50	MGD	=	1736	gpm	=	3.868 cfs
Peak Influent Flow Rate:	7.50	MGD	=	5208	gpm	=	11.604 cfs

CHANNEL GEOMETRY:

Channel Width:	5.0	ft
Design Channel Flow Depth:	0.7	ft
Max. Channel Depth:	1.8	ft

BAR RACK GEOMETRY:

Bar Size:	0.375	in
Clear Space Between Bars:	0.500	in
Incline Angle:	60	degrees
No. of Bars in Rack:	68	
Clear Space:	2.875	sf per ft of channel depth

HEADLOSS THROUGH BAR SCREEN:

Channel Area (Avg):	3.5	sf
Channel Area (Max):	9.0	sf
Approach Velocity (Avg):	1.11	fps (using design channel depth)
Approach Velocity (Peak):	1.29	fps (using max. channel depth)
Bar Screen Area (Avg):	2.01	sf
Bar Screen Area (Max):	5.18	sf
Velocity Through Bars (Avg):	1.92	fps (using design channel depth)
Velocity Through Bars (Max):	2.24	fps (using max. channel depth)

$$HeadLoss = \frac{V^2 - v^2}{0.7 \times 2 \times g}$$

V= Velocity of flow through openings in rack
v= Approach velocity
g= Acceleration of gravity, 32.2

Assuming No Clogging:

Head Loss (Design):	0.0549	ft
Head Loss (Max):	0.075	ft

Assuming Clogging:

Clogging Factor:	0.500	
Head Loss (Design):	0.219	ft
Head Loss (Max):	0.299	ft

INITIAL SBR BASIN DESIGN

Number of Basins =	2	
Number of Cycles per Day =	4	per Basin
Total Cycle Time =	6.00	hrs / cycle
Volume per Cycle =	312,500	gal / cycle
Side Water Depth (SWD) =	28.0	ft

Fill

Time to Fill = 24 hrs/day / Total No. of Cycles per day

Time to Fill (T_f)= 3.00 hrs / cycle

Average Flow Rate = Volume per Cycle / Time to Fill

Average Flow Rate = 1,736.1 gpm

React

Minimum Required Aeration Volume:

Maximum Organic Loading: 25 lbs BOD5/day/1000 cf

(TCEQ Chap. 217.154, Conventional Activated Sludge with Nitrification, with temperatures between 13°C and 15°C)

BOD_5 Loading: 7,089 lbs/day

Minimum Required Aeration Volume (V_a): 283,560.0 cf

Initial Assumption:

Aerated Portion of Fill:	0%	
Aerated Portion of React:	100%	
React Portion of Total Cycle:	34%	
React Cycle Time (T_r):	2.04	hrs
Aerated React Cycle Time (T_{ra}):	2.04	hrs

Minimum Total Volume Required (V_t) = V_a / T_a

V_t = 834,000 cf = 6,238,737 gal

Minimum Total Volume Required per Basin =	417,000.0	cf =	3,119,368.5	gal		
Minimum Surface Area Required per Basin =	14,892.9	sf				
Proposed Basin Size =	94.0	ft x	160.0	ft x	28.0	ft SWD
Round Basin Size =	137.7	ft diameter				
Proposed Volume per Basin =	421,120.0	cf				

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Interim Phase

Settle

Maximum Overflow Rate @ 2-Hr Peak Flow =	1200	gal/day/sf	(TCEQ Chap. 217.154, Conventional Activated Sludge with Nitrification, with temperatures between 13°C and 15°C)
Min. Surface Area Required (Proposed Surface Area per basin) =	15,040.0	sf	
Maximum Overflow Rate =	12,533.3	gpm	
Volume per Cycle =	312,500	gal	
Minimum Settle Time (T_S) =	24.93	min	
Use Ts =	25.00	min = 0.42 hrs	

Decant

Assumed Flow Rate of Decanter =	6,950.0	gpm	
Decanters per Basin =	2		
Total Decant Flow Rate per Basin =	13,900.0	gpm	
Volume per Decant =	312,500	gal	
Decant Time (T_d) =	22.48	min =	0.37 hrs

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Interim Phase

SBR DESIGN

Number of Basins =	2				
Number of Cycles per Day =	4				
Volume per Cycle =	312,500	gal			
Side Water Depth (SWD) =	28	ft			
Minimum Total Volume Needed =	834,000	cf			
Minimum Volume per Basin =	417,000.0	cf			
Minimum Surface Area Required per Basin =	15,040.0	sf			
Proposed Basin Size =	94.0	ft x	160.0	ft x	28.0 ft SWD
Proposed Surface Area =	136.4	ft diameter			
Volume Proposed Per basin	421,120	cf			
Volume Proposed Total	842,240	cf			
Total Cycle Time =	6.00	hrs			
Max. Fill Time (Tf):	3.00	hrs (at design flow)			
Anoxic Fill Time (T f,an):	3.00	*hrs*			
Aerated Fill Time (T f,aer):	0.00	*hrs*			
React Time (T_r):	2.04	hrs			
Settle Time (T_s):	0.42	hrs			
Decant Time (T_d):	0.37	hrs			
Idle Time (T_i):	0.17	hrs			

Hydraulic Retention Time

$$\tau = V / Q$$

Hydraulic Retention Time = 2.52 days

F/M

$$F/M = \frac{Q \times BOD_{5,inf}}{MLSS \times V}$$

F/M = 0.046 gBOD/gMLSS-d

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Interim Phase

Wastewater Characteristics

bCOD = 1.6(BOD) = 560 mg/l (Biodegradable COD)
nbCOD = COD - bCOD = 140 mg/l (non-biodegradable COD)

iTSS = TSS - VSS
TSS = 300 mg/l
VSS = 210 mg/l
iTSS = 90 mg/l

$$\frac{bpCOD}{pCOD} = \frac{(bCOD/BOD)(BOD - sBOD)}{COD - sCOD}$$

sBOD: soluble BOD
sCOD: soluble COD
bpCOD: Biodegradable particulate COD
pCOD: Particulate COD

Assume: sCOD = 33% of COD = 231 mg/l
Assume: sBOD = 33% of BOD = 116 mg/l

bpCOD/pCOD = 0.80

$$nbVSS = \left[1 - \left(\frac{bpCOD}{pCOD}\right)\right] BOD$$

nbVSS = 70.0 mg/l (non-biodegradable VSS)

Sludge Retention Time

$$(P_{X,TSS})SRT = \frac{QY(S_O - S)SRT}{[1+(k_d)SRT](0.85)} + Q(nbVSS)SRT + \frac{QY_n(NO_x)SRT}{[1+(k_{dn})SRT](0.85)} + \frac{(f_d)(k_d)Q(Y)(S_O - S)SRT^2}{[1+(k_d)SRT](0.85)} + Q(TSS_O - VSS_O)SRT$$

$$(P_{X,TSS})SRT = (V)(X_{MLSS})$$

X_{MLSS} =	3000	g/m^3		
V =	421,120.0	cf/basin =	11,924.78	m^3 / basin
Q (per Basin) =	1.25	MGD =	4,731.76	m^3 / day
(Px,TSS)SRT =	35,774,338	g		

Assume So ≈ So -S

So = bCOD =	560	g/m^3		
Assume Nox ≈	80%	of TKN =	40.0	g/m^3
SRT =	**29.16**	**days**		

MLVSS

$$(P_{X,VSS})SRT = \frac{QY(S_O - S)SRT}{[1+(k_d)SRT]} + Q(nbVSS)SRT + \frac{QY_n(NO_x)SRT}{[1+(k_{dn})SRT]} + \frac{(f_d)(k_d)Q(Y)(S_O - S)SRT^2}{[1+(k_d)SRT]}$$

$$(P_{X,VSS})SRT = V_T(X_{MLVSS})$$

(Px,vss)SRT =	21,300,780	g
MLVSS =	1786	mg/l

Sludge Yield

$$P_{X,TSS} = \frac{(V)(MLSS)}{SRT}$$

Px,TSS = 5,409

$$Q_{Sludge} = \frac{P_{X,TSS}}{8.34 \times PercentSolids}$$

Assume Percent Solids = 1.5 %

Qsludge = 43,236 gal/day

NITRIFICATION / DENITRIFICATION

Nitrification

$$K_n \ln\frac{N_o}{N_t} + (N_o - N_t) = X_n\left(\frac{\mu_{mn}}{Y_n}\right)\left(\frac{DO}{k_o + DO}\right)t$$

N_t = NH_4-N concentration at time t (mg/L)
X_n = Nitrifying bacteria concentration (mg/L)
DO = Dissolved Oxygen concentration= 2.0 mg/L

$$NO_x = TKN_o - N_e - 0.12P_{x,bio}/Q$$

NOx = Nitrogen oxidized (mg/L)
TKN_o = Influent TKN (mg/L)
N_e = Effluent NH4-N (mg/L)
$P_{x,bio}$ = Nitrogen in cell tissue

$$P_{x,bio} = \frac{QY(S_o - S)}{1 + (k_d)SRT} + \frac{QY_n(NO_x)}{1 + (k_{dn})SRT} + \frac{(f_d)(k_d)QY(S_o - S)SRT}{1 + (k_d)SRT}$$

Q =	1,250,000	gpd/basin =	4,731.8	m^3/day/basin
So - S =	560	g/m^3 (from SRT calculation)		
Nox =	40.0	g/m^3 (from SRT calculation)		
SRT =	29.16270079	days		
Px,bio =	399,188	g/day =	399.2	kg/day
NOx =	36.9	g/m^3		

NOx added per cycle = Fill Volume x NOx = 43,623 g per fill cycle
NH_4-N remaining before Fill Cycle = Settle Volume x N_e = 32,225.56 g
Total Oxidizable N at beginning of Cycle = 75,848 g

N_o = Total Oxidizable N at beginning of Cycle / Total Basin Volume = 6.36 g/m^3

$$X_n = \frac{Q(Y_n)(NO_x)SRT}{[1 + (k_d)SRT]V}$$

X_n = 17.55 g/m^3

Time Needed: 0.06057 days = 1.454 hours
Aeration Time Proposed 2.04 hours
Adequate Aeration time available for Nitrification

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Interim Phase

Denitrification

NO_x Added per Cycle:	43,623	g/fill cycle		
Vt:	11,924.8	m^3		
NO_3-N:	3.66	g/m^3 at end of aeration with tank full		
Vs:	10,741.8	m^3		
NO_3-N:	39,295	g after decant		

$$x_b = \frac{QY(S_o - S)SRT}{(1 + (k_d)SRT)Vt}$$ xb= 668.7 g/m^3

Biomass in System:	7,974	kg		
BOD Feed Rate:	828	kg/day		
F/Mb:	0.104	g/g*day		
SDNRb:	0.07	g/g*day at 20°C		

From Metcalf & Eddy, Fig. 8-23, Pg 755. for rbCOD/bCOD of 0.10

$SDNR_{14}$:	0.062	g/g*day		

$NO_x = (SDNR_b)(x_b)(Vt) = NO_3$-N removal capacity

NOx:	*490,949*	*g/day*		
Fill Time:	3.0	hrs		
NOr at	3.0	hrs =	61,369	g
NO3-N Available:	39,295	g		

All NO3-N can be removed during Fill 156.2%

Alkalinity

Alkanity Required for Nitrification:	263	mg/l		
Alkanity Recovered in Denitrification:	132	*mg/l*		
Net Alkanity Required:	132	mg/l		
Residual Alkalinity Needed to maintain pH:	80	mg/l		
Total Alkalinity Required in Influent:	212	mg/l		
Alkalinity Available in Influent:	200	mg/l		
Alkalinity Addition Needed:	**12**	**mg/l**		
Added as $CaCO_3$:	**110.2**	**kg/day =**	**243.03**	**lbs/day**

Garry Montgomery

From: Garry Montgomery
Sent: Monday, April 04, 2016 11:42 AM
To: 'Larry Diamond'
Subject: GVSUD W10015360001
Attachments: Response to TCEQ 2015.05.04- Part 2.pdf

Second email.

Garry Montgomery, P.E., CFM, SIT
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SBR OXYGEN REQUIERMENTS

Actual Oxygen Transfer Rate (AOTR)

TCEQ Criteria:	2.20	lbs O_2 / lb BOD removed
BOD_5 Removed =	7,089.000	lbs/day
AOTR =	15,596	lbs O_2 / day

Standard Oxygen Transfer Rate (SOTR)

$$SOTR = AOTR\left[\frac{C_{s,20}}{\alpha F(\beta C_{sd} - C)}\right]\left(1.024^{20-T}\right)$$

T = 30 °C

$$C_{s,20} = 9.07 \times \left(1 + \frac{0.4 \times D}{34}\right)$$

D = 28 ft (depth, SWD)
$C_{s,20}$ = 12.06 mg/l (DO saturation at standard conditions)

$$C_{sd} = Cst \times \left(Fe + \frac{0.4 \times D}{34}\right)$$

Cst =	8.24	mg/l (DO saturation at liquid temp & sea level)
Fe =	0.97	Elevation Factor
C_{sd} =	10.71	mg/l (DO saturation at design conditions)
α =	0.85	coefficient/correction factor
β =	0.95	Salinity-surface tension correction factor
F =	1.00	Fouling factor
C =	2.0	mg/l (operating Oxygen concentration)
SOTR =	21,357	lbs O_2 / day

Design SOTR

Aeration time/cycle =	2	hrs/cycle
Cycles/day/basin =	4	
Total Aeration time =	8	hrs/day/basin
No. of Basins =	2	
Design SOTR for Aeration =	1,309	lbs O2/hr/basin

Minimum Design Air Flow

Density of Air at Temp. of	30	°C =	0.07270626 lbs/cf
Amount of Oxygen =	0.01685	lbs/cf	
Minimum Design Air Flow =	3,698	SCFM (per basin being aerated)	

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Interim Phase

AEROBIC DIGESTER

Average Sludge Yield from SBR:	43,236	gal/day			
TCEQ Minimum Sludge Retention Time:	15	days			
SRT from SBR Treatment Basins:	29.1627	days			
Minimum SRT needed in Aerobic Digester:	0	days			
Minimum Proposed Aerobic Digester Volume:	750,000	gallons =	100,261	cubic feet	
Minimum Digester Sludge Retention Time:	17.3	days			
Total Sludge Retention Time:	46.5	days			

Oxygen Requirements

Criteria:	30.0	scfm per 1000 cf of volume
Minimum Design Air Flow =	3008	scfm

SBR EFFLUENT EQUALIZATION

Minimum Working Volume Equal to:	2.5	*Cycles*
Volume per Cycle:	312,500	gallons
Minimum Working Volume:	**781,250**	**gallons**

UV DISINFECTION

Averege Flow:	2.5	MGD =	1737	gpm
Peak Flow:	7.5	MGD =	5209	gpm
No. of Lamps per Module:	40			
Lamp Length:	62	*in*		
Recommended Flow per Lamp:	18.0	gpm		
Minimum No.of Lamps Needed:	290	lamps		
No. of Modules Needed:	**7.3**	**modules, use:**	**8**	**modules**

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Interim Phase

BELT FILTER PRESS

Solids Generated

Percent Solids in Sludge:	1.5	%
BOD_5 removed	7,089	lbs/day
Dry Sludge Produced	5,409	lbs/day
Wet Sludge Produced	360,590	lbs/day
Wet Sludge Produced	43,236	gal/day

Length of Sustainded Peak (days)	Peaking Factor	Waste Sludge Mass Loading (lbs/day)	Total Sustained Loading (lb)
1	2.4	12,981	12,981
14	1.32	7,140	99,955

Belt Press Sludge Loading Rate: 600 lb/m*hr (200 to 1500 lb/m*hr typical)

Two **2.5** **m Belt Filter Presses**

Total Sludge Loading Rate: 3,000 *lb/m*hr*

Belt Press Average Mass Loading Condition (Press 7-days of Sludge in 5-day work week)

5,409 lbs/day x 7 days = 37,862 lbs

37,862 lbs / 5 days = 7,572 lbs /day

7,572 lbs/day / 3,000 lb/m*hr = **2.52 hrs/day**

Peak Mass Loading Condition (Press 14-days of Peak Sludge in 10-days)

7,140 lbs/day x 14 days = 99,955 lbs

99,955 lbs / 10 days = 9,996 lbs /day

9,996 lbs/day / 3,000 lb/m*hr = **3.33 hrs/day**

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

INFLUENT

Flow:

Average:	5	MGD
Peak:	15	MGD

Site Elevation: 550 ft MSEL

Composition:

	Design Values	
Assumed Values		
Peak Biological Oxygen Demand 5-day (BOD_5):	350	mg/l
Total Suspended Solids (TSS):	300	mg/l
Ammonia (NH_3-N):	26	mg/l
Chemical Oxygen Demand (COD):	700	mg/l
Alkalinity	200	mg/l
Total Dissolved Solids (TDS):	550	mg/l
Total Nitrogen (N):	50	mg/l
Phosphorus (P):	9	mg/l

Temperatures:

Winter Temp (Min.):	15	°C
Summer Temp (Max.):	30	°C

EFFLUENT

Composition:

Biological Oxygen Demand 5-day (BOD_5):	10	mg/l
Total Suspended Solids (TSS):	15	mg/l
Ammonia (NH_3-N):	3	mg/l
Dissolved Oxygen:	5	mg/l

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

CHARACTERISTICS & COEFFICIENTS

MLSS =	3000	mg/l at normal operating level
Volatile Suspended Solids =	70	% of Total Suspended Solids
Minimum DO during aeration =	2.0	mg/l

Kinetic Coefficients for heterotrophic bacteria

Y=	0.40	g VSS / g bCOD
kd =	0.12	g VSS / g VSS*d
kd =	1.04	unitless
kd, 14°C =	0.099	g / g*d
fd =	0.15	unitless

Kinetic Coefficients for nitrification

Yn =	0.12	g VSS / g NH4-N
Ko =	0.50	g / m^3
Kn =	0.74	g NH4-N / m^3
Kn =	1.053	unitless
Kn, 14°C =	0.572	g / m^3
kdn =	0.080	g VSS / g VSS*d
kdn =	1.040	unitless
kdn, 14°C =	0.066	g / g*d
μmn =	0.75	g VSS / g VSS*d
μn =	1.07	unitless
μm,14°C =	0.535	g / g*d

a: *Metcalf & Eddy, Wastewater Engineering Treatment & Reuse, 4th Ed., Tables 8-10 & 8-11, Pgs 704-705*

LOADING

BOD5 Loading:

BOD5 Removed = $\frac{8.34 x Q (BOD_5 \text{ inf} - BOD_5 eff)}{10^6}$

BOD5 Removed = 14,178 lbs/day

TSS Loading:

TSS Removed = $\frac{8.34 x Q x (TSS \text{ inf} - TSS eff)}{10^6}$

TSS Removed = 11,885 lbs/day

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

FINE SCREEN

Bar Spacing:	0.25	in
Average Flow Rate:	5.0	MGD
Approximate Volume of Screenings:	13	cf/MG
Anticipated Volume of Screenings:	65	cf per day

COARSE SCREEN (BYPASS/OVERFLOW BAR SCREEN)

INFLUENT FLOW RATE:

Average Influent Flow Rate:	5.00	MGD	=	3472 gpm	=	7.736	cfs
Peak Influent Flow Rate:	15.00	MGD	=	10417 gpm	=	23.209	cfs

CHANNEL GEOMETRY:

Channel Width:	5.0	ft
Design Channel Flow Depth:	1.2	ft
Max. Channel Depth:	2.8	ft

BAR RACK GEOMETRY:

Bar Size:	0.375	in
Clear Space Between Bars:	0.500	in
Incline Angle:	60	degrees
No. of Bars in Rack:	68	
Clear Space:	2.875	sf per ft of channel depth

HEADLOSS THROUGH BAR SCREEN:

Channel Area (Avg):	5.6	sf
Channel Area (Max):	13.8	sf
Approach Velocity (Avg):	1.33	fps (using design channel depth)
Approach Velocity (Peak):	1.69	fps (using max. channel depth)
Bar Screen Area (Avg):	3.35	sf
Bar Screen Area (Max):	7.91	sf
Velocity Through Bars (Avg):	2.31	fps (using design channel depth)
Velocity Through Bars (Max):	2.94	fps (using max. channel depth)

$$HeadLoss = \frac{V^2 - v^2}{0.7 \times 2 \times g}$$

V= Velocity of flow through openings in rack
v= Approach velocity
g= Acceleration of gravity, 32.2

Assuming No Clogging:

Head Loss (Design):	0.0790	ft
Head Loss (Max):	0.128	ft

Assuming Clogging:

Clogging Factor:	0.500	
Head Loss (Design):	0.316	ft
Head Loss (Max):	0.512	ft

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

INITIAL SBR BASIN DESIGN

Number of Basins =	4	
Number of Cycles per Day =	4	per Basin
Total Cycle Time =	6.00	hrs / cycle
Volume per Cycle =	312,500	gal / cycle
Side Water Depth (SWD) =	28.0	ft

Fill

Time to Fill = 24 hrs/day / Total No. of Cycles per day

Time to Fill (Tf)= 1.50 hrs / cycle

Average Flow Rate = Volume per Cycle / Time to Fill

Average Flow Rate = 3,472.2 gpm

React

Minimum Required Aeration Volume:

Maximum Organic Loading: 25 lbs BOD5/day/1000 cf

(TCEQ Chap. 217.154, Conventional Activated Sludge with Nitrification, with temperatures between 13°C and 15°C)

BOD_5 Loading: 14,178 lbs/day

Minimum Required Aeration Volume (V_a): 567,120.0 cf

Initial Assumption:

Aerated Portion of Fill:	0%	
Aerated Portion of React:	100%	
React Portion of Total Cycle:	59%	
React Cycle Time (T_r):	3.54	hrs
Aerated React Cycle Time (T_{ra}):	3.54	hrs

Minimum Total Volume Required (V_t) = V_a / Ta

V_t = 961,220 cf = 7,190,409 gal

Minimum Total Volume Required per Basin =	240,305.1	cf =	1,797,602.2	gal		
Minimum Surface Area Required per Basin =	8,582.3	sf				
Proposed Basin Size =	94.0	ft x	160.0	ft x	28.0	ft SWD
Round Basin Size =	*104.5*	*ft diameter*				
Proposed Volume per Basin =	421,120.0	cf				

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

Settle

Maximum Overflow Rate @ 2-Hr Peak Flow =	1200	gal/day/sf	
			(TCEQ Chap. 217.154, Conventional Activated Sludge with Nitrification, with temperatures between 13°C and 15°C)
Min. Surface Area Required (Proposed Surface Area per basin) =	15,040.0	sf	
Maximum Overflow Rate =	12,533.3	gpm	
Volume per Cycle =	312,500	gal	
Minimum Settle Time (T_s) =	24.93	min	
Use Ts =	25.00	min = 0.42 hrs	

Decant

Assumed Flow Rate of Decanter =	6,950.0	gpm	
Decanters per Basin =	2		
Total Decant Flow Rate per Basin =	13,900.0	gpm	
Volume per Decant =	312,500	gal	
Decant Time (Td) =	22.48	min =	0.37 hrs

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

SBR DESIGN

Number of Basins =	4				
Number of Cycles per Day =	4				
Volume per Cycle =	312,500	gal			
Side Water Depth (SWD) =	28.0	ft			
Minimum Total Volume Needed =	961,220	cf			
Minimum Volume per Basin =	240,305.1	cf			
Minimum Surface Area Required per Basin =	15,040.0	sf			
Proposed Basin Size =	94.0	ft x	160.0 ft x	28.0	ft SWD
Proposed Surface Area =	138.4	ft diameter			
Volume Proposed Per basin	421,120	cf			
Volume Proposed Total	1,684,480	cf			
Total Cycle Time =	6.00	hrs			
Max. Fill Time (T_f):	1.50	hrs (at design flow)			
Anoxic Fill Time ($T_{f,an}$):	*1.50*	*hrs*			
Aerated Fill Time ($T_{f,aer}$):	*0.00*	*hrs*			
React Time (T_r):	3.54	hrs			
Settle Time (T_s):	0.42	hrs			
Decant Time (T_d):	0.37	hrs			
Idle Time (T_i):	0.17	hrs			

Hydraulic Retention Time

$$\tau = V / Q$$

Hydraulic Retention Time = 2.52 days

F/M

$$F/M = \frac{Q \times BOD_{5,inf}}{MLSS \times V}$$

F/M = 0.046 gBOD/gMLSS-d

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

Wastewater Characteristics

bCOD = 1.6(BOD) =	560	mg/l (Biodegradable COD)
nbCOD = COD - bCOD =	140	mg/l (non-biodegradable COD)

iTSS = TSS - VSS

TSS =	300	mg/l
VSS =	210	mg/l
iTSS =	90	mg/l

$$\frac{bpCOD}{pCOD} = \frac{(bCOD/BOD)(BOD - sBOD)}{COD - sCOD}$$

sBOD: soluble BOD
sCOD: soluble COD
bpCOD: Biodegradable particulate COD
pCOD: Particulate COD

Assume: sCOD =	33%	of COD =	231	mg/l
Assume: sBOD =	33%	of BOD =	116	mg/l

bpCOD/pCOD = 0.80

$$nbVSS = \left[1 - \left(\frac{bpCOD}{pCOD}\right)\right] BOD$$

nbVSS = 70.0 mg/l (non-biodegradable VSS)

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

Sludge Retention Time

$$(P_{X,TSS})SRT = \frac{QY(S_o - S)SRT}{[1+(k_d)SRT](0.85)} + Q(nbVSS)SRT + \frac{QY_n(NO_x)SRT}{[1+(k_{dn})SRT](0.85)} + \frac{(f_d)(k_d)Q(Y)(S_o - S)SRT^2}{[1+(k_d)SRT](0.85)} + Q(TSS_o - VSS_o)SRT$$

$$(P_{X,TSS})SRT = (V)(X_{MLSS})$$

X_{MLSS} =	3000	g/m^3		
V =	421,120.0	cf/basin =	11,924.78	m^3 / basin
Q (per Basin) =	1.25	MGD =	4,731.76	m^3 / day

(Px,TSS)SRT = 35,774,338 g

Assume So = So -S

So = bCOD = 560 g/m^3

Assume Nox = 80% of TKN = 40.0 g/m^3

SRT = 29.16 days

MLVSS

$$(P_{X,VSS})SRT = \frac{QY(S_o - S)SRT}{[1+(k_d)SRT]} + Q(nbVSS)SRT + \frac{QY_n(NO_x)SRT}{[1+(k_{dn})SRT]} + \frac{(f_d)(k_d)Q(Y)(S_o - S)SRT^2}{[1+(k_d)SRT]}$$

$$(P_{X,VSS})SRT = V_T(X_{MLVSS})$$

(Px,vss)SRT = 21,300,780 g

MLVSS = 1786 mg/l

Sludge Yield

$$P_{X,TSS} = \frac{(V)(MLSS)}{SRT}$$

PX,TSS = 10,818

$$Q_{Sludge} = \frac{P_{X,TSS}}{8.34 \times PercentSolids}$$

Assume Percent Solids = 1.5 %

Qsludge = 86,472 gal/day

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

NITRIFICATION / DENITRIFICATION

Nitrification

$$K_n \ln\frac{N_o}{N_t} + (N_o - N_t) = X_n\left(\frac{\mu_{mn}}{Y_n}\right)\left(\frac{DO}{k_o + DO}\right)t$$

Nt = NH4-N concentration at time t (mg/L)
Xn = Nitrifying bacteria concentration (mg/L)
DO = Dissolved Oxygen concentration= 2.0 mg/L

$$NO_x = TKN_o - N_e - 0.12P_{x,bio}/Q$$

NOx = Nitrogen oxidized (mg/L)
TKNo = Influent TKN (mg/L)
Ne = Effluent NH4-N (mg/L)
Px,bio = Nitrogen in cell tissue

$$P_{x,bio} = \frac{QY(S_o - S)}{1+(k_d)SRT} + \frac{QY_n(NO_x)}{1+(k_{dn})SRT} + \frac{(f_d)(k_d)QY(S_o - S)SRT}{1+(k_d)SRT}$$

Q =	1,250,000	gpd/basin =	4,731.8	m^3/day/basin
So - S =	560	g/m^3 (from SRT calculation)		
Nox =	40.0	g/m^3 (from SRT calculation)		
SRT =	29.16270082	days		
Px,bio =	399,188	g/day =	399.2	kg/day
NOx =	36.9	g/m^3		

NOx added per cycle = Fill Volume x NOx = 43,623 g per fill cycle
NH4-N remaining before Fill Cycle = Settle Volume x Ne = 32,225.56 g
Total Oxidizable N at beginning of Cycle = 75,848 g

No = Total Oxidizable N at beginning of Cycle / Total Basin Volume = 6.36 g/m^3

$$X_n = \frac{Q(Y_n)(NO_x)SRT}{[1+(k_d)SRT]V}$$

Xn = 17.65 g/m^3

Time Needed: 0.06057 days = 1.454 hours
Aeration Time Proposed: 3.54 hours
Adequate Aeration time available for Nitrification

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

Denitrification

NO_x Added per Cycle:	43,623	g/fill cycle		
Vt:	11,924.8	m^3		
NO_3-N:	3.66	g/m^3 at end of aeration with tank full		
Vs:	10,741.8	m^3		
NO_3-N:	39,295	g after decant		

$$x_b = \frac{QY(S_o - S)SRT}{(1+(k_d)SRT)Vt}$$

Xb= 668.7 g/m^3

Biomass in System.	7,974	kg		
BOD Feed Rate:	1,656	kg/day		
F/Mb:	0.208	g/g*day		
SDNRb:	0.07	g/g*day at 20°C		

From Metcalf & Eddy, Fig. 8-23, Pg 755, for rbCOD/bCOD of 0.10

SDNR14:	0.062	g/g*day		

NO_x = (SDNRb)(xb)(Vt) = NO_3-N removal capacity

NO_x:	490,949	g/day		
Fill Time:	1.5	hrs		
NOr at	1.5	hrs =	30,684	g
NO3-N Available:	39,295	g		

NO3-N removed during Fill: 78.1%

Alkalinity

Alkanity Required for Nitrification:	263	mg/l		
Alkanity Recovered in Denitrification:	103	mg/l		
Net Alkanity Required:	160	mg/l		
Residual Alkalinity Needed to maintain pH:	80	mg/l		
Total Alkalinity Required in Influent:	240	mg/l		
Alkalinity Available in Influent:	200	mg/l		
Alkalinity Addition Needed:	**40**	**mg/l**		
Added as $CaCO_3$:	**766.5**	**kg/day =**	**1689.81**	**lbs/day**

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

SBR OXYGEN REQUIERMENTS

Actual Oxygen Transfer Rate (AOTR)

TCEQ Criteria:	2.20	lbs O_2 / lb BOD removed
BOD_5 Removed =	14,178.000	lbs/day
AOTR =	31,192	lbs O_2 / day

Standard Oxygen Transfer Rate (SOTR)

$$SOTR = AOTR\left[\frac{C_{s,20}}{\alpha F(\beta C_{sd} - C)}\right](1.024^{20-T})$$

T = 30 °C

$$C_{s,20} = 9.07 \times \left(1 + \frac{0.4 \times D}{34}\right)$$

D =	28	ft (depth, SWD)
$C_{s,20}$ =	12.06	mg/l (DO saturation at standard conditions)

$$C_{sd} = Cst \times \left(Fe + \frac{0.4 \times D}{34}\right)$$

Cst =	8.24	mg/l (DO saturation at liquid temp & sea level)
Fe =	0.97	Elevation Factor
Csd =	10.71	mg/l (DO saturation at design conditions)
α =	0.85	coefficient/correction factor
β =	0.95	Salinity-surface tension correction factor
F =	1.00	Fouling factor
C =	2.0	mg/l (operating Oxygen concentration)
SOTR =	42,714	lbs O_2 / day

Design SOTR

Aeration time/cycle =	3.54	hrs/cycle
Cycles/day/basin =	4	
Total Aeration time =	14	hrs/day/basin
No. of Basins =	4	
Design SOTR for Aeration =	754	lbs O2/hr/basin

Minimum Design Air Flow

Density of Air at Temp. of	30	°C =	0.07270626 lbs/cf
Amount of Oxygen =	0.01685	lbs/cf	
Minimum Design Air Flow =	2,131	SCFM (per basin being aerated)	

Green Valley Special Utility District - Santa Clara Creek No. 1
Wastewater Treatment Design Calculations
Final Phase

AEROBIC DIGESTER

Average Sludge Yield from SBR:	86,472	gal/day		
TCEQ Minimum Sludge Retention Time:	15	days		
SRT from SBR Treatment Basins:	29.1627	days		
Minimum SRT needed in Aerobic Digester:	0	days		
Minimum Proposed Aerobic Digester Volume:	750,000	gallons =	100,261	cubic feet
Minimum Digester Sludge Retention Time:	8.7	days		
Total Sludge Retention Time:	37.8	days		

Oxygen Requirements

Criteria:	30.0	scfm per 1000 cf of volume
Minimum Design Air Flow =	3008	scfm

SBR EFFLUENT EQUALIZATION

Minimum Working Volume Equal to:	2.5	Cycles
Volume per Cycle:	312,500	gallons
Minimum Working Volume:	**781,250**	**gallons**

UV DISINFECTION

Average Flow:	5.0	MGD =	3473	gpm
Peak Flow:	15.0	MGD =	10417	gpm
No. of Lamps per Module:	40			
Lamp Length:	62	in		
Recommended Flow per Lamp:	18.0	gpm		
Minimum No.of Lamps Needed:	579	lamps		
No. of Modules Needed:	**14.5**	**modules, use:**	**16**	**modules**

UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL DEVELOPMENT
3251 North Highway 123 Bypass
Seguin, TX 78155-6115

Voice: (830) 372-1043
Fax: (830) 372-0020
TDD: (254) 742-9712

DEC 18 2002

Mr. Richard R. DeMunbrun, President
Green Valley Special Utility District
P.O. Box 99
Marion, TX 78124-0099

Dear Mr. DeMunbrun:

This letter establishes conditions which must be understood and agreed to before further consideration may be given to this application. These conditions must be met before loan closing or start of construction. State and Local Office staff of USDA Rural Development will administer the loan and/or grant on behalf of the Rural Utilities Service (RUS). Any changes in project cost, source of funds, scope of services, or any other significant change in the project or applicant must be reported to and approved by USDA Rural Development by written amendment to this letter. If significant changes are made without obtaining such approval, USDA Rural Development may discontinue processing the application.

This letter does not constitute loan and/or grant approval, nor does it ensure that funds are or will be available for the project. The docket may be completed on the basis of a loan not to exceed $584,000.

The interest rate will be the lower of the rate in effect at the time of loan approval or the time of loan closing. A written request should submitted to USDA Rural Development staff at least 15 calendar days before loan closing, if the Special Utility District does not want the interest rate changed to the rate at loan closing. The loan and/or grant will be considered approved on the date a signed copy of Form RD 1940-1, "Request for Obligation of Funds," is mailed to the Special Utility District.

The loan will be scheduled for repayment over a period of 40 years. A cash reserve fund will be required in an amount equal to one annual installment. This amount will be reached by making monthly deposits, which will accumulate at the rate of one-tenth of the total annual installment each year. The reserve fund is to assure that payments will be made on time and for emergency situations that may arise. This fund will be established in a separate interest bearing account(s) at a federally insured financial institution.

Following are the conditions that must be understood, agreed to, and met:

1. USE OF FACILITY

A local ordinance must be adopted which requires mandatory use of the facilities. The applicant must agree in writing to enforce such ordinance. No free service or use of the facility will be permitted.

2. REPAYMENT SCHEDULE

A. Green Valley Special Utility District will provide its own funds to pay interest during construction.

Principal payments will be deferred one year after loan closing. Payments on this loan will be paid directly to USDA Rural Development. The use of a paying agent is not required.

B. Form SF-5510, "Authorization Agreement for PreAuthorized Payments," must be executed for this loan, as well as all existing loans. A copy of this (these) agreement(s) should be forwarded to the State Office.

3. CONTRIBUTION AND USER VERIFICATION

A. Any required contribution shall be considered as the first funds expended.

B. This Letter of Conditions is based upon 6,217 water users that will use the facilities when service becomes initially available. The number of users will be verified by a USDA Rural Development official using RUS Bulletin-TX 1780-40, "Certification of Users by Rural Development Manager."

4. MULTIPLE ADVANCES

A. In accordance with RUS Instruction 1780, Section 1780.45 (b) (1), multiple advances may be used.

B. RUS Bulletin 1780-10 will be used to inform private lenders of RUS's commitment.

C. The loan docket is to contain a copy of your interim financing arrangements. If you are unable to obtain interim financing, you should furnish a statement to this effect. If you have any questions, I will discuss this with you.

D. The Debt Collection Improvement Act (DCIA) of 1996 requires that, effective January 1999, all Federal payments must be made by Electronic Funds Transfer/Automated Clearing House (EFT/ACH). A benefit of receiving payments by EFT/ACH is that funds are directly deposited to the Green Valley Special Utility District's account at a financial institution and are available on the date of payment.

E. The Green Valley Special Utility District will complete Form SF-3881, "Electronic Funds Transfer Payment Enrollment Form," for each account where funds will be electronically received. The completed form(s) must be received by USDA Rural Development at least thirty (30) days prior to loan closing

F. Cash advances should coincide with cash needs.

5. SECURITY REQUIREMENTS

A. Revenue Bonds in the amount of $584,000 will be delivered to USDA Rural Development, made payable to the United States of America.

B. The principal repayment schedule should be in the amount best adapted to making principal retirement and interest payments which closely approximate equal installments of combined interest and principal.

C. The Bond Ordinance must contain the following:

1. A clause to the effect that, in the event any Bond is mutilated, destroyed, lost or stolen, any security or indemnity as may be required by the Issuer and Registrar from the registered owner applying for the replacement Bond shall not be required from the United States of America as long as it is holder of the Bonds.

2. The attached "Loan Program Requirements and Documents to Control" revised 6/10/02 as prepared by the Office of General Counsel, must be included without change.

3. Refer to the attached unnumbered letter "Minimum Requirements for Bond Counsel Opinions Rural Utilities Service & Community Facilities Programs" dated October 17, 2002.

D. Written consent to incur additional debt must be obtained from the Green Valley Special Utility District's present creditor prior to USDA Rural Development obligating funds for this project.

E. Attached is Form RD 1910-11, "Applicant Certification - Federal Collection Policies For Consumer or Commercial Debts." This form must be executed prior to loan closing.

6. ORGANIZATION

A. A complete list of elected officials, type of organization (whether city, township, water control and improvement district, authority, or special purpose), and the authority under which the Green Valley Special Utility District is organized, should be furnished to USDA Rural Development

B. RUS Bulletin 1780-27, "Loan Resolution (Public Bodies)" must be adopted.

7. BUSINESS OPERATIONS

A. The Green Valley Special Utility District's authorized official must approve the Operating Budget prior to funding approval.

B. The facilities will be operated by the governing body in accordance with State laws, Bond Ordinance or Resolution, and the Bonds serving as security for the loan. During the first full year of operation, the Green Valley Special Utility District will furnish to USDA Rural Development quarterly or monthly if the need arises, a summary of its operations. Form RD 442-2, "Statement of Budget, Income and Equity," will be provided for this purpose. Audits are to be performed in accordance with generally accepted government auditing standards (GAGAS). In addition, the audits are to be performed in accordance with various Office of Management and Budget (OMB) circulars. Annual reports and audits are to be furnished as set forth in RUS Instruction 1780, Section 1780-47.

A supplemental report is required annually containing:

a. Total gallons of water purchased and/or produced
b. Total gallons of water sold
c. Total number of customers
d. Percentage of water loss
e. List of current governing body names, addresses, and telephone numbers

C. All water shall be metered by meters furnished and installed by the Green Valley Special Utility District for the sole use of the member or customer.

D. The loan is subject to the provisions of the Federal Civil Rights and Equal Opportunity laws. The Green Valley Special Utility District must agree to comply with these requirements by executing Forms RD 400-4, "Assurance Agreement," and RD 400-1, "Equal Opportunity Agreement."

E. As part of the docket, the Green Valley Special Utility District will present for USDA Rural Development review and approval a management plan, a facility maintenance plan, and a proposal for the maintenance of accounts and records and obtaining audit reports. Such plans should include written agreements for management, maintenance, accounting and auditor services.

F. The Green Valley Special Utility District must adopt utility rates that will generate sufficient revenue to pay debt service, reserve, operation and maintenance, and any necessary depreciation reserve. The rates must be approved by USDA Rural Development before loan closing or beginning of construction.

G. The loan is subject to the provisions of Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. Section 794). It provides, in part, as follows:

> "No handicapped individual in the United States shall, solely by reason of their handicap, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance."

H. Form AD-1047, "Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Cover Transactions," must be executed to certify that the Green Valley Special Utility District is not debarred or suspended from Government assistance.

I. For any contract in excess of $25,000, Form AD-1048, "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," must be executed by any person or entity the Green Valley Special Utility District does business with as a result of this Government assistance certifying that they are not debarred or suspended from Government assistance.

8. GRADUATION - REFINANCING RUS DEBT

If, at any time in the future, the Green Valley Special Utility District is able to refinance the amount of the indebtedness owed the Government by obtaining a loan for such purpose from a responsible cooperative or private credit source at reasonable rates and terms for similar purposes and periods of time, the Green Valley Special Utility District will be required to apply for and accept such a loan in sufficient amount to refinance its RUS indebtedness.

9. INSURANCE AND BONDING

A. The buildings and removable parts of the facility will be covered by insurance covering the usual hazards in the area in an amount approved by USDA Rural Development prior to the final inspection. Public Liability and Property Damage

Insurance will be required according to recommendations of the consulting engineer and attorney. Workmen's Compensation Insurance will be carried as required by State law. Copies of all insurance policies will be obtained prior to loan closing and made part of the loan docket.

B. Fidelity or employee dishonesty bonding coverage will be provided to USDA Rural Development for all persons who have access to funds. Coverage may be provided either for all individual positions or persons, or through "blanket" coverage providing protection for all appropriate employees and/or officials. The amount of the coverage required will be no less than the total annual debt service requirement for all RUS loans. Form RD 440-24, "Position Fidelity Schedule Bond," may be used. A copy of the policy will be furnished to USDA Rural Development at loan closing or prior to beginning construction, whichever occurs first.

10. CONSTRUCTION - ENVIRONMENTAL MITIGATION MEASURES

A. All construction will be on contract documents as outlined in RUS Instruction 1780, Subpart C. The consulting engineer, attorney, and USDA Rural Development will assist with this requirement.

B. The consulting engineer will prepare construction contract documents and specifications using RUS Instruction 1780, Subpart C, and State supplements.

C. After the final plans and specifications have been approved in writing by the Texas Commission on Environmental Quality (TCEQ), formerly known as TNRCC, and the USDA Rural Development engineer, and closing instructions have been issued by the Office of General Counsel, construction bids may be received. USDA Rural Development must be represented at all bid openings and negotiations.

D. Bids should not be received on any contract unless the contract can be awarded within sixty days.

E. When bids have been received and it is determined that construction can be completed within the funds available, the successful bidder(s) must be advised that loan funds cannot be made available until all requirements of the closing instructions have been met. The contract will be awarded to the lowest responsive and responsible bidder unless approved by the USDA Rural Development State Office.

F. Executed contracts and bonds are to be approved in writing by USDA Rural Development before any construction is started.

G. In accordance with RUS Instruction 1780, Section 1780.76 (h), any changes in construction, addition and/or deletion will be made only on written change order, Form RD 1924-7, "Contract Change Order." Approval by the authorized Green Valley Special Utility District official(s), contractor, USDA Rural Development

engineer, or USDA Rural Development official is required before any work is done. If any facility design or proposed construction activities deviate from those contained in the approved environmental documents, the Green Valley Special Utility District may be required to undertake additional environmental review activities.

H. An authorized representative of the Green Valley Special Utility District will monitor and provide a report to USDA Rural Development on actual performance during construction. Full time inspection is required for all construction. A resume of qualifications of the resident inspector must be submitted for USDA Rural Development's acceptance. Daily inspection reports will be prepared in accordance with RUS Instruction 1780, Section 1780.76 (d). All estimates for payments to contractors may be made on Form RD 1924-18, "Partial Payment Estimate," prepared and certified by the consulting engineer, certified by the contractor, and approved by the appropriate Green Valley Special Utility District official(s) and USDA Rural Development.

I. The contracts must contain a clause which states "if cultural materials are encountered during construction, work will cease in the immediate area and the Texas State Historic Preservation Officer (SHPO) and USDA Rural Development State Environmental Coordinator (SEC) will be contacted. Work will not resume in the affected area until authorized by the SHPO and SEC."

J. The Green Valley Special Utility District must enact a binding resolution or covenant to prohibit service to structures proposed to be built in floodplains.

Such covenant or resolution must be in place prior to USDA Rural Development's approval of final plans and specifications. Along with a copy of the resolution or covenant, satisfactory evidence must be submitted to RUS that the covenant or resolution is fully enforceable and has been adopted in a manner consistent with all applicable State and local requirements.

K. The Green Valley Special Utility District and the consulting engineer shall insure that all requirements of the U.S. Army Corps of Engineers (USACE) "Nationwide Permit 12" are complied with during the construction of the proposed waterline and appurtenances. This shall include the TCEQ Nationwide Permit Water Quality Certification Conditions. The construction plans, specifications and contract documents shall include all applicable provisions of "Nationwide Permit 12"and TNRCC permit conditions. Upon completion of the proposed improvements, the Green Valley Special Utility District must sign and submit the required certification to USDA Rural Development and USACE that the work, including any required mitigation, was completed in compliance with the "Nationwide Permit 12."

L. To mitigate potential development in wetlands, the Green Valley Special Utility District must enact a binding resolution or covenant in order to prohibit service to areas where wetlands exist without verification that the proper USACE, Section 404

permits have been obtained. Such covenant or resolution must be in place prior to USDA Rural Development's approval of final plans and specifications. Along with a copy of the resolution or covenant, the Green Valley Special Utility District must provide evidence satisfactory to USDA Rural Development that the covenant or resolution is fully enforceable and has been adopted in a manner consistent with all applicable State and local requirements.

11. RESTRICTION ON LOBBYING

A. Federal law requires that each recipient who requests or receives a Federal contract, grant, loan, or a Federal commitment to guarantee a loan disclose the expenditure of any funds for lobbying activities. RD Instruction 1940-Q, Exhibit A-1, "Certification for Contracts, Grants, and Loans" must be executed prior to loan and/or grant approval if the loan request exceeds $150,000 and/or the grant request exceeds $100,000.

B. Any person who requests or receives a contract, subcontract, or subgrant (consulting engineers, construction contractors, etc.) in excess of $100,000 must complete RD Instruction 1940-Q, Exhibit A-1 "Certification for Contracts, Grants, and Loans".

C. Standard Form (SF) LLL, "Disclosure of Lobbying Activities," will be completed by any recipient requesting or receiving a USDA Rural Development contract where the grant exceeds $100,000, or loan exceeds $150,000, and has made or has agreed to make any payment using funds other than appropriated funds to influence or attempt to influence a decision in connection with this specific award.

12. PUBLIC INFORMATION REQUIREMENTS

The general public must be informed regarding the development of this project. A public meeting must be held prior to loan approval to give the citizenry an opportunity to become acquainted with the project and to comment on such items as economic and environmental impact, service area, and alternatives to the project. At least ten (10) days prior to the meeting, the Green Valley Special Utility District will be required to publish a notice of the meeting in a newspaper of general circulation in the service area, to post a public notice at the applicant's principal office, and to notify USDA Rural Development. A copy of the published notice and minutes of the public meeting must be provided to USDA Rural Development.

Closing instructions issued by the Office of General Counsel must be complied with.

Attached please find three additional copies of this letter and attachments. One copy should be furnished to the consulting engineer, to the attorney, and to the bond counsel. I want to meet with the governing board, the consulting engineer, attorney, and bond counsel so that we may discuss the contents of this letter.

Please complete and return the attached Form RD 1942-46, "Letter of Intent To Meet Conditions," if the Green Valley Special Utility District desires that further consideration be given to this funding request.

If the conditions set forth in this letter are not met within 90 days from the date hereof, USDA Rural Development reserves the right to discontinue the processing of this application.

Sincerely,

FOR: RICHARD G. GRAMS
Rural Development Manager
USDA Rural Development, Seguin, Texas

Attachments

REQUIRED PROVISION --- REV. 6-10-02

SECTION ___.

LOAN PROGRAM REQUIREMENTS AND DOCUMENTS TO CONTROL

Section _____. Definitions.

For the purposes of this Section, the following acronyms and terms shall be defined as follows:

(a) *RUS*: The Rural Utilities Service, an agency of the United States of America within the United States Department of Agriculture, and any successor agency thereof.

(b) *FmHA*: The Farmers Home Administration, a former agency of the United States of America within the United States Department of Agriculture and its successor agency, the RUS.

(c) *Loan*: The loan in the amount of $_____ from the [Purchaser] to the [Town][City][County][Borrower], which has been authorized under 7 U.S.C. § 1926, and which is represented by the [Purchaser's] purchase of the [Certificates][bonds].

(d) *Agency rules*: The statutes, rules, regulations and policies of the former FmHA or of the RUS, in effect on the date hereof, which pertain to or which are applicable to the loan and such future statutes, rules, regulations and policies which are not inconsistent with the express provisions hereof.

(e) *Loan document provisions*: The terms, conditions, requirements and provisions of the loan instruments and loan documents, including but not limited to, loan resolutions, security agreements, assurance agreements, certifications, and equal opportunity agreements, which were signed by the _____[borrower] for the benefit of the United States of America and/or of the RUS, and for the purpose of obtaining the loan.

Section ____. Provision for Debt [use for a city or county borrower and where the debt is secured in whole or in part by taxes]

To the extent that the loan document provisions and/or the agency rules create a "debt" of the _____[borrower] (within the meaning of § 7 of Article 11 of the Texas Constitution), the governing body of _____ [borrower] shall compute and ascertain the rate and amount of ad valorem tax, based upon the latest approved tax rolls of said [town][city][county], with full allowances being made for tax delinquencies and costs of collection, which will be sufficient to raise and produce the money required to pay any sums which may be or become due during any such year on account of said "debt", in no instance to be less than two (2%) per cent of such obligation, together with all interest thereon. Said rate and amount of ad valorem tax is hereby ordered to be levied and is hereby levied against all taxable property in said [town][city][county] for each year which any liability exists by reason of the "debt" incurred, and said ad valorem tax shall be assessed and collected each such year until all of the "debt" incurred shall have been

discharged.

[*Alternative debt provision* - Bond counsel may propose their own standard "debt" provision to be reviewed and approved by the agency. This provision, once approved by RUS, will then be used in all future ordinances or orders drafted by that bond counsel.]

Section _____. Compliance with Agency Rules

(a) To the extent permitted by State law and if such law is not otherwise preempted by federal statute, regulation or rule, the _____[borrower] shall comply with all agency rules and loan document provisions.

(b) Notwithstanding any other term, condition, requirement or provision contained in this [Ordinance] [Order], the agency rules and loan document provisions shall, to the extent permitted by State law and if such law is not otherwise preempted by federal statute, regulation or rule, control to the extent of any conflict between the [Ordinance] [Order] and such agency rules or such loan document provisions.

Section _____. Interest Accrual.

Notwithstanding any other term, condition, requirement or provision contained in this [Ordinance] [Order], interest on a [Certificate] [bond] shall continue to accrue and be payable to the United States of America so long as the [Certificate] [bond] remains unpaid and outstanding. Interest will not cease to accrue for any reason (including the establishment of a redemption date or prepayment date) until the date when payment in full has been received at the agency office designated to receive payments. For the purpose of determining "the date when payment in full has been received at the agency office designated to receive payments," such date shall be:

1. when payment is made by hand delivery, the date when such payment has been physically delivered into the possession of such agency at the address given to the Issuer;

2. when payment is made by first class mail, the third day following Issuer's mailing of the payment, postage prepaid, using the U.S. Postal Service and Issuer's receipt of written proof of the mailing from the U.S. Postal Service identifying the date of mailing;

3. when payment is made by overnight delivery, the first day following Issuer's sending of the payment, using the U.S. Postal Service or another delivery service, such as Federal Express, and Issuer's receipt of written proof of sending from the delivery service identifying the date of sending;

4. when payment is made by electronic transfer of funds, the date that the electronic transfer of funds for the payment is completed; or

5. when payment is made by preauthorized electronic debit or draft, the date that the electronic debit or draft for the payment is paid.

Section _____. Redemption or Prepayment.

Notwithstanding any other term, condition, requirement or provision contained in this [Ordinance] [Order], redemption or prepayment of a [Certificate] [bond] may occur without presentation or presentment of the [Certificate] [bond].

Section _____. Limitation on Application of this Section.

(a) The provisions of this section shall be operative only for so long as any of the [Certificates] [bonds] issued under this [Ordinance] [Order] are owned or held by: (1) the United States of America; or (2) any agency thereof.

(b) The provisions of this section shall not be used to or shall not be construed so as to allow the [Ordinance] [Order] to violate any applicable provision of Texas law to the extent that such law is not otherwise preempted by applicable federal statute, regulation or rule.

SECTION ____.

CHAPTER 9, BUSINESS AND COMMERCE CODE REQUIREMENTS

Chapter 1208, Government Code, applies to the issuance of the [bonds/notes/certificates of obligation] and the pledge of the [taxes/revenues/combination thereof] granted by the Issuer under Section ____ of this [resolution/ordinance/order], and such pledge is therefore valid, effective, and perfected. If Texas law is amended at any time while the [bonds/notes/certificates of obligation] are outstanding and unpaid such that the pledge of the [taxes/revenues/combination thereof] granted by the Issuer under Section ____ of this [resolution/ordinance/order] is to be subject to the filing requirements of Chapter 9, Business & Commerce Code, then in order to preserve to the registered owners of the [bonds/notes/certificates of obligation] the perfection of the security interest in said pledge, the Issuer agrees to take such measures as it determines are reasonable and necessary under Texas law to comply with the applicable provisions of Chapter 9, Business & Commerce Code and enable a filing to perfect the security interest in said pledge to occur.

List of Approved "Debt" Provisions

1. Mark Mendel, Kemp, Smith, Duncan & Hammond, P.C., El Paso, Texas --

> To provide for the payment of any other legally incurred obligations of the [Town][City][County] with respect to the United States under the Agency rules or Loan Document Provisions, there is hereby levied for the current year and each succeeding year thereafter while the [Certificates] [Bonds] or interest thereon or any such other legally incurred obligations remain outstanding and unpaid, a tax on the taxable property in the [Town][City][County] that is sufficient to pay such other legally incurred obligations, within the limits prescribed by law, full allowance being made for delinquencies and costs of collection. The tax, if any, levied by this Section [9.3(c)] shall be assessed and collected each year and retained by the [Town][City][County] for application to the payment of such other legally incurred obligations, and such tax shall not be diverted to any other purpose.

[NOTE: The words appearing within brackets may vary or change from one ordinance or order to another depending upon the type of borrower and the terms used in the ordinance or order.]

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. 028726 STC-D

JOANN F. MURPHEY, ET AL -TO- GREEN VALLEY SPECIAL UTILITY DISTRICT

CORRECTION
WARRANTY DEED

DATE: December 19, 2014

GRANTOR: JOANN F. MURPHEY, joined pro forma by her husband, JERRY MURPHEY; and JAMES W. TURK A/K/A JAMES TURK, Independent Executor of the Estate of Claudette B. Turk (a/k/a Claudette Blumberg Turk and Claudette June Turk), Deceased, and joining pro forma as her husband

GRANTOR'S MAILING ADDRESS: 606 Springvale, San Antonio, Texas 78227 (Bexar County)

GRANTEE: GREEN VALLEY SPECIAL UTILITY DISTRICT

GRANTEE'S MAILING ADDRESS: P. O. Box 99, Marion, Texas 78124-0099 (Guadalupe County)

CONSIDERATION: Cash and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged

PROPERTY (including any improvements): All that certain tract or parcel of land containing 19.311 acres of land out of the Guadalupe Torres Survey, Abstract No. 313, Guadalupe County, Texas, and being more fully described by metes and bounds in Exhibit "A" attached.

The Property is conveyed in its present condition, with any defects, and without warranties except warranties of title and warranties in the contract between the parties, if any.

RESERVATIONS FROM CONVEYANCE: For Grantor and Grantor's heirs, successors, and assigns forever, a reservation of an undivided 50% of all oil, gas and other minerals owned by Grantor in and under and that may be produced from the Property.

Grantor waives the right of ingress and egress to and from the surface of the Property relating to the portion of the mineral estate owned by Grantor.

Nothing herein, however, restricts or prohibits the pooling or unitization of the portion of the mineral estate owned by Grantor with land other than the Property; or the exploration or production of the oil, gas, and other minerals by means of wells that are drilled or mines that open on land other than the Property but enter or bottom under the Property, provided that these operations in no manner interfere with the surface or subsurface support of any improvements constructed or to be constructed on the Property.

EXCEPTIONS TO CONVEYANCE AND WARRANTY: Validly existing easements, and rights-of-way, of record or not; all presently recorded and validly existing restrictions, reservations, covenants, conditions, oil and gas leases, mineral interests, that affect the Property; validly existing rights of adjoining owners in any walls and fences situated on a common boundary; any discrepancies, conflicts, or shortages in area or boundary lines; any encroachments or overlapping of improvements; and taxes for 2014, the payment of which Grantee assumes.

Grantor, for the Consideration and subject to the Reservations from Conveyance and the Exceptions to Conveyance and Warranty, grants, sells, and conveys to Grantee the Property, together with all and singular the rights and appurtenances thereto in any way belonging, to have and to hold it to Grantee and Grantee's heirs, successors, and assigns forever. Grantor binds Grantor and Grantor's heirs and successors to warrant and forever defend all and singular the Property to Grantee and Grantee's heirs, successors, and assigns against every person whomsoever lawfully claiming or to claim the same or any part thereof, except as to the Reservations from Conveyance and the Exceptions to Conveyance and Warranty.

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

This Correction Warranty Deed is made in place of and to correct a Warranty Deed from Joann F. Murphey, joined pro forma by her husband, Jerry Murphey, and Claudette June Turk, joined pro forma by her husband, James Turk, to Green Valley Special Utility District, dated December 19, 2014, and recorded in Document Number 2014023215 of the Official Public Records of Guadalupe County, Texas. By mistake that Warranty Deed inadvertently conveyed the property as 65.00 acres of land in Guadalupe Torres Survey, A-313, Guadalupe County, Texas, when in truth and fact the property being conveyed is a 19.311 acre tract and a 45.689 acre tract, Guadalupe Torres Survey, A-313, Guadalupe County, Texas, and each tract was to be conveyed by a separate deed to the Grantee. This Correction Warranty Deed, conveying the 19.311 acre tract, is made by Grantors and accepted by Grantee to correct that mistake, is effective on December 19, 2014, the date of the original Warranty Deed, and in all other respects confirms the former Warranty Deed. Another correction deed is being executed concurrently to convey the 45.689 acre tract from Grantor to Grantee.

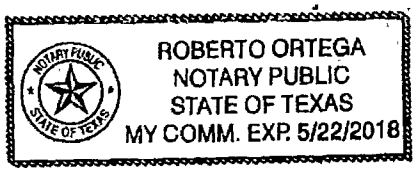
JOANN F. MURPHEY

JERRY MURPHEY

THE STATE OF TEXAS

COUNTY OF Bexar

This instrument was acknowledged before me on the 10 day of November, 2015, by JOANN F. MURPHEY.

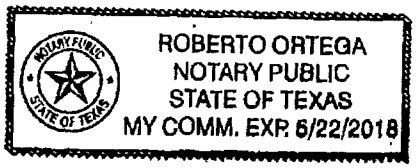


Notary Public, State of Texas
Notary Name: Roberto Ortega

THE STATE OF TEXAS

COUNTY OF Bexar

This instrument was acknowledged before me on the 10 day of November, 2015, by JERRY MURPHEY.



Notary Public, State of Texas
Notary Name: Roberto Ortega

James W. Turk

A/K/A James Turk

JAMES W. TURK A/K/A JAMES TURK, Independent Executor of the Estate of Claudette B. Turk (a/k/a Claudette Blumberg Turk and Claudette June Turk), Deceased, and

James W. Turk

A/K/A James Turk

JAMES W. TURK A/K/A JAMES TURK

THE STATE OF TEXAS

COUNTY OF DALLAS

This instrument was acknowledged before me on the 10 day of NOVEMBER, 2015, by JAMES W. TURK A/K/A JAMES TURK, individually and as Independent Executor of the Estate of Claudette B. Turk (a/k/a Claudette Blumberg Turk and Claudette June Turk), Deceased.

L. Henry Atterman

Notary Public, State of Texas

Notary Name: L. Henry Atterman

L. HENRY ALTERMAN
Notary Public State of Texas
My Commission Expires
October 21, 2019

ACCEPTANCE BY GRANTEE:

GREEN VALLEY SPECIAL UTILITY DISTRICT

By: _____
PAT ALLEN,
General Manager

TRACY S. RAPPMUND
Notary Public, State of Texas
My Commission Expires
March 17, 2016

THE STATE OF TEXAS

COUNTY OF GUADALUPE

This instrument was acknowledged before me on the 17th day of November 2015, by PAT ALLEN, General Manager of GREEN VALLEY SPECIAL UTILITY DISTRICT, on behalf of GREEN VALLEY SPECIAL UTILITY DISTRICT.

_____
Notary Public, State of Texas
Notary Name: Tracy S. Rappmund

River City Engineering
1011 W. County Line Road * NEW BRAUNFELS, TX. 78130
PHONE (830) 625-0337 FAX (830) 625-0858
dlamberts@rcetx.com
Firm Registration #10193949

All that certain tract or parcel of land containing 19.311 acres of land out of the Guadalupe Torres Survey, Abstract No. 313, Guadalupe County, Texas, being the same land as that certain called 20 acre parcel described in Volume 2821, Page 423 of the Official Records of Guadalupe County, Texas, further being a portion of that certain 65.000 acre parcel of land described in Document No. 2014023215 of said Official Records; Said 19.311 acre parcel being more particularly described by metes and bounds as follows:

BEGINNING at a ½ inch rebar found on the southwesterly right-of-way line of Linne Road for the most easterly corner and POINT OF BEGINNING of this parcel, same being the most easterly corner of said 65.000 acre parcel and the most northerly corner of that certain called 59.95 acre parcel described in Volume 3003, Page 362 of said Official Records;

THENCE departing said right-of-way line and with the common line of this parcel with a portion of said 59.95 acre parcel, South 59 deg 40' 23" West, a distance of 1503.91 feet (called South 61 deg 41' 13" West, 1503.91 feet) to a created point for the most southerly corner of this parcel, same being the most easterly corner of that certain called 20 acre parcel described in Volume 3051, Page 561 of said Official Records;

THENCE with the common line of this parcel with said 20 acre parcel described in Volume 3051, Page 561, North 30 deg 07' 53" West, a distance of 575.96 feet to a ½ inch rebar found for the most westerly corner of this parcel, same being the most northerly corner of said 20 acre parcel and being located on the southeasterly line of that certain called 116 acre tract of land described in Volume 2821, Page 426 of said Official Records;

THENCE with the common line of said 20 acre parcel with said 116 acre tract, North 59 deg 32' 28" East, a distance of 1377.68 feet to a created point on the aforementioned right-of-way of Linne Road for the most northerly corner of this parcel, same being the most easterly corner of said 116 acre tract;

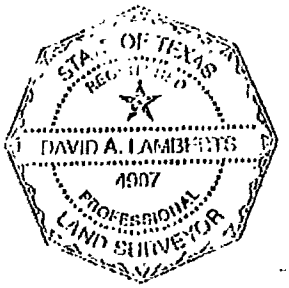
THENCE with said right-of-way line, the following three (3) courses:

1). South 48 deg 51' 21" East, a distance of 206.14 feet (called South 49 deg 00' East) to a concrete monument found;

2). South 40 deg 59' 25" East, a distance of 320.00 feet (called South 41 deg 56' East, 320.0 feet) to a ½ inch rebar set (capped "RPLS 4907");

EXHIBIT "A"

3). South 29 deg 57' 11" East, a distance of 69.21 feet (called South 30 deg 00' East, 70.4 feet) to the POINT OF BEGINNING and containing 19.311 acres of land with all bearings called for herein based of the Texas Coordinate System as established from the North American Datum 0f 1983 (CORS96) for the South Central Zone.



David A. Lamberts R.P.L.S. No. 4907
J.O. No. 6096-104-2 (DRAWING PREPARED)

2015023858
FILED AND RECORDED
OFFICIAL PUBLIC RECORDS
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PAGES: 7
TERESA KIEL, COUNTY CLERK
GUADALUPE COUNTY, TEXAS

Teresa Kiel

→ STC

EXHIBIT "A"

GVSUD 100438

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. 028726 STC-DR

JOANN F. MURPHEY, ET AL -TO- GREEN VALLEY SPECIAL UTILITY DISTRICT

CORRECTION
WARRANTY DEED

DATE: December 19, 2014

GRANTOR: JOANN F. MURPHEY, joined pro forma by her husband, JERRY MURPHEY; and JAMES W. TURK A/K/A JAMES TURK, Independent Executor of the Estate of Claudette B. Turk (a/k/a Claudette Blumberg Turk and Claudette June Turk), Deceased, and joining pro forma as her husband

GRANTOR'S MAILING ADDRESS: 606 Springvale, San Antonio, Texas 78227 (Bexar County)

GRANTEE: GREEN VALLEY SPECIAL UTILITY DISTRICT

GRANTEE'S MAILING ADDRESS: P. O. Box 99, Marion, Texas 78124-0099 (Guadalupe County)

CONSIDERATION: Cash and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged

PROPERTY (including any improvements): All that certain tract or parcel of land containing 45.689 acres of land out of the Guadalupe Torres Survey, Abstract No. 313, Guadalupe County, Texas, and being more fully described by metes and bounds in Exhibit "A" attached.

The Property is conveyed in its present condition, with any defects, and without warranties except warranties of title and warranties in the contract between the parties, if any.

RESERVATIONS FROM CONVEYANCE: For Grantor and Grantor's heirs, successors, and assigns forever, a reservation of an undivided 50% of all oil, gas and other minerals owned by Grantor in and under and that may be produced from the Property.

Grantor waives the right of ingress and egress to and from the surface of the Property relating to the portion of the mineral estate owned by Grantor.

Nothing herein, however, restricts or prohibits the pooling or unitization of the portion of the mineral estate owned by Grantor with land other than the Property; or the exploration or production of the oil, gas, and other minerals by means of wells that are drilled or mines that open on land other than the Property but enter or bottom under the Property, provided that these operations in no manner interfere with the surface or subsurface support of any improvements constructed or to be constructed on the Property.

EXCEPTIONS TO CONVEYANCE AND WARRANTY: Validly existing easements, and rights-of-way, of record or not; all presently recorded and validly existing restrictions, reservations, covenants, conditions, oil and gas leases, mineral interests, that affect the Property; validly existing rights of adjoining owners in any walls and fences situated on a common boundary; any discrepancies, conflicts, or shortages in area or boundary lines; any encroachments or overlapping of improvements; and taxes for 2014, the payment of which Grantee assumes.

Grantor, for the Consideration and subject to the Reservations from Conveyance and the Exceptions to Conveyance and Warranty, grants, sells, and conveys to Grantee the Property, together with all and singular the rights and appurtenances thereto in any way belonging, to have and to hold it to Grantee and Grantee's heirs, successors, and assigns forever. Grantor binds Grantor and Grantor's heirs and successors to warrant and forever defend all and singular the Property to Grantee and Grantee's heirs, successors, and assigns against every person whomsoever lawfully claiming or to claim the same or any part thereof, except as to the Reservations from Conveyance and the Exceptions to Conveyance and Warranty.

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

This Correction Warranty Deed is made in place of and to correct a Warranty Deed from Joann F. Murphey, joined pro forma by her husband, Jerry Murphey, and Claudette June Turk, joined pro forma by her husband, James Turk, to Green Valley Special Utility District, dated December 19, 2014, and recorded in Document Number 2014023215 of the Official Public Records of Guadalupe County, Texas. By mistake that Warranty Deed inadvertently conveyed the property as 65.00 acres of land in Guadalupe Torres Survey, A-313, Guadalupe County, Texas, when in truth and fact the property being conveyed is a 19.311 acre tract and a 45.689 acre tract, Guadalupe Torres Survey, A-313, Guadalupe County, Texas, and each tract was to be conveyed by a separate deed to the Grantee. This Correction Warranty Deed, conveying the 45.689 acre tract, is made by Grantors and accepted by Grantee to correct that mistake, is effective on December 19, 2014, the date of the original Warranty Deed, and in all other respects confirms the former Warranty Deed. Another correction deed is being executed concurrently to convey the 19.311 acre tract from Grantor to Grantee.

JOANN F. MURPHEY

JERRY MURPHEY

THE STATE OF TEXAS

COUNTY OF Bexar

This instrument was acknowledged before me on the 10 day of November, 2015, by JOANN F. MURPHEY.

ROBERTO ORTEGA
NOTARY PUBLIC
STATE OF TEXAS
MY COMM. EXP. 5/22/2018

Notary Public, State of Texas
Name: Roberto Ortega

THE STATE OF TEXAS

COUNTY OF Bexar

This instrument was acknowledged before me on the 10 day of November, 2015, by JERRY MURPHEY.

ROBERTO ORTEGA
NOTARY PUBLIC
STATE OF TEXAS
MY COMM. EXP. 5/22/2018

Notary Public, State of Texas
Name: Roberto Ortega

James W Turk
A/K/A James Turk
JAMES W. TURK A/K/A JAMES TURK, Independent Executor of the Estate of Claudette B. Turk (a/k/a Claudette Blumberg Turk and Claudette June Turk), Deceased, and

James W. Turk
A/K/A James Turk
JAMES W. TURK A/K/A JAMES TURK

THE STATE OF TEXAS

COUNTY OF DALLAS

This instrument was acknowledged before me on the 10 day of NOVEMBER, 2015, by JAMES W. TURK A/K/A JAMES TURK, individually and as Independent Executor of the Estate of Claudette B. Turk (a/k/a Claudette Blumberg Turk and Claudette June Turk), Deceased.

L. HENRY ALTERMAN
Notary Public, State of Texas
My Commission Expires
October 21, 2019

L. Henry Alterman
Notary Public, State of Texas
Notary Name: L. Henry Alterman

ACCEPTANCE BY GRANTEE:

GREEN VALLEY SPECIAL UTILITY DISTRICT

By: _____
PAT ALLEN,
General Manager

TRACY S. RAPPMUND
Notary Public, State of Texas
My Commission Expires
March 17, 2016

THE STATE OF TEXAS

COUNTY OF GUADALUPE

This instrument was acknowledged before me on the 17th day of November, 2015, by PAT ALLEN, General Manager of GREEN VALLEY SPECIAL UTILITY DISTRICT, on behalf of GREEN VALLEY SPECIAL UTILITY DISTRICT.

Tracy S. Rappmund
Notary Public, State of Texas
Notary Name: Tracy S. Rappmund

River City Engineering
1011 W. County Line Road * NEW BRAUNFELS, TX. 78130
PHONE (830) 625-0337 FAX (830) 625-0858
dlamberts@rcetx.com
Firm Registration #10193949

All that certain tract or parcel of land containing 45.689 acres of land out of the Guadalupe Torres Survey, Abstract No. 313, Guadalupe County, Texas, being all of that certain called 20 acre parcel described in Volume 3051, Page 561 and a portion of that certain called 116 acre tract described in Volume 2821, Page 426, all of the Official Records of Guadalupe County, Texas, further being out of that certain 65.000 acre parcel of land described in Document No. 2014023215 of said Official Records; Said 45.689 acre parcel being more particularly described by metes and bounds as follows:

BEGINNING at a created point on the southwesterly right-of-way line of Linne Road for the most easterly corner and POINT OF BEGINNING of this parcel, same being the most easterly corner of said 116 acre tract and the most northerly corner of that certain called 20 acre parcel described in Volume 2821, Page 423 of said Official Records;

THENCE departing said right-of-way line and with the common line of said 116 acre tract with said 20 acre parcel described in Volume 2821, Page 423, South 59 deg 32' 28" West, a distance of 1377.68 feet to a 1/2 inch rebar found for the most westerly corner of said 20 acre parcel, same being the most northerly corner of said 20 acre parcel described in Volume 3051, Page 561 and an interior corner of this parcel;

THENCE with the common line of said 20 acre parcel described in Volume 2821, Page 423 with said 20 acre parcel described in Volume 3051, Page 561, South 30 deg 07' 53" East, a distance of 575.96 feet to a created point for the most southerly corner of said 20 acre parcel described in Volume 2821, Page 423, same being the most easterly corner of said 20 acre parcel described in Volume 3051, page 561 and being located in the northwesterly line of that certain called 59.95 acre parcel described in Volume 3003, page 362 of said Official Records;

THENCE with the common line of this parcel with said 59.95 acre parcel, South 59 deg 40' 23" West, a distance of 810.13 feet to a ½ inch rebar found for angle, said being the most northerly corner of that certain called 12.166 acre parcel described in Volume 1035, Page 601 of said Official Records;

THENCE with the common line of this parcel with said 12.166 acre parcel, South 59 deg 37' 01" West, a distance of 690.11 feet (called South 60 deg 38' 19" West) to a ½ inch rebar found for the most southerly corner of this parcel, same being the most southerly corner of said 20 acre parcel and the most easterly corner of that certain called 72.204 acre parcel described in Volume 1347, Page 601 of said Official Records;

EXHIBIT "A"

THENCE with the common line of said 20 acre parcel with said 72.204 acre parcel, North 30 deg 25' 55" West, a distance of 569.05 feet (called North 30 deg 00" West, 579 feet) to a ½ inch rebar found for an exterior corner of this parcel, same being the most westerly corner of said 20 acre parcel, the most northerly corner of said 72.204 acre parcel and lying in the southeasterly line of the aforementioned 116 acre tract;

THENCE with the common line of said 20 acre parcel with said 116 acre tract, North 59 deg 20' 58" East, a distance of 670.68 feet to a ½ inch rebar set (capped "RPLS 4907") for an interior corner of this parcel;

THENCE severing said 116 acre tract, North 30 deg 25' 55" West, a distance of 575.36 feet to a ½ inch rebar set (capped "RPLS 4907") on the common line of said 116 acre tract with that certain called 22.7 acre parcel described in Volume 387, Page 121 of the Deed Records of Guadalupe County, Texas for the most westerly corner of this parcel;

THENCE with the common line of said 116 acre tract with said 22.7 acre parcel, North 59 deg 22' 16" East, a distance of 1816.08 feet (called North 59 deg 39' East) to a ½ inch rebar set (capped "RPLS 4907") on the aforementioned right-of-way of Linne Road for the most northerly corner of this parcel, same being the most northerly corner of said 116 acre tract and the most easterly corner of said 22.7 acre parcel;

THENCE with said right-of-way line, the following six (6) courses:

1). South 68 deg 25' 55" East, a distance of 118.68 feet (called South 68 deg 31' East, 118.0 feet) to a concrete monument found;

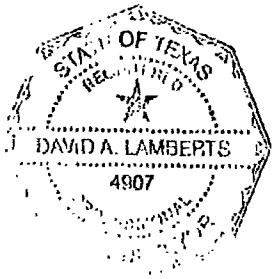
2). South 23 deg 37' 03" East, a distance of 153.65 feet (called South 23 deg 31' East, 155.0 feet) to a concrete monument found;

3). South 44 deg 15' 15" East, a distance of 133.94 feet (called South 44 deg 06' East, 134.5 feet) to a concrete monument found;

4). North 78 deg 44' 56" East, a distance of 203.51 feet (called North 78 deg 30' East, 204.0 feet) to a concrete monument found;

5). North 89 deg 46' 53" East, a distance of 100.44 feet (called North 90 deg 00' East, 100.0 feet) to a concrete monument found;

6). South 48 deg 51' 21" East, a distance of 89.73 feet (called South 49 deg 00' East) to the POINT OF BEGINNING and containing 45.689 acres of land with all bearings called for herein based of the Texas Coordinate System as established from the North American Datum 0f 1983 (CORS96) for the South Central Zone.



David A. Lamberts R.P.L.S. No. 4907
J.O. No. 6096-104-3 (DRAWING PREPARED)
EXHIBIT "A"

This page has been added by the Guadalupe County Clerk's office to comply with the statutory requirement that the recording information shall be placed at the foot of the record.

-> Seguin Title

2015023857
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OFFICIAL PUBLIC RECORDS
11/20/2015 3:41:23 PM
PAGES: 8
TERESA KIEL, COUNTY CLERK
GUADALUPE COUNTY, TEXAS

Teresa Kiel

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. 028726 STC--DR

JOANN F. MURPHEY, ET AL -TO- GREEN VALLEY SPECIAL UTILITY DISTRICT

CORRECTION
WARRANTY DEED

DATE: December 19, 2014

GRANTOR: JOANN F. MURPHEY, joined pro forma by her husband, JERRY MURPHEY; and JAMES W. TURK A/K/A JAMES TURK, Independent Executor of the Estate of Claudette B. Turk (a/k/a Claudette Blumberg Turk and Claudette June Turk), Deceased, and joining pro forma as her husband

GRANTOR'S MAILING ADDRESS: 606 Springvale, San Antonio, Texas 78227 (Bexar County)

GRANTEE: GREEN VALLEY SPECIAL UTILITY DISTRICT

GRANTEE'S MAILING ADDRESS: P. O. Box 99, Marion, Texas 78124-0099 (Guadalupe County)

CONSIDERATION: Cash and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged

PROPERTY (including any improvements): All that certain tract or parcel of land containing 45.689 acres of land out of the Guadalupe Torres Survey, Abstract No. 313, Guadalupe County, Texas, and being more fully described by metes and bounds in Exhibit "A" attached.

The Property is conveyed in its present condition, with any defects, and without warranties except warranties of title and warranties in the contract between the parties, if any.

RESERVATIONS FROM CONVEYANCE: For Grantor and Grantor's heirs, successors, and assigns forever, a reservation of an undivided 50% of all oil, gas and other minerals owned by Grantor in and under and that may be produced from the Property.

Grantor waives the right of ingress and egress to and from the surface of the Property relating to the portion of the mineral estate owned by Grantor.

Nothing herein, however, restricts or prohibits the pooling or unitization of the portion of the mineral estate owned by Grantor with land other than the Property; or the exploration or production of the oil, gas, and other minerals by means of wells that are drilled or mines that open on land other than the Property but enter or bottom under the Property, provided that these operations in no manner interfere with the surface or subsurface support of any improvements constructed or to be constructed on the Property.

EXCEPTIONS TO CONVEYANCE AND WARRANTY: Validly existing easements, and rights-of-way, of record or not; all presently recorded and validly existing restrictions, reservations, covenants, conditions, oil and gas leases, mineral interests, that affect the Property; validly existing rights of adjoining owners in any walls and fences situated on a common boundary; any discrepancies, conflicts, or shortages in area or boundary lines; any encroachments or overlapping of improvements; and taxes for 2014, the payment of which Grantee assumes.

Grantor, for the Consideration and subject to the Reservations from Conveyance and the Exceptions to Conveyance and Warranty, grants, sells, and conveys to Grantee the Property, together with all and singular the rights and appurtenances thereto in any way belonging, to have and to hold it to Grantee and Grantee's heirs, successors, and assigns forever. Grantor binds Grantor and Grantor's heirs and successors to warrant and forever defend all and singular the Property to Grantee and Grantee's heirs, successors, and assigns against every person whomsoever lawfully claiming or to claim the same or any part thereof, except as to the Reservations from Conveyance and the Exceptions to Conveyance and Warranty.

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

This Correction Warranty Deed is made in place of and to correct a Warranty Deed from Joann F. Murphey, joined pro forma by her husband, Jerry Murphey, and Claudette June Turk, joined pro forma by her husband, James Turk, to Green Valley Special Utility District, dated December 19, 2014, and recorded in Document Number 2014023215 of the Official Public Records of Guadalupe County, Texas. By mistake that Warranty Deed inadvertently conveyed the property as 65.00 acres of land in Guadalupe Torres Survey, A-313, Guadalupe County, Texas, when in truth and fact the property being conveyed is a 19.311 acre tract and a 45.689 acre tract, Guadalupe Torres Survey, A-313, Guadalupe County, Texas, and each tract was to be conveyed by a separate deed to the Grantee. This Correction Warranty Deed, conveying the 45.689 acre tract, is made by Grantors and accepted by Grantee to correct that mistake, is effective on December 19, 2014, the date of the original Warranty Deed, and in all other respects confirms the former Warranty Deed. Another correction deed is being executed concurrently to convey the 19.311 acre tract from Grantor to Grantee.

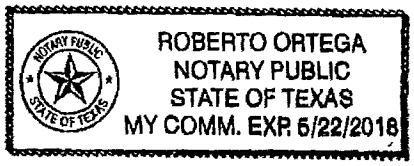
JOANN F. MURPHEY

JERRY MURPHEY

THE STATE OF TEXAS

COUNTY OF Bexar

This instrument was acknowledged before me on the 10 day of November, 2015, by JOANN F. MURPHEY.



Notary Public, State of Texas
Name: Roberto Ortega

THE STATE OF TEXAS

COUNTY OF Bexar

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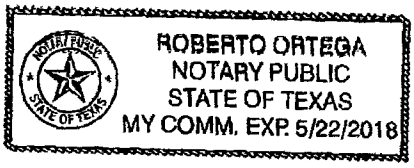


Notary Public, State of Texas
Name: Roberto Ortega

James W. Turk
A/K/A James Turk

JAMES W. TURK A/K/A JAMES TURK, Independent Executor of the Estate of Claudette B. Turk (a/k/a Claudette Blumberg Turk and Claudette June Turk), Deceased, and

James W. Turk
A/K/A James Turk

JAMES W. TURK A/K/A JAMES TURK

THE STATE OF TEXAS

COUNTY OF DALLAS

This instrument was acknowledged before me on the 10 day of NOVEMBER, 2015, by JAMES W. TURK A/K/A JAMES TURK, individually and as Independent Executor of the Estate of Claudette B. Turk (a/k/a Claudette Blumberg Turk and Claudette June Turk), Deceased.

L. HENRY ALTERMAN
Notary Public, State of Texas
My Commission Expires
October 21, 2019

L. Henry Alterman
Notary Public, State of Texas
Notary Name: L. Henry Alterman

ACCEPTANCE BY GRANTEE:

GREEN VALLEY SPECIAL UTILITY DISTRICT

By: _____
PAT ALLEN,
General Manager

TRACY S. RAPPMUND
Notary Public, State of Texas
My Commission Expires
March 17, 2016

THE STATE OF TEXAS

COUNTY OF GUADALUPE

This instrument was acknowledged before me on the 17th day of November, 2015, by PAT ALLEN, General Manager of GREEN VALLEY SPECIAL UTILITY DISTRICT, on behalf of GREEN VALLEY SPECIAL UTILITY DISTRICT.

Tracy S. Rappmund
Notary Public, State of Texas
Notary Name: Tracy S. Rappmund

River City Engineering
1011 W. County Line Road * NEW BRAUNFELS, TX. 78130
PHONE (830) 625-0337 FAX (830) 625-0858
dlamberts@reetx.com
Firm Registration #10193949

All that certain tract or parcel of land containing 45.689 acres of land out of the Guadalupe Torres Survey, Abstract No. 313, Guadalupe County, Texas, being all of that certain called 20 acre parcel described in Volume 3051, Page 561 and a portion of that certain called 116 acre tract described in Volume 2821, Page 426, all of the Official Records of Guadalupe County, Texas, further being out of that certain 65.000 acre parcel of land described in Document No. 2014023215 of said Official Records; Said 45.689 acre parcel being more particularly described by metes and bounds as follows:

BEGINNING at a created point on the southwesterly right-of-way line of Linne Road for the most easterly corner and POINT OF BEGINNING of this parcel, same being the most easterly corner of said 116 acre tract and the most northerly corner of that certain called 20 acre parcel described in Volume 2821, Page 423 of said Official Records;

THENCE departing said right-of-way line and with the common line of said 116 acre tract with said 20 acre parcel described in Volume 2821, Page 423, South 59 deg 32' 28" West, a distance of 1377.68 feet to a 1/2 inch rebar found for the most westerly corner of said 20 acre parcel, same being the most northerly corner of said 20 acre parcel described in Volume 3051, Page 561 and an interior corner of this parcel;

THENCE with the common line of said 20 acre parcel described in Volume 2821, Page 423 with said 20 acre parcel described in Volume 3051, Page 561, South 30 deg 07' 53" East, a distance of 575.96 feet to a created point for the most southerly corner of said 20 acre parcel described in Volume 2821, Page 423, same being the most easterly corner of said 20 acre parcel described in Volume 3051, page 561 and being located in the northwesterly line of that certain called 59.95 acre parcel described in Volume 3003, page 362 of said Official Records;

THENCE with the common line of this parcel with said 59.95 acre parcel, South 59 deg 40' 23" West, a distance of 810.13 feet to a ½ inch rebar found for angle, said being the most northerly corner of that certain called 12.166 acre parcel described in Volume 1035, Page 601 of said Official Records;

THENCE with the common line of this parcel with said 12.166 acre parcel, South 59 deg 37' 01" West, a distance of 690.11 feet (called South 60 deg 38' 19" West) to a ½ inch rebar found for the most southerly corner of this parcel, same being the most southerly corner of said 20 acre parcel and the most easterly corner of that certain called 72.204 acre parcel described in Volume 1347, Page 601 of said Official Records;

EXHIBIT "A"

THENCE with the common line of said 20 acre parcel with said 72.204 acre parcel, North 30 deg 25' 55" West, a distance of 569.05 feet (called North 30 deg 00" West, 579 feet) to a ½ inch rebar found for an exterior corner of this parcel, same being the most westerly corner of said 20 acre parcel, the most northerly corner of said 72.204 acre parcel and lying in the southeasterly line of the aforementioned 116 acre tract;

THENCE with the common line of said 20 acre parcel with said 116 acre tract, North 59 deg 20' 58" East, a distance of 670.68 feet to a ½ inch rebar set (capped "RPLS 4907") for an interior corner of this parcel;

THENCE severing said 116 acre tract, North 30 deg 25' 55" West, a distance of 575.36 feet to a ½ inch rebar set (capped "RPLS 4907") on the common line of said 116 acre tract with that certain called 22.7 acre parcel described in Volume 387, Page 121 of the Deed Records of Guadalupe County, Texas for the most westerly corner of this parcel;

THENCE with the common line of said 116 acre tract with said 22.7 acre parcel, North 59 deg 22' 16" East, a distance of 1816.08 feet (called North 59 deg 39' East) to a ½ inch rebar set (capped "RPLS 4907") on the aforementioned right-of-way of Linne Road for the most northerly corner of this parcel, same being the most northerly corner of said 116 acre tract and the most easterly corner of said 22.7 acre parcel;

THENCE with said right-of-way line, the following six (6) courses:

1). South 68 deg 25' 55" East, a distance of 118.68 feet (called South 68 deg 31' East, 118.0 feet) to a concrete monument found;

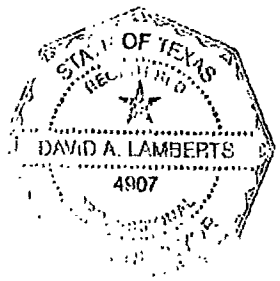
2). South 23 deg 37' 03" East, a distance of 153.65 feet (called South 23 deg 31' East, 155.0 feet) to a concrete monument found;

3). South 44 deg 15' 15" East, a distance of 133.94 feet (called South 44 deg 06' East, 134.5 feet) to a concrete monument found;

4). North 78 deg 44' 56" East, a distance of 203.51 feet (called North 78 deg 30' East, 204.0 feet) to a concrete monument found;

5). North 89 deg 46' 53" East, a distance of 100.44 feet (called North 90 deg 00' East, 100.0 feet) to a concrete monument found;

6). South 48 deg 51' 21" East, a distance of 89.73 feet (called South 49 deg 00' East) to the POINT OF BEGINNING and containing 45.689 acres of land with all bearings called for herein based of the Texas Coordinate System as established from the North American Datum 0f 1983 (CORS96) for the South Central Zone.



David A. Lamberts R.P.L.S. No. 4907
J.O. No. 6096-104-3 (DRAWING PREPARED)
EXHIBIT "A"

This page has been added by the Guadalupe County Clerk's office to comply with the statutory requirement that the recording information shall be placed at the foot of the record.

-> Seguin Title

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TERESA KIEL, COUNTY CLERK
GUADALUPE COUNTY, TEXAS

Teresa Kiel

Green Valley Special Utility District's
Summary of Legal Costs Relating to Defending CCN
as of June 27, 2016

Date	Description	Amount
April 2016	Cibolo's Petition for Decertification - PUC Docket No. 45702	$6,139.00
May 2016*	Cibolo's Petition for Decertification - PUC Docket No. 45702	$7,263.00
June 2016*	Cibolo's Petition for Decertification - PUC Docket No. 45702	$28,680.00
Total		$ 42,082.00

Additionally, it is estimated that Green Valley SUD will incur an additional $50,000 to $200,000 in legal fees in order to complete the docket.

Green Valley SUD also anticipates additional legal costs for appeals, if necessary.

* Estimated

1401 FOCH STREET | SUITE 150 | FORT WORTH, TEXAS 76107

May 13, 2016

Mr. Pat Allen
Green Valley Special Utility District
PO Box 99
Marion, Texas 78124

SUBJECT: APPLICATION TO OBTAIN SINGLE CERTIFICATION OF 1,694 ACRES IN THE CITY OF CIBOLO AND DECERTIFY A PORTION OF GREEN VALLEY SPECIAL UTILITY DISTRICT'S SEWER; CERTIFICATE OF CONVENIENCE AND NECESITY NO. 20973

Dear Mr. Allen,

At your request, we are pleased to provide appraisal services with regard to the above-described matter. *This letter, when signed by you, shall constitute our agreement with regard to our engagement.*

This assignment will be developed and prepared in conformity with and subject to the requirements of the Appraisal Institute's Code of Professional Ethics, the Uniform Standards of Professional Appraisal Practice, the Public Utility Commission, and the State of Texas. Additionally, we have not performed any services related to the subject property prior to this assignment.

Our fee for this assignment will be in the range of **$8,000-$12,000** for an appraisal report, with all work after completion of the appraisal invoiced on an hourly rate basis. The appraisal is intended to be used by the client for the proposed decertification of the subject property in the above-described matter.

Work will be billed by the tenth of every month, with the full amount due 10 days after the invoice date. In addition to our fees, we are to be reimbursed for all direct expenses including, but not limited to, delivery services, legal documents, travel, mileage, exhibits, photographs, copying, etc. Prior to commencement of this engagement we require a **$5,000** retainer, which will be applied to the final invoice.

Our current hourly rates are as follows:

Joshua M. Korman	$ 300.00
John Kostohryz	$ 200.00
Kenneth M. Link III	$ 175.00
Associate Appraiser	$ 125.00
Research Analyst	$ 75.00

A KOR Group principal will make himself available to review each invoice with a designated client representative as to the necessity and reasonableness of the work performed. It is the responsibility of the client to review the invoices for work performed within 10 days upon receipt of each invoice.

The file and work product produced in regards to this assignment are the exclusive property of KOR Group and subject to peer review by State and Federal Agencies and by the Appraisal Institute. Additionally, we will make a copy of the file available to the client at their request or at the request of the court or the Public Utility Commission.

It is understood that our engagement and payment for the services rendered hereunder are not dependent or contingent upon any loan commitment, transaction, trial outcome, opinions rendered, or any funds received by you over and above the fee stated herein.

This contract is cancelable on a 10-day written notice. Should either party cancel this contract, the outstanding balance for professional services shall be due within 30 days of such act.

If the above agreement meets with your approval, please execute this proposal and return the original. We look forward to working with you on this project.

Very Truly Yours,

Joshua M. Korman

AGREED:

By: Pat Allen Date: 5/16/2016

Name: PAT ALLEN

Title: General Manager

GREEN VALLEY SPECIAL UTILITY DISTRICT

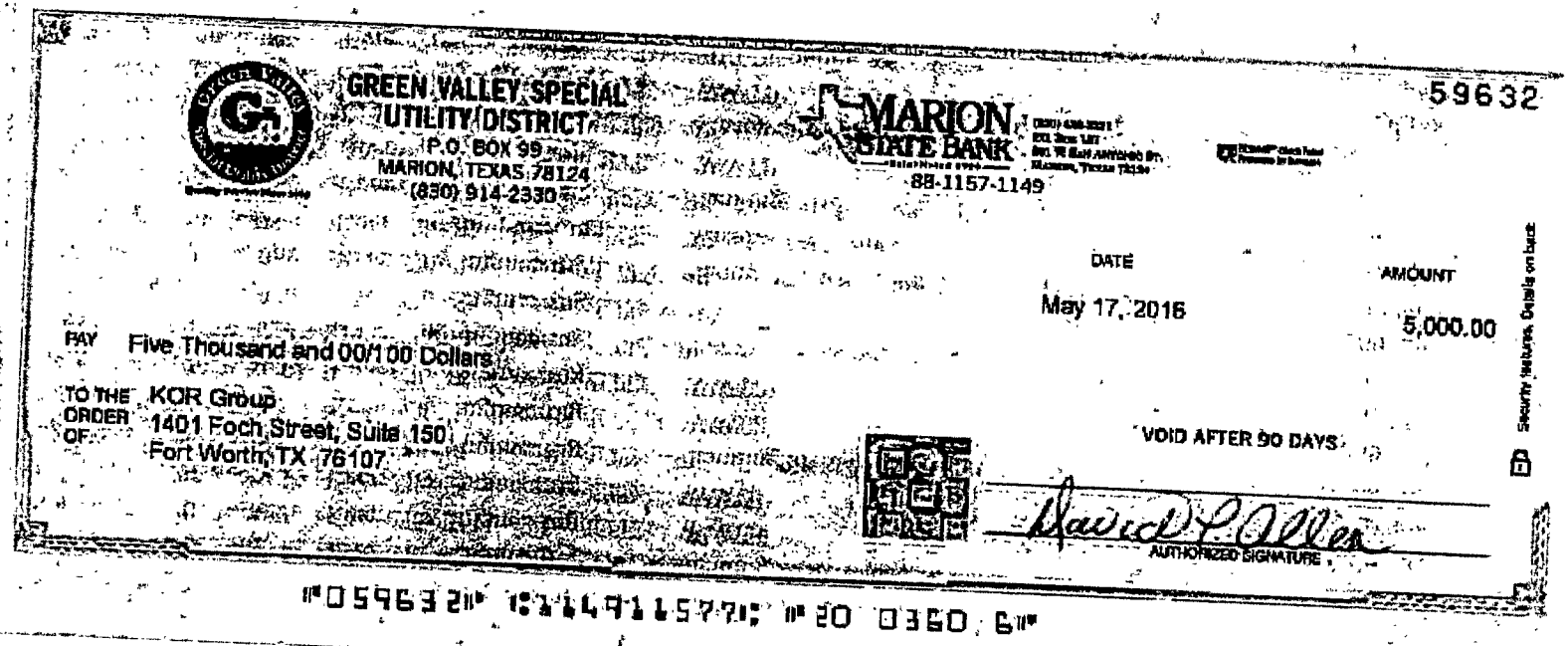
KOR Group

59632

Check Date: May 17, 2016

Check Amount: $5,000.00

Invoice	Date	Discount Taken	Amount Paid	Quantity	Description
			5,000.00		Appraisal Services 1,694 Acres City of Cibolo



GREEN VALLEY SPECIAL UTILITY DISTRICT
P.O. BOX 99
MARION, TEXAS 78124
(830) 914-2330

MARION STATE BANK
88-1157-1149

59632

DATE: May 17, 2016

AMOUNT: 5,000.00

PAY: Five Thousand and 00/100 Dollars

TO THE ORDER OF: KOR Group
1401 Foch Street, Suite 150
Fort Worth, TX 76107

VOID AFTER 90 DAYS

AUTHORIZED SIGNATURE

Security features. Details on back.

⑈059632⑈ ⑆114911577⑆ ⑈20 0360 6⑈

GREEN VALLEY SPECIAL UTILITY
Waste Water Invoices

Account Description	Date	Reference	Trans Description	Debit Amt
Eng & Leg - Wastewater Project	08/20/09	1244	Law office of Mark Zeppa - Harvest Hills	283.33
Eng & Leg - Wastewater Project	03/31/10	2010-3117	River City Engineering LTD. - Emergency Generator Plant	1,616.25
Eng & Leg - Wastewater Project	08/15/12	2012-4364	River City Engineering LTD. - CCMA service area annexation	7,206.25
Eng & Leg - Wastewater Project	06/15/13	2013-4854	River City Engineering LTD. - Planning 2013 Wastewater	500.00
Eng & Leg - Wastewater Project	06/15/13	2013-4855	River City Engineering LTD. - WWTP	1,250.00
Eng & Leg - Wastewater Project	07/15/13	2013-4912	River City Engineering LTD. - WWTP	1,720.00
Eng & Leg - Wastewater Project	08/15/13	2013-4960	River City Engineering LTD. - Planning 2013 Wastewater	1,500.00
Eng & Leg - Wastewater Project	08/15/13	2013-4961	River City Engineering LTD. - WWTP	3,000.00
Eng & Leg - Wastewater Project	09/15/13	2013-5030	River City Engineering LTD. - WWTP	500.00
Eng & Leg - Wastewater Project	09/15/13	2013-5029	River City Engineering LTD. - Planning - wastwater	1,000.00
Eng & Leg - Wastewater Project	10/15/13	2013-5070	River City Engineering LTD. - WWTP	800.00
Eng & Leg - Wastewater Project	10/15/13	2013-5069	River City Engineering LTD. - Planning Waste water 2013	1,200.00
Eng & Leg - Wastewater Project	12/15/13	2013-5198	River City Engineering LTD. - Wastewater Planning	800.00
Eng & Leg - Wastewater Project	01/15/14	2014-5237	River City Engineering LTD. - Planning 2013 Wastewater	1,200.00
Eng & Leg - Wastewater Project	02/15/14	2014-5279	River City Engineering LTD. - WWTP	765.00
Eng & Leg - Wastewater Project	02/15/14	2014-5280	River City Engineering LTD. - Wastewater planning	1,413.75
Eng & Leg - Wastewater Project	03/15/14	2014-5338	River City Engineering LTD. - WWTP	1,250.00
Eng & Leg - Wastewater Project	03/15/14	2014-5339	River City Engineering LTD. - 2013 Planning wastewater	2,665.00
Eng & Leg - Wastewater Project	04/15/14	2014-54010	River City Engineering LTD. - WWTP	1,430.00
Eng & Leg - Wastewater Project	04/15/14	2014-5397	River City Engineering LTD. - WWTP	3,922.50
Eng & Leg - Wastewater Project	05/15/14	2014-5457	River City Engineering LTD. - WWTP	420.00
Eng & Leg - Wastewater Project	05/15/14	2014-5460	River City Engineering LTD. - WWTP	2,012.50
Eng & Leg - Wastewater Project	05/15/14	2014-5456	River City Engineering LTD. - Wastewater Planning	4,886.25
Eng & Leg - Wastewater Project	06/15/14	2014-5510	River City Engineering LTD. - WWTP	707.50
Eng & Leg - Wastewater Project	06/15/14	2014-5515	River City Engineering LTD. - WWTP	1,122.50
Eng & Leg - Wastewater Project	06/15/14	2014-5516	River City Engineering LTD. - Wastewater planning	3,840.00
Eng & Leg - Wastewater Project	07/15/14	2014-5562	River City Engineering LTD. - WWTP	250.00
Eng & Leg - Wastewater Project	07/15/14	2014-5561	River City Engineering LTD. - WWTP	250.00
Eng & Leg - Wastewater Project	07/15/14	2014-5555	River City Engineering LTD. - Planning wastewater	1,671.00
Eng & Leg - Wastewater Project	08/15/14	2014-5617	River City Engineering LTD. - WWTP	482.50
Eng & Leg - Wastewater Project	08/15/14	2014-5614	River City Engineering LTD. - WWTP	1,790.00
Eng & Leg - Wastewater Project	08/15/14	2014-5613	River City Engineering LTD. - Wastewater planning	2,085.00

GREEN VALLEY SPECIAL UTILITY
Waste Water Invoices

Account Description	Date	Reference	Trans Description	Debit Amt
Eng & Leg - Wastewater Project	09/02/14	9.2.14.3	Texas Land & Right of Way Co. - Water treatment plant	320.00
Eng & Leg - Wastewater Project	09/15/14	2014-5666	River City Engineering LTD. - WWTP	322.50
Eng & Leg - Wastewater Project	09/15/14	2014-5665	River City Engineering LTD. - Wastewater planning	1,250.00
Eng & Leg - Wastewater Project	09/30/14	1591	Law office of Mark Zeppa - Prof. serv. - sewer	200.00
Eng & Leg - Wastewater Project	10/15/14	2014-5707	River City Engineering LTD. - Water master plan update	1,912.50
Eng & Leg - Wastewater Project	10/15/14	2014-5715	River City Engineering LTD. - Wastewater planning	2,750.00
Eng & Leg - Wastewater Project	10/15/14	2014-5702	River City Engineering LTD. - WWTP Permitting	8,650.00
Eng & Leg - Wastewater Project	11/04/14	11.4.14.1	Texas Land & Right of Way Co. - Water Treatment Plant	4,812.00
Eng & Leg - Wastewater Project	11/10/14	56676	Seguin Title - Escrow for 65 acres Wastewater Treatment Plant Linne Rd	10,000.00
Eng & Leg - Wastewater Project	11/15/14	2014-5734	River City Engineering LTD. - Waste water planning	700.00
Eng & Leg - Wastewater Project	11/15/14	2014-5738	River City Engineering LTD. - WWTP	1,200.00
Eng & Leg - Wastewater Project	11/15/14	2014-5742	River City Engineering LTD. - Waste water treatment plant	10,150.00
Eng & Leg - Wastewater Project	12/02/14	12.2.14.5	Texas Land & Right of Way Co. - Water & Sewer treatment plant	800.00
Eng & Leg - Wastewater Project	12/15/14	2014-5774	River City Engineering LTD. - Wastewater planning	450.00
Eng & Leg - Wastewater Project	12/15/14	2014-5776	River City Engineering LTD. - WWTP.	1,645.00
Eng & Leg - Wastewater Project	12/15/14	2014-5781	River City Engineering LTD. - 2014 WWTP permitting	13,825.00
Eng & Leg - Wastewater Project	01/15/15	2015-5816	River City Engineering LTD. - 2014 WWTP Permitting	13,700.00
Eng & Leg - Wastewater Project	02/13/15	57180	TCEQ - Filing waste water permit	2,050.00
Eng & Leg - Wastewater Project	02/15/15	2015-5865	River City Engineering LTD. - WWTP	355.00
Eng & Leg - Wastewater Project	02/15/15	2015-5854	River City Engineering LTD. - 2014 WWTP permitting	16,675.00
Eng & Leg - Wastewater Project	03/09/15	1606	Law office of Mark Zeppa - NorTex Farms, Sewer plant	200.00
Eng & Leg - Wastewater Project	03/15/15	2015-5894	River City Engineering LTD. - WWTP	750.00
Eng & Leg - Wastewater Project	03/15/15	2015-5890	River City Engineering LTD. - 2014 WWTP permitting	5,568.75
Eng & Leg - Wastewater Project	04/15/15	2015-5912	River City Engineering LTD. - WWTP Permitting	552.50
Eng & Leg - Wastewater Project	04/15/15	2015-5914	River City Engineering LTD. - WWTP	675.00
Eng & Leg - Wastewater Project	04/15/15	2015-5918	River City Engineering LTD. - WWTP Permitting	4,540.00
Eng & Leg - Wastewater Project	05/15/15	2015-5996	River City Engineering LTD. - WWTP permitting	10,018.75
Eng & Leg - Wastewater Project	06/03/15	6.3.15	Texas Land & Right of Way Co. - Treatment Plt	1,808.00
Eng & Leg - Wastewater Project	06/15/15	2015-6034	River City Engineering LTD. - Planning 2013 Wastewater	450.00
Eng & Leg - Wastewater Project	06/15/15	2015-6037	River City Engineering LTD. - WWTP Permitting	11,372.50
Eng & Leg - Wastewater Project	07/15/15	2015-6072	River City Engineering LTD. - WWTP permitting	3,808.75
Eng & Leg - Wastewater Project	08/15/15	2015-6111	River City Engineering LTD. - WWTP	1,467.50

GREEN VALLEY SPECIAL UTILITY
Waste Water Invoices

Account Description	Date	Reference	Trans Description	Debit Amt
Eng & Leg - Wastewater Project	08/15/15	2015-6114	River City Engineering LTD. - WWTP permitting	2,750.00
Eng & Leg - Wastewater Project	08/15/15	2015-6109	River City Engineering LTD. - Union Wine WL	4,025.00
Eng & Leg - Wastewater Project	08/21/15	58186	Texas Land & Right of Way Co. - Water & Sewer Treatment	1,043.00
Eng & Leg - Wastewater Project	09/15/15	2015-6156	River City Engineering LTD. - WWTP	1,425.00
Eng & Leg - Wastewater Project	09/15/15	2015-6158	River City Engineering LTD. - 2014 WWTP permitting	5,145.00
Eng & Leg - Wastewater Project	10/15/15	2015-6199	River City Engineering LTD. - 2014 WWTP Permitting	5,310.00
Eng & Leg - Wastewater Project	11/15/15	2015-6237	River City Engineering LTD. - 2014 WWTP Permitting	2,007.50
Eng & Leg - Wastewater Project	12/15/15	2015-6276	River City Engineering LTD. - WWTP Permitting	150.00
Eng & Leg - Wastewater Project	01/15/16	2016-6329	River City Engineering LTD. - WWTP Permitting	4,060.00
Eng & Leg - Wastewater Project	02/15/16	2016-6370	River City Engineering LTD. - WWTP Permitting	1,950.00
Eng & Leg - Wastewater Project	03/15/16	2016-6409	River City Engineering LTD. - WWTP Permitting	1,323.75
Eng & Leg - Wastewater Project	04/15/16	2016-6448	River City Engineering LTD. - WWTP Permitting	3,125.00
Eng & Leg - Wastewater Project	05/15/16	2016-6496	River City Engineering LTD. - WWTP Permitting	750.00
			Total	219,582.33

Green Valley Special Utility District
529 South Center Street
P.O. Box 99
Marion, Texas 78124
(830) 914-2332
www.gvsud.org

IH 10 INDUSTRIAL PARK

WATER SERVICE FEASIBILITY STUDY

November 15, 2013
Revised June 25, 2014
Revised November 19, 2014

RIVER CITY ENGINEERING
Civil, Environmental and Surveying
Texas Engineering Firm F-1546 Texas Survey Firm 10193949

River City Engineering, PLLC
1011 W. County Line Road
New Braunfels, Texas 78130
(830) 626-3588
www.rcetx.com

GVSUD 100462

Table of Contents

1.0 General Overview

Green Valley Special Utility District (GVSUD) authorized River City Engineering, Inc. (RCE) to prepare this Water Service Feasibility Study for the proposed development named **GVDC – IH 10 Industrial Park** by Verbal Authorization on September 27, 2013. GVDC requested revision to the report in June 2014, and November 2014.

RCE reviewed the potential impact for GVSUD to provide domestic potable water service to the above referenced development. This study reviews the proposed land use assumptions (LUA) which defines the intended use of the proposed development. This LUA is used to determine the proposed developments requested domestic potable water usage or volume. RCE compares GVSUD's existing available water rights inventory to the proposed development's water demand request. This comparison insures the proposed development is aligned with any of GVSUD's long-term planning goals. RCE then models how the proposed development would impact GVSUD infrastructure and what improvements and associated costs would be required to deliver the proposed development their domestic potable water demand request. In addition to domestic potable water service, RCE reviews any infrastructure improvements necessary to provide the proposed development additional emergency water services. The proposed infrastructure improvements are shown on Exhibit 1 - Proposed Development Vicinity Map. Exhibit 1 will be revised once the land has been platted and the location of the GVSUD meter station has been confirmed. Finally, RCE recommends condition items for GVSUD management and Board of Directors consideration. The purpose of this Water Service Feasibility Study is to advise GVSUD management on the potential positive and negative impacts that this non-standard service request could have on GVSUD's current and future public water system. The Water Service Feasibility Study may be used as a toolbox of negotiation items that can be reviewed, discussed, and agreed between GVSUD and the proposed development. The final approval of any GVSUD domestic potable water service contract with any proposed development shall be through compliance with GVSUD tariff and by vote of the GVSUD Board of Directors.

2.0 Land Use Assumptions (LUA)

The proposed development is located at the northwest corner of Santa Clara Road and IH 10. The intended Land Use Assumption (LUA) for this proposed development is zoned light industrial. The property owner, Guadalupe Valley Development Corporation (GVDC) provided projections for the build-out Equivalent Dwelling Units (EDU) that will occupy this 159.5 acre proposed development. The phased development will include 180 EDUs in July 2015, and 103 EDUs for three additional phases for a total EDU count of 489, and 294 acre feet of water per year. The development has requested the following meter sizes: 10 1-inch, 10 2-inch, 5 4-inch and 10 6-inch meters. This equates to 880 EDUs based on meter size equivalents from the Texas Rural Water Association (TRWA).

3.0 Water Availability

The applicant provided projected water use calculations of 95 million gallons per year, 8 million gallons per month and a highest day use of 622,000. Pressure requirements range from 35-80 psi with a 65 psi average for this application.

GVSUD currently has an adequate supply of available water to provide the proposed development as requested in the non-standard water service agreement. To aid in GVSUD's long term plans, RCE recommends the proposed development take advantage of water conservation to reduce the proposed development's water demand such as reduction of irrigation demand, and other conservative designs (example: drought hardy grass and efficient water fixtures) can further reduce the proposed development's water demand request and look more attractive for a GVSUD non-standard water service agreement.

To summarize GVSUD's water availability situation, currently GVSUD has sufficient domestic potable water to supply this proposed development. From RCE's analysis, it is reasonable to conclude that GVSUD can be assured it can provide long-term continuous and adequate retail public water utility service to this proposed non-standard service request.

4.0 Impact to Existing Domestic Potable Water Infrastructure

Impact to Existing Distribution System

The Wagner Pressure Plane serves the area southwest of the City of Marion located in the center of GVSUD's distribution system. This pressure plane has a hydraulic grade line of 880 feet mean sea level. This area is currently using the Canyon Regional Water Authority (CRWA) Wagner Booster Pump Station to serve this pressure plane. The existing infrastructure at the Wagner Booster Pump Station includes two (2) 2MG ground storage tanks and five (5) booster pumps each with a capacity of 2,250 gpm.

The nearest connection to the existing GVSUD water distribution system is an 8-inch PVC water line and 2-inch PVC water line on the north side of Bolton Road. Neither of these pipes have the capacity to meet the water and fireflow demands required for this development, however they will supplement flows during maintenance operations or potential fireflow scenarios.

There is an existing CRWA water transmission main of adequate size available to service the proposed development. The 24" transmission main receives water from the CRWA Leissner Booster Pump Station 2MG ground storage tank with an overflow of 670 feet with an additional pump head of 227 feet. The water main runs along the south side of IH 10 from east to west, and recently a transmission main has been installed within the GVDC Industrial Tract as part of the CRWA Santa Clara Transmission Main Project.

Pressure readings from a nearby fire hydrant indicate that the pressure averages 128 psi at this location.

To serve this tract, GVSUD will design and construct a metering station within the property to provide service to this development and the surrounding service area. The metering station will be located within a 50 foot by 50 foot tract of land along the west boundary of the IH 10 Industrial Park property. Exhibit 1 contains several maps from the Developer's application showing the proposed development. GVSUD will design and construct the meter station to serve the development and the adjacent service area. The property will be GVSUD's Fee Simple property and the meter station will be controlled by CRWA. The location of the meter station site shall be coordinated with GVSUD prior to platting or dedication.

The internal piping infrastructure within the property will be the responsibility of the developer and should be coordinated with GVSUD. Once approved for construction and the installation has been accepted by GVSUD the internal waterlines within the development will be dedicated to GVSUD for future operation and maintenance. The internal piping within the development shall be tied to the existing distribution system along Bolton Road and Santa Clara Road during construction. All piping within this development is proposed to be 16-inch C-905 PVC. During previous discussions on this tract, GVSUD requested utility easements along the property boundaries for future water and wastewater infrastructure. These easements shall be coordinated with GVSUD prior to platting or dedication.

Due to the CRWA Leissner Booster Pump Station pressure plane serving at 897 feet of head, the meter station will be designed with a pressure reducing valve to reduce pressure delivered to the development and surrounding service area. The topography of the property averages an elevation of 618'; this would correlate to a pressure at the meter station of approximately 120 psi or 279 feet of head. This application for service requests a pressure range of 35-80 psi with an average of 65 psi.

Impact to Existing Water Storage

The water demand required for the proposed development shall be delivered from the Leissner Booster Pump Station with a 2MG volume tank. The ground storage tank located at Leissner Booster Pump Station will not require any improvements to accommodate the domestic potable water demand request for the proposed development. Additional storage is provided by current GVSUD and CRWA infrastructure, including the Wagner Booster Pump Station, the Plant 3 elevated storage tank and GVSUD has a project identified within their master plan to construct additional elevated storage in this area in the future.

5.0 Additional Emergency Water Services

Additional emergency water services are desired by the proposed development to meet a specific fire flow requirements. The proposed development's engineer shall provide the required fireflow criteria to GVSUD that verify the applicable state and local standards are satisfied for an industrial development of this size in this area.

With the proposed GVSUD water distribution system listed above, it is our engineering opinion that the system is capable of delivering additional emergency water services required by standard fireflow criteria and subject to the same conditions if the GVSUD Board of Directors decides to offer this additional service. The developer shall verify the fireflow requirements at the time of construction and verify any reductions available for providing a sprinkler system within the development. The additional emergency water service requirements for the proposed development shall be **zoned light industrial (I-1)**, the additional emergency water service available at a minimum follows:

Flow: **3000 gpm**
Duration: **240 minutes**
Pressure: **25 psi**

3000 gpm * 240 minutes = 720,000 gallons of additional emergency water volume required. The development will have access to more than adequate supply of water; RCE has no reservations in providing additional emergency water service with the proposed upgrades to the system and extension of the CRWA water transmission main. The 3000 gpm requirement allows for the largest building feasible, which includes a Type I or Type II structure equipped with a sprinkler system. Fireflow requirements may be reduced once the future tenants and type of construction are identified. This site will have water available from multiple sources for long term uninterrupted service.

6.0 Wastewater Service

The application for service also included a request for sanitary sewer service. The calculations provided within the application indicate a Dry Weather Average Daily Flow of 119,805 gallons per day for treatment and conveyance capacity. GVSUD has multiple service options available to this tract of land. The development will be responsible for design and construction of the onsite collection system. The offsite conveyance and treatment facilities will be designed and constructed by GVSUD. The development will be responsible for the costs associated with the conveyance infrastructure and treatment capacity required to address their application, GVSUD will fund any oversizing of the collection and conveyance system or treatment facilities. At this time the estimated cost for the offsite conveyance system and treatment facilities required to address the flowrates provided in the Developer's application is $3,624,200. This estimate was calculated based on the Living Unit Equivalent (LUE) referenced in the

application, totaling 489 at full buildout. This estimated cost will secure capacity in the conveyance system and treatment facility for full build out of the development.

To address the timeline of the development, GVSUD will have service available to meet the Developer's flowrate at the time of development. The District is working toward agreements for longterm wastewater service within their CCN, and will meet the requirements of the development.

7.0 Estimated Costs – Water Impact Fees

GVSUD has elected to construct the meter station to serve this tract and adjacent developments at their expense. The only expense at this time for the developer will be the internal waterlines to serve their development, connections to adjacent infrastructure and easement/fee simple property dedication.

GVSUD's current impact fee is $2600 per EDU. A summary of the meter sizes and associated impact fees is shown below:

10 1-inch meters = 10 x 2.5 EDUs/meter = 25 EDUs x $2600 = $65,000
10 2-inch meters = 10 x 8 EDUs/meter = 80 EDUs x $2600 = $208,000
5 4-inch meters = 5 x 30 EDUs/meter = 150 x $2600 = $390,000
10 6-inch meters = 10 x 62.5 EDUs/meter = 625 x $2600 = $1,625,000

Total Impact Fees associated with this request = $2,288,000

EDUs/meter calculations were calculated per meter using TRWA's meter equivalents table.

8.0 Conclusion and Recommendations

In our engineering opinion, the GVSUD's domestic potable water system is capable of serving this proposed development with potable domestic water service provided that the conditions outlined in this report are met by the proposed development.

The following condition items are provided for GVSUD's consideration:

1. Dedication of easements along all boundary lines for exclusive use by GVSUD.
2. Dedication of a fee simple property for the meter station installation. Location to be determined in coordination with GVSUD prior to platting with the City of Cibolo.
3. GVSUD recommends using residential pressure reducing valves at each meter should the developer/engineer require reduced pressure.
4. Proposed development meets GVSUD's satisfaction that all possible conservation design responsibilities have been established and the proposed development domestic potable water demand request is reduced due to conservation measures.

5. The proposed development complies with GVSUD's tariff requirements and pays all applicable fees.
6. Attachment 2 provides the required easement certification for platting and GVSUD water service, to be included on the plat documents. All water mains to be within dedicated easements.
7. GVSUD shall approve the location and material type for piping and all appurtenances prior to construction and final acceptance of the project in accordance with GVSUD standard waterline specifications.
8. Upon construction completion and GVSUD acceptance, all system improvements shall be dedicated to and maintained by GVSUD. The contractor must warranty all construction for a minimum of one year. All system improvements that are not prepared by GVSUD must be submitted to GVSUD for review and approval. In addition, approval from TCEQ will be required as a condition of construction approval by GVSUD.
9. Payment of the associated offsite conveyance and treatment capacity fees will guarantee capacity for all phases of the proposed development. The design and construction of all offsite conveyance system and treatment facilities will be completed by GVSUD with the Developer being responsible for the associated cost to secure the required capacity. The onsite collection system will be the sole expense of the Developer and dedicated to GVSUD for future operation and maintenance.

This water service feasibility study is subject to the approval and/or modification by the GVSUD Board of Directors after consideration of the information provided herein and the application of the policies of GVSUD.

Thank you for the opportunity to prepare this water service feasibility study. If you have any questions, please do not hesitate to contact River City Engineering at (830) 626-3588.

Sincerely,

Garry D. Montgomery, P.E.
River City Engineering, PLLC

Revised June 25, 2014
Revised November 19, 2014

Exhibit 1
(Proposed Development Location Maps Provided by the Developer)

Attachment 2
(Easement Certification)

GREEN VALLEY SPECIAL UTILITY DISTRICT CERTIFICATE

This land development plat has been submitted to and approved by Green Valley Special Utility District for Easements. Upon request of the Customer and payment of the required fees, the District will provide domestic water service to each lot in this Subdivision, by Agreement with the Developer.

_____ Agent
Green Valley Special Utility District

EASEMENT CERTIFICATE

The Owner of the land shown on this plat and whose name is subscribed hereto, in person or through a duly authorized agent, dedicates to the Green Valley Special Utility District of Marion, Texas, its successors and assigns, a perpetual Easement with the right to erect, construct, install and lay over and across those areas marked as "Waterline Easement" and in all streets and byways, such pipelines, service lines, water meters and other water system appurtenances as it requires, together with the right of ingress and egress, the right to remove from said lands all trees, shrubs, grasses, pavements, fences, structures, improvements, or other obstructions which may interfere with the facility or the access thereto. It is agreed and understood that no building, concrete slab or walls will be placed within said Easement areas. No other utility lines may be located within 36" parallel to water lines.

Any monetary loss to Green Valley SUD resulting from modifications required of utility equipment located within said Easements due to grade change or ground elevation alterations shall be charged to the person or persons deemed responsible for said grade changes or ground elevation alterations. Upon entering in and upon said Easement, the District will endeavor to restore the land surface to a useable condition but is not obligated to restore it to a pre-existing condition.

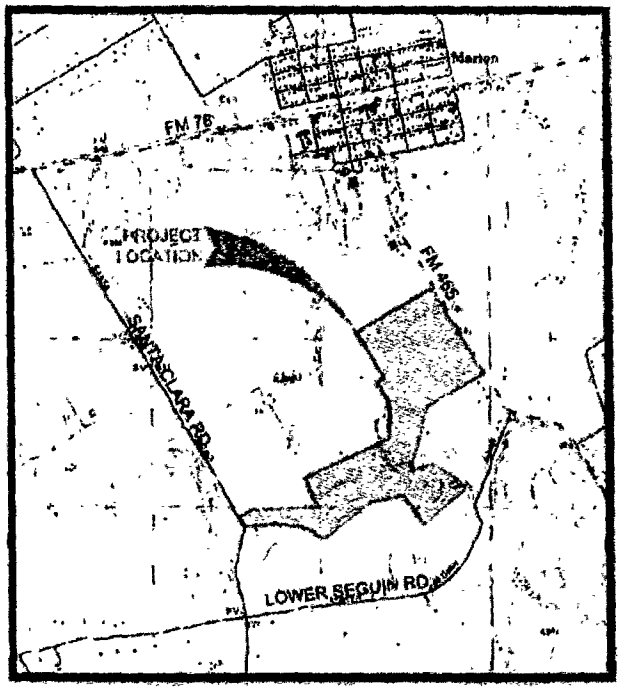
The Easement conveyed herein was obtained or improved through Federal financial assistance. This Easement is subject to the provision of Title VI of the Civil Rights Act of 1964, and the regulations issued pursuant thereto for so long as the Easement continues to be used for the same or similar purpose for which financial assistance was extended or for so long as the Grantee owns it, whichever is longer.

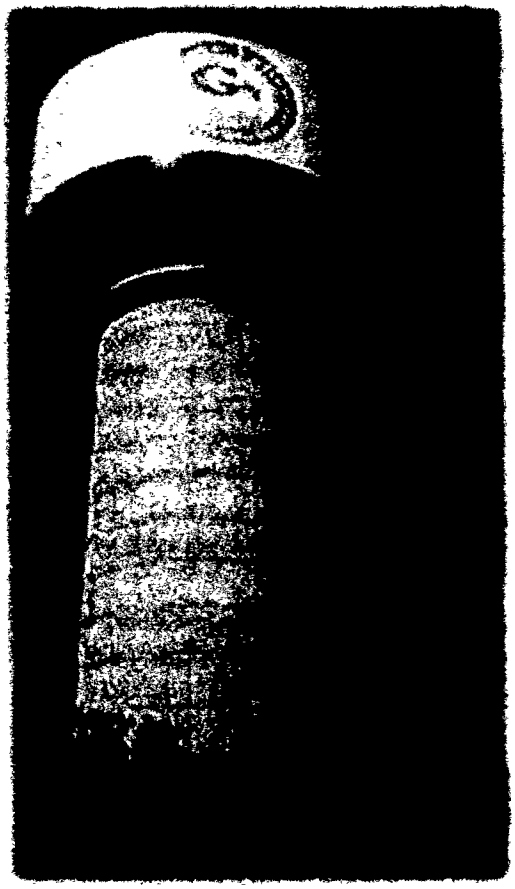
_____ Owner
(This Easement Certificate is to be executed and notarized by Owner of property and affixed to plat.)

Green Valley Special Utility District
529 South Center Street
P.O. Box 99
Marion, Texas 78124
(830) 914-2332
www.gvsud.org

Woods of St. Claire Subdivision

WATER SERVICE FEASIBILITY STUDY





STATE OF TEXAS
GARRY D. MONTGOMERY, JR.
114438
LICENSED
PROFESSIONAL ENGINEER

River City Engineering, PLLC
1011 W. County Line Road
New Braunfels, Texas 78130
(830) 626-3588
www.rcetx.com
RCE Project #6096-130

RIVER CITY ENGINEERING
Civil, Environmental and Surveying
Texas Engineering Firm F-1646 Texas Survey Firm 10193949

Table of Contents

1.0 General Overview

Green Valley Special Utility District (GVSUD) authorized River City Engineering, PLLC. (RCE) to prepare this Water Service Feasibility Study for the proposed development named **Woods of St. Claire** by Verbal Authorization on July 31, 2015.

RCE reviewed the potential impact for GVSUD to provide domestic potable water service to the above referenced development. This study reviews the proposed land use assumptions (LUA) which defines the intended use of the proposed development. This LUA is used to determine the proposed developments requested domestic potable water usage or volume. RCE compares GVSUD's existing available water rights inventory to the proposed development's water demand request. This comparison insures the proposed development is aligned with GVSUD's long-term planning goals. RCE then assesses how the proposed development would impact GVSUD infrastructure and what improvements and associated costs would be required to deliver the proposed development their domestic potable water demand request. In addition to domestic potable water service, RCE reviews any infrastructure improvements necessary to provide the proposed development additional emergency water services, as requested by the applicant. The proposed infrastructure improvements are shown on Exhibit 1 - Proposed Development Vicinity Map. Finally, RCE recommends condition items for GVSUD management and Board of Directors consideration. The purpose of this Water Service Feasibility Study is to advise GVSUD management on the potential positive and negative impacts that this non-standard service request could have on GVSUD's current and future public water system. The Water Service Feasibility Study may be used as a toolbox of negotiation items that can be reviewed, discussed, and agreed between GVSUD and the proposed development. The final approval of any GVSUD domestic potable water service contract with any proposed development shall be through compliance with GVSUD tariff and by vote of the GVSUD Board of Directors.

2.0 Land Use Assumptions (LUA)

The proposed development is located along FM 465, approximately 0.59 miles south of the city of Marion. The intended Land Use Assumption (LUA) for this proposed development is zoned Residential. This 237 acre proposed phased development will contain 105 5/8 x 3/4 -inch water meters for Residential use, equating to **105 build-out Equivalent Dwelling Units (EDU)**. For planning purposes the GVSUD Board of Directors and management typically use 0.4 acre-feet/year as a conservative measure of annual water use to estimate future use of planned developments. Therefore, the proposed development is requesting a non-standard water service contract for GVSUD to supply **42 acre-feet** of domestic potable water per year.

Water Availability

Based on the computation of the annual projected water use divided by 357 gallons per EDU per day the developer has requested 105 - 5/8 x 3/4 -inch metered services for Residential at final build out of the proposed development. The annual water usage equates to approximately 14 million gallons. RCE and GVSUD use the conservative value of 0.4 acre-feet/connection for planning purposes in this report. GVSUD currently has an adequate supply of available water to provide the proposed development as stated in the non-standard water service application. To aid in GVSUD's long term plans, RCE recommends the proposed development take advantage of water conservation design responsibilities to reduce the proposed development's water demand. Such design responsibilities like reduction of irrigation demand, and conservation designs (example: drought hardy grass and efficient water fixtures) can further reduce the proposed development's water demand request and look more attractive for a GVSUD non-standard water service agreement.

To summarize GVSUD's water availability situation, currently GVSUD has sufficient domestic potable water to supply this proposed development. From RCE's analysis, it is reasonable to conclude that GVSUD can be assured it can provide long-term continuous and adequate retail public water utility service to this proposed non-standard service request.

3.0 Impact to Existing Domestic Potable Water Infrastructure

Impact to Wagner Booster Pump Station

The proposed development shall be serviced with available water from the District's Wholesale water provider from the Wagner Booster Pump Station. The proposed development would not require any modifications to the existing site infrastructure for adequate Domestic Potable Water Service.

Impact to Existing Distribution System

There is an existing GVSUD water distribution pipe of 12-inch diameter in the vicinity of the proposed development. The 12-inch water main is located on the east side of Santa Clara Road adjacent to this development. This waterline currently provides Domestic Potable Water service to local connections. The developer will be required to construct a 12-inch water main from Santa Clara Road to supply the development. GVSUD shall be responsible for construction of subsequent 12-inch waterlines for future growth as shown in Exhibit 1.

The topography as provided by the Guadalupe County contours shows the highest area of the development at the 630 MSL contour. With Wagner Pump Station hydraulic pressure plane being at 880 feet, the District can serve the proposed 237 acre

development from the existing pressure available. Due to the approximate maximum 280 feet of head (121 psi) at the lowest point and minimum 250 feet of head (108 psi) at the highest point in the tract, the pressure within the development will be adequate for domestic use. The potable water service pressure requested typically is in the 35-70 psi range, therefore the developer may opt to install pressure reducing valves at their service to lower pressure.

Impact to Existing Water Storage

The water demand required for the proposed development shall be delivered from the ground storage tanks at the Wagner Booster Pump Station with the existing 4 million gallon volume tanks. The ground storage tank located at Wagner Booster Pump Station will not require any improvements to accommodate the domestic potable water demand request for the proposed development. The current pressure plane provides compliance with TCEQ minimums for pumping capacity, ground storage and elevated or hydro-pneumatic storage. GVSUD is planning elevated storage for this service area as part of the priority Capital Improvement Projects.

4.0 Additional Emergency Water Services

Additional emergency water services were requested at a rate of 500 gpm to meet fireflow demands for the site. With the proposed improvements discussed in Section 3.0 the District will be able to provide the required flow demands without reservation.

5.0 Estimated Costs

Table 6.1 summarizes the expected costs to the proposed development required for GVSUD to confidently provide **domestic potable water service** to the proposed development. The internal piping will be designed, modeled and constructed by the developer once approved by GVSUD. Once released for service all internal piping shall be dedicated to GVSUD for operation and maintenance. The water impact fees are shown in the table, these are due at time of meter request.

Table 6.1: Water Fees

WATER ACQUISTION	CONNECTION FEE	IMPACT FEE	TOTAL EDUs	TOTAL COST
$1,500	$925	$2,600	105	$527,625

The Developer will be responsible for the cost associated with the installation of a 12-inch PVC water distribution main and associated appurtenances through the development. GVSUD shall be responsible for the cost associated with the installation of 12-inch lines to tie the development into the existing water system as shown in Exhibit 1. A cost estimate is available for review in Attachment 2.

6.0 Conclusion and Recommendations

In our engineering opinion, the GVSUD's domestic potable water system is capable of serving this proposed development with potable domestic water service provided that the conditions outlined in this report are met by the proposed development.

The following condition items are provided for GVSUD's consideration:

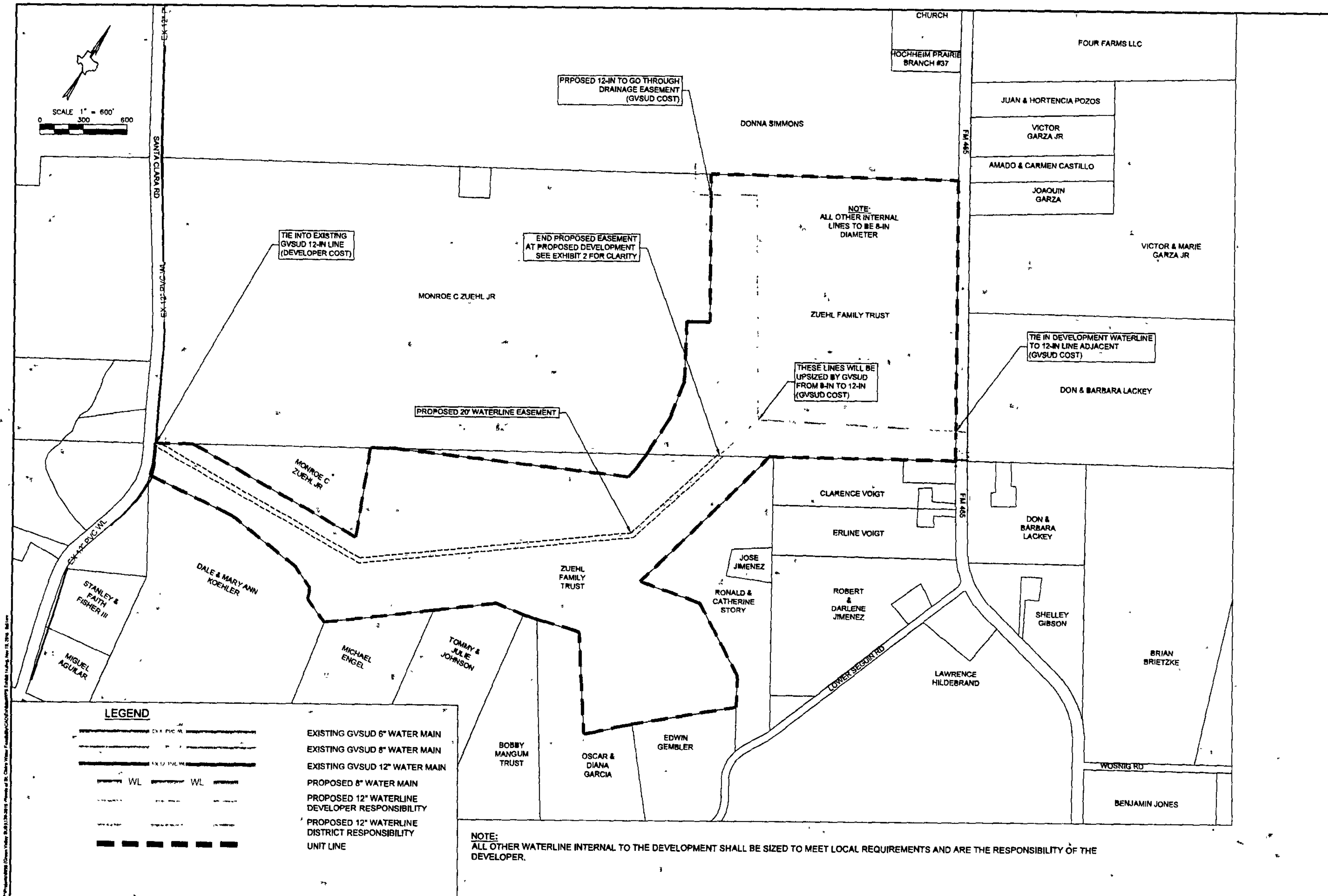
1. Infrastructure improvements associated with installation of 12-inch PVC distribution main and appurtenances to provide service to the proposed development. All waterline easements shall be 20 foot in width and dedicated to GVSUD in the plat for the property.
2. The proposed development complies with GVSUD's tariff requirements and pays all applicable fees.
3. Attachment 2 provides the required easement certification for platting and GVSUD water service, to be included on the plat documents.
4. GVSUD shall approve the location and material type for piping and all appurtenances prior to construction and final acceptance of the project in accordance with GVSUD standard waterline specifications at time of preliminary and final platting. Electrical, telephone and wastewater conflicts shall be minimized. A GVSUD inspector will be present during installation of waterline improvements.
5. Upon construction completion and GVSUD acceptance, all system improvements shall be dedicated to and maintained by GVSUD. The contractor must warranty all construction for a minimum of one year. All system improvements that are not prepared by GVSUD must be submitted to GVSUD for review and approval prior to construction.
6. A cost estimate of anticipated impact fees has been provided. Impact fees will be due at the time of service request, not at time of platting.

This water service feasibility study is subject to the approval and/or modification by the GVSUD Board of Directors after consideration of the information provided herein and the application of the policies of GVSUD. Thank you for the opportunity to prepare this water service feasibility study. If you have any questions, please do not hesitate to contact River City Engineering at (830) 626-3588.

Sincerely,

Garry D. Montgomery, P.E.
River City Engineering, PLLC.

Exhibit 1
(Proposed Improvements)



GVSUD 100480

NO.	REVISIONS	APP'D	DATE
DESIGNED BY PAS	SCALE 1" = 200'		
DRAWN BY PAS	DATE 18 November, 2015		
CHECKED BY GDM	PROJECT NO × 6098-130		

RIVER CITY ENGINEERING
CIVIL, ENVIRONMENTAL & CONSULTING
Texas Registered Engineering Firm F-1546

Green Valley Special Utility District

Exhibit 1 - Proposed Development Vicinity Map

SHEET NO 7
OF 1 SHEETS