



Under Pressure: Water Storage Tank Nitrification

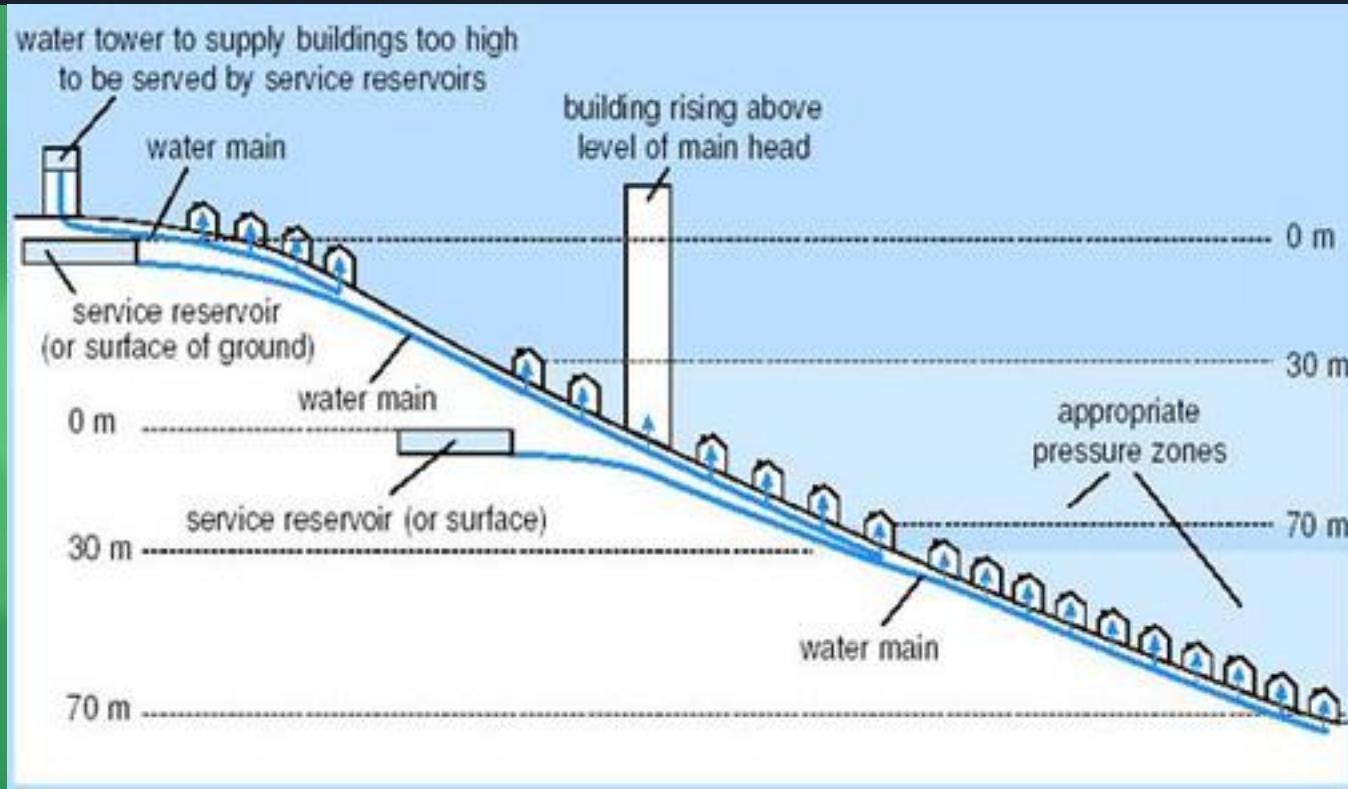


10/22/2018 – 1/23/2019

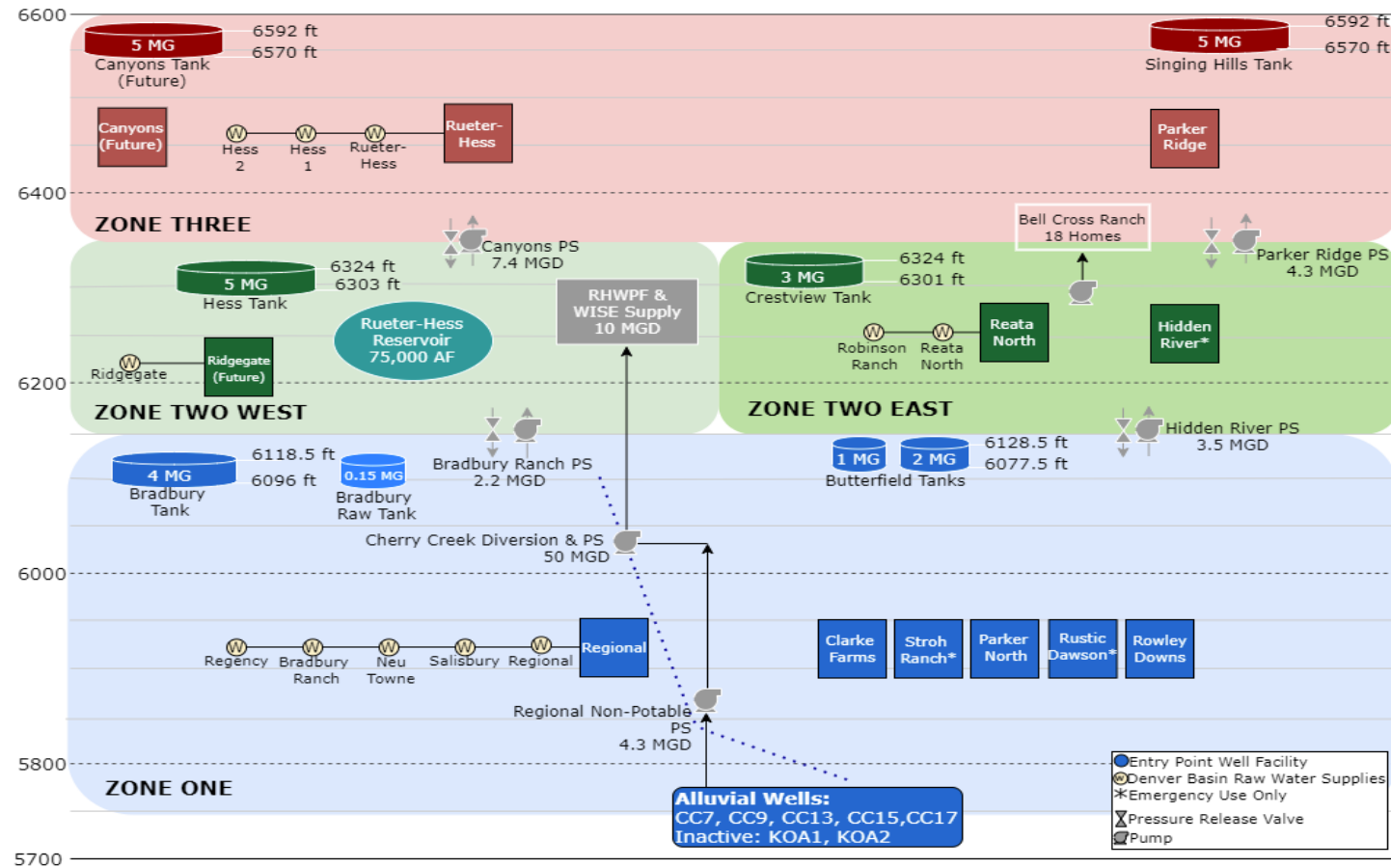
Background

- Converted distribution system from gas chlorine to liquid and added LAS for chloramines
- Consolidated entry points from 18 to 8
- During conversion, all PRVs isolated to prevent flow between pressure zones
- Laboratory performed frequent tank sampling to monitor for nitrification in tanks and system
- Butterfield Tank initially tested low for chlorine and chloramines
- Next sampling results had increasing nitrates
- The pressure is building...

Distribution System Pressure Zones

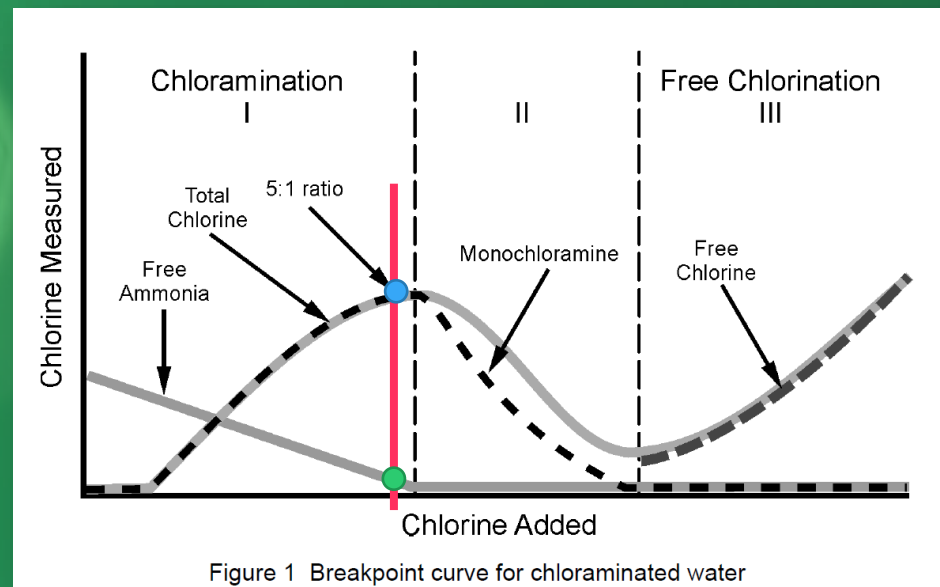


Distribution System Pressure Zones



Distribution Nitrification Response

Chloramination Process...



Distribution Nitrification Response

Nitrification Process...why is it bad?

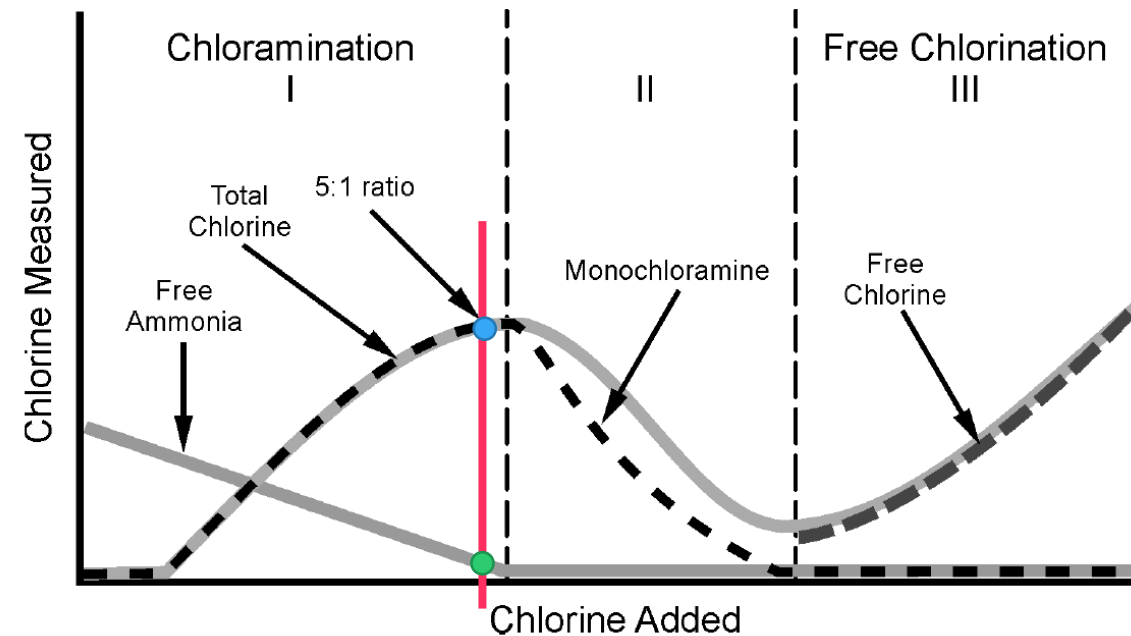
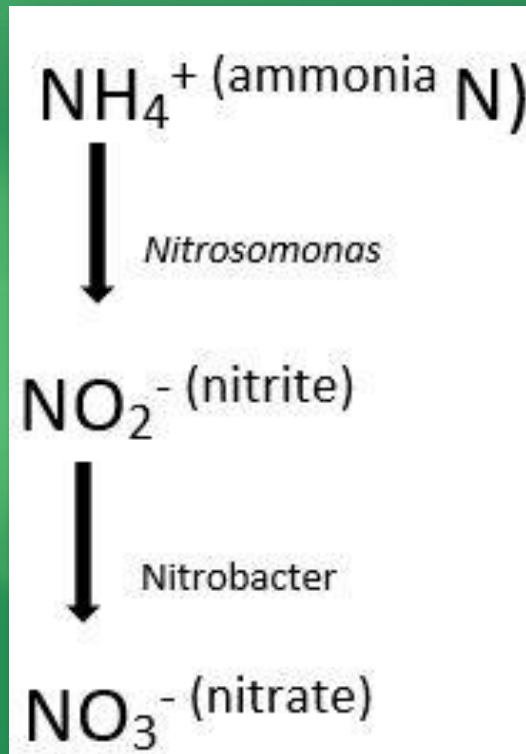


Figure 1 Breakpoint curve for chloraminated water

Distribution Nitrification Response

Overall Timeline... Laboratory



Distribution Nitrification Response

Overall Timeline...Laboratory

181022C

Drinking Water Chain of Custody												
Parker Water and Sanitation District Laboratory										Colilert SM# 9223 PWSID# CO-		
WEEK 4												
Report any deviation to NAP@pwsd.org												
State Guidance=Do not collect Sample if Total Cl2 <0.2mg/L												
Date	Time	Address	pH	Temp	Cl Mono	Cl ₂ -Total	Free NH ₃	Alkalinity	Redox (mV)	TDS (mg/L)	Turbidity (NTU)	Comments
10-22	9:20	#1 10185 Urbana Dr	8.23	18.9	1.75	1.74	0.28	113	500	192	2.93	NH ₃ =0.25
	9:45	#2 17000 1/2 Wintergreen Pkwy #31	8.16	19.3	1.91	1.92	0.40	100	486	135	1.80	NH ₃ =0.38
	9:44	#3 16782 Trail Sky Circle	8.15	21.3	2.28	2.27	0.43	101	512	141	1.54	NH ₃ =0.49
	9:55	#4 16069 E. Summit Fox	8.06	19.7	2.23	2.32	0.53	92	513	116	1.72	NH ₃ =0.50
	10:25	#5 15714 1/2 Indian Brook Cir	8.04	20.5	1.90	1.99	0.44	86	514	200	1.42	NH ₃ =0.47
	10:55	#6 12501 1/2 Prince Creek Dr	7.95	24.1	3.10	3.23	0.60	93	522	133	1.69	NH ₃ >0.60
	12:20	#7 6620 1/2 Stroh Road #38	8.14	22.2	2.24	2.44	0.57	99	494	129	1.83	NH ₃ >0.60
NT	NT	#8 12946 1/2 Reata Ridge Dr. #28	NT	NT	NT	NT	NT	NT	NT	NT	TILL	Further Notice
10-22	12:25	#9 12358 1/2 S Parker Road #37	8.12	24.4	3.02	3.00	0.53	94	522	124	5.36	NH ₃ =0.57
	12:59	#10 21067 Hawthorne Ln	8.14	20.9	1.92	1.93	0.34	102	499	140	1.31	NH ₃ =0.34
	1:00	#11 21518 Wanderlust Pl.	8.41	21.2	1.38	2.00	0.44	94	496	151	0.90	NH ₃ =0.37
	1:10	#12 11670 Snow Creek Ln.	8.48	20.9	2.01	2.18	0.38	94	488	123	1.08	NH ₃ =0.38
	1:25	#13 11401 1/2 Donerail St #21	8.46	21.3	2.29	2.26	0.53	100	496	136	1.30	NH ₃ =0.53
	1:40	#14 23296 1/2 Blackwolf Way	8.47	20.7	1.96	2.00	0.30	97	482	150	1.16	NH ₃ =0.40
	1:55	#15 11425 S. Fountain Hills St.	8.38	20.4	2.10	2.17	0.38	99	495	145	1.40	NH ₃ =0.40
	2:00	#16 11470 Belle Cross Cir	8.55	20.8	0.82	0.95	0.13	93	471	185	1.04	NH ₃ =0.10
	2:30	#17 20105 1/2 E. Mainstreet	8.15	20.6	2.28	2.21	0.84	99	477	138	1.87	NH ₃ =0.45
	2:18	#18 19201 1/2 Lincoln Ave #33	8.46	21.5	2.25	2.30	0.42	94	498	285	1.25	NH ₃ =0.37

Relinquished By	Date	Time	Cl ₂ Verification	Lot	Result	Entered:
10-22-18	2:40	122018351	2.02			
10-22-18	2:40pm	XP	2.06			
1-Aug-2019			2.06			

*Samples must be kept < 10 °C during transport

Temperature of samples upon arrival at lab? 8.2

18102304

Parker Water Sanitation District TANK Project Field Sheet											
Sample Date: 10/23/18											
Collect (1) 100mL Sterile HPC/Site Equipment Calibrated: Y / N Date:											
Time	Sampler	Sample Location	SL1000		SL1000 ChemKeys			HQL10	Redox	Temp	Comments
			SU	°C	IDL 0.04	IDL 0.05	IDL 0.04				
			pH	Temp	Cl ₂ Total	Free Ammonia	Monochloramine				
10:30		Bradbury Tank	7.94	18.8	1.57	0.24	1.55	494	22	15	
12:00		Hess Tank	8.11	21.0	1.97	0.38	1.97	515	22	10	
12:40		Butterfield Tank	7.95	22.4	1.96	0.36	1.90	508	15	33	
1:30		Crestview Tank	8.07	21.7	1.72	0.31	1.69	488	21	15	
2:00		Singing Hills Tank	8.05	20.4	1.80	0.32	1.77	482	21	12	

Date	Location	Dilution	Date In	Time IN	Units IN	Date Out	Time OUT	Units OUT	Plate #1	Plate #2	MPN/mL
	Bradbury Tank	1									
	Hess Tank	1									
	Butterfield Tank	1									
	Crestview Tank	1									
	Singing Hills Tank	1									

*Samples must be kept < 10 °C during transport

Relinquished By: Date: Time: EPA: Cl₂ Verification: 2.06

Accepted By: Date: Time: Lot: 122018351 1.99

QC Check: XP 8/19 2.05

Media/Sample: #REF! #REF! Quarterly/Lot: 1.97

Phos Buffer: #REF! #REF! Quarterly/Lot: 1.97

HPC Media: #REF! #REF! Quarterly/Lot: 1.97

Quarterly/Lot Check? Yes No Sample Temp

Entered: Validated: Approved:

Relinquished By: Date: Received By: Date:

Distribution Nitrification Response

Overall Timeline...Operations

10/22/2018 –
High Free NH₃
across system

181022C.

Drinking Water Chain of Custody										Colilert SM# 9223 PWSID# CO-		
Parker Water and Sanitation District Laboratory										WEEK 4		
Report any deviation to NAP@pwsd.org										State Guidance=Do not collect Sample if Total Cl2 <0.2mg/L		
Date	Time	Address	pH 6.5-8.5	Temp	Cl Mono 1.0-3.5	Cl ₂ -Total 0.5-3.5	Free NH ₃ < 0.3	Alkalinity	Redox (mV)	TDS (mg/L)	Turbidity (NTU)	Comments
10-22	9:20	#1 10185 Urbana Dr	8.23	18.9	1.75	1.74	0.28	113	500	192	2.93	NH ₃ =0.25
	9:45	#2 17000 1/2 Wintergreen Pkwy #31	8.16	19.3	1.91	1.92	0.40	100	486	135	1.80	NH ₃ =0.38
	9:45	#3 16782 Trail Sky Circle	8.15	21.3	2.28	2.27	0.43	101	512	141	1.54	NH ₃ =0.49
	9:55	#4 16069 E. Summit Fox	8.06	19.7	2.23	2.32	0.53	92	513	116	1.72	NH ₃ =0.50
	10:25	#5 15714 1/2 Indian Brook Cir	8.04	20.5	1.90	1.99	0.44	86	514	200	1.42	NH ₃ =0.47
	10:55	#6 12501 1/2 Prince Creek Dr	7.95	24.1	3.10	3.23	0.60	93	522	123	1.19	NH ₃ =0.60
	12:20	#7 6620 1/2 Stroh Road #38	8.14	22.2	2.24	2.44	0.57	99	494	129	1.83	NH ₃ =0.60
NT	NT	#8 12946 1/2 Reata Ridge Dr. #28	NT	NT	NT	NT	NT	NT	NT	NT	TILL	Further Notice
10-22	12:35	#9 12358 1/2 S Parker Road #37	8.12	24.4	3.02	3.00	0.53	94	522	124	5.36	NH ₃ =0.57
	12:40	#10 21067 Hawthorne Ln	8.14	20.9	1.92	1.93	0.34	102	499	140	1.31	NH ₃ =0.34
	1:00	#11 21518 Wanderlust Pl.	8.41	21.2	1.38	2.00	0.44	94	496	151	0.90	NH ₃ =0.37
	1:10	#12 11670 Snow Creek Ln.	8.48	20.9	2.01	2.18	0.38	94	488	123	1.08	NH ₃ =0.38
	1:25	#13 11401 1/2 Donerail St #21	8.46	21.3	2.29	2.26	0.53	100	496	136	1.30	NH ₃ =0.53
	1:40	#14 23296 1/2 Blackwolf Way	8.47	20.7	1.96	2.00	0.30	97	482	150	1.16	NH ₃ =0.40
	1:55	#15 11425 S. Fountain Hills St.	8.38	20.4	2.10	2.17	0.38	99	495	145	1.40	NH ₃ =0.40
	2:00	#16 11470 Belle Cross Cir	8.55	20.8	0.82	0.95	0.13	93	471	185	1.04	NH ₃ =0.13
	2:30	#17 20105 1/2 E. Mainstreet	8.15	20.6	2.28	2.21	0.84	99	477	138	1.87	NH ₃ =0.84
	2:40	#18 19201 1/2 Lincoln Ave #33	8.46	21.5	2.25	2.30	0.42	94	498	285	1.25	NH ₃ =0.37
Relinquished By			Date		Time		Cl ₂ Verification		Lot		Result	
NAP			10-22-18		2:40 pm		2.0 mg/L		122018351		2.02	
Accepted By			Date		Time				XP		2.06	
									1-Aug-2019		2.06	
											2.02	
*Samples must be kept < 10 °C during transport												
Temperature of samples upon arrival at lab? 8.2												

Operations Response:

- Strategy was to decrease water age
- Discovered Bradbury and Butterfield tank levels weren't fluctuating as they should
- Increased Monochloramine concentration at EPs running

Distribution Nitrification Response

Overall Timeline...

10/23/2018 –
High Free NH₃ in
Tanks

Parker Water Sanitation District
TANK Project Field Sheet
Sample Date: 10/23/18

18102304

Collect (1) 100mL Sterile HPC/Site
Equipment Calibrated: Y / N Date:

Time	Sampler	Sample Location	SL1000		SL1000 ChemKeys			HQ110 mV Redox	pH
			SU	°C	IDL 0.04 CL2, Total	IDL 0.05 Free Ammonia	IDL 0.04 Monochloramine		
1030		Bradbury Tank	7.94	18.8	1.57	0.24	1.55	494	22.15
1200		Hess Tank	8.11	21.0	1.97	0.38	1.97	515	22.10
1240		Butterfield Tank	7.95	22.4	1.96	0.36	1.90	508	45.33
1300		Crestview Tank	8.07	21.7	1.72	0.31	1.69	488	21.15
2000		Singing Hills Tank	8.05	20.4	1.80	0.32	1.77	482	21.12

Date	Location	Dilution	Date In	Time IN	Units IN	Date Out	Time Out	Units OUT	Plate #1	Plate #2	MPN/mL
	Bradbury Tank	1									
	Hess Tank	1									
	Butterfield Tank	1									
	Crestview Tank	1									
	Singing Hills Tank	1									

*Samples must be kept < 10 °C during transport

Relinquished By: Date: Time: EPA

Accepted By: Date: Time: EPA

Lot # Exp Date QC Check

Colliert Bottle #REF! #REF! Quarterly/Lot

Media/Simplate #REF! #REF! Quarterly/Lot

Phos Buffer #REF! #REF! Quarterly/Lot

HPC Media #REF! #REF! Quarterly/Lot

Quarterly/Lot Control Check? Yes No Sample Temp

Entered: Validated: Approved:

Relinquished By: Date: Received By: Date:

Operations Response:

- 36 PRV's being checked
- Isolated Butterfield Tank from the distribution system

Distribution Nitrification Response

Overall Timeline...

11/1/2018 –
Elevated Free
NH₃ across
system, High
Free NH₃ at a
few sites

18110108

Drinking Water Chain of Custody										Colliert SM# 9223 PWSID# CO-		
Parker Water and Sanitation District Laboratory										WEEK 2		
Report any deviation to NAP@pwsd.org				State Guidance=Do not collect Sample if Total Cl ₂ <0.2mg/L								
Date	Time	Address	pH 6.5-8.5	Temp	Cl ₂ Mono 1.0-3.5	Cl ₂ Total 0.5-3.5	Free NH ₃ < 0.3	Alkalinity	Redox (mV)	TDS (mg/L)	Turbidity (NTU)	Comments
11/1/2018	8:50	#1 17048 Dewberry Dr	8.31	17.9	1.81	1.96	0.29	106	457	132		
11/1/2018	8:10	#2 10821 1/2 Willow Reed Cir #30	8.15	18.4	1.78	1.91	0.26	111	492	153		
11/1/2018	8:25	#3 16617 1/2 Tin Cup Court #12	8.19	21.2	2.16	2.47	0.23	105	480	129		
11/1/2018	8:40	#4 11361 Haswell Dr	8.02	23.7	3.10	3.24	0.12	110	509	129		
11/1/2018	8:55	#5 10914 1/2 Ledges Rd #09	8.61	19.0	2.32	2.29	0.21	100	518	127		
11/1/2018	9:15	#6 14731 1/2 Torino St #22	8.04	19.7	1.98	2.06	0.24	102	488	145		
11/1/2018	9:20	#7 11678 1/2 Jutland St #18	8.11	19.1	2.31	2.35	0.10	90	516	126		
11/1/2018	9:50	#8 12877 Capitol Creek St #40	7.91	24.1	3.46	3.81	0.20	101	520	138		
11/1/2018	10:05	#9 8122 1/2 Copperhead Trail #27	7.81	19.1	0.20	0.00	0.00	88	469	225	10.00	0.00
11/1/2018	10:15	#10 20115 (7531) E. Hilltop Rd	7.98	23.1	1.99	2.62	0.28	112	495	124		
11/1/2018	10:25	#11 11945 S. Saunter Ln.	8.23	22.2	1.70	1.76	0.36	121	501	123		NH ₃ =0.15
11/1/2018	10:30	#12 11294 Mesa Verde Ln.	8.38	19.9	1.69	1.64	0.27	115	468	133		
11/1/2018	11:00	#13 11086 Riva Ridge Dr. #32	8.45	20.3	2.10	2.12	0.32	118	473	148		NH ₃ =0.32
11/1/2018	11:20	#14 21140 1/2 Willow Park Pl #02	8.52	17.9	1.28	1.24	0.20	104	493	136		pH=8.48
11/1/2018	11:30	#15 10751 1/2 Quail Creek Dr #03	8.50	18.5	2.17	2.34	0.30	119	483	131		pH=8.48
11/1/2018	11:40	#16 20304 Vista Cir	8.23	19.0	2.11	2.13	0.34	101	503	126	132	NH ₃ =0.20
11/1/2018	11:50	#17 11187 S. Cambridge Ct.	8.41	23.3	1.20	1.20	0.11	100	517	126		
11/1/2018	12:10	#18 7152 1/2 Homestead Rd #17	8.21	18.7	2.20	2.20	0.21	101	510	133		

Relinquished By	Date	Time	Lot	Result	Entered:
			122018351	2.01	Validated:
Accepted By	Date	Time	XP	1.99	Approved:
	11-1-18	12:00	1-Aug-2019	2.03	11-5-18
		Temp °C		1.97	

*Samples must be kept < 10 °C during transport

Temperature of samples upon arrival at lab? 7.4

Suebatan

Operations Response:

- Found two PRVs bypassed and shut them down. Almost immediately saw Bradbury tank level drop.



Zone 1

Zone 2

Zone 3

Franktown Parker FPS-1

© 2018 Google

Google

39°29'54.05" N 104°47'14.09" W elev 5957 ft

Distribution Nitrification Response

Overall Timeline...

11/5/2018 – High Free NH₃ across system and Tanks

Parker Water and Sanitation District
TANK Project Field Log
Sample Date: 11/5/18

Collect (1) 100ml Bottle/100ml Sample
Equipment Calibrated: 11/5/18

18110609

Date	Time	Sampler	Sample Location	pH	Temp	CL ₂ , Total	Free Ammonia	Monochloramine	HQ11D	Redox	Collect (100ml Bottle/100ml Sample)
				SU	°C	mg/L	mg/L	mg/L	mV	mV	
11/6/18	3:00	NH	Bradbury Tank	8.15	19.7	1.68	0.36	1.67	499		
	3:46		Hess Tank	8.17	19.8	1.83	0.34	1.79	517		
	2:40		Butterfield Tank	8.23	20.6	1.98	0.43	1.89	500		
	1:20		Crestview Tank	8.13	20.4	1.80	0.30	1.77	485		
	1:50		Singing Hills Tank	8.10	20.8	2.18	0.34	2.26	484		

Parker Water and Sanitation District Laboratory
Drinking Water Chain of Custody
WEEK 1

Report any deviation to NAP@pwsd.org
State Guidance=Do not collect Sample if Total Cl₂ <0.2mg/L

Date	Time	Address	pH	Temp	Cl ₂ Mono	Cl ₂ Total	Free NH ₃	Alkalinity	Redox (mV)	TDS (mg/L)	Turbidity (NTU)	Comments
11/5/2018	8:20	#1 18100 E. Woodman Drive	8.22	19.3	1.61	1.66	0.38	109	472	132	1.67	NH ₃ =0.34
11/5/2018	8:23	#2 18451 1/2 Ponderosa Dr. #24	8.43	18.7	1.01	1.11	0.22	118	503	130	0.97	
11/5/2018	8:30	#3 17275 Dewberry Cir.	8.24	18.8	1.57	1.34	0.25	103	498	130	0.49	
11/5/2018	8:40	#4 17179 Hawksbead Dr.	8.19	18.2	1.55	1.59	0.26	101	498	130	0.69	
11/5/2018	8:45	#5 11869 Hayfork Ct	8.25	18.1	2.55	2.05	0.36	144	500	144	0.35	NH ₃ =0.32
11/5/2018	8:45	#6 16867 1/2 Trail View Circle	8.14	18.9	2.03	2.06	0.41	104	492	145	0.81	NH ₃ =0.36
11/5/2018	8:45	#7 12194 S. Red Sky Dr.	8.18	20.4	2.60	2.59	0.48	110	505	123	0.81	NH ₃ =0.39
11/5/2018	8:45	#8 18201 East Plaza Drive	8.25	18.9	1.75	1.77	0.40	111	502	162	0.85	NH ₃ =0.38
11/5/2018	8:45	#9 11157 Tumbleweed Way	8.26	18.7	2.10	2.21	0.40	117	509	132	0.88	NH ₃ =0.34
11/5/2018	8:45	#10 11991 Ridgeview Ln.	8.17	20.3	1.94	1.99	0.34	104	506	133	0.53	NH ₃ =0.34
11/5/2018	8:45	#11 23929 1/2 Canterbury Trail #36	8.24	21.7	2.38	2.42	0.35	98	497	134	0.45	NH ₃ =0.27
11/5/2018	8:45	#12 11062 Blackwolf Ln.	8.28	18.4	2.50	2.48	0.27	105	484	136	1.61	
11/5/2018	8:45	#13 21783 Silver Meadows Ln.	8.67	15.9	1.63	1.69	0.31	104	491	135	1.84	NH ₃ =NR
11/5/2018	8:45	#14 11039 Cannonade Dr.	8.49	16.9	1.70	1.72	0.34	106	479	140	0.59	NH ₃ =0.32
11/5/2018	8:45	#15 20105 1/2 E. Williamson Dr. #1	8.38	21.3	2.08	1.66	0.38	98	506	137	0.81	NH ₃ =0.38
11/5/2018	8:45	#16 11424 Brownstone Dr. #	8.22	19.7	2.34	2.55	0.36	114	512	127	3.41	NH ₃ =0.35
11/5/2018	8:45	#17 7315 Sagebrush Dr	8.21	17.2	2.38	2.43	0.36	121	518	129	0.74	NH ₃ =0.35
11/5/2018	8:45	#18 6485 1/2 E Ponderosa Dr. #26	8.36	19.1	0.97	0.98	0.26	120	493	136	0.89	

Relinquished By: [Signature] Date: 11/5/18 Time: 12:45pm

Accepted By: [Signature] Date: 11/5/18 Time: 1:44

Temperature of samples upon arrival at lab? 74

Cl₂ Verification: 2.0 mg/L

Lot: 122018351 Result: 2.00 Validated: 1-9-2019

XP: 1.99 Approved: 11-7-18

1-Aug-2019 1.99 2.00

Bring Key...

Operations Response:

- Added a substantial amount of Chlorine to Butterfield Tank
- Identified that it takes well over 24 hours to mix tanks
- Testing tanks daily

Distribution Nitrification Response

Overall Timeline...



Parker Water and Sewer District
TANK Project Field
Sample Date: 11/27/18

18112709

Collect: 1/4ly Collect: 10 ml Bottle / Site
Equipment Calibrated: Y N Date: 11/27/18

Date	Time	Sampler	Sample Location	pH SU	Temp °C	CL2, Total mg/L	Free Ammonia mg/L	Monochloramine mg/L	HQ11D mV	Collect RBC Nitrate/Nitrite?
				6.5-8.5		0.5-3.5	>0.3	1.0-3.5	ORP	
11/27/18	5:40	NA	Bradbury Tank	8.66	16.1	0.39	0.13	0.33	515	☐
	4:15		Hess Tank	7.93	14.8	1.46	0.18	1.36	517	☐
	12:50		Butterfield Tank	7.75	19.8	0.07	0.04	0.03	487	☐
	12:10		Crestview Tank	8.63	18.3	1.31	0.34	1.39	498	☐
			Singing Hills Tank	8.04	17.6	1.48	0.28	1.42	521	☐

Date	Location	H2O Depth	Tank Depth				
	Bradbury Tank	14	22'				
	Hess Tank	14	22'				
	Butterfield Tank	32	48'	CL2=0.06	NH3=0.04	Monio=0.03	
	Crestview Tank	12	21'	NH3=0.33	Monio=1.33		
	Singing Hills Tank	8	21'				

Relinquished:	Date:	Entered:	NA 11/27/18
Received:	Date:	Validated:	
		Approved:	MAC 11-29-18

Relinquished By: _____ Date: _____
Received By: _____ Date: _____

Operations Response:

- Working on plan to address Butterfield Tank.
- 11/28/2018 – Ops moving water from Crestview to Butterfield. Isolated Butterfield and Hidden River Booster from system. Started Reata EP with elevated monochloramine





USDOT 1514857 C2

Parker Water
& Irrigation District



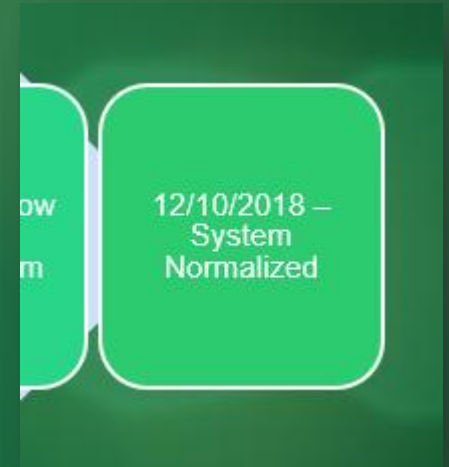
48

Distribution Nitrification Response

Overall Timeline... System Normalized

18121004

Drinking Water Chain of Custody													
Parker Water and Sanitation District Laboratory												PWSID# CO-0118040	
WEEK 2													
Report any deviation to NAP@pwsd.org				State Guidance=Do not collect Sample if Total Cl2 <0.2mg/L									
Date	Time	Address	pH 6.5-8.5	Temp	Cl Mono 1.0-3.5	Cl ₂ Total 0.5-3.5	Free NH3 <0.3	Alkalinity	Redox (mV)	TDS (mg/L)	Turbidity (NTU)	Comments	
12/10	8:00	#1 17048 Dewberry Dr	8.42	14.0	1.12	1.23	0.15	147	493	223	0.41		
	8:10	#2 10821.5 Willow Reed Cir #30	8.22	12.3	1.62	1.81	0.09	143	520	272	0.31		
	8:30	#3 16617.5 Tin Cup Court #12	8.23	12.5	1.49	1.63	0.17	146	519	267	0.26		
	8:50	#4 11361 Haswell Dr	8.20	12.8	1.44	1.53	0.16	143	520	270	0.95		
	9:00	#5 10914.5 Ledges Rd #09	8.19	11.9	1.65	1.79	0.17	137	531	284	0.43		
	9:10	#6 14731.5 Torino St #22	8.16	12.2	1.27	1.50	0.20	140	532	277	0.67		
	9:25	#7 11678.5 Jutland St #18	8.07	12.4	1.93	2.19	0.17	145	541	299	0.27		
	9:35	#8 12877.5 Capitol Creek St #40	8.24	12.9	1.49	1.42	0.17	143	519	273	0.85	Amo=0.22	
	9:50	#9 8122.5 Copperhead Trail #27	8.21	11.7	0.19	0.34	0.16	132	511	250	3.38	Redox/Hypochlorite	
	10:05	#10 20115 (7531) E. Hilltop Rd	8.45	11.6	0.38	0.43	0.17	108	473	148	1.16	W=0.40 Cl ₂ =0.45	
	10:15	#11 11945 S. Saunter Ln.	8.37	14.2	1.28	1.30	0.18	135	476	253	0.61		
	10:25	#12 11294 Mesa Verde Ln.	8.25	14.0	1.03	1.14	0.19	146	508	262	0.95	op=508	
	10:50	#13 11086.5 Riva Ridge Dr. #32	8.48	15.1	1.59	1.63	0.11	119	506	203	0.71		
	11:00	#14 21140.5 Willow Park Pl #02	8.39	11.4	0.78	0.82	0.20	146	523	256	0.58	M=0.72	
	11:15	#15 10751.5 Quail Creek Dr #03	8.52	12.9	1.42	1.48	0.18	145	496	271	0.20		
	11:20	#16 20304 Vista Cir	8.41	12.1	1.00	1.20	0.18	133	524	271	0.26		
	11:45	#17 11187 S. Cambridge Ct.	8.25	12.3	1.13	1.29	0.19	138	531	257	0.38		
	12:00	#18 7152.5 Homestead Rd #17	8.20	13.5	1.31	1.50	0.20	150	527	256	0.77		
Relinquished By					Lot		Result		Entered:				
Date					122018351		2.02		Validated: #=17-18				
Time					XP		2.00		Approved: 12-17-18				
Accepted By					Aug-19		2.03						
Date							1.97						
Time													
Temp °C													
Temperature of samples upon arrival at lab?													



Operations Response:

- Butterfield isolated - draining



© 2018 Google

Google earth

39°29'44.07" N 104°44'38.67" W elev 6055 ft eye alt 9082 ft

Distribution Nitrification Response

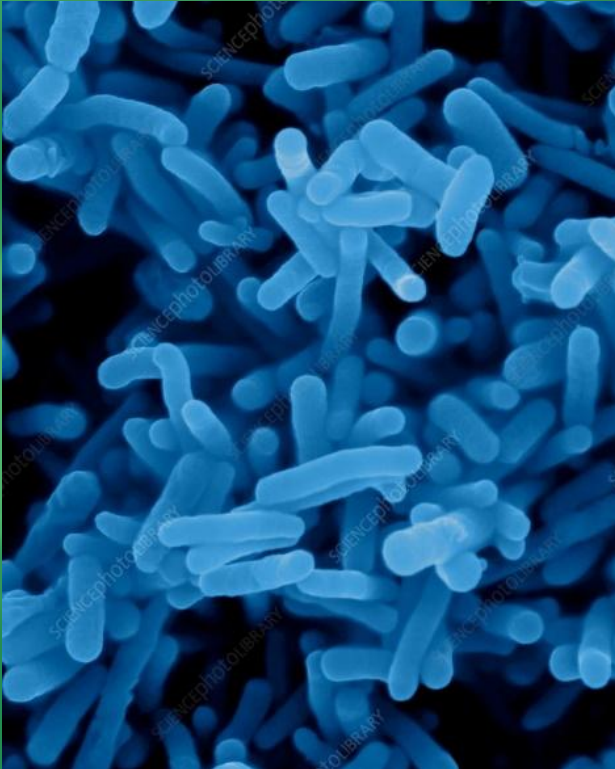
Overall Timeline... System Normalized

Moving Forward...

- More immediate and precise dosing
- Determining best parameters to use in LAS dosing
- Learning to utilize instrumentation in new ways
- Balancing timing and flow from 8 entry points to optimize tank turnover

Distribution Nitrification Response

Open Discussion and Questions?



Travis Scurlock -
publicworksdirector@townofelizabeth.org

303-901-0174