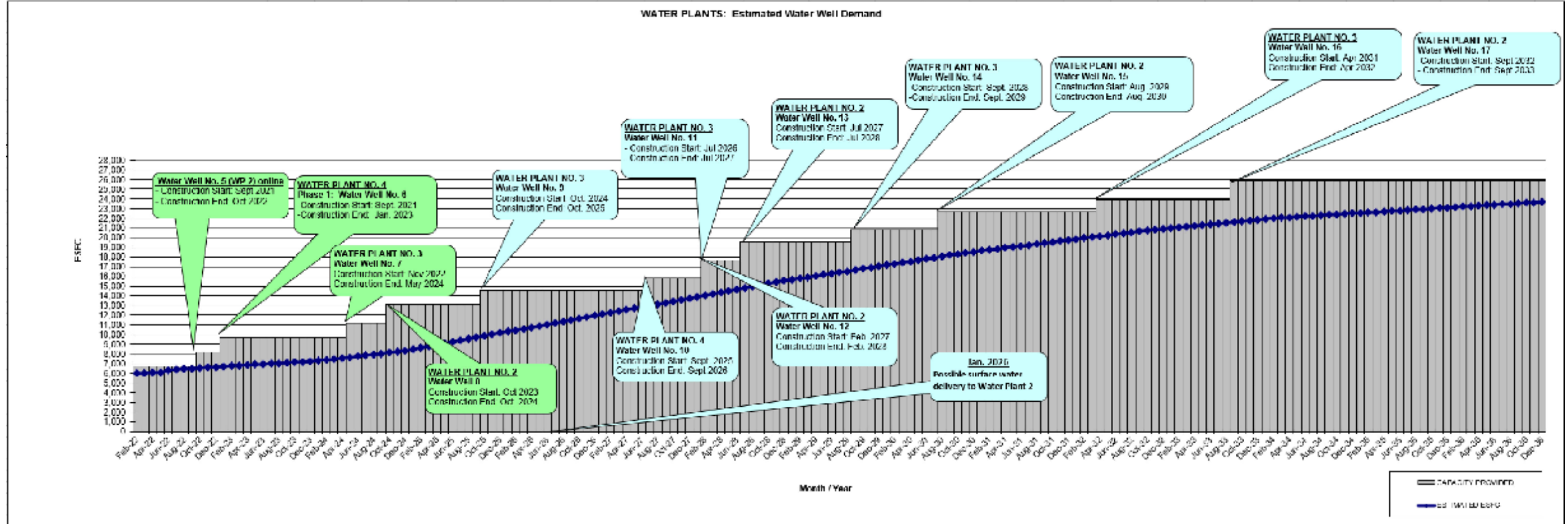


Bridgeland Water System

HARRIS COUNTY MUD 418, 419, 489, 490

JUNE 07, 2022

BRIDGELAND WATER MODELING



"ULTIMATE "WATER PLANT DESIGN

WATER PLANT #1

WATER PLANT #2

BRIDGELAND CAPACITY PROJECTIONS BASED ON HISTORICAL USEAGE			
Future Water Plant No. 1 Capacities			
Facilities	Existing Capacity	TCEQ Min Req. per ESFC	Allowable Connections
Water Supply			limiting component
Well No. 1	900 gpm **		(2 M gal. per day) 3,323
Well No. 2	300 gpm		
Surface Water	1,458 gpm		
TOTAL	2,658 gpm	0.8 gpm	
Storage Facilities			
Ground Storage Tank	250,000 gal		
Ground Storage Tank	250,000 gal		
Ground Storage Tank	0 gal		
Elevated Storage Tank	750,000 gal		
TOTAL	1,250,000 gal	300 gal	4,167
Elevated Storage Tanks			
Tank No. 1	750,000 gal		
Tank No. 2	0 gal		
TOTAL	750,000 gal	100 gal	7,500
Hydropneumatic Tanks			
Tank No. 1	15,000 gal		
Tank No. 2	15,000 gal		
TOTAL	30,000 gal	12 gal	N/A
Service Pumps			
Jockey Pump No. 1	150 gpm		
Booster Pump No. 2	2,000 gpm		
Booster Pump No. 3	2,000 gpm		
Booster Pump No. 4	2,000 gpm		
Booster Pump No. 5	2,000 gpm		
Booster Pump No. 6	2,000 gpm		
TOTAL	10,150 gpm	2 gpm	5,075
** Well capacity reduced from 1200 to 900 gpm			

Future Water Plant No. 2 Capacities			
Facilities	Existing Capacity	TCEQ Min Req. per ESFC	Allowable Connections
Water Supply			
Well No. 1-10	14,400 gpm		
Surface Water	0 gpm		
TOTAL	14,400 gpm	0.8 gpm	18,000
Storage Facilities			
Ground Storage Tank	500,000 gal		
Ground Storage Tank	1,000,000 gal		
Ground Storage Tank	1,000,000 gal		
Ground Storage Tank	1,000,000 gal		
Elevated Storage Tank	1,000,000 gal		
Elevated Storage Tank	1,000,000 gal		
TOTAL	5,500,000 gal	300 gal	18,333
Elevated Storage Tanks			
Tank No. 1	1,000,000 gal		
Tank No. 2	1,000,000 gal		
TOTAL	2,000,000 gal	100 gal	20,000
Hydropneumatic Tanks			
Tank No. 1	15,000 gal		
Tank No. 2	15,000 gal		
TOTAL	30,000 gal		N/A
Service Pumps			
Jockey Pump No. 1	1,000 gpm		limiting component
Booster Pump No. 2	2,000 gpm		
Booster Pump No. 3	3,000 gpm		
Booster Pump No. 4	3,000 gpm		
Booster Pump No. 5	3,000 gpm		
Booster Pump No. 6	3,000 gpm		
Booster Pump No. 7	5,000 gpm		
Booster Pump No. 8	5,000 gpm		
Booster Pump No. 9	5,000 gpm		
Booster Pump No. 10	5,000 gpm		
TOTAL	35,000 gpm	2 gpm	17,500

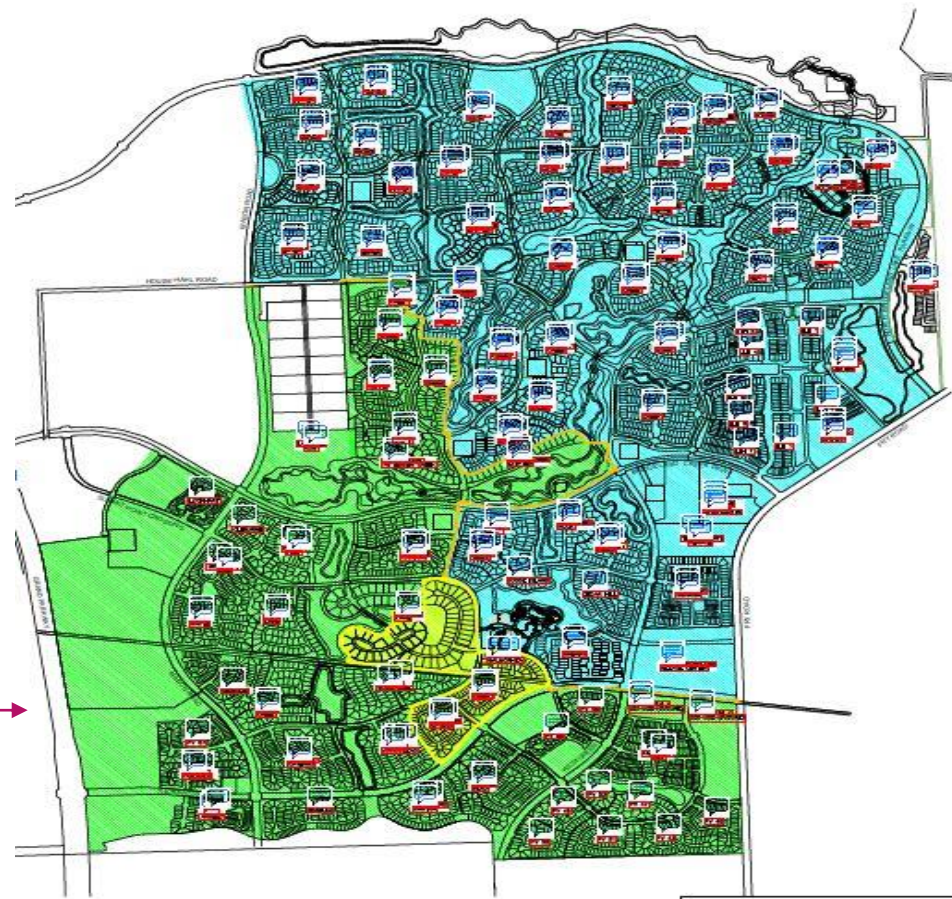
“CURRENT” WATER SYSTEM CAPABILITIES

June 1, 2022

COMPONENT	FUNCTION	UNITS	NORTH (3,564 Connections)	SOUTH (2,780 Connections)
EST/GST VOLUME	STORAGE	TOTAL GALLONS	1,250,000	1,500,000
BOOSTER	PRESSURE	GALLONS / MINUTE	10,150	11,300
SUPPLY	PRODUCTION	TOTAL GALLONS*	4,115,000	3,312,000
SUPPLY AT NORTH IS 2 ON-SITE WELLS +WHCRWA				
SUPPLY AT SOUTH IS FROM 1 ON-SITE WELL & 1 ONE REMOTE WELL				
*=total gallons produced in a 24-hour period				

“Split” System

SOUTH
SYSTEM



NORTH
SYSTEM

Split System Origination

▶ WATER PLANT #1 (WATER WELL #1 AND #2; EST #1)

- ▶ Traditionally disinfected with Chlorine
- ▶ Aesthetically pleasing; inexpensive to produce
- ▶ Subsidence created the need to move to surface water
- ▶ West Harris County Regional Water Authority (WHCRWA)
- ▶ Surface Water
 - ▶ Can not treat with chlorine. (produces THM)
 - ▶ Only can use Chloramines

▶ WATER PLANT #2 (WATER WELL #3 & #4; EST #2)

- ▶ Well #3 began producing water with Iron Reducing Bacteria (IRB)
- ▶ The water with the IRB began reacting with the surface water from WP1 and creating water quality issues in entire water system.
- ▶ The only solution was to flush water nonstop to reduce reaction; not a long-term fix
- ▶ The idea was to isolate the systems into North and South

HC419 WQT 201908

HC419 WQT 202108

Water Utility Services, Inc.

P.O. Box 2628
Spring, Texas 77383
281-290-0704

Chart Area

Client: Inframark
2002 West Grand Pkwy North, Ste 100
Katy, TX 77449
Vanessa Chapa

Test Report - Nitrification Monitoring

PROJECT LOCATION: H.C. MUD #419 COLLECTED BY: RD
COLLECTION DATE: 08/28/19 SAMPLE MATRIX: Potable Water
SAMPLE TYPE: Grab

SAMPLE LOCATION	Total Chlorine mg/L	Monochloramine mg/L	Free Ammonia mg/L	Nitrate-N mg/L	Nitrite-N mg/L	HPC* cfu/ml	pH s.u	Iron Bacteria	Action
16734 Highland Country	0.34	<0.10	0.27	0.470	0.058	TNTC	7.54	positive	A
19302 Ft Leaton	0.24	<0.10	0.04	0.431	0.033	TNTC	7.42	positive	A
19315 Tapacolmes	0.25	<0.10	0.24	0.373	0.097	TNTC	7.82	positive	A
19327 Copper Lantern	0.19	<0.10	0.09	0.440	0.297	TNTC	7.77	positive	A
Hydrant W Creekside Bend	0.26	<0.10	0.33	0.419	0.325	TNTC	7.64	positive	A

Method: Hach 10200 Hach 10200 Hach 10200 EPA 300.0 EPA 300.0 SM 9215 EPA 150.1 BART
Analyst: KWM RD RD AE AE AE RD AE
Date: 08/28/19 08/28/19 08/28/19 08/28/19 08/28/19 08/28/19 08/28/19 08/28/19 08/28/19

* HPC - Heterotrophic Plate Count, cfu - colony forming units

TNTC - to numerous to count

Free ammonia of 0.15 mg/L or less is recommended.

N - none required
T - trace of nitrification - reduce water age
A - active nitrification - flushing recommended
R - raise chlorine residual

Steve Grychka

Steve Grychka
Laboratory Director

Water Utility Services, Inc.

P.O. Box 2628
Spring, Texas 77383
281-290-0704

Client: Inframark
2002 West Grand Pkwy North, Ste 100
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Vanessa Chapa

Test Report - Nitrification Monitoring

PROJECT LOCATION: H.C. MUD #419 COLLECTED BY: KWM
COLLECTION DATE: 08/25/21 SAMPLE MATRIX: Potable Water
SAMPLE TYPE: Grab

SAMPLE LOCATION	Total Chlorine mg/L	Monochloramine mg/L	Free Ammonia mg/L	Nitrate-N mg/L	Nitrite-N mg/L	HPC* cfu/ml	pH s.u	Iron Bacteria	Action
HC418 GST1	3.60	3.58	0.09	0.181	<0.01	12	7.76	negative	N
HC418 GST2	3.50	3.40	0.10	0.141	<0.01	4	7.73	negative	N
HC418 Surface Line	3.30	3.24	0.14	0.194	<0.01	10	7.69	negative	N
18131 Williams Elm	2.00	2.00	0.03	0.115	<0.01	18	7.65	negative	N
18438 Pin Oak Bend	2.60	2.41	0.16	0.207	<0.01	20	7.68	negative	N
17526 W Bermonds Bend Ct	3.00	2.90	0.10	0.172	<0.01	16	7.67	negative	N
12318 Johns Purchase Ct	2.30	2.26	0.11	0.179	0.012	26	7.64	negative	T
12114 N Founders Shore Dr	3.20	3.14	0.06	0.122	<0.01	12	7.66	negative	N
12007 Fullers Grant Ct	3.40	3.36	0.18	0.219	<0.01	8	7.69	negative	N
12303 S Raven Shore Ct	3.30	3.22	0.07	0.148	<0.01	8	7.68	negative	N
18910 N Thomas Shore Dr	3.10	2.97	0.09	0.168	<0.01	14	7.62	negative	N
18806 Valley Cove Dr	3.50	3.47	0.06	0.161	<0.01	12	7.65	negative	N
18802 Cove Mill Ln	3.40	3.34	0.05	0.142	<0.01	18	7.67	negative	N
12330 Terrace Cove Ln	3.30	3.18	0.04	0.145	<0.01	10	7.63	negative	N
19138 Cove Forest Dr	2.40	2.32	0.11	0.246	0.027	24	7.65	negative	T
19127 Cove Manor Ln	3.30	3.17	0.14	0.201	<0.01	8	7.68	negative	N
16730 Cedaryard Ln	1.92	1.85	0.13	0.193	<0.01	16	7.72	negative	N
19018 Leeward Bend Ct	1.78	1.73	0.06	0.179	<0.01	16	7.70	negative	N
HC 418 WP2 GST 1	1.55	<0.10	<0.01	<0.10	<0.01	6	8.02	negative	N

Method: Hach 10200 Hach 10200 Hach 10200 EPA 300.0 EPA 300.0 SM 9215 EPA 150.1 BART
Analyst: KWM KWM KWM AE AE AE KWM AE
Date: 08/25/21 08/25/21 08/25/21 08/25/21 08/25/21 08/25/21 08/25/21 08/25/21 08/25/21

* HPC - Heterotrophic Plate Count, cfu - colony forming units

TNTC - to numerous to count

Free ammonia of 0.15 mg/L or less is recommended.

N - none required
T - trace of nitrification - reduce water age
A - active nitrification - flushing recommended
R - raise chlorine residual

Comprehensive Potable water production/metering

HARRIS COUNTY M.U.D. NO. 418, 419, 489 & 490 Combined Water Production Report May-22

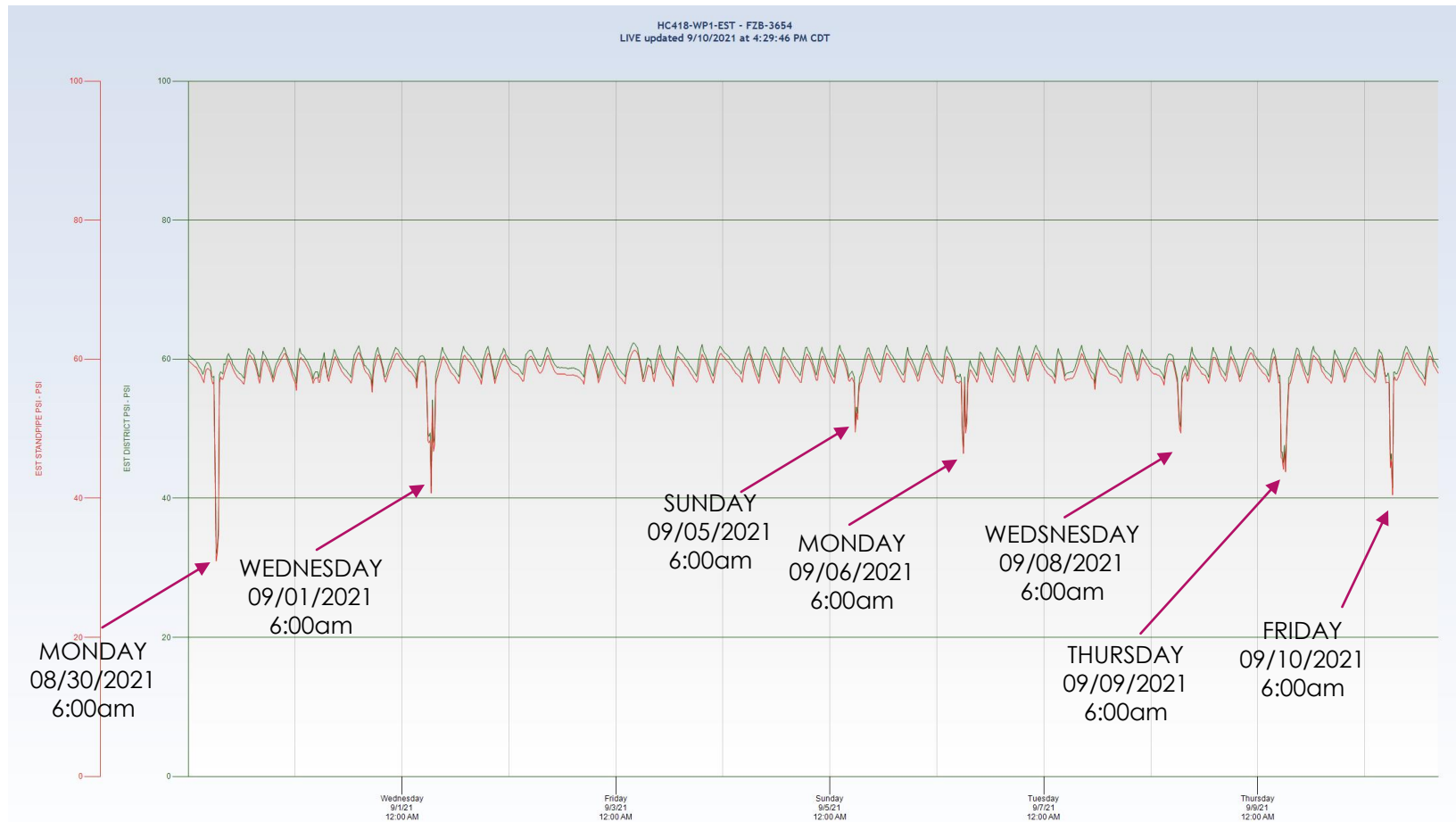
MONTH	READ DATES	(A) 490 USAGE	(B) 489 USAGE	(C) 419 USAGE	(D) TTL BILLED	COMBINED MAINT (E)	E+D TOTAL	F PUMPED	G SURFACE WATER	D/E+(F+G) % ACC.
May-21	04/07/21 - 05/06/21	0	21,955,000	39,421,000	61,376,000	2,252,696	63,628,696	30,868,000	37,165,000	93.53%
Jun-21	05/07/21 - 06/04/21	76,000	18,931,000	32,495,000	51,502,000	5,083,810	56,585,810	31,072,000	30,989,000	91.18%
Jul-21	06/05/21 - 07/06/21	0	24,582,000	44,891,000	69,473,000	2,376,250	71,849,250	41,555,000	38,271,000	90.01%
Aug-21	07/07/21 - 08/04/21	0	21,678,000	36,305,000	57,983,000	9,607,650	67,590,650	36,804,000	36,007,000	92.83%
Sep-21	08/05/21 - 09/03/21	28,000	30,086,000	45,833,000	75,947,000	7,278,825	83,225,825	51,326,000	38,402,000	92.75%
Oct-21	09/04/21 - 10/05/21	72,000	26,322,000	40,836,000	67,230,000	5,722,300	72,952,300	43,711,000	41,170,000	85.95%
Nov-21	10/06/21 - 11/04/21	66,000	24,877,000	36,998,000	61,941,000	3,503,200	65,444,200	43,203,000	38,407,000	80.19%
Dec-21	11/05/21 - 12/03/21	162,000	20,764,000	29,002,000	49,928,000	4,389,250	54,317,250	28,902,000	30,800,000	90.98%
Jan-22	12/04/21 - 01/05/22	399,000	19,823,000	28,699,000	48,921,000	3,599,750	52,520,750	27,530,000	30,316,000	90.79%
Feb-22	01/06/22 - 02/04/22	484,000	16,152,000	22,664,000	39,300,000	4,333,500	43,633,500	24,313,000	25,434,000	87.71%
Mar-22	02/05/22 - 03/04/22	1,195,000	15,679,000	21,371,000	38,245,000	8,869,000	47,114,000	26,003,000	24,000,000	94.22%
Apr-22	03/05/22 - 04/04/22	1,329,000	20,482,000	31,010,000	52,821,000	4,213,200	57,034,200	32,559,000	33,675,000	86.11%
May-22	04/05/22 - 05/04/22	2,125,000	31,351,000	42,582,000	76,058,000	4,412,150	80,470,150	45,330,000	44,464,000	89.62%
TOTAL		5,936,000	292,682,000	452,107,000	750,725,000	65,641,581	816,366,581	463,176,000	449,100,000	
AVERAGE		456,615	22,514,000	34,777,462	57,748,077	5,049,352	62,797,429	35,628,923	34,546,154	89.68%

STP Data

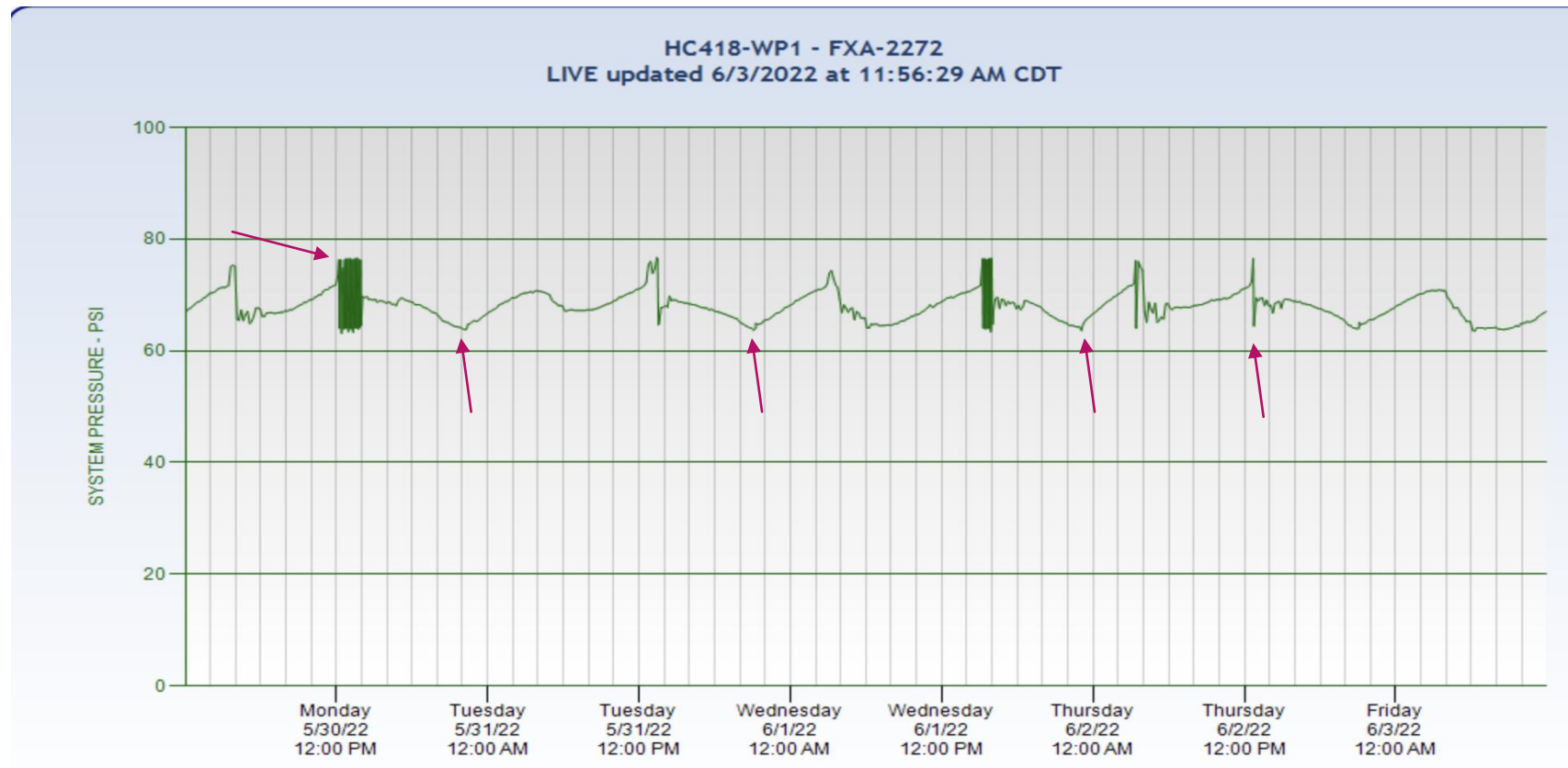
Wastewater Treatment Permit Summary for the Month of April

	DISCHARGE PERMIT	ACTUAL	COMPLIANT	RE_USE PERMIT	ACTUAL	COMPLIANT	PERCENT	Apr-22	Apr-21	% Over Last Year
Avg. Treated Flow	2.1 MGD	0.000	N/A		0.895	Yes	42.6%	0.895	1.058	-7.8%
Avg. cBOD	7 mg/L	n/a	N/A	5 mg/L	<4.11	Yes				
Avg. TSS	15 mg/L	n/a	N/A		n/a	N/A				
Avg. Ammonia Nitrogen	2 mg/L	n/a	N/A		n/a	N/A				
E. coli Bacteria	63 CFU	n/a	N/A	20 CFU	<1.45	Yes				
Avg. Turbidity		n/a	N/A	3 NTU	1.430	Yes				
MIN. PH	6.5 STD UNITS	n/a	N/A		6.99	Yes				
MAX. PH	9.0 STD UNITS	n/a	N/A		7.41	Yes				

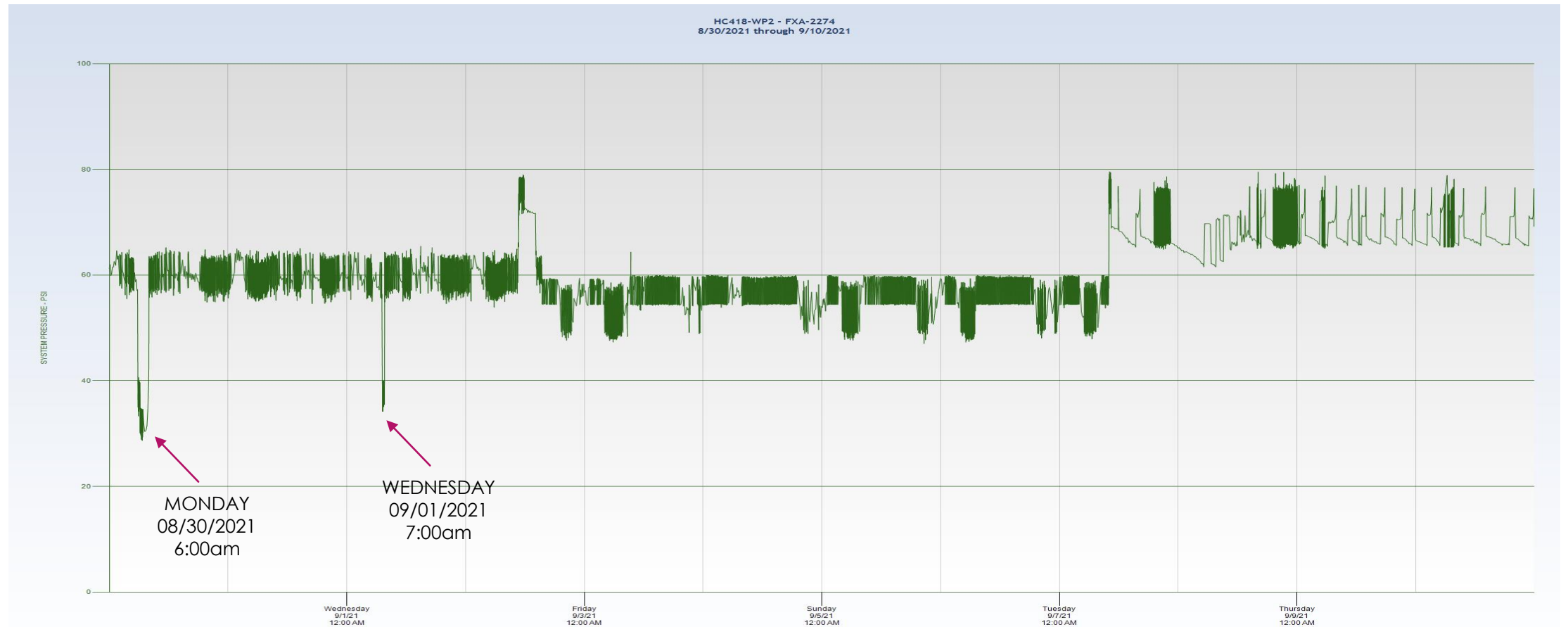
North Water Plant Pressure readings 08/30/21-09/10/21



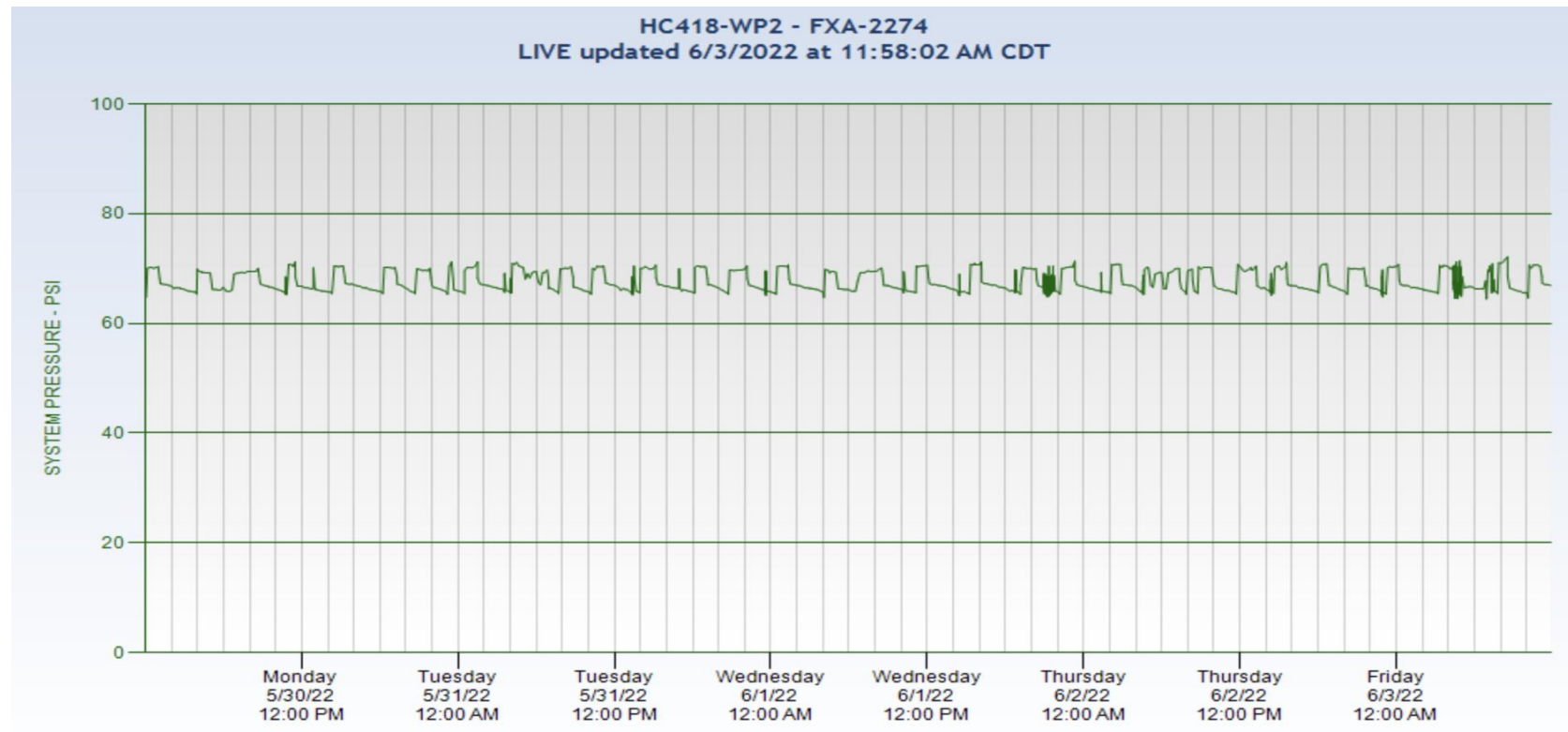
North Water Plant Pressure readings 05/30/22-06/03/22

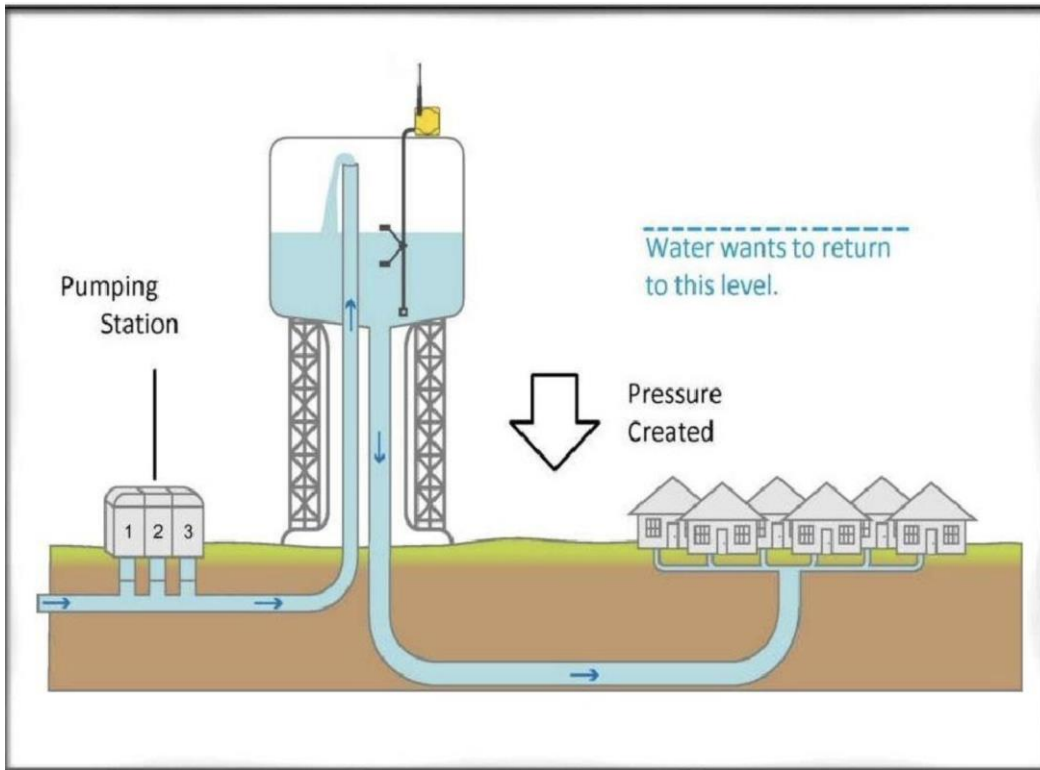


South Water Plant Pressure readings 08/30/21-09/10/21

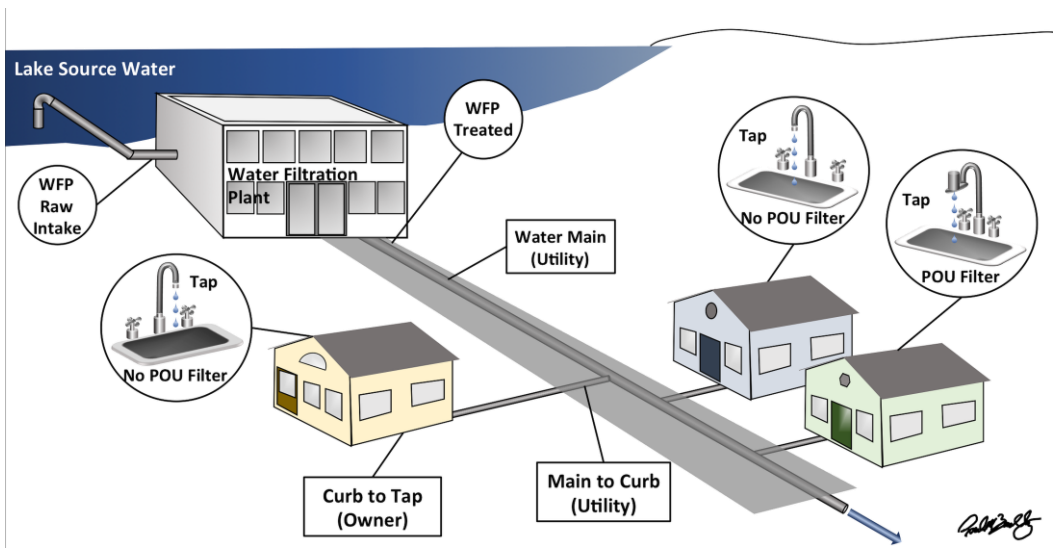


South Water Plant Pressure readings 05/30/22-06/03/22





Water distribution with EST



Water distribution w/out EST

WHCRWA/BRIDGELAND SUMMARY

- ▶ HC MUD 418 has a water supply commitment with the WHCRWA in the amount of **2.1 MGD**, provided the water is available and we do not have any type of emergency condition. Because of this commitment, the Bridgeland metering station has been labeled a priority site, which means that the WHCRWA operations team will make every effort to supply the district with their contracted flow, and the MUD operator is first to be notified of any condition affecting the operation of the Authority.
- ▶ **Typically, we would set the metering station valves to that flow in gallons per minute, which is just under 1500 GPM, and tell the operator to lower the well setpoint and take more surface water.** However, after extensive talks with Jeremy over the summer seasons, a set GPM is not enough to keep up with the MUD's morning and overnight demand. We have seen this many times over the years, with both wells running and 3,000 GPM of surface water supplied, the EST and GST levels at Water Plant #1 are still dropping at 6 AM.
- ▶ The WHCRWA operations team has a specific plan in place for HC MUD 418, where the metering station valves are set up to run at their maximum capacity of 2500 GPM on average for peak summer hours up to 3,000 GPM, and any flow reductions needed on our side would be done during periods of lower demand after the MUD receives their daily contracted flow.

Theories

1. Most irrigation systems are “preset” by irrigation companies to run MWF in the early morning.
2. Many families are getting ready for work and school in the early morning.
3. Some curbs in Bridgeland have black algae growing on sides or green algae growing on sidewalks; signs over overwatering.

Conclusion: There is a significant amount of potable usage specifically from 4:00am-8:00am MWF

Drought Contingency Plan

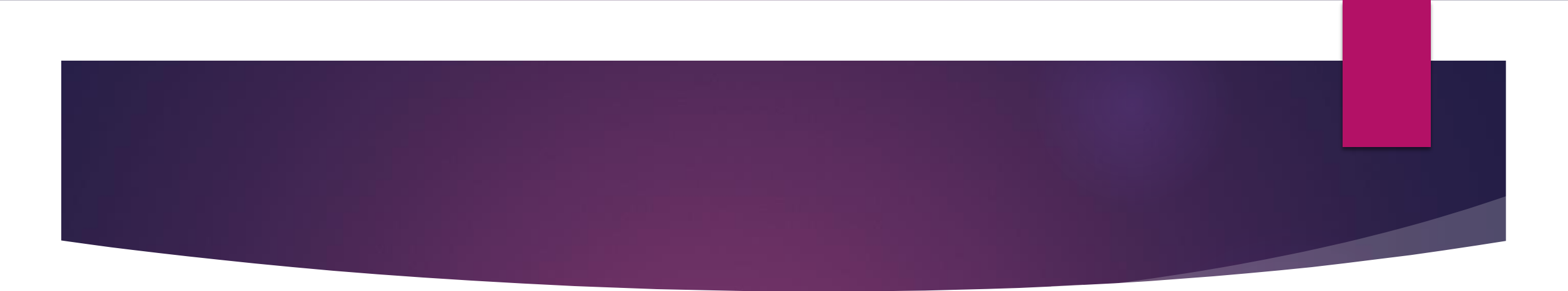
- ▶ [https://texreg.sos.state.tx.us/public/readtac\\$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_floc=&p_ploc=&pg=1&p_tac=&ti=30&pt=1&ch=288&rl=20](https://texreg.sos.state.tx.us/public/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_floc=&p_ploc=&pg=1&p_tac=&ti=30&pt=1&ch=288&rl=20)
- ▶ A drought contingency plan for a retail public water supplier, where applicable, must include the following minimum elements.
- ▶ (1) Minimum requirements. Drought contingency plans must include the following minimum elements.
- ▶ (A) Preparation of the plan shall include provisions to actively inform the public and affirmatively provide opportunity for public input. Such acts may include, but are not limited to, having a public meeting at a time and location convenient to the public and providing written notice to the public concerning the proposed plan and meeting.
- ▶ (B) Provisions shall be made for a program of continuing public education and information regarding the drought contingency plan.
- ▶ (C) The drought contingency plan must document coordination with the regional water planning groups for the service area of the retail public water supplier to ensure consistency with the appropriate approved regional water plans.
- ▶ (D) The drought contingency plan must include a description of the information to be monitored by the water supplier, and specific criteria for the initiation and termination of drought response stages, accompanied by an explanation of the rationale or basis for such triggering criteria.
- ▶ (E) The drought contingency plan must include drought or emergency response stages providing for the implementation of measures in response to at least the following situations:
 - ▶ **(i) reduction in available water supply up to a repeat of the drought of record;**
 - ▶ **(ii) water production or distribution system limitations;**
 - ▶ **(iii) supply source contamination; or**
 - ▶ **(iv) system outage due to the failure or damage of major water system components (e.g., pumps).**
- ▶ (F) The drought contingency plan must include specific, quantified targets for water use reductions to be achieved during periods of water shortage and drought. The entity preparing the plan shall establish the targets. The goals established by the entity under this subparagraph are not enforceable.
- ▶ (G) The drought contingency plan must include the specific water supply or water demand management measures to be implemented during each stage of the plan including, but not limited to, the following:

DCP Summary

- ▶ Level 1
 - ▶ Trigger - Well Run times/RWA Supply is equivalent to 16 hours per day
 - ▶ Release
- ▶ Level 2
 - ▶ Trigger - Well Run times/RWA Supply is equivalent to 18 hours per day
 - ▶ Release
- ▶ Level 3
 - ▶ Trigger - Well Run times/RWA Supply is equivalent to 20 hours per day
 - ▶ Release

Solutions

- ▶ Install pressure sensors at strategic points around community too monitor system pressure
- ▶ Convert 300 connections from North to South
 - ▶ 399 in 202110
- ▶ Bring Well #4 online (WP2)
- ▶ Convert 300 more connections from North to South
 - ▶ 460 in 202204
- ▶ Bring Inframark into the social media circles to help residents understand facts, including Facebook Live sessions
- ▶ Modify DCP and communicate to include designated watering day and times
- ▶ Engage “Water Wise” type program to assist residents on how to properly water including:
 - ▶ Irrigation programming videos/assistance
 - ▶ Online water use calculators; Aeration of yards



In an effort to conserve water and regulate the residential demand on the Bridgeland Potable Water System, we ask that the Builders set irrigation control systems on new constructions per the following guidelines set by the District's Water Conservation Plan:

Even Numbered Addresses: Between midnight and 4am on Mondays, Wednesdays, and Fridays.

Odd Numbered Addresses: Between midnight and 4am on Tuesday, Thursday, and Sunday.

Thank you for your cooperation,

Board of Directors



QUESTIONS??

Bridgeland Water System

HARRIS COUNTY MUD 418, 419, 489, 490

JUNE 07, 2022