Bridgeland Water System

HARRIS COUNTY MUD 418, 419, & 489

SEPTEMBER 13, 2021

Agenda

- Background
  - Drought Contingency Plan defined
  - Water Modeling
  - Plant design
- Initial Water Quality Challenges
  - Split System origination
  - WQT testing before/after
  - Split System
  - WQT results
  - Current Water Supply Capabilities
- Current Water Quality Challenges

Drought Contingency Plan

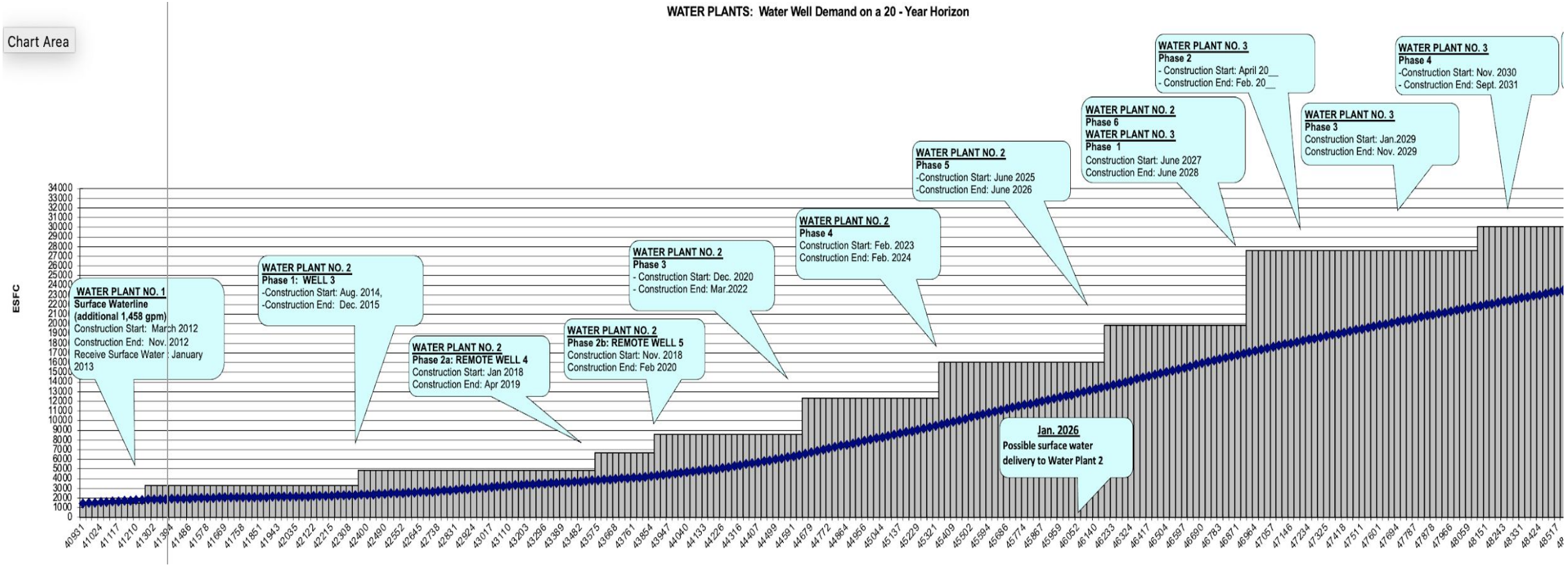
- https://texreg.sos.state.tx.us/public/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=30&pt=1&ch=288&rl=20

- 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

- Level1
  - 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
  - Trigger - Well Run times/RWA Supply is equivalent to 20 hours per day
  - Release

WATER MODELING



"ULTIMATE "WATER PLANT DESIGN

WATER PLANT #1

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 **		
Well No. 2	300 gpm		
Surface Water	1,458 gpm		(2 M gal. per day)
TOTAL	2,658 gpm	0.8 gpm	3,323
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

WATER PLANT #2

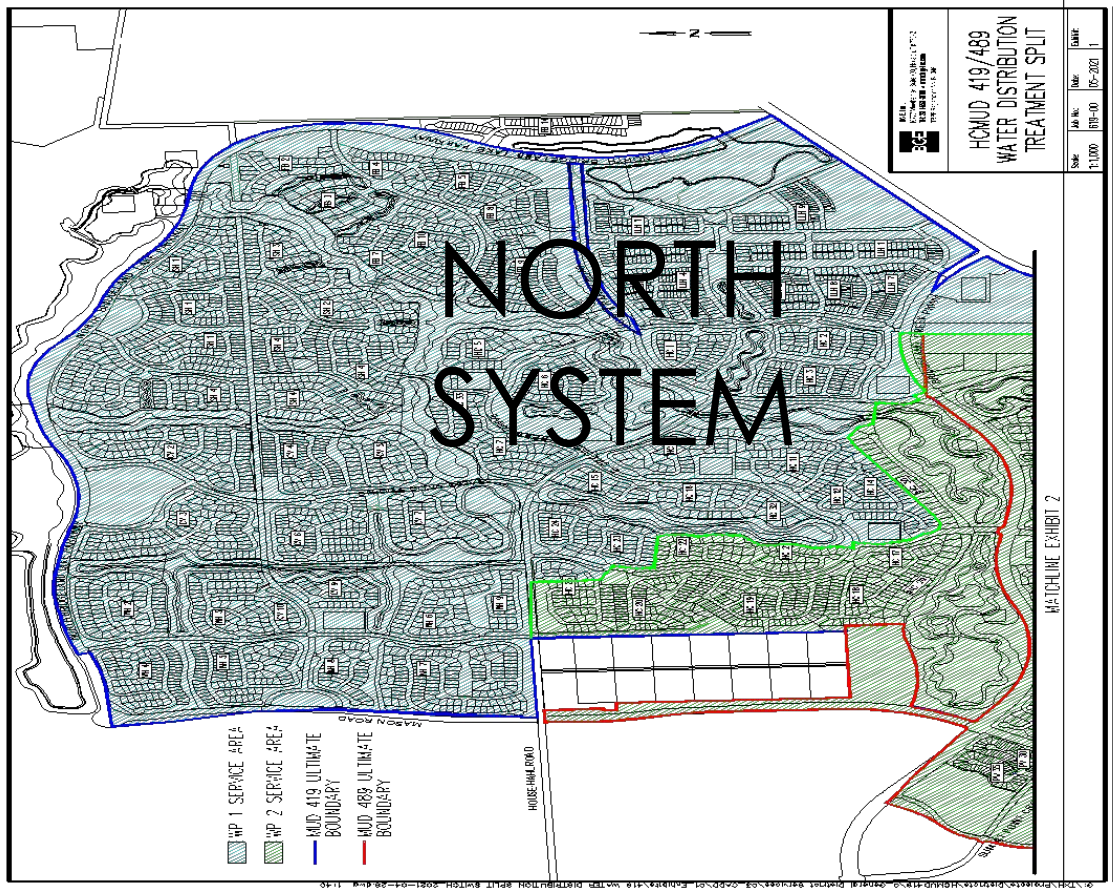
Future Water Plant No. 2 Capacities

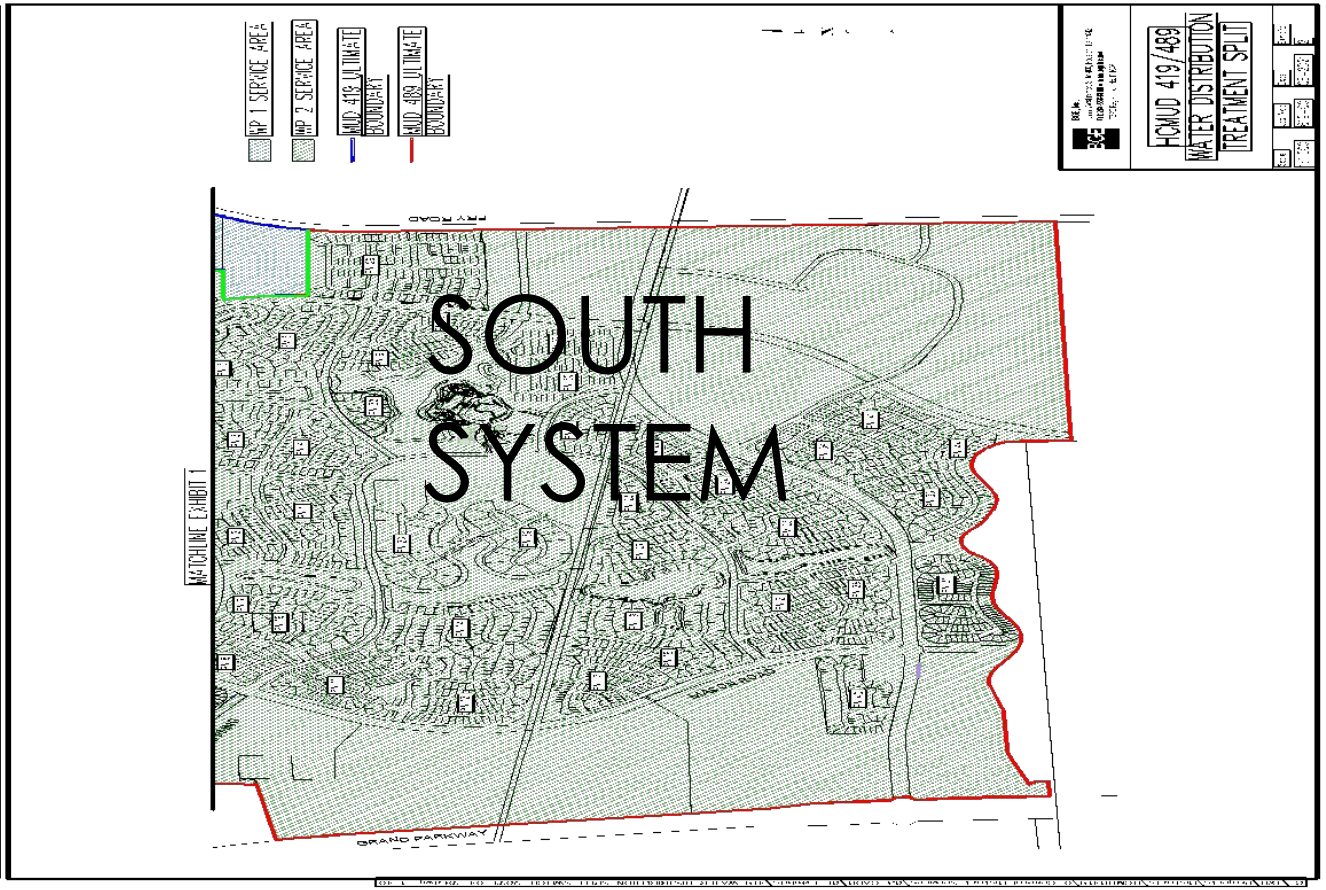
Facilities	Existing Capacity	TCEQ Min Req. per ESFC	Allowable Connections
Water Supply			
Well No. 1-10	14,400 gpm		
Surface Water	0 gpm		
TOTAL	14,400 gpm	0.8 gpm	18,000
Storage Facilities			
Ground Storage Tank	500,000 gal		
Ground Storage Tank	1,000,000 gal		
Ground Storage Tank	1,000,000 gal		
Ground 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			limiting component
Jockey Pump No. 1	1,000 gpm		
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

Split System Origination

- Water Plant #1 (Water well 1&2; WHCRWA)
  - 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)
    - Well #3 began producing water with Iron Reducing Bacteria (IRB)
    - The water with the IEB began reacting with the water from WP1 and creating water quality issues in entire water system.

“Split” System





HC419 WQT 201908

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:	[illegible]D	RD	RD	AE	AE	[illegible]	RD	[illegible]E	
Date:	08/[illegible]8/19	08/28/19	08/28/19	08/28/19	08/28/19	08/2[illegible]/19	08/28/19	08/[illegible]8/19	

* HPC - Heterotrophic Plate Count, cfu - colony forming units TNTC - to numerous to coun

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

HC419 WQT 202108

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Client: Inframark
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Katy, TX 77449
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	KWM	KWM	KWM	
Date:	08/[illegible]/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

"CURRENT" WATER PLANT CAPABILITIES

	UNITS	NORTH (3,356 CONNECTIONS)	SOUTH (2,200 Connections)
EST/GST VOLUME	GALLONS	1,250,000	1,500,000
BOOSTER	GALLONS PER MINUTE	10,150	10,000
SUPPLY	GALLONS	4,774,000	4,608,000
SUPPLY AT NORTH IS 2 WELLS +WHCRWA			
SUPPLY AT SOUTH IS FROM 1 WELL			

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 3000 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 3000 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.

Comprehensive Potable water production/metering

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.
Jul-20	06/05/20 - 07/06/20	0	21,715,000	57,748,000	79,463,000	1,353,500	80,816,500	32,200,000	53,587,000	94.21%
Aug-20	07/07/20 - 08/04/20	0	23,555,000	51,268,000	74,823,000	2,998,650	77,821,650	40,295,000	46,082,000	90.10%
Sep-20	08/05/20 - 09/03/20	0	27,221,000	62,641,000	89,862,000	1,677,500	91,539,500	50,863,000	49,171,000	91.51%
Oct-20	09/04/20 - 10/06/20	0	22,785,000	48,656,000	71,441,000	6,431,112	77,872,112	42,169,000	45,156,000	89.18%
Nov-20	10/07/20 - 11/04/20	0	19,590,000	43,438,000	63,028,000	2,687,600	65,715,600	39,241,000	32,926,000	91.06%
Dec-20	11/05/20 - 12/04/20	0	17,201,000	36,392,000	53,593,000	2,525,420	56,118,420	29,896,000	32,385,000	90.11%
Jan-21	12/05/20 - 01/05/21	0	12,989,000	24,808,000	37,797,000	1,697,950	39,494,950	18,881,000	23,720,000	92.71%
Feb-21	01/06/21 - 02/02/21	0	10,484,000	21,091,000	31,575,000	1,666,500	33,241,500	17,562,000	20,302,000	87.79%
Mar-21	02/03/21 - 03/04/21	0	14,383,000	24,830,000	39,213,000	4,432,950	43,645,950	28,534,000	19,201,000	91.43%
Apr-21	03/05/21 - 04/06/21	0	17,521,000	35,098,000	52,619,000	3,504,120	56,123,120	24,577,000	34,968,000	94.25%
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%
TOTAL		76,000	252,912,000	522,777,000	775,765,000	38,688,058	814,453,058	427,713,000	463,923,000	
AVERAGE		5,846	19,454,769	40,213,615	59,674,231	2,976,004	62,650,235	32,901,000	35,686,385	91.31%

Most recent data – Plant 1

Logsheet for Harris County MUD #418 Water Plant #1

Name	Date	Time	Mins Elapsed	Well #1 Flow	Well #1 Pumpage	Well #2 Flow	Well #2 Pumpage	RA Flow Totalizer #1	RA Flow Gal #1
Scott Robinson	44,445	9:20 AM	-	40,155	282	99,158	696	371,753	821
Leonard Ramirez	44,447	2:26 PM	-	40,437	242	99,854	584	372,574	638
Leonard Ramirez	44,448	2:29 PM	-	40,679	76	100,438	178	373,212	1,285
Leonard Ramirez	44,448	10:18 AM	-	40,755	52	100,616	136	374,497	1,555
Leonard Ramirez	44,449	10:28 AM	-	40,807	15	100,752	50	376,052	1,006
Shawn Peek	44,450	6:37 AM	-	40,822	42	100,802	109	377,058	1,667
Shawn Peek	44,451	8:00 AM	1,523	40,864		100,911		378,725	
Max				40,864	282	100,911	696	378,725	1,667
Min				40,155	15	99,158	50	371,753	638
Avg				40,646	118	100,362	292	374,839	1,162
Sum				284,519	709	702,531	1,753	2,623,871	6,972
Count				7	6	7	6	7	6

Most recent data – Water Plant #2

Logsheet for Harris County MUD #418 Water Plant #2

Name	Date	Time	Mins Elapsed	Bleach #1 Gal	Bleach #1 gal Used	LAS #1 Gal	LAS #1 Gal Used	Well #1 Flow	Well #1 Pumpage
Scott Robinson	09/06/2021	7:42 AM	0	2700	0	580	0	789983	1148
Leonard Ramirez	09/07/2021	8:12 AM	0	2700	60	580	0	791131	899
Leonard Ramirez	09/08/2021	1:34 PM	0	2640	50	580	0	792030	1654
Leonard Ramirez	09/09/2021	8:40 AM	0	2590	60	580	0	793684	1421
Leonard Ramirez	09/10/2021	8:20 AM	0	2530	50	580	0	795105	1449
Shawn Peek	09/11/2021	7:50 AM	0	2480	55	580	0	796554	1485
Shawn Peek	09/12/2021	8:55 AM	0	2425	38	580	0	798039	1232
Scott Robinson	09/13/2021	7:10 AM	1335	2387		580		799271	
Max				2700.00	60.00	580.00	0.00	799271.00	1654.00
Min				2387.00	0.00	580.00	0.00	789983.00	899.00
Avg				2556.50	44.71	580.00	0.00	794474.63	1326.86
Sum				20452.00	313.00	4640.00	0.00	6355797.00	9288.00
Count				8.00	7.00	8.00	7.00	8.00	7.00

STP Data

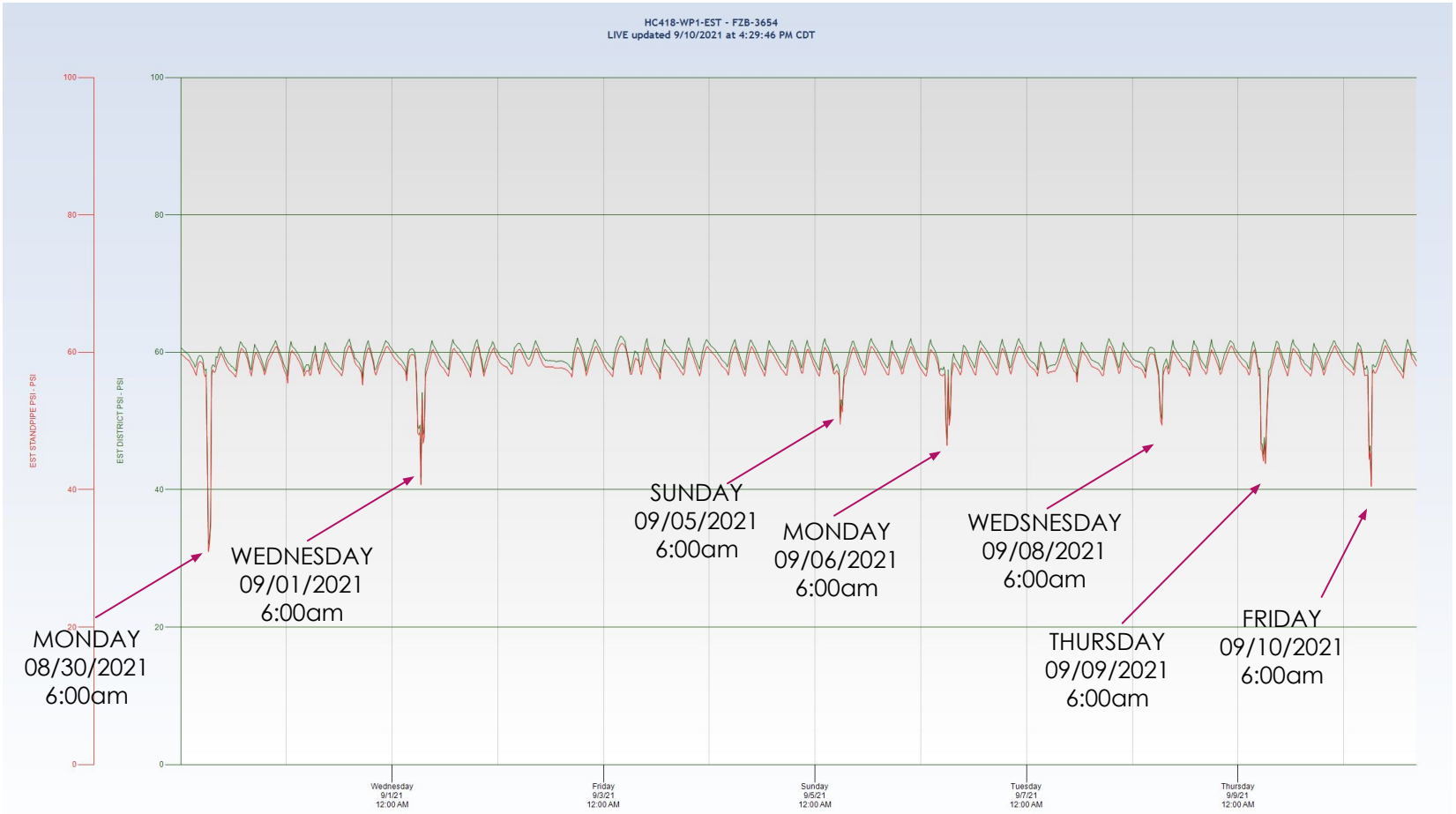
Wastewater Treatment Permit Summary for the Month of June

	DISCHARGE PERMIT	ACTUAL	COMPLIANT	RE_USE PERMIT	ACTUAL	COMPLIANT		PERCENT	Jun-21	Jun-20	% Over Last Year
Avg. Treated Flow	2.1 MGD	0.000	N/A		1.156	Yes	MGD	55.0%	1.156	0.825	15.7%
Avg. cBOD	7 mg/L	n/a	N/A	5 mg/L	2.26	Yes	mg/L				
Avg. TSS	15 mg/L	n/a	N/A		n/a	N/A	mg/L				
Avg. Ammonia Nitrogen	2 mg/L	n/a	N/A		n/a	N/A	mg/L				
E. coli Bacteria	63 CFU	n/a	N/A	20 CFU	1.18	Yes	CFU/100mL				
Avg. Turbidity		n/a	N/A	3 NTU	1.10	Yes	NTU				
MIN. PH	6.5 STD UNITS	n/a	N/A		6.62	Yes	mgd				
MAX . PH	9.0 STD UNITS	n/a	N/A		7.53	Yes	mgd				

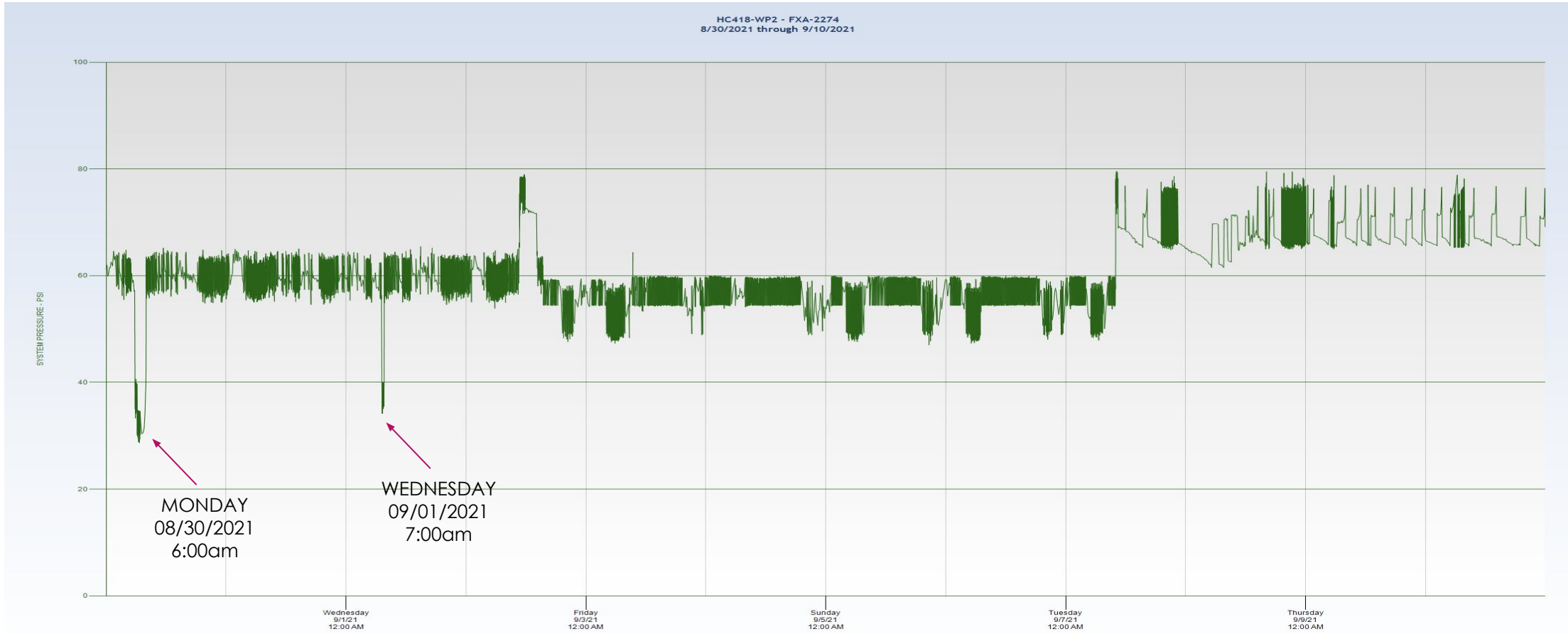
STP & Flushing irrigation breakdown

- Is flushing causing our water issues?
  - **79.821M** is what the Bridgeland pumped and received from WHCRWA in July 2021
  - **2.376M** was flushed in the community during July 2021
  - **Roughly speaking that is 2.976% per month is used for flushing**
- How much water goes to the sanitary waste?
  - **79.821M** is what the Bridgeland pumped and received from WHCRWA in July 2021
  - **35.836M was measured at the STP. (**We averaged 1.156M per day at STP)
  - **Roughly 44.89% of the pumped/received water is treated at the STP**
- How much are we using to irrigate and sanitary waste?
  - **38.282M, or 47.95% is used to flushing and STP**
- How much are we using to irrigate?
  - **41.528M or 52.055 is used for residential irrigation**

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



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



Theories

1. Residents are replanting damaged vegetation from URI.
2. Most irrigation systems are “preset” by irrigation companies to run MWF in the early morning.
3. Many families are getting ready for work and school in the early morning.
4. 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

Solutions

- Install pressure sensors at strategic points around community too monitor system pressure
- Convert 300 connections from North to South
- Bring Well #4 online (WP2)
- Convert 300 more connections from North to South
- 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

- September 15th