



Project Castle Bay

General Situation

- There is inadequate retention time following disinfection to achieve the CT requirements to satisfy GUDI protocols prior to the first residence.
- Dillon has been instructed to proceed with identifying the options to address CT requirements.
- The system has not been able to fill the reservoir, likely due to leaks or other losses in the distribution system.

Objectives

1. Upgrade treatment equipment at Spencer Lane Pumphouse to control pathogens consistent with AFNWA regulations[bacteria, viruses and protozoa] to lift Boil Water Advisory
2. Restore water levels in the Castle Bay reservoir adequate for fire protection
3. Establish new wells near Castle Bay reservoir and develop treatment facilities consistent with AFNWA regulations
4. Establish new wells near Spenser Lane pumphouse to control pathogens consistent with AFNWA regulations

System Map



What is ICS and how does it work?

The Incident Command System or ICS is a standardized, on-scene, all – risk incident management concept. ICS allows its users to adopt an integrated organizational structure to match the complexities and demands of single or multiple incidents without being hindered by jurisdictional boundaries.

Benefits of using ICS?

- Clarifying chain of command and supervision responsibilities to improve accountability.
- Leveraging interoperable communications systems and plain language to improve communications.
- Providing an orderly, systematic planning process.
- Implementing a common, flexible, predesigned management structure.

ICS 215 Planning Worksheet



Operational Planning Worksheet/Wall Chart (ICS 215)

1. Incident Name: Operations Castle Bay				2. Operational Period: Date From: April 17, 2023 Date To: 09:00 Time From: May 1, 2023 Time To: 08:59																
3. Branch	4. Division, Group, or Other	5. Work Assignment & Special Instructions	6. Resources	Dillon Consulting	CWRS Consulting	Technical Services	Valve Trailer	Leak Detection	Hydrant Assement	Valve Cleaning C+	Flagging Team	GIS Tech	Leak Repair	Electrical Contract+	Plumbing Contract+	7. Overhead Position(s)	8. Special Equipment & Supplies	9. Reporting Location	10. Requested Arrival Time	
Planning	Upgrade Group	Upgrade treatment equipment at Spencer Lane Pump house to control pathogens consistent with AFNWA regulations [bacteria, viruses and protozoa] to lift Soil Water Advisory	Req.	4	1											PSC	N.A	N.A	N.A	
			Have	4	1															
			Need	0	0															
OPS	Leak Group	Restore water levels in the Castle Bay reservoir adequate for fire protection	Req.			1	1	2	1	3	1	1	2			OSC	As per requests	Eskasoni	Varies	
			Have			1	1	1	0	3	1	1	0							
			Need			0	0	1	1	0	0	0	2							
OPS	Upgrade Group	WTP Analyzer Upgrades	Req.											1	1	OSC	As per requests	Eskasoni	Varies	
			Have											0	1					
			Need											1	0					
			Req.																	
			Have																	
			Need																	
			Req.																	
			Have																	
			Need																	
			Req.																	
			Have																	
			Need																	
11. Total Resources Required				4	1	1	1	2	1	3	1	1	2	1	1	14. Prepared by:				
12. Total Resources - Have on Hand				4	1	1	1	1	0	3	1	1	0	0	1	Name: <u>Jeff Wujcik</u>				
13. Total Resources Need To Order				0	0	0	0	1	1	0	0	0	2	1	0	Position/Title: <u>Operations Section Chief</u>				
															Signature: <u>[Signature]</u>					
															Date/Time: <u>April 17, 2023/ 9:00</u>					

Leak Detection

- Acoustic Correlators
- Micro Sensors



Hydrant Inspection

Hydrant Number (H**)	
Maintenance Status	
Inspector	
Inspection Date	
Are chains missing?	Yes/No
Needs to be painted?	Yes/No
Needs marker?	Yes/No
Needs lubrication?	Yes/No
Needs grease?	Yes/No
Drains correctly?	Yes/No
Notes	
Pressure	
Flow Rate	
Flow Duration	
Is the hydrant leaking?	Yes/No
Is the hydrant operable?	Yes/No
Inspection Group	
Fire Station	
Total Water Used	
Comments	

This annual inspection ensures hydrants have not been damaged or are not holding water that could freeze over winter, both of which would render the hydrant unusable in the event of an emergency.

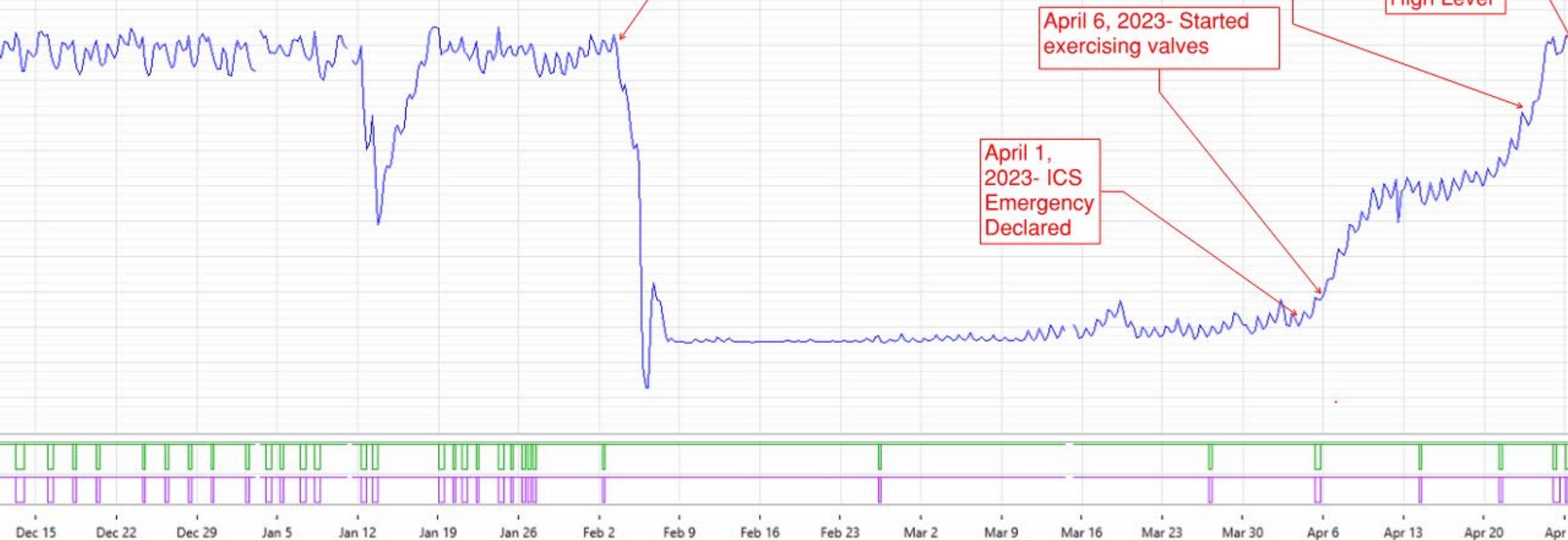
Castle Bay – Spencer's Lane WTP

Deficiency: No inline Turbidity Analyzers on Well Inlets

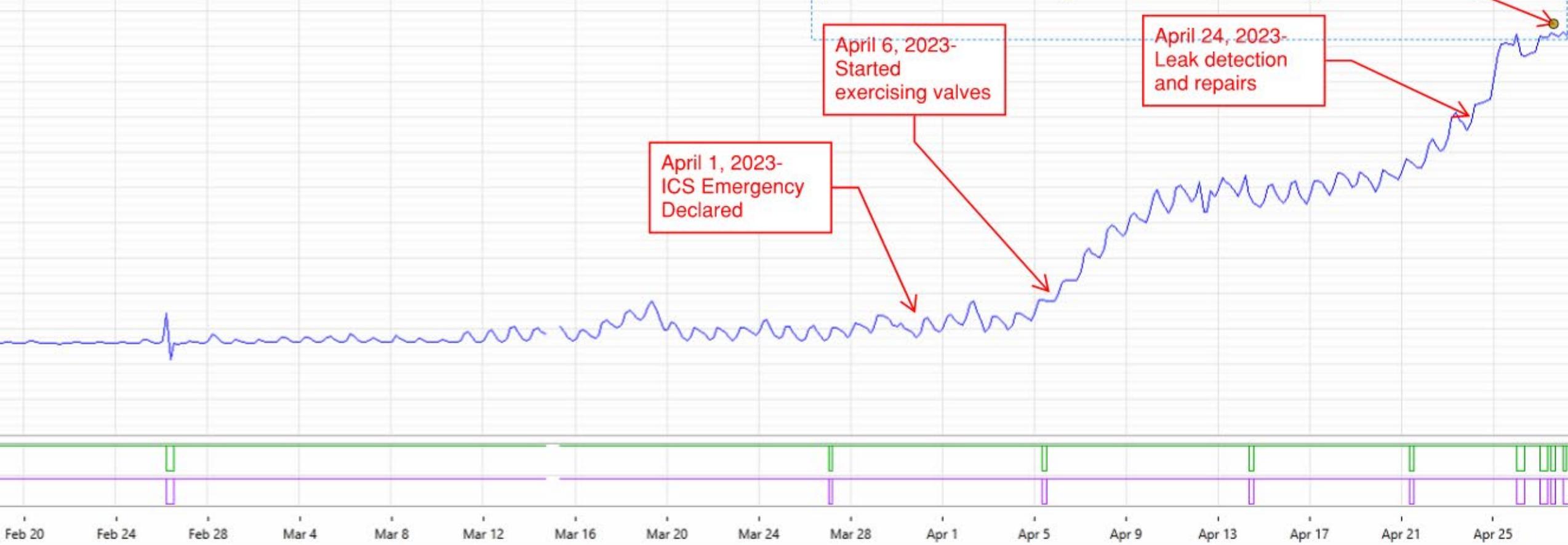
- Two new HACH tu5300sc turbidity analyzers and one sc4500 controller installed at WTP. New sample lines, power/ signal wiring and all accessories installed. Signals programmed/ configured on PLC and VTScada to allow for trending, alarming and monitoring.

Deficiency: One functional pump and one damaged pump. New GammaX pumps found on shelf with missing parts.

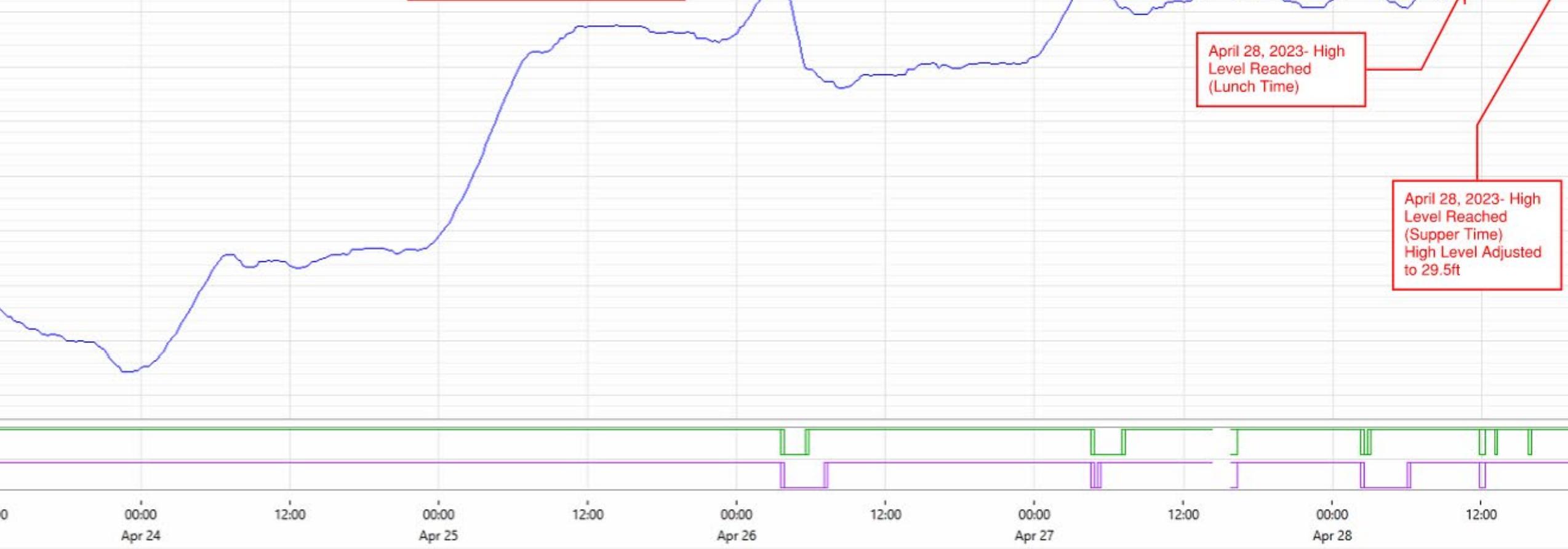
- Installed new injection panel complete with calibration chamber/ BPV/ PRV, two new Prominent GammaX injection pumps, injection lance, tubing, foot valves, level switch and signal cables. Existing logic for chemical pumps only included on/off control for each pump so changed the programming to allow the pumps to operate as flow pace vs. the manual mode currently operating in. New pumps have been commissioned and are now online and visible for control and monitoring on VTScada, readings were closely monitored over the weekend to ensure proper injection is being achieved.



Description	Value	Minimum	Maximum	Average	Starts	On Time
Tank 2 Level		-0.676 ft	30.7 ft	19.1 ft		
PH2 Pump 1 Running		Off	On	0.98	58	172 Days 19:53:44
PH2 Pump 2 Running		Off	On	0.979	55	172 Days 18:50:05



Description	Value	Minimum	Maximum	Average	Starts	On Time
Tank 2 Level		-0.676 ft	29.5 ft	11.8 ft		
PH2 Pump 1 Running		Off	On	0.997	19	88 Days 22:46:00
PH2 Pump 2 Running		Off	On	0.994	15	88 Days 19:29:31



April 28, 2023- High Level Reached (Lunch Time)

April 28, 2023- High Level Reached (Supper Time) High Level Adjusted to 29.5ft

Description	Value	Minimum	Maximum	Average	Starts	On Time
Tank 2 Level		18.8 ft	29.5 ft	25 ft		
PH2 Pump 1 Running		Off	On	0.966	9	6 Days 16:52:44
PH2 Pump 2 Running		Off	On	0.945	6	6 Days 13:35:55

Disinfection Requirements

Based on the NSECC standards, the following disinfection requirements are applicable for the existing wells at Castle Bay:

- 4-log reduction of viruses, required for all water sources;
- 3-log reduction of protozoa (Giardia and Cryptosporidium), required for groundwater under the direct influence of surface water (GUDI) sources (GUDI assessment for Castle Bay is ongoing by Dillon); and
- Secondary disinfection required to maintain a minimum free chlorine residual of 0.2 mg/L throughout the distribution system at all times.

Deficiency Options

UV

- APS to spec a D18 Trojan UV unit, a bit bigger than the current system but hopeful that with only minor plumbing upgrades it will fit in the existing space.
- ProMinent is another option but D18 Trojan unit is the front runner.

CT

- Contact pipe loop system, carrying the water 75m away then 75m back to the pumphouse before releasing to the network. A sample line would be located in the building at the end of the loop.

UV System Upgrade Option

A UV dose of 186 mJ/cm² is required to achieve 4-log inactivation of viruses by UV disinfection. Therefore, for the purpose of this option, replacing the existing UV reactor with one capable of providing this increased dose would need to be considered.

Enquiries were made to APS about a validated UV reactor capable of providing the required dosage of 186 mJ/cm² at the existing flow rate of 14 L/s. APS provided a specification for the Trojan UVSwiftSC D18 model, validated at a UVT of 88% for 14 L/s. To implement this concept, the existing UV reactor would be decommissioned and replaced with the D18 model.

The new reactor requires a minimum footprint of 173 cm X 80 cm X 80 cm (L X H X W) for installation, and an additional 178 cm of clearance lengthwise for maintenance. Based on preliminary review of WTP layout and measurements, a single D18 reactor is anticipated to fit in the location of the existing reactor with minor piping modifications. The single unit is capable of processing the existing well production rate, but does not provide any redundancy.

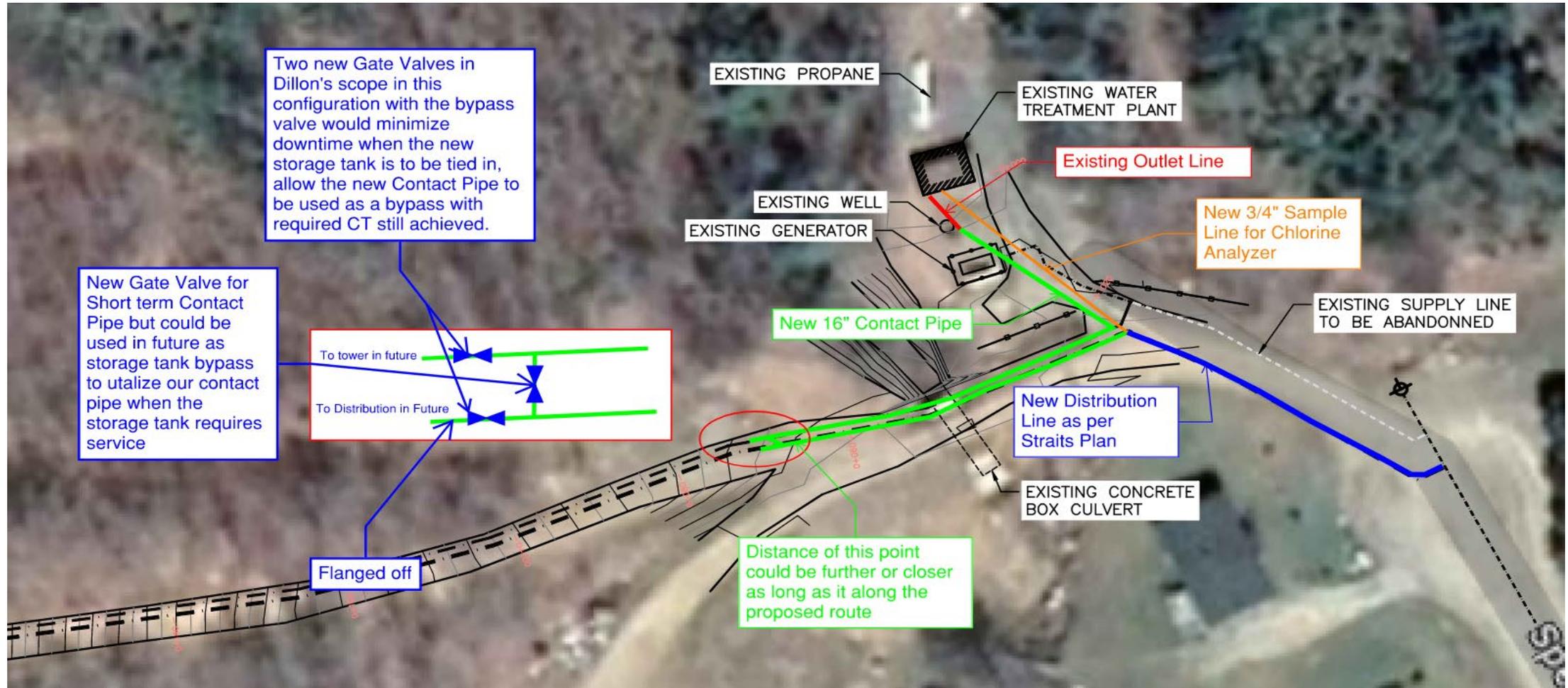
Pipe Loop Option

Concept for a contact pipe loop, which would include the following:

- Achieve a perfect baffle factor of 1.0; and
- Include an appropriate length of pipe to allow for adequate contact time before the chlorinated water is reintroduced into the distribution system.

To minimize disruption to the water supply system, the proposed concept involves tying into the current distribution system outside the building to intercept the flow. A double wide trench would accommodate a loop of piping extending away from and back to the tie-in point, enabling the water to undergo an extended residence time before reintroduction into the distribution system. Prior to leaving the building, the water would be chlorinated via the existing system, and a chlorine analyzer would be installed to measure the free chlorine residual at the conclusion of the contact pipe upon reintroduction to the distribution system.

Contact Time – Pipe loop Option



Pipeline - Future Development



Option Comparison

Pipe loop Option

Benefits	Challenges
<ul style="list-style-type: none"> Minimal disruption within WTP for installation. Provides secondary disinfection confirmation with addition of chlorine analyzer. Quicker implementation timeline. Local contractor/internal resources can be largely utilized. Least costly option. Simple system for operation, lowest life cycle cost. 	<ul style="list-style-type: none"> Requires ~45 m of doublewide trench construction. Will likely increase chlorine usage. May require short-term water shutoff during construction for tie-ins.

UV Option

Benefits	Challenges
<ul style="list-style-type: none"> Once installed, system operates similarly to existing system. No construction disruption outside of WTP building. 	<ul style="list-style-type: none"> UVT needs to be periodically monitored to confirm operation within validated range. If UVT falls outside of validated range, virus protection is not confirmed. 10-12-week lead time for UV reactor. Unknown lead-time for electrical equipment Costlier of the two options. Upgrades to the electrical system are required. Will likely require short-term water shutoff during construction. Existing inventory of UV Bulbs from the B series will not work with the proposed D series. Increased electrical consumption relative to existing system. Highest life cycle cost.

Discussion or Questions?

End.