Marine Corps Base (MCB) Camp Lejeune Restoration Advisory Board (RAB) Meeting Minutes

MEETING DATE:	May 3, 2023
LOCATION:	Coastal Carolina Community College, Business Technology Building, Jacksonville, North Carolina
ATTENDEES:	Thomas Richard/MCB Camp Lejeune Laura Spung/MCB Camp Lejeune David Towler/MCB Camp Lejeune Eric Adams/MCB Camp Lejeune Angela Moore/NCDEQ Jennifer Tufts/EPA Laura Bader/RAB Co-Chair Thomas Mattison/RAB member Rob Johnson/Community member Adam Jones/Community member Ruth Kehoe/Community member Bryan Revell/NAVFAC Matt Louth/CH2M Monica Fulkerson/CH2M Dylan Elks/Meadows
FROM:	Monica Fulkerson/CH2M
DATE:	May 18, 2023

I. Welcome and Introductions

Mr. Richard began the meeting, introduced the team, and explained the purpose of the RAB.

II. Site 82 Treatment Plant Update

Objective: The purpose of this agenda item is to discuss the principles and design of the treatment plant at Site 82, as well as performance and system optimization over time.

Overview: A presentation was reviewed by Mr. Elks.

An overview of Site 82 was presented. Site 82 is within Operable Unit 2, which includes storage lots 201, 202, and 203 (the former Defense Reutilization and Marketing Office). It was used for equipment, chemical, and waste storage. Constituents of concern (COC) include volatile organic compounds (VOCs) and metals in the shallow and deep aquifers. The treatment system was constructed in 1996 to address VOCs and metals in groundwater. Metals treatment was for shallow influent only and was discontinued in 2009. Groundwater is extracted from six recovery wells that are screened from approximately 35 to 55 feet (ft) below ground surface (bgs) and three recovery wells that are screened around 110 to 155 ft bgs.

Shallow and deep groundwater influent is recovered via down-well pumps and buried conveyance into the plant. Treatment of VOCs currently includes volatilization via air stripping and adsorption via carbon. Air stripping creates a counter current of contaminated water and clean air, forcing dissolved VOCs out of solution and into the gas phase. The treatment plant has utilized both packed column and sieve tray air stripping. A packed column tower was replaced with two sieve tray air strippers in 2019. Adsorption

occurs when a gas or liquid solute accumulates on the surface of a solid or a liquid (the adsorbent) forming a molecular or atomic film (the adsorbate). At the treatment plant, adsorption of any remaining VOCs (post-air stripping) is achieved by granular activated carbon (GAC) filtration. GAC is porous with high internal surface area allowing molecules of VOCs to become trapped. The treatment plant doubled its GAC filtration to four 8,000-pound filter tanks in 2016. Mr. Elks reviewed a process flow diagram to show how groundwater moves through the system.

Over time, changing conditions prompted the need for optimization. New COCs were detected, such as 1,1,2,2-tetrachloroethane (PCA), which is relatively resistant to volatilization. More restrictive regulatory standards were enacted. Buildup/scaling of precipitated nuisance metals (iron and calcium) was occurring, and all equipment was aging. To address these concerns, in 2015, sand filtration was added and in 2016, a Groundwater Treatment Plant Evaluation was conducted to assess further optimization strategies. Findings indicated that treatment plant effectiveness was limited by transient high flows to the air stripper, resulting in decreased VOC removal and causing higher VOC loading to the GAC process. The GAC process was arranged as two vessels in parallel which resulted in inefficient carbon use. Air stripping continued to be compromised by fouling caused mostly by iron and calcium. Existing pumps exceeded the service life (20 years) and additional recovery wells were needed to optimize mass recovery. Mr. Elks showed an updated process flow diagram to illustrate how the plant was optimized. This included standalone sand filtration for shallow influent, doubling the GAC filtration, adding an additional sand filter for air stripping, replacing pumps, and chemical addition to address nuisance metals.

Optimization was effective. A reduction in total suspended solids (TSS) and VOCs in shallow influent was observed, which reduces pressure on downstream filters and air stripping, resulting in reduced maintenance (e.g., backwashing and filter media exchanges reduced by 50 percent) and more complete volatilization by air stripping. Despite these improvements, removal of PCA was incomplete. Replacing the tower air stripper with the tray air strippers resulted in 100 percent removal of PCA. GAC remains as a polishing step, resulting in added protection for surface water. Mr. Elks showed the final process flow diagram to reflect the plant configuration following these changes.

Currently, the plant treats 9-12 million gallons of groundwater per month and removes 100 to 200 pounds of VOC mass per month. Since startup, the plant has treated over 1 billion gallons of groundwater and removed approximately 225,000 pounds of VOC mass. All VOCs have been treated to non-detectable levels since 2020 (100 percent efficiency). Optimization has decreased required maintenance significantly. GAC media replacement was reduced from once per year to more than three years. Backwashing of GAC and sand filtration was reduced from one to three times per week to once or twice a month. Similarly, cartridge filter changeouts are reduced from one to three per week to two per month.

Mr. Johnson asked about the air flowrates before and after optimization. Mr. Elks estimated hundreds of cubic feet per minute, but was uncertain of the exact number. Ms. Moore asked about the controls relating to discharge to the creek. Mr. Elks described how the pumps controlled system flow. Ms. Moore asked how the effluent related to the flow in the creek. Mr. Elks said he did not know the exact number, but that changes in plant operation would not influence base flow in the creek. Mr. Jones asked if the plant has to be shut down when hurricanes arrive. Mr. Elks said no, but that there are safety shutdowns. Mr. Jones followed up to ask if the system shut down, would the plume discharge to the creek. Mr. Elks explained that it would eventually if off for a long time.

III. Site 35 Brinson Creek Investigation

Objective: The purpose of this agenda item is to review the site background and investigation approach, present sampling results, and review the schedule.

Overview: A presentation was reviewed by Ms. Fulkerson.

An overview of Site 35 was presented. Site 35 is the former Camp Geiger Fuel Farm, where groundwater is contaminated with VOCs. The selected remedy for Site 35 includes air sparging, which operated between 2010 and 2013 and was restarted in 2020 as part of a pilot study; monitored natural attenuation (MNA); and land use controls (LUCs). Currently, MNA of groundwater is ongoing and LUCs are in place.

During Long-term Monitoring (LTM), vinyl chloride (VC) concentrations in the most downgradient monitoring well, IR35-MW62, have sporadically exceeded 10 times the North Carolina Surface Water Quality Standard (10 x NCSWQS), which suggests the potential for VC in groundwater to impact surface water. This is the basis for investigation in Brinson Creek. It is noted that monitoring well IR35-MW62 was damaged and abandoned in 2019. Attempts to reinstall a well in this area were unsuccessful due to site conditions.

The Brinson Creek Investigation was conducted in two phases. During Phase 1, the objective was to evaluate the groundwater-to-surface water pathway to determine whether VOCs in groundwater are impacting surface water and determine whether additional action is warranted. The investigation approach was to collect two rounds of samples (6 months apart in January 20201 and July 2021) of the following: 6 pore water samples; 6 surface water samples; and 6 sediment samples. Samples were analyzed for site-specific VOCs, including tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (DCE), VC, and benzene. VC was detected in exceedance of the project action limit (PAL) in pore water only in one location (PW11). In January 2021, VC was 53 µg/L and in July 2021, VC was 27 µg/L. Based on these results, additional investigation was recommended.

During Phase 2, the objective was to refine the delineation of the groundwater plume east of U.S. Highway 17; identify where groundwater may be discharging to the creek; and determine whether additional action is warranted. The investigation approach was to collect 10 co-located surface water, sediment, and pore water samples; collect up to 8 groundwater grab samples via slide hammer (with locations and quantity based on pore water results); and analyze for site-specific VOCs.

Benzene, cis-1,2-DCE, and VC were detected in groundwater. Only VC was detected above the PAL, at one location, with a concentration of 34 µg/L. Benzene, cis-1,2-DCE, and VC were also detected in pore water. Similarly, only VC was detected above the PAL, at two locations (31 µg/L and 32 µg/L, respectively). In sediment, again benzene, cis-1,2-DCE, and VC were detected. VC was detected above the PAL at one location (60 µg/kg) and benzene was detected above the PAL at one location (24 µg/kg). There were no detections of site-specific VOCs in surface water.

Although isolated exceedances of VC and benzene PALs for groundwater, pore water, and/or sediment were detected, there were no detections of benzene or VC in surface water. This suggests the COCs are not discharging from groundwater to surface water at detectable concentrations. LTM data indicates that COCs are decreasing at monitoring well IR35-MW49, located in the vicinity of the Brinson Creek investigation. Based on these conclusions, continued monitoring at IR35-MW49 is recommended. If VC concentrations change to increasing at IR35-MW49, then the collection of surface water samples should be considered.

The Brinson Creek Summary Tech Memo will be submitted as draft in June 2023 and is anticipated to be finalized in August 2023.

Ms. Moore asked about whether low-flow conditions were taken into consideration during data evaluation. Ms. Fulkerson responded that two seasonal sampling events were conducted, which did not reveal a significant difference in results. It was noted that Brinson Creek is not as significant a waterway as Wallace Creek and discharges directly to the New River.

IV. RAB Business

Mr. Jones asked if the State and EPA are assigned to the Base or the region. Ms. Moore responded that she is assigned to MCB Camp Lejeune along with another State regulator who splits the sites with her. Both work on other sites as well. Ms. Tufts responded similarly that she is assigned to MCB Camp Lejeune and other sites as well. Mr. Jones asked if creeks are tested near ranges. Mr. Richard responded that former ranges are investigated as part of CERCLA but that active ranges are under a different program.

Ms. Keho asked if we could speak about a barracks evacuation last year that was related to water. Mr. Towler responded that this was a false positive for a detection of nitrite reported by a mechanical contractor and that residents were returned to the barracks shortly thereafter. Ms. Kehoe asked how to report potential environmental issues related to stormwater runoff. Mr. Richard and Mr. Towler responded that runoff related issues are handled by others, but that they can help make connections to the right resources.

Mr. Richard announced the retirement of Mr. Brian Wheat from the RAB. Moving forward, copies of the presentations will be shared along with the meeting minutes. The next RAB meeting will be scheduled for August 2023 and an email with the projected date will be sent to the RAB members.

Treatment Plant Update
Site 82

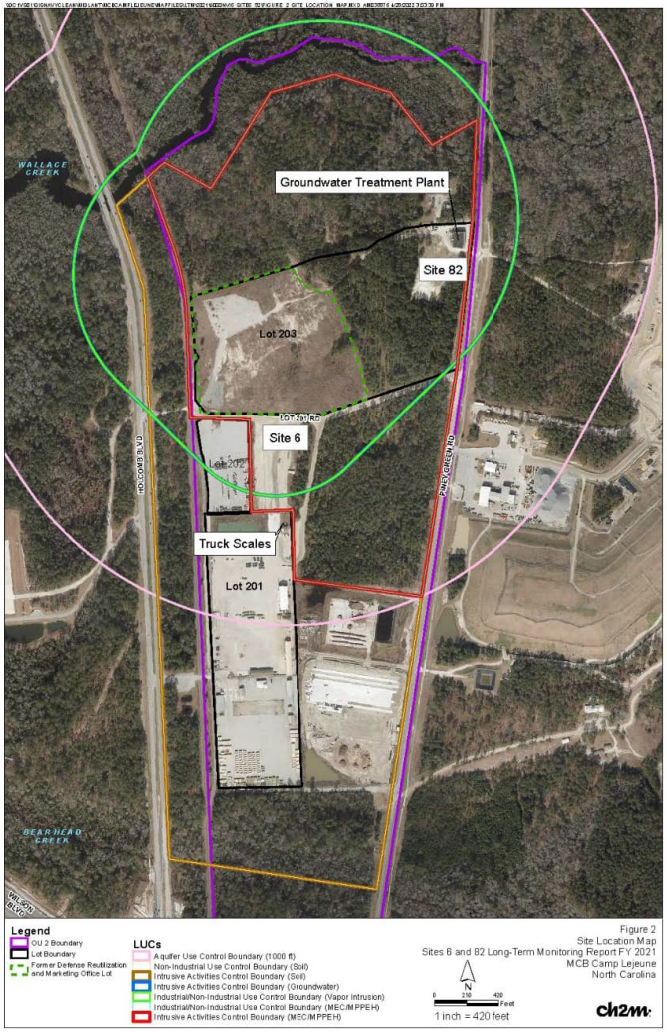
Environmental Quality

OBJECTIVE

- Background
- Treatment Principles
- System Design and Optimization Overtime
- Performance and Efficacy

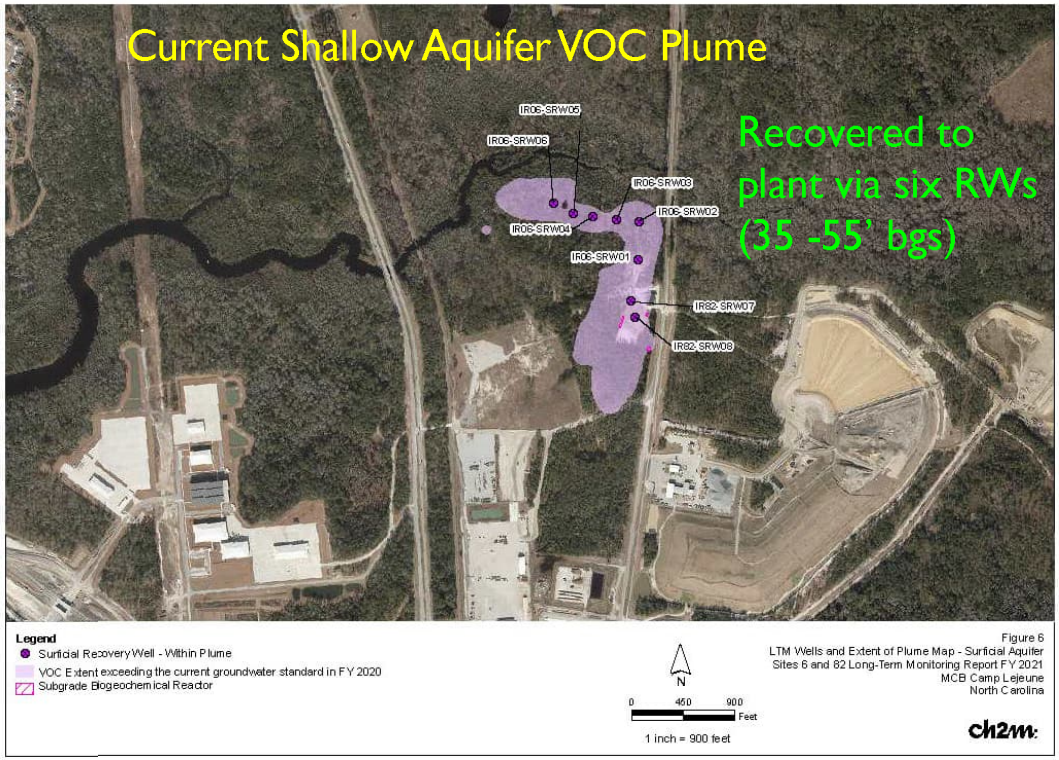
BACKGROUND

- System treats Constituents of Concern (COCs) of Site 82 within Operable Unit 2 (Sites 6, 9 & 82)
  - Site 6 and 82 : Include Storage Lots 201, 202 & 203 (former Defense Reutilization and Marketing Office). Used for equipment and chemical storage, and disposal of and storage of wastes. Site 82 consists of the eastern portion of Lot 203
  - COCs include volatile organic compounds (VOCs) and metals – Shallow and deep aquifers
  - Treatment system constructed in 1996 to treat VOCs and metals (metals treatment for shallow influent only – Discontinued in 2009)



BACKGROUND

- Current VOC - COCs include:
  - 1,2-Dichloroethane
  - **Cis & Trans-1,2-Dichloroethene**
  - Ethylbenzene
  - **Tetrachloroethene**
  - **Trichloroethene**
  - **Vinyl Chloride**
  - **1,1,2,2-Tetrachloroethane**
  - **1,1,2-Trichloroethane**
  - **1,1-Dichloroethene**
  - 1,2-Dichloropropane
  - 1,4-Dichlorobenzene
  - Benzene
  - Chlorobenzene
  - **Chloroform**
  - Chloromethane



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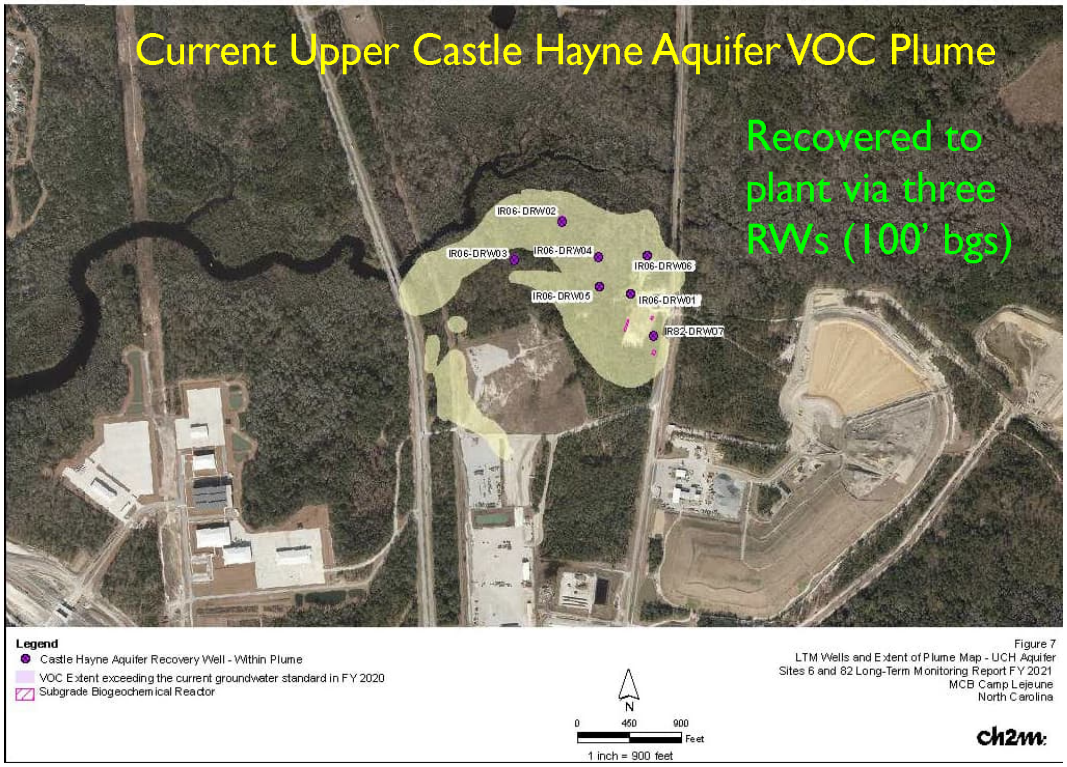
  - **Tetrachloroethene**
  - **Trichloroethene**
  - **Vinyl Chloride**
  - **1,1,2,2-Tetrachloroethane**
  - **1,1,2-Trichloroethane**
  - **1,1-Dichloroethene**
  - 1,2-Dichloropropane
  - 1,4-Dichlorobenzene
  - Benzene
  - Chlorobenzene
  - **Chloroform**
  - Chloromethane



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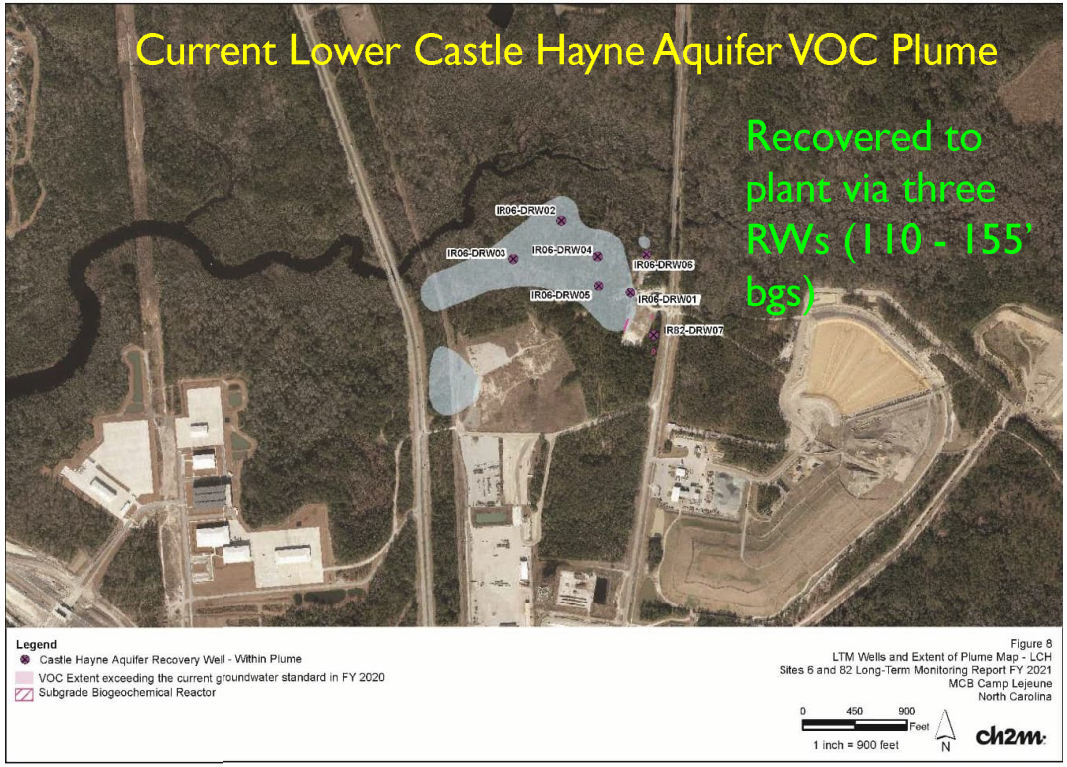
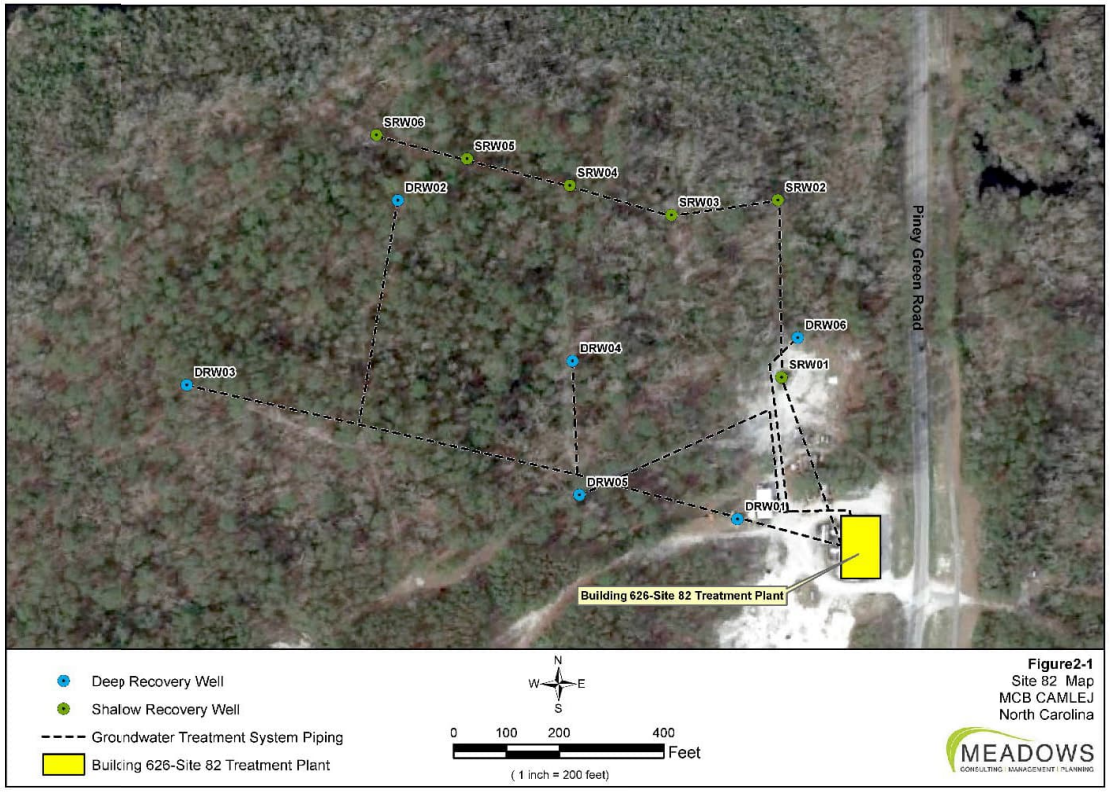
  - **1,1,2,2-Tetrachloroethane**
  - **1,1,2-Trichloroethane**
  - **1,1-Dichloroethene**
  - 1,2-Dichloropropane
  - 1,4-Dichlorobenzene
  - Benzene
  - Chlorobenzene
  - **Chloroform**
  - Chloromethane



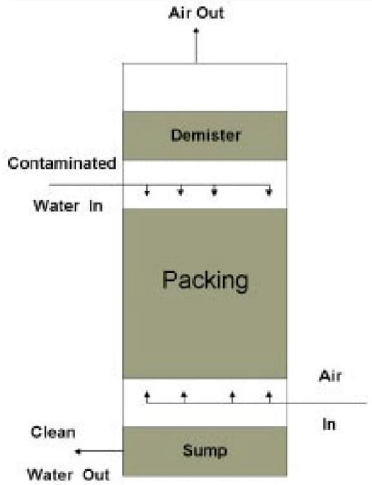
TREATMENT PRINCIPLES

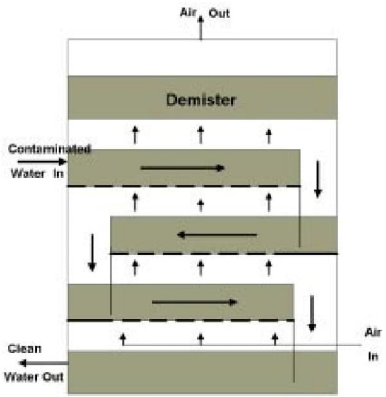
- Shallow and deep groundwater influent is recovered via down-well pumps and buried conveyance into the plant
- Treatment of VOCs currently includes:
  - Volatilization via air stripping
  - Adsorption via carbon filtration (finishing step)
- Formerly metals treatment was conducted by precipitation and physical removal



TREATMENT PRINCIPLES

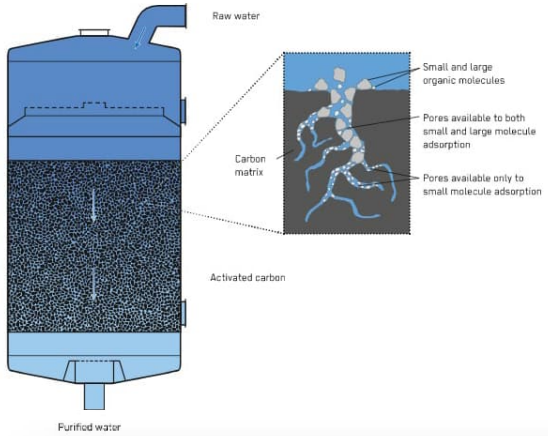
- Volatilization of VOCs is achieved at the plant by air stripping
- Air stripping creates a counter current of contaminated water and clean air, forcing dissolved VOCs out of solution and into gas phase
- Two primary types of air strippers:
  - Packed Column (PC)
  - Sieve Tray (ST)
- Site 82 has utilized both, though the PC air stripper (tower) was replaced with two ST air strippers in 2019

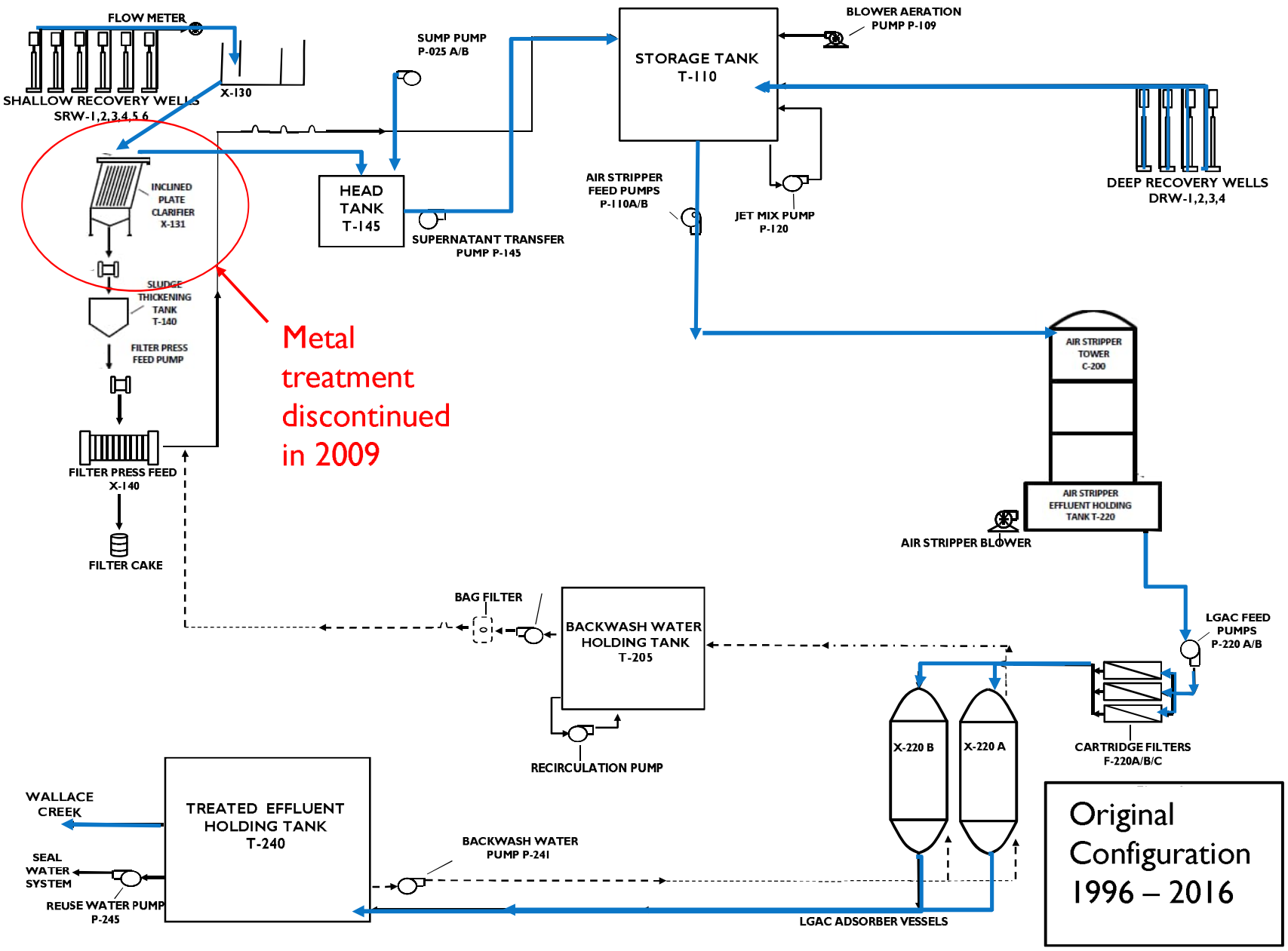




TREATMENT PRINCIPLES

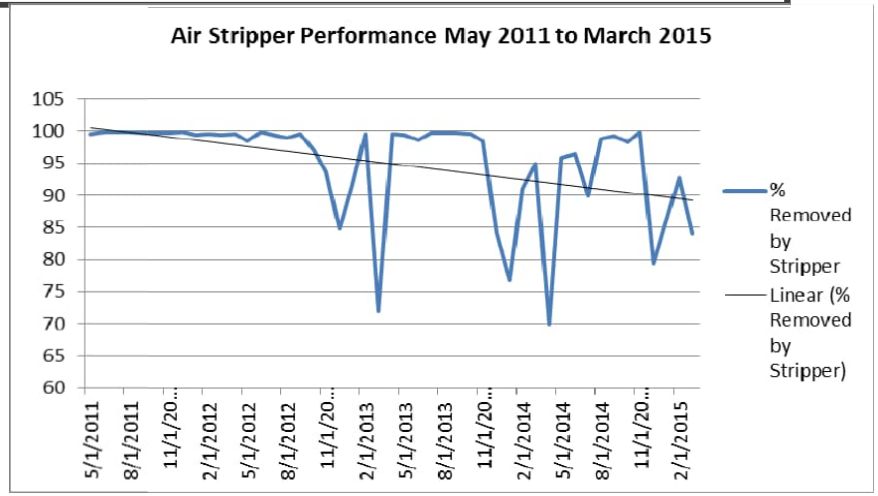
- Adsorption occurs when a gas or liquid solute accumulates on the surface of a solid or a liquid (adsorbent) forming a molecular or atomic film (the adsorbate)
- At Site 82 adsorption of any remaining VOCs (post-air stripping) is achieved by granular activated carbon (GAC) filtration
- GAC is porous with high internal surface area allowing GAC to trap (adsorb) to molecules of VOC .
- Site 82 doubled its GAC filtration to four 8k pounds filter tanks in 2016 – 32K pounds total
- GAC filtration is the last step prior discharge to surface water
- Since the replacement of the packed column AS with sieve tray AS in 2019, performance data indicates full remediation with AS alone, leaving the GAC as a finishing step

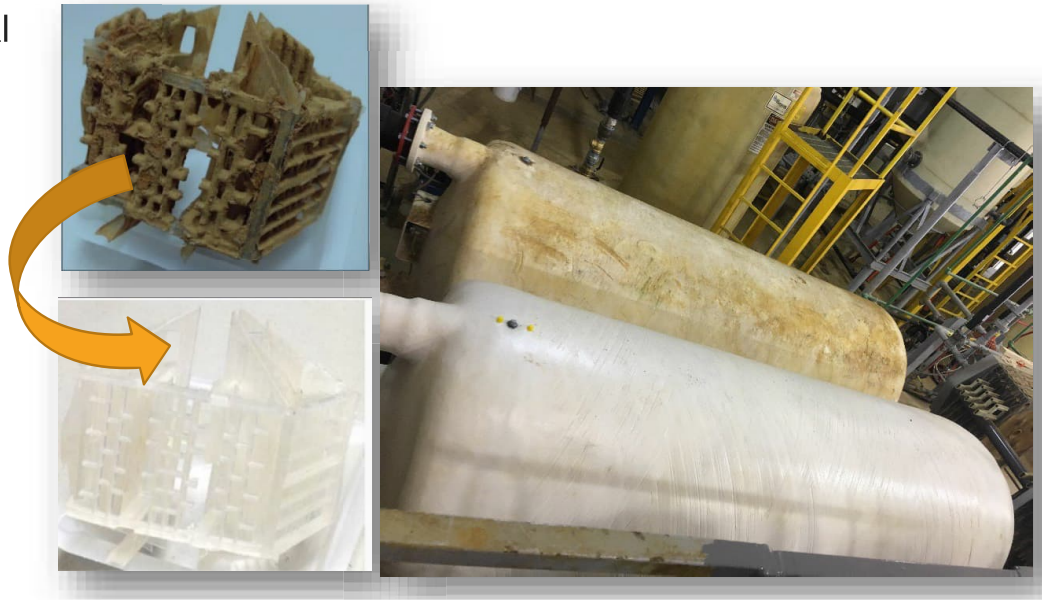



FLOW METER
SHALLOW RECOVERY WELLS
SRW-1,2,3,4,5,6
X-130
SUMP PUMP
P-025 A/B
STORAGE TANK
T-110
BLOWER AERATION
PUMP P-109
DEEP RECOVERY WELLS
DRW-1,2,3,4
INCLINED
PLATE
CLARIFIER
X-131
HEAD
TANK
T-145
SUPERNATANT TRANSFER
PUMP P-145
AIR STRIPPER
FEED PUMPS
P-110A/B
JET MIX PUMP
P-120
SLUDGE
THICKENING
TANK
T-140
FILTER PRESS
FEED PUMP
Metal
treatment
discontinued
in 2009
AIR STRIPPER
TOWER
C-200
AIR STRIPPER
EFFLUENT HOLDING
TANK T-220
AIR STRIPPER BLOWER
FILTER PRESS FEED
X-140
FILTER CAKE
BAG FILTER
BACKWASH WATER
HOLDING TANK
T-205
LGAC FEED
PUMPS
P-220 A/B
RECIRCULATION PUMP
X-220 B
X-220 A
CARTRIDGE FILTERS
F-220A/B/C
WALLACE
CREEK
TREATED EFFLUENT
HOLDING TANK
T-240
BACKWASH WATER
PUMP P-241
SEAL
WATER
SYSTEM
REUSE WATER PUMP
P-245
LGAC ADSORBER VESSELS
Original
Configuration
1996 – 2016

SYSTEM OPTIMIZATION

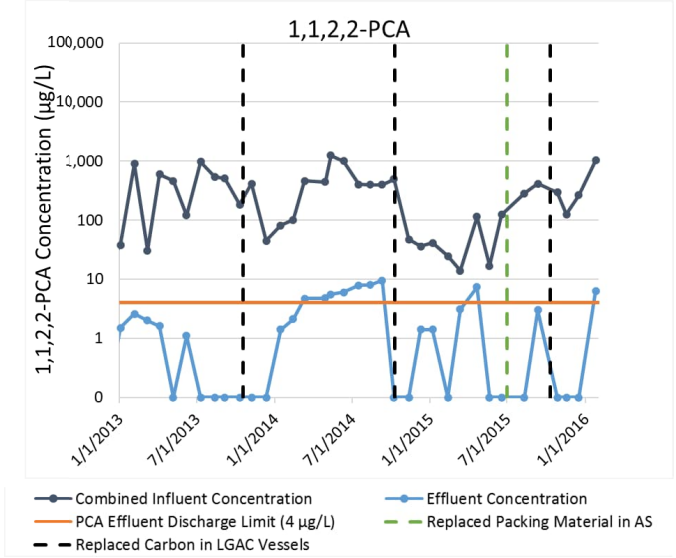
- Over time changing conditions prompted need for optimization:
  - Introduction of new COC, 1,1,2,2-tetrachloroethane (PCA) (relatively resistant to volatilization)
  - More restrictive regulatory standards
  - Buildup/scaling of precipitated nuisance metals (Fe, Ca). Enhanced by removal of metals treatment
  - Aging equipment
- In 2015 PC-AS media was replaced and sand filtration was added upstream of AS(to remove TSS). Previous media replacement was 2009

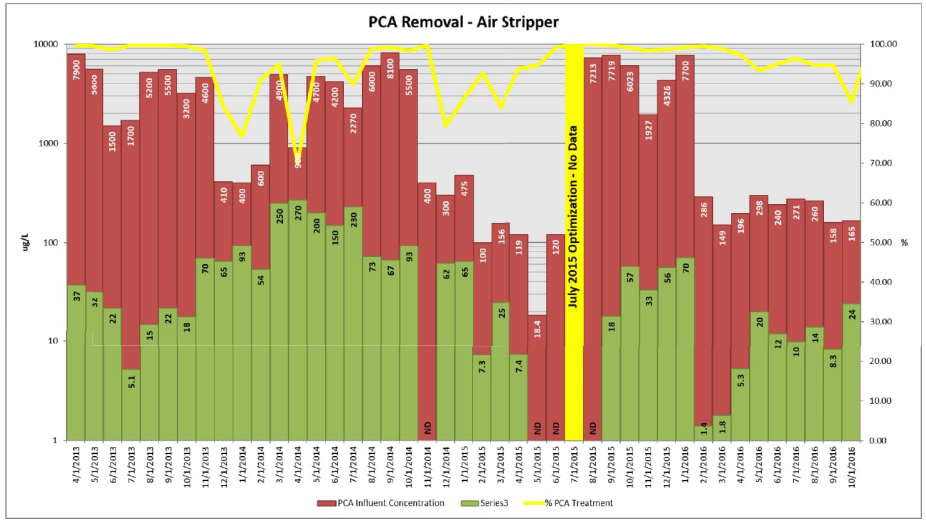


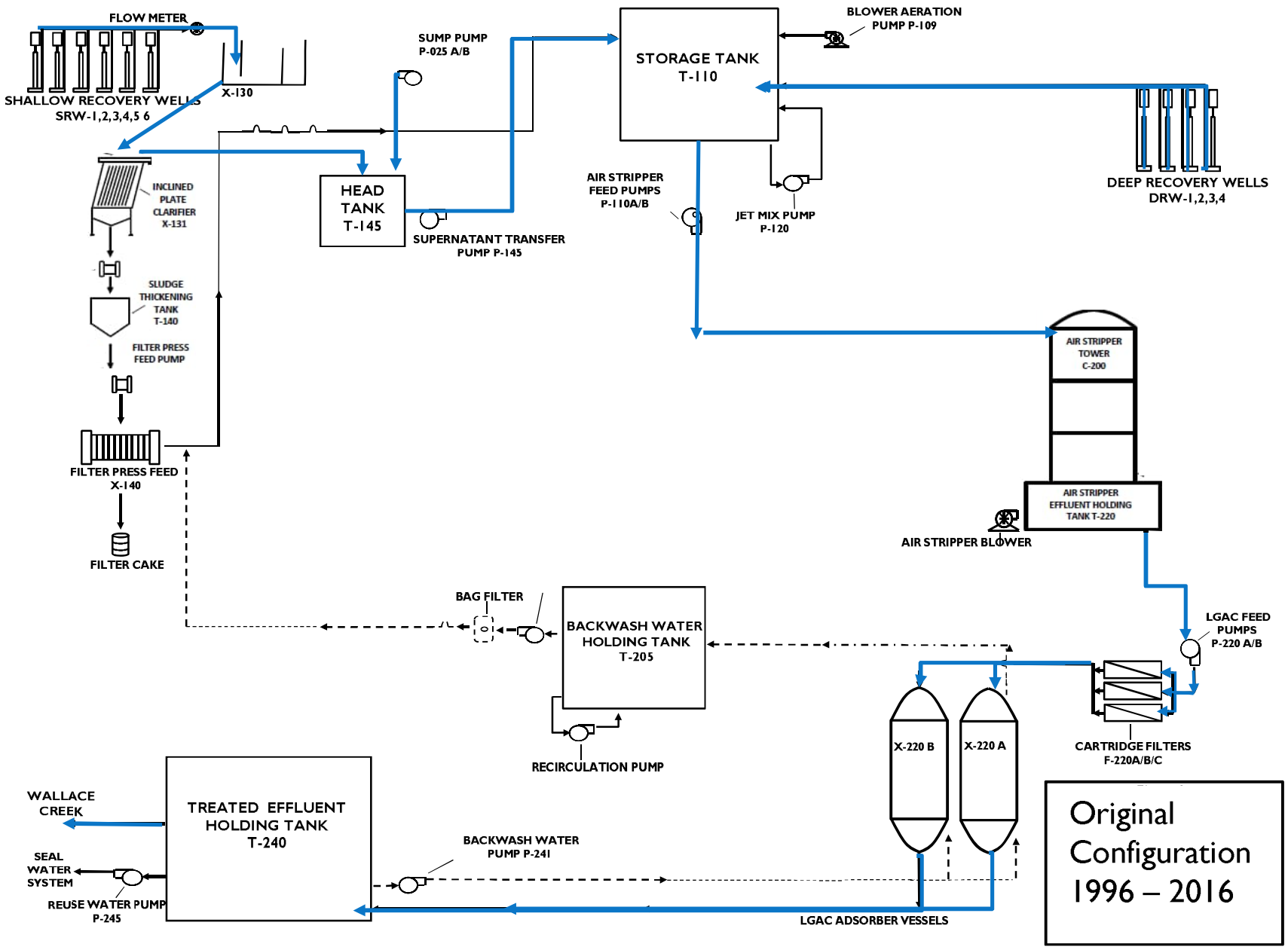


SYSTEM OPTIMIZATION

- Added sand filtration and new AS media was effective, though only temporarily
- In 2016 CH2M conducted a Groundwater Treatment Plant (GWTP) Evaluation to assess further optimization strategies
- Findings indicated:
  - GWTP effectiveness limited by transient high flows to AS resulting in decreased VOC removal and causing higher VOC loading to GAC process
  - GAC process arranged as two vessels in parallel which results in inefficient carbon use
  - AS still compromised by fouling caused mostly by iron and calcium
  - Pumps have exceeded service life (20 years)
  - Additional recovery wells needed






FLOW METER
SHALLOW RECOVERY WELLS
SRW-1,2,3,4,5 6
X-130
SUMP PUMP
P-025 A/B
STORAGE TANK
T-110
BLOWER AERATION
PUMP P-109
DEEP RECOVERY WELLS
DRW-1,2,3,4
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P-220 A/B
X-220 B
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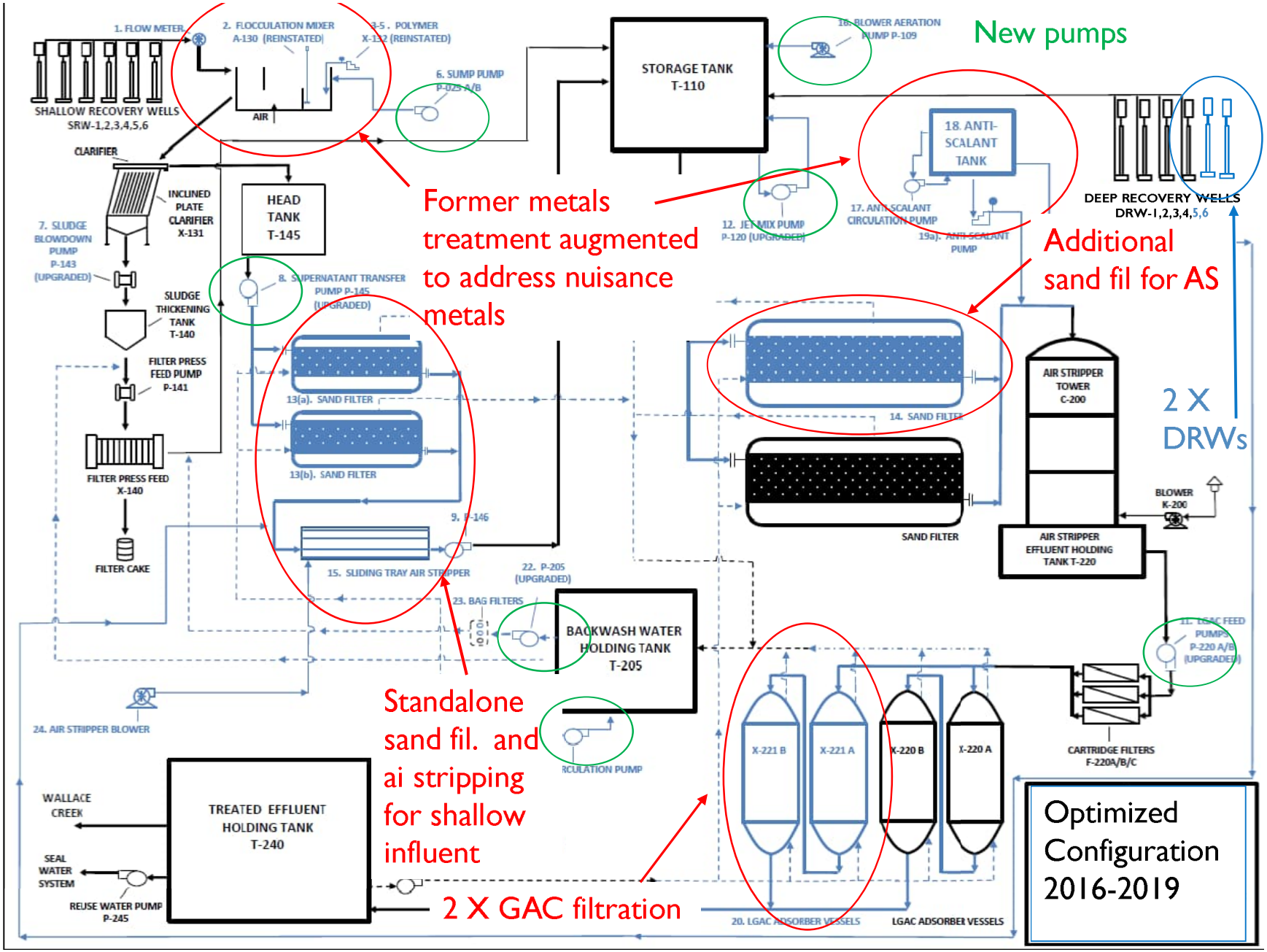
P-245
BACKWASH WATER
PUMP P-241
LGAC ADSORBER VESSELS
Original
Configuration
1996 – 2016


1. FLOW METER
2. FLOCCULATION MIXER A-130 (REINSTATED)
3-5. POLYMER X-122 (REINSTATED)
6. SUMP PUMP P-025 A/B
SHALLOW RECOVERY WELLS SRW-1,2,3,4,5,6
AIR
STORAGE TANK T-110
16. BLOWER AERATION PUMP P-109
New pumps
CLARIFIER
INCLINED PLATE CLARIFIER X-131
HEAD TANK T-145
7. SLUDGE BLOWDOWN PUMP P-143 (UPGRADED)
SLUDGE THICKENING TANK T-140
FILTER PRESS FEED PUMP P-141
FILTER PRESS FEED X-140
FILTER CAKE
8. SUPERNATANT TRANSFER PUMP P-145 (UPGRADED)
13(a). SAND FILTER
13(b). SAND FILTER
9. P-146
15. SLIDING TRAY AIR STRIPPER
Former metals treatment augmented to address nuisance metals
12. JET MIX PUMP P-120 (UPGRADED)
17. ANTI SCALANT CIRCULATION PUMP
18. ANTI-SCALANT TANK
19a). ANTI-SCALANT PUMP
DEEP RECOVERY WELLS DRW-1,2,3,4,5,6
Additional sand fil for AS
14. SAND FILTER
SAND FILTER
AIR STRIPPER TOWER C-200
2 X DRWs
BLOWER K-200
AIR STRIPPER EFFLUENT HOLDING TANK T-220
22. P-205 (UPGRADED)
23. BAG FILTERS
BACKWASH WATER HOLDING TANK T-205
11. LGAC FEED PUMPS P-220 A/B (UPGRADED)
24. AIR STRIPPER BLOWER
Standalone sand fil. and ai stripping for shallow influent
RCULATION PUMP
X-221 B
X-221 A
X-220 B
X-220 A
CARTRIDGE FILTERS F-220A/B/C
WALLACE CREEK
SEAL WATER SYSTEM
REUSE WATER PUMP P-245
TREATED EFFLUENT HOLDING TANK T-240
2 X GAC filtration
20. LGAC ADSORBER VESSELS
LGAC ADSORBER VESSELS
Optimized Configuration 2016-2019

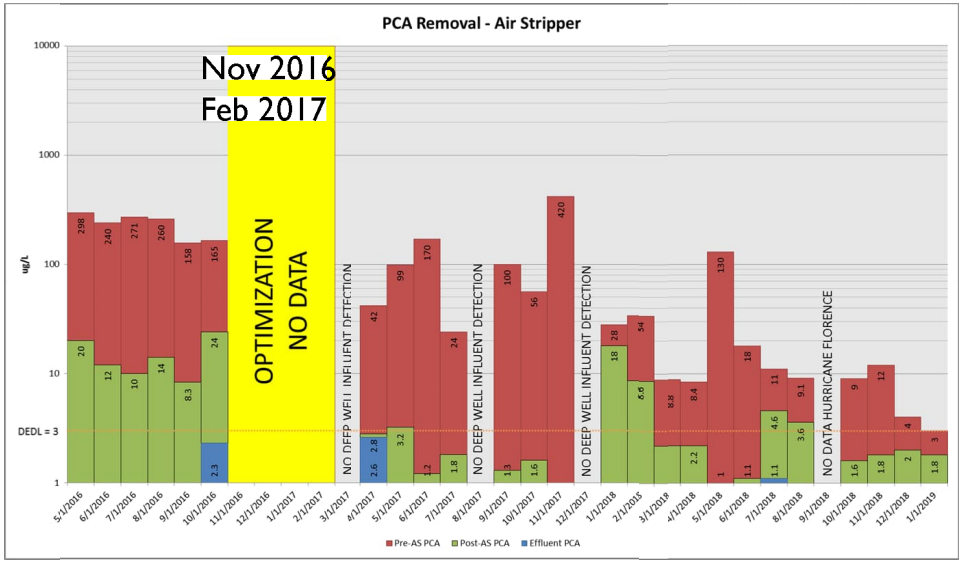
SYSTEM OPTIMIZATION

- Optimization was effective
- Reduction in Total Suspended Solids (TSS) and VOCs in shallow influent reduces pressure on downstream filters and AS, resulting in:
  - Reduce maintenance. Backwashing and filter media exchanges reduces by 50%
  - More complete volatilization by PC-AS
- Despite improvements, removal of PCA via AS was incomplete.
- Effectiveness of ST-AS prompted interest in replacing PC-AS

ST-AS for Shallow Well Influent

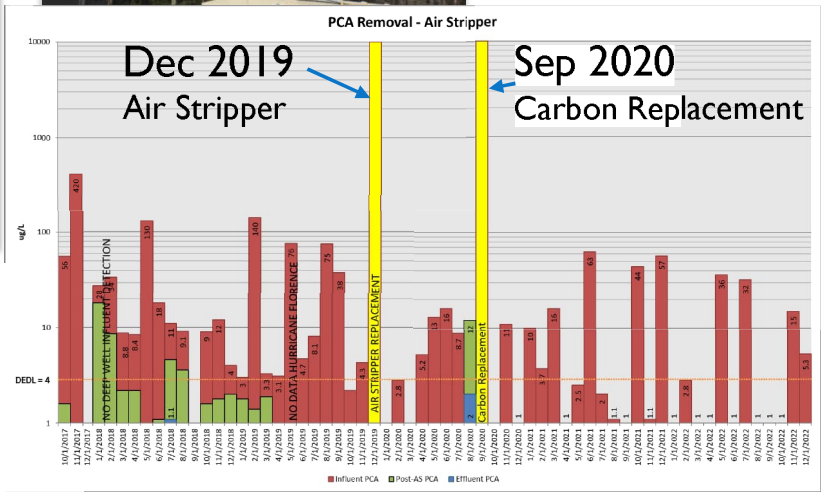
	Jul-18		Aug-19	
Detected COCs	Shallow Infl (ug/L)	Post Tray AS (ug/L)	Shallow Infl (ug/L)	Post Tray AS (ug/L)
trans-1,2-Dichloroethene	**150**	<1	**180**	<1
cis-1,2-Dichloroethene	**360**	<1	**530**	<1
Tetrachloroethane	**520**	<1	**590**	<1
Trichloroethene	**1400**	<1	**1600**	<1
1,1,2,2-Tetrachloroethane	**590**	<1	**1900**	<1

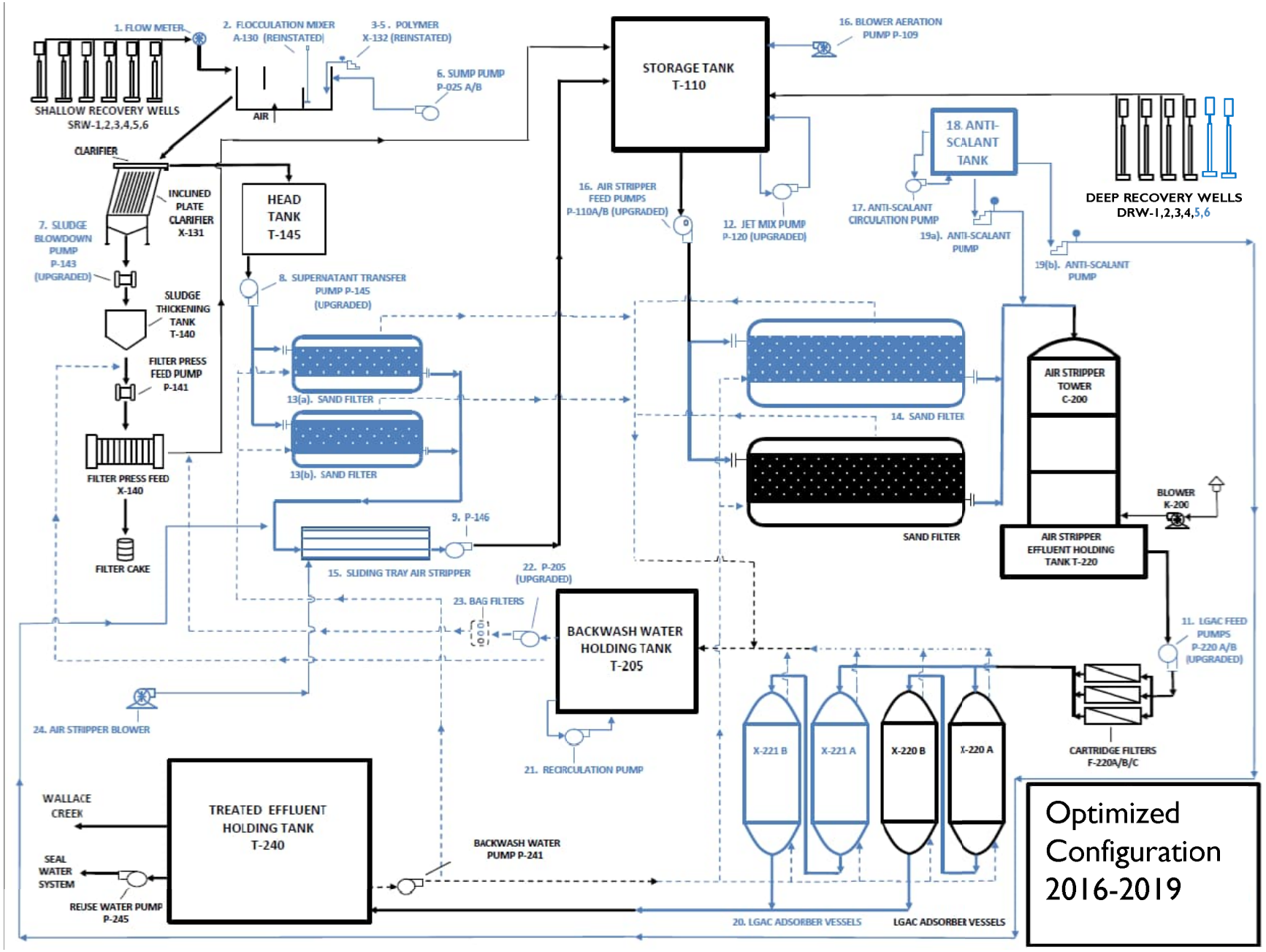
PC-AS for Combined Well Influent

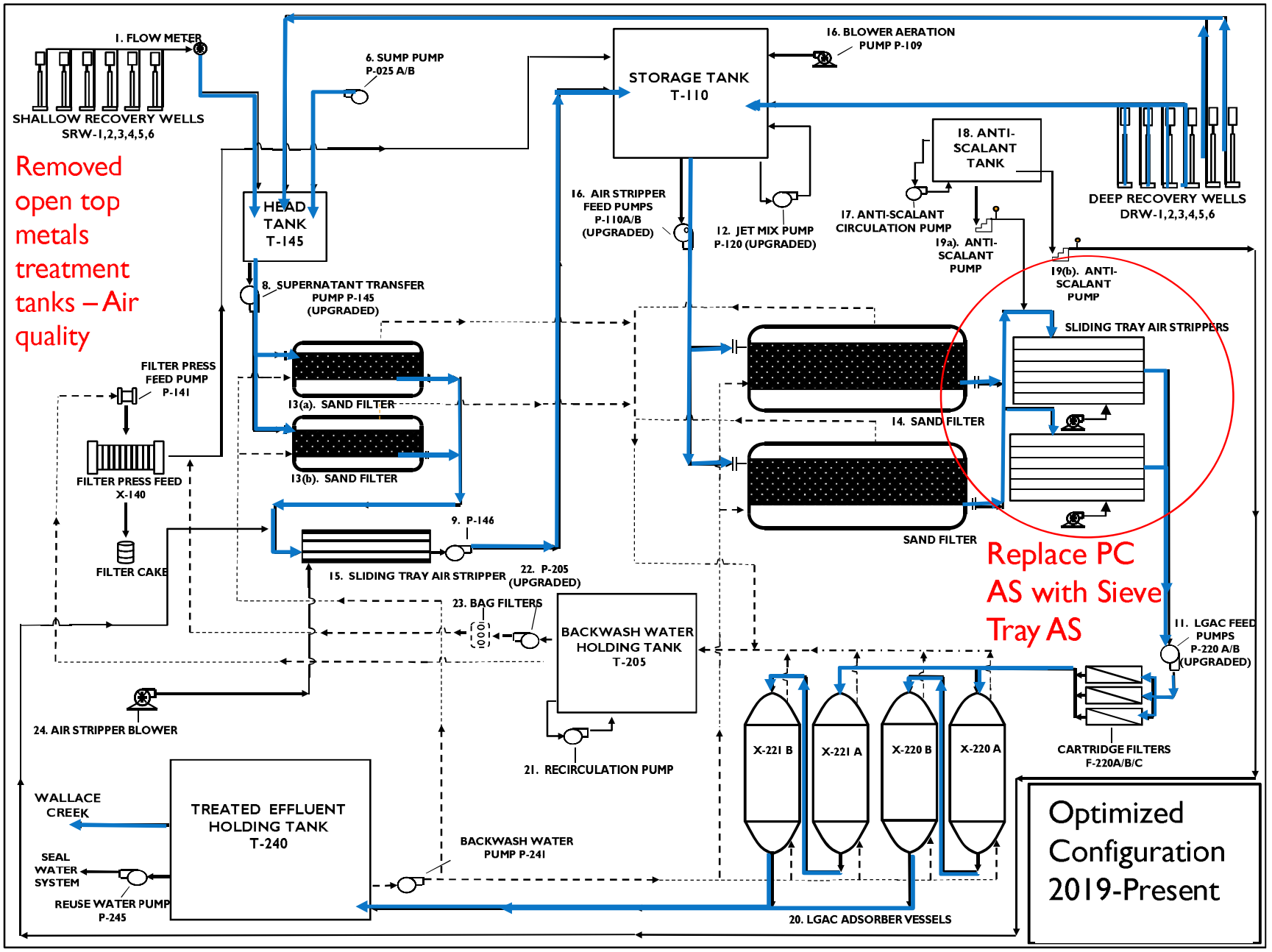


SYSTEM OPTIMIZATION

- Packed column tower AS replaced with two QED E-Z Tray ST air strippers in June 2019
- Other than one event in August 2020 (circuit failure) the ST-AS have treated all VOCs in influent at 100% efficiency
- Leaves GAC filtration as finishing step. Greatly decreases loading rates and increases lifespan
- Added protection for surface water



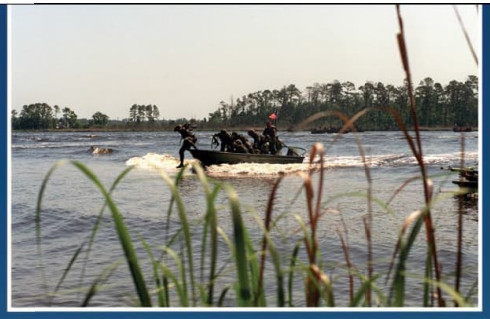

1. FLOW METER
2. FLOCCULATION MIXER A-130 (REINSTATED)
3-5. POLYMER X-132 (REINSTATED)
6. SUMP PUMP P-025 A/B
SHALLOW RECOVERY WELLS SRW-1,2,3,4,5,6
AIR
CLARIFIER
INCLINED PLATE CLARIFIER X-131
7. SLUDGE BLOWDOWN PUMP P-143 (UPGRADED)
SLUDGE THICKENING TANK T-140
FILTER PRESS FEED PUMP P-141
FILTER PRESS FEED X-140
FILTER CAKE
HEAD TANK T-145
8. SUPERNATANT TRANSFER PUMP P-145 (UPGRADED)
13(a). SAND FILTER
13(b). SAND FILTER
9. P-146
15. SLIDING TRAY AIR STRIPPER
STORAGE TANK T-110
16. BLOWER AERATION PUMP P-109
16. AIR STRIPPER FEED PUMPS P-110A/B (UPGRADED)
12. JET MIX PUMP P-120 (UPGRADED)
18. ANTI-SCALANT TANK
17. ANTI-SCALANT CIRCULATION PUMP
19a). ANTI-SCALANT PUMP
19(b). ANTI-SCALANT PUMP
DEEP RECOVERY WELLS DRW-1,2,3,4,5,6
14. SAND FILTER
SAND FILTER
AIR STRIPPER TOWER C-200
BLOWER K-200
AIR STRIPPER EFFLUENT HOLDING TANK T-220
22. P-205 (UPGRADED)
23. BAG FILTERS
BACKWASH WATER HOLDING TANK T-205
11. LGAC FEED PUMPS P-220 A/B (UPGRADED)
24. AIR STRIPPER BLOWER
21. RECIRCULATION PUMP
X-221 B
X-221 A
X-220 B
X-220 A
CARTRIDGE FILTERS F-220A/B/C
WALLACE CREEK
SEAL WATER SYSTEM
REUSE WATER PUMP P-245
TREATED EFFLUENT HOLDING TANK T-240
BACKWASH WATER PUMP P-241
20. LGAC ADSORBER VESSELS
LGAC ADSORBER VESSELS
Optimized Configuration 2016-2019

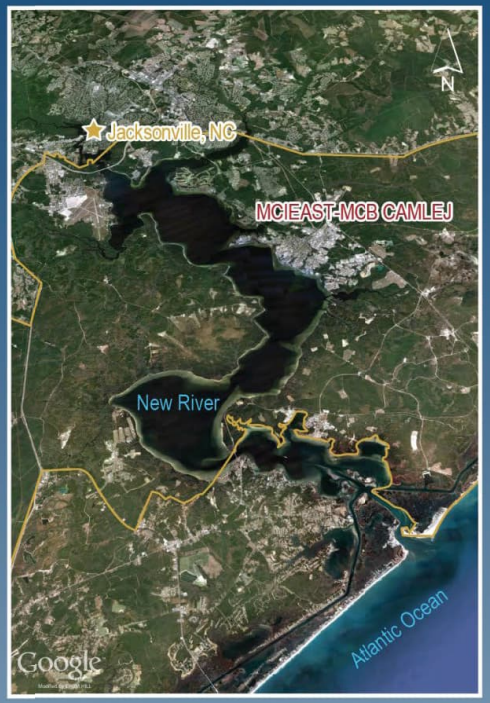

1. FLOW METER
SHALLOW RECOVERY WELLS
SRW-1,2,3,4,5,6
6. SUMP PUMP
P-025 A/B
STORAGE TANK
T-110
16. BLOWER AERATION
PUMP P-109
18. ANTI-
SCALANT
TANK
DEEP RECOVERY WELLS
DRW-1,2,3,4,5,6
Removed
open top
metals
treatment
tanks – Air
quality
HEAD
TANK
T-145
16. AIR STRIPPER
FEED PUMPS
P-110A/B
(UPGRADED)
12. JET MIX PUMP
P-120 (UPGRADED)
17. ANTI-SCALANT
CIRCULATION PUMP
19a). ANTI-
SCALANT
PUMP
19(b). ANTI-
SCALANT
PUMP
8. SUPERNATANT TRANSFER
PUMP P-145
(UPGRADED)
SLIDING TRAY AIR STRIPPERS
FILTER PRESS
FEED PUMP
P-141
13(a). SAND FILTER
14. SAND FILTER
FILTER PRESS FEED
X-140
13(b). SAND FILTER
SAND FILTER
9. P-146
FILTER CAKE
15. SLIDING TRAY AIR STRIPPER
22. P-205
(UPGRADED)
Replace PC
AS with Sieve
Tray AS
23. BAG FILTERS
BACKWASH WATER
HOLDING TANK
T-205
11. LGAC FEED
PUMPS
P-220 A/B
(UPGRADED)
24. AIR STRIPPER BLOWER
X-221 B
X-221 A
X-220 B
X-220 A
CARTRIDGE FILTERS
F-220A/B/C
21. RECIRCULATION PUMP
WALLACE
CREEK
TREATED EFFLUENT
HOLDING TANK
T-240
BACKWASH WATER
PUMP P-241
SEAL
WATER
SYSTEM
REUSE WATER PUMP
P-245
20. LGAC ADSORBER VESSELS
Optimized
Configuration
2019-Present

PERFORMANCE & EFFICACY

- Currently the Site 82 GWTP treat **9-12 million gallons** of groundwater per month, and removes **100-200 lbs** of VOC mass from groundwater per month
- Since inception, the Site 82 GWTP has treated over **1billion gallons** of groundwater, and removed approximately **225,000 lbs** of VOC mass from groundwater
- GWTP has treated ALL VOCs to non-detect (**100% efficiency**) since August 2020
- Optimization has decreased required maintenance significantly
  - GAC media replacement down from 1/year to > 3 years (last replacement 2020)
  - Backwashing of GAC and SF down from 1-3 / week to 1-2/month
  - Cartridge filters changeouts down from 1-3/week to 2/month

QUESTIONS





Site 35 Brinson Creek Investigation

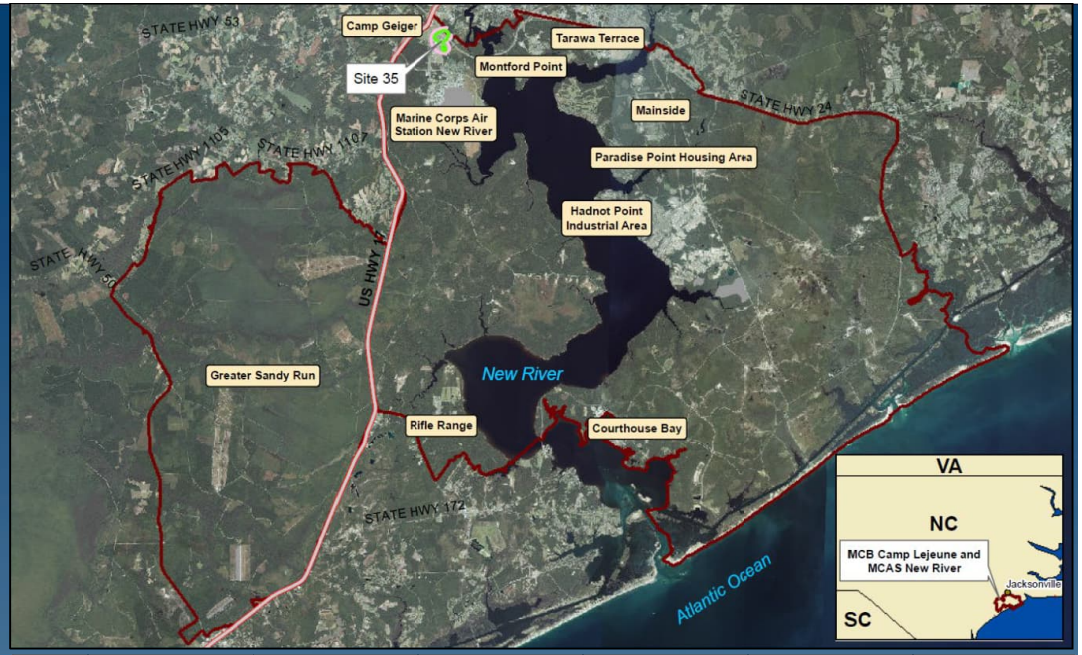
MCB Camp Lejeune Restoration Advisory Board Meeting May 3, 2023

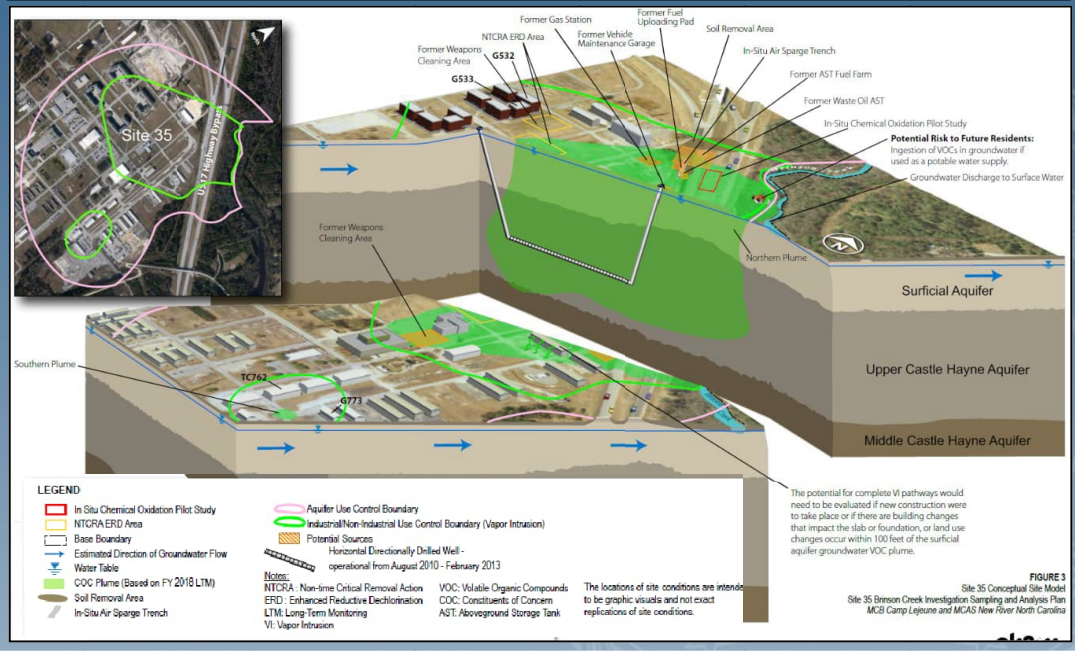
Objectives

- Review site background and investigation approach
- Present sampling results
- Review schedule

Site 35 Background

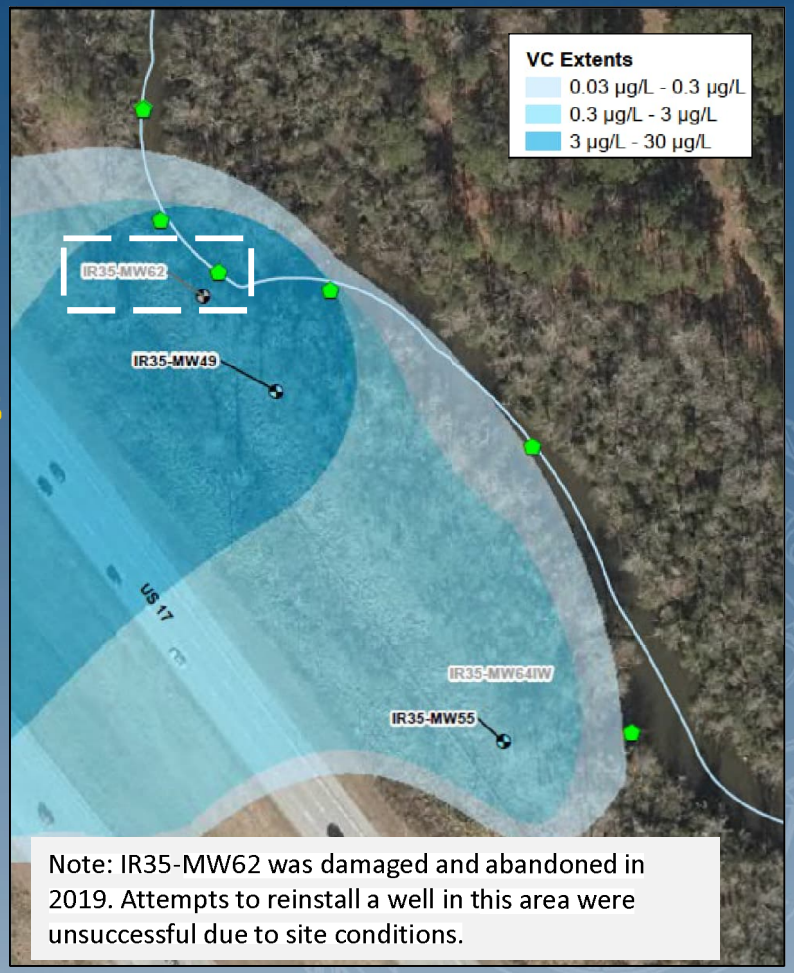
- Former Camp Geiger Fuel Farm
  - Volatile organic compounds (VOCs) in groundwater
- Selected Remedy
  - Air Sparging (2010-2013)
    - Restarted in August 2020
  - Monitored Natural Attenuation (MNA)
  - Land Use Controls (LUCs)
- Current Status
  - MNA of groundwater ongoing
  - LUCs in-place





Brinson Creek Investigation

- **Rationale**
  - **Vinyl chloride (VC) concentrations in IR35-MW62, the most downgradient monitoring well, have sporadically exceeded 10 times the North Carolina Surface Water Quality Standard (10 x NCSWQS)**
    - **Suggests potential for VC in groundwater to impact surface water**

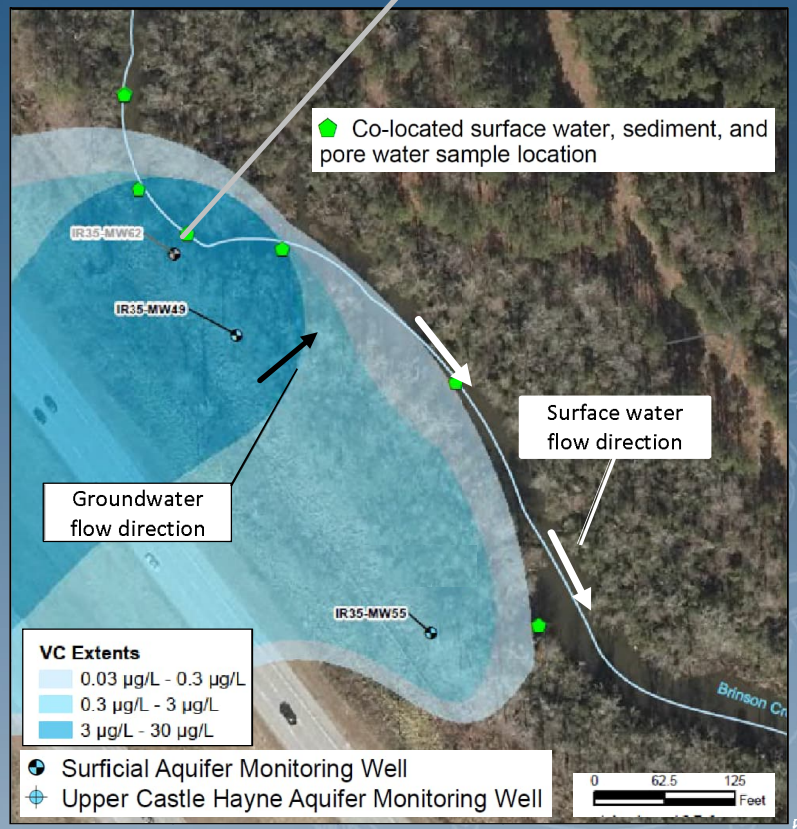


Note: IR35-MW62 was damaged and abandoned in 2019. Attempts to reinstall a well in this area were unsuccessful due to site conditions.

Brinson Creek Investigation: Phase 1

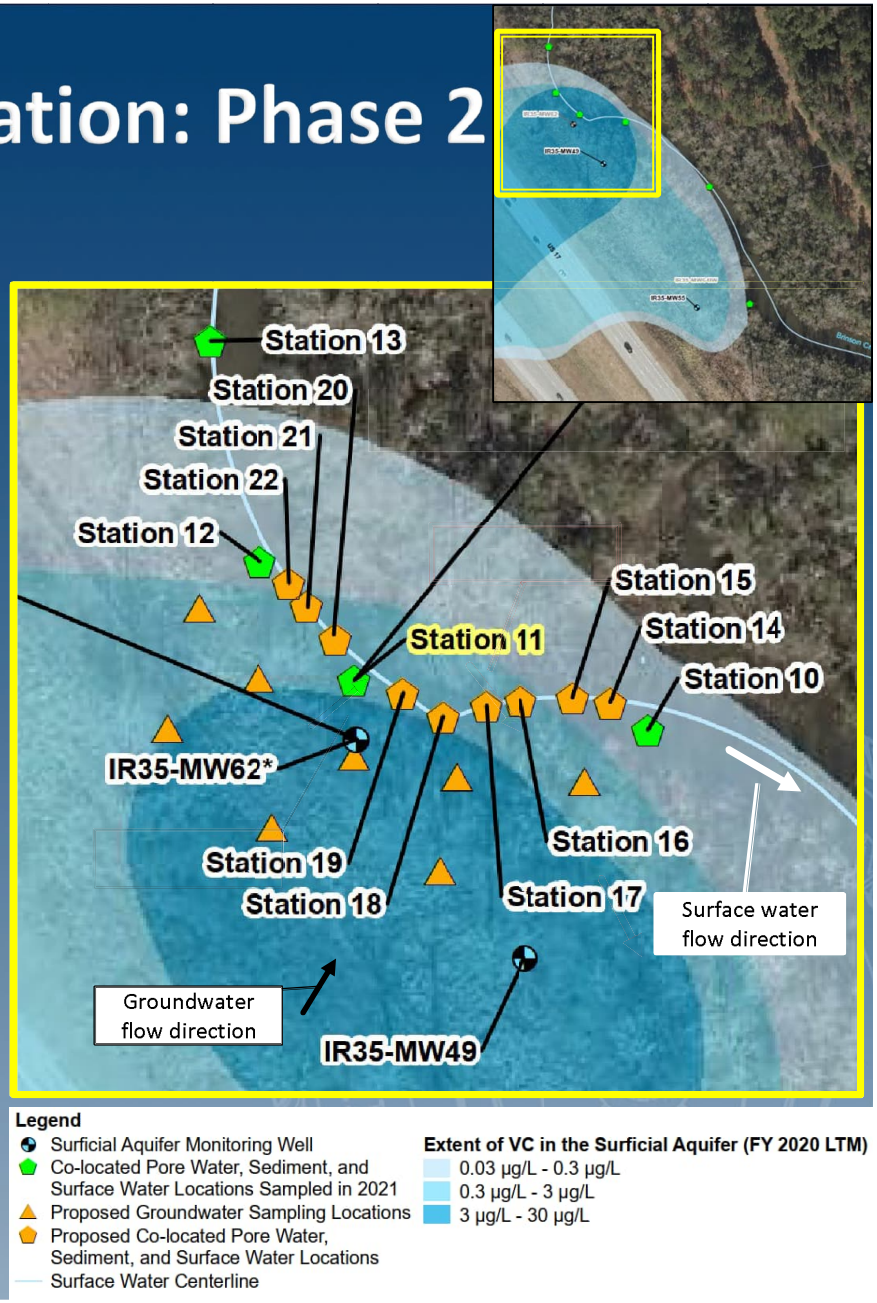
- **Objective:**
  - Evaluate the groundwater-to-surface water pathway to determine whether VOCs in groundwater are impacting surface water and determine whether additional action is warranted
- **Approach:**
  - Collected two rounds (6 months apart in January 2021 and July 2021) of the following:
    - 6 pore water samples
    - 6 surface water samples
    - 6 sediment samples
  - Analyzed for site-specific VOCs
    - Tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (DCE), VC, and benzene
- **Result:**
  - VC detected in exceedance of project action limit (PAL) in one media (pore water) in one location (PW11)
  - Addition investigation recommended

Media	PAL	January 2021	July 2021
Pore water at PW11, µg/L	24	53	27



Brinson Creek Investigation: Phase 2

- **Objective:**
  - Refine the delineation of the groundwater plume east of U.S. Highway 17
  - Identify where groundwater may be discharging to the creek
  - Determine whether additional action is warranted
- **Approach:**
  - Collect 10 co-located surface water, sediment, and pore water samples
  - Collect up to 8 groundwater grab samples via slide hammer drilling method
    - Location and quantity based on pore water results
  - Analyze for site-specific VOCs
    - PCE, TCE, cis-1,2-DCE, VC, and benzene

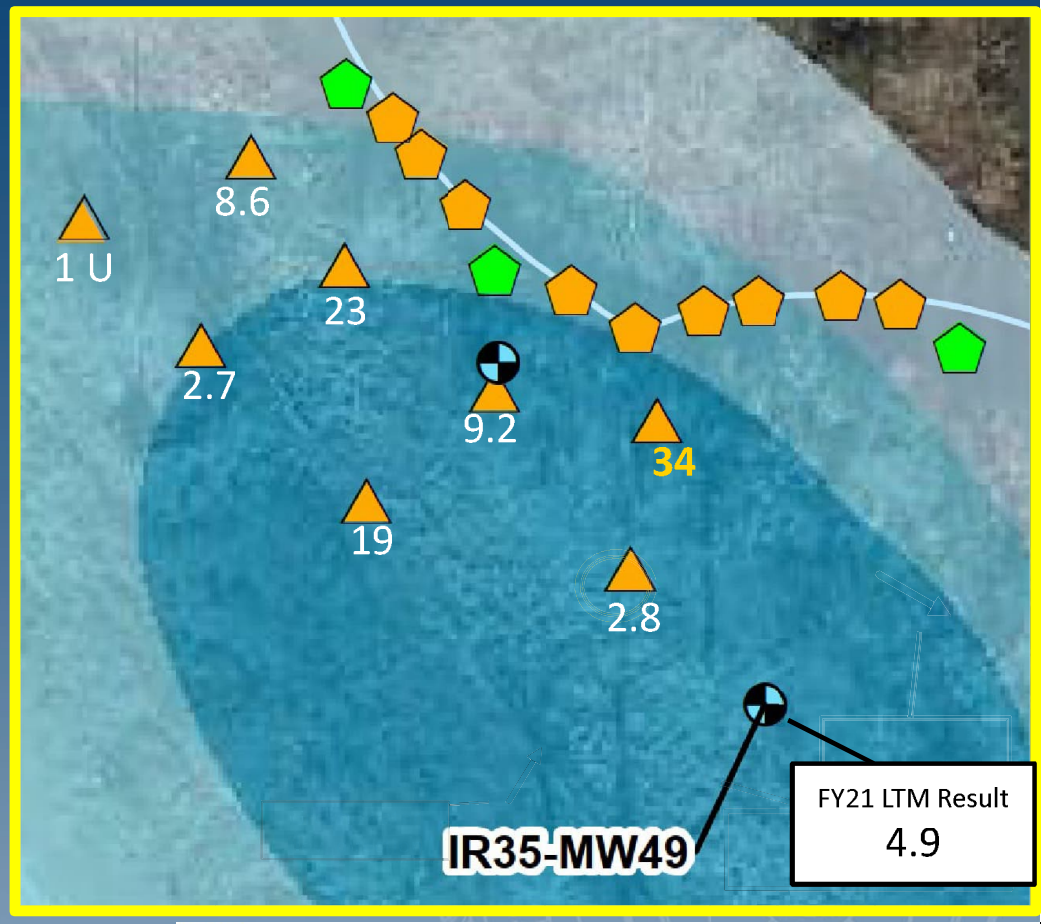


Groundwater Grab Samples

Collected week of December 6, 2022

Groundwater Results

- Benzene, cis-1,2-DCE, and VC detected
- VC above PAL (24 µg/L)
  - 1 location (34 µg/L)



Surface water, sediment, and pore water sampling

Collected October 2022

Driving porewater push point to depth

Collecting porewater sample

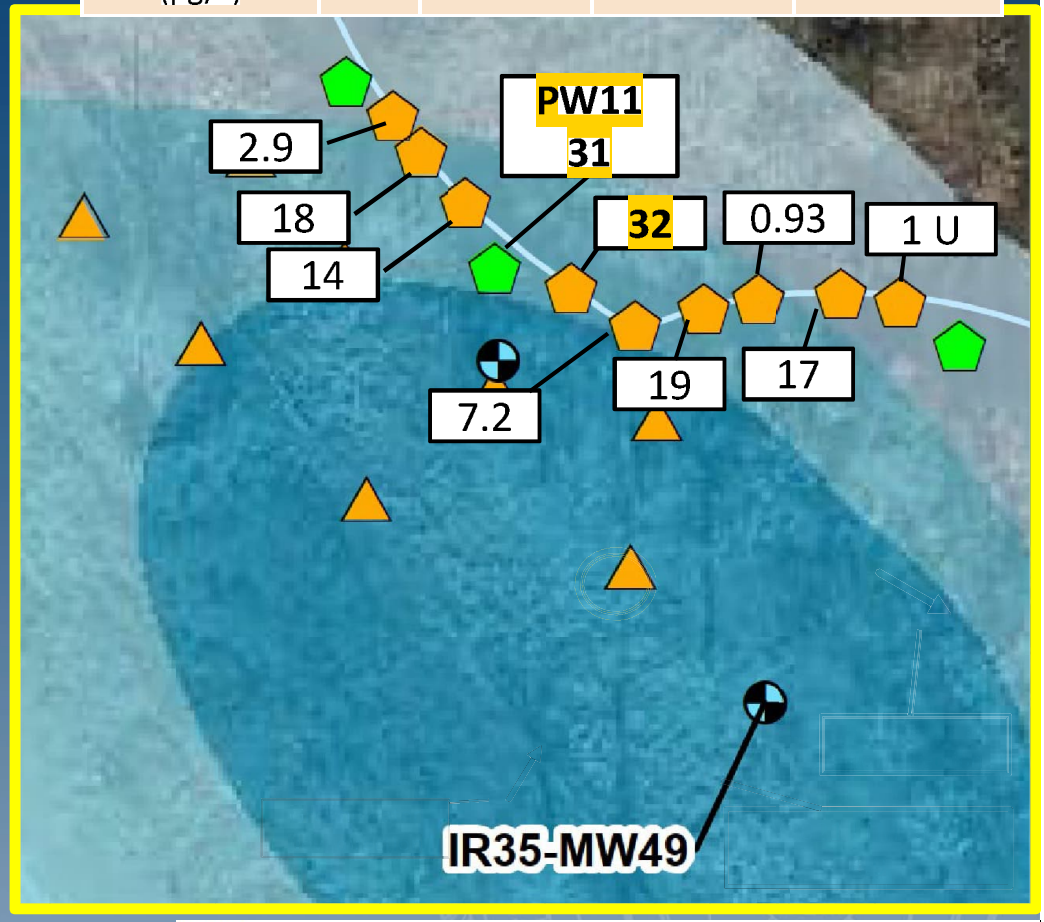
Collecting sediment sample

Collecting surface water sample

Pore Water Results

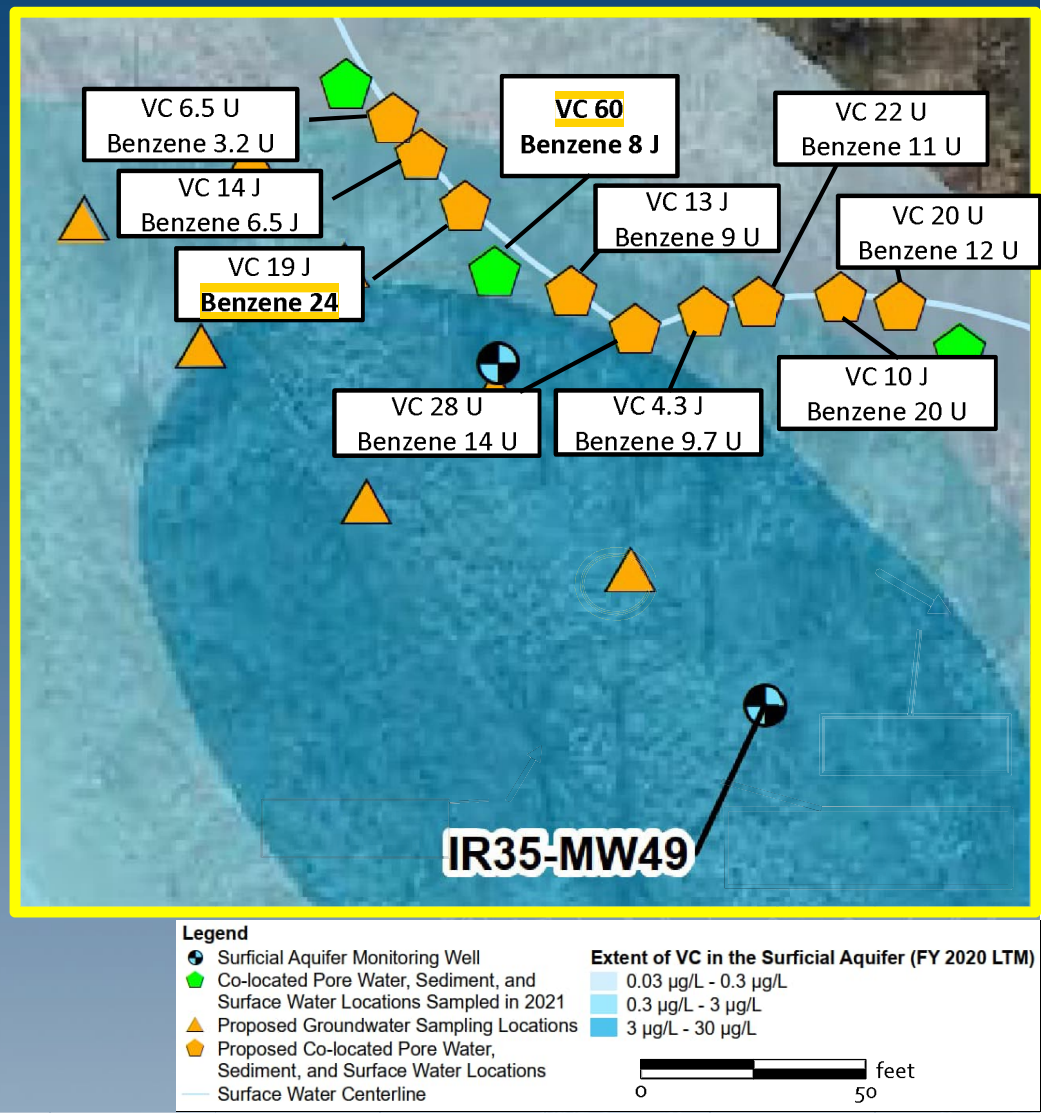
	PAL	Jan 2021	Jul 2021	Nov 2022
PW11 Results (µg/L)	24	53	27	31

- Benzene, cis-1,2-DCE, and VC detected
- Only VC above PAL (24 µg/L)
  - 2 locations



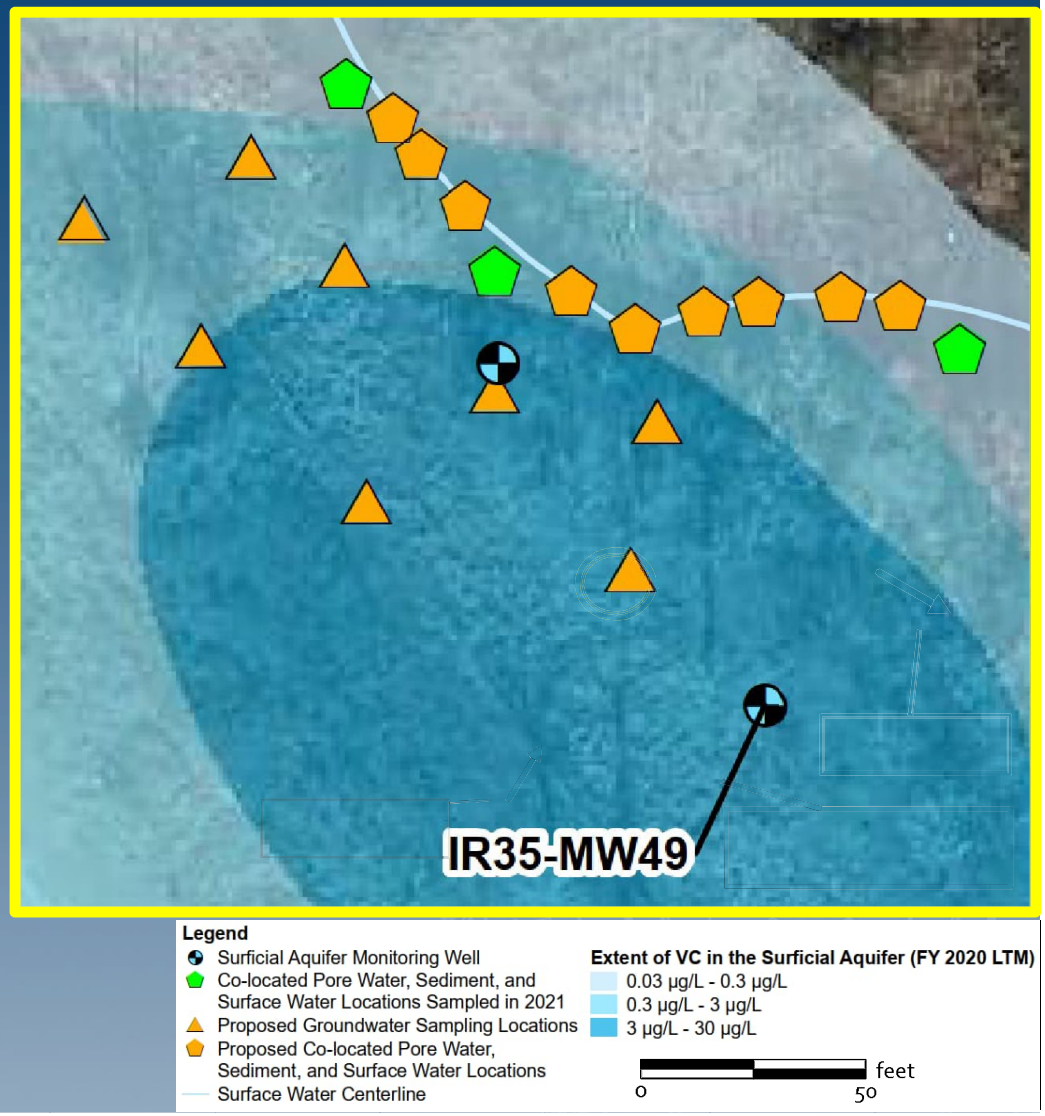
Sediment Results

- Benzene, cis-1,2-DCE, and VC detected
- VC above PAL (59 µg/kg)
  - 1 location
- Benzene above PAL (10 µg/kg)
  - 1 location



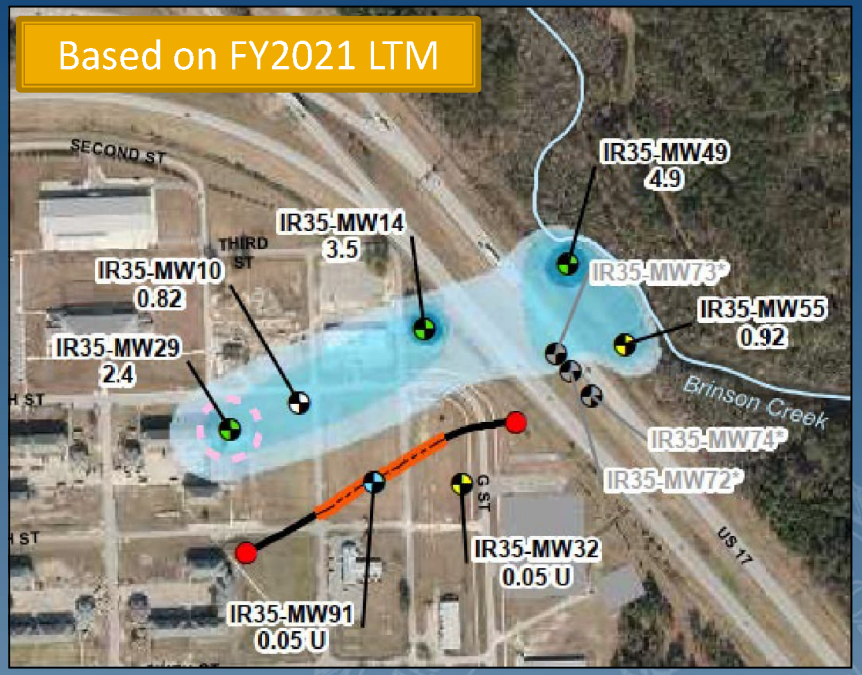
Surface Water Results

- No detections in Surface Water



Conclusions and Recommendation

- **Conclusions**
  - **Although isolated exceedances of VC and benzene PALs for groundwater, pore water, and/or sediment were detected, there were no detections of benzene or VC in surface water**
    - **COCs are not discharging from groundwater to surface water at detectable concentrations**
  - **LTM indicates decreasing concentrations at IW35-MW49**
- **Recommendations**
  - **Continue LTM at IR35-MW49**
  - **If VC concentrations change to increasing at IR35-MW49, consider collecting surface water samples**



Schedule

- Summary Tech Memo
  - Draft – June 2023
  - Final – August 2023