

**Travis Air Force Base  
Environmental Restoration Program  
Restoration Program Manager's  
Meeting Minutes  
16 October 2019, 0930 Hours**

Mr. Lonnie Duke of the Air Force Civil Engineer Center (AFCEC) Restoration Installation Support Section (ISS) conducted the Restoration Program Manager's (RPM) meeting on 16 October 2019 at 0930 hours in Building 248 at Travis AFB, California. Attendees included:

Lonnie Duke	AFCEC/CZOW
Glenn Anderson	AFCEC/CZOW
Monika O'Sullivan	AFCEC/CZOW
Angel Santiago	AFCEC/CZOW
Milton 'Gene' Clare	AFCEC/CZOW
Rachel Brinegar	Travis AFB/PA
Kurt Grunawalt	Travis AFB/Legal
Brian Boccellato	USACE-Omaha
(via telephone)	
Nadia Hollan Burke	EPA
Adriana Constantinescu	RWQCB
Dominique Forrester	DTSC
(via telephone)	
Amanda Rohrbaugh	TechLaw, Inc.
(via telephone)	
Leslie Royer	CH2M/Jacobs
Tony Chakurian	CH2M/Jacobs
Jeff Gamlin	CH2M/Jacobs
(via telephone)	
Jill Dunphy	CH2M/Jacobs
(via telephone)	
Jeannette Cumberland	CH2M/Jacobs

Handouts distributed prior to or at the meeting, discussions, and presentations included:

Attachment 1	Meeting Agenda
Attachment 2	Master Meeting and Document Schedule
Attachment 3	SBBGWTP Monthly Data Sheet (September 2019)
Attachment 4	CGWTP Monthly Data Sheet (September 2019)
Attachment 5	LF007C Monthly Data Sheet (September 2019)
Attachment 6	ST018 Monthly Data Sheet (September 2019)
Attachment 7	SS015 Optimized EVO Delivery via Solar-Powered Organic Carbon
Attachment 8	LF008 Remedial Action Completion Report
Attachment 9	Fourth Five Year Review
Attachment 10	Program Update
Attachment 11	TRIAD Discussion: Recently Identified POCO Investigation Near Closed Site OW050

## **1. ADMINISTRATIVE**

### **A. Previous Meeting Minutes**

September 2019 Draft Meeting Minutes were accepted as Final with no changes.

### **B. Action Item Review**

Action items from September 2019 were reviewed.

Action Item 1 is ongoing: Ms. O'Sullivan to provide updates on perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). October 2019 update: Ms. O'Sullivan informed the team that the Draft Quality Assurance Project Plan (QAPP) will be delayed. There was a substantial change in process related to required notifications within the Air Force and to congressional representatives before the QAPP can be submitted to the regulators.

Action Item 2 is ongoing: Mr. Duke will continue to provide design and construction information for the new KC-46 Hangar construction project. October

2019 update: Mr. Duke said that the design for the building has been approved, and the Remedial Design and Remedial Action (RD/RA) work plan to relocate the horizontal extraction well has been finalized and provided to the construction team. A little background work is needed to make sure the contractor will comply with environmental needs. We are still waiting on the final ROD amendment. The soil excavation must be completed first before the contract is awarded so it does not impact the construction project. Ms. Burke asked how will they determine the soil remediation work has been completed? Mr. Duke said confirmation sample collection and analyses will be used to verify that cleanup standards have been met.

### **C. Master Meeting and Document Schedule Review (see Attachment 2)**

The Travis AFB Master Meeting and Document Schedule (MMDS) was discussed during this meeting (see Attachment 2).

#### **Travis AFB Annual Meeting and Teleconference Schedule**

The next RPM meeting will be a teleconference held on 20 November 2019 at 0930. This will be the final meeting for 2019.

The 2020 Meeting Schedule has been provided so that attendees can start planning ahead for next year.

#### **Travis AFB Master Document Schedule**

- Community Relations Plan Update (CRP): There was no change to the schedule. This document will be finished as soon as the other higher-priority documents are completed, will resume in early 2020.
- Amendment to the NEWIOU Soil, Sediment, and Surface Water Record of Decision (ROD) for the Travis AFB ERP Sites SS016 and SD033: Draft Final Due date was changed to reflect the actual submittal date, Final Due changed accordingly. EPA attorney is supposed to finish their review today and will forward to supervisor for final signature; hopefully this week. The Water Board mentioned a minor error on the Water Board RTC table header; it names DTSC instead of the Water Board. DTSC said the RTCs addressed their concerns, and that the DTSC attorney is reviewing and will confirm with EPA. EPA and the Water Board are on schedule to submit signatures by 6 November 2019. A PDF of the signed copy is acceptable to be followed with “wet signature”. Travis AFB is waiting to hear from US Fish and Wildlife Service (USFWS) on their request to conduct field work during the rainy season; have a verbal okay from USFWS, and are expecting to receive an official letter.

- Site SS016 Remedial Design/Remedial Action Work Plan: The final due date was changed to 6 November 2019 so that the document can be revised in accordance with relevant changes in the final NEWIOU ROD Amendment. This excavation project is located within the footprint of the future new KC-46 hangar, so **this document is critical and is delayed due to excessive delays on the Amendment to the NEWIOU Soil, Sediment and Surface Water ROD.**
- Site SD031 Soil Remedial Investigation/Feasibility Study (RI/FS): Ms. Constantinescu inquired if the agency comments due date could be moved from 11/11/2019 (a Federal holiday) to 11/12/2019. The Air Force agreed to change the document schedule. **This document is important and although not time-critical, must be completed during the current contract.**
- Potrero Hills Annex (FS, PP, and ROD): No change was made to the schedule; Ms. Constantinescu said they are making progress according to the work plan; additional soil and groundwater samples were collected downgradient to support the risk assessment. The Water Board has not made a final decision regarding the request for No Further Action (NFA) for the upland areas.
- Quarterly Newsletter (October 2019): Draft to Agencies date changed to 8 October 2019, the rest of the dates were changed accordingly. Mr. Anderson thanked Ms. Burke for her viewpoint contribution, and said that next year the newsletter will be published semi-annually while transitioning between contracts.
- Fourth Five-Year Review Report for Multiple Groundwater, Soil, and Sediment Sites: Document was moved from 'Primary Documents' to 'Informational Documents' in Master Meeting and Document Schedule (MMDS). No change was made to the schedule; the Responses to Comments, Draft Final, and Final due dates remain TBD. **This document is very important but not critical.**
- Site SS046 Remedial Action Completion Report and Well Decommissioning Work Plan: No changes were made to the schedule; the document will be moved to the History section next month.
- 2018 Annual Site LF007 Corrective Action Management Unit Inspection, Monitoring, and Maintenance Report: Response to Comments Due and Final Due were changed to reflect the submittal date; there were no comments from the agencies.
- Site LF008 Remedial Action Completion Report: No changes were made to the schedule. EPA may request more review time.
- Site SD043 Site Closure Report: No changes were made to the schedule. Travis AFB is in the process of responding to regulator comments.
- Site SS046 Well Decommissioning and Site Closeout Tech Memo: The Draft to Agencies and RAB date was changed to 15 October 2019. The Agency Comments Due date was changed accordingly. The rest of the schedule remained unchanged.

- Recently Identified POCO Investigation Near Closed Site OW050 Work Plan: This is a new document and the name is temporary. Ms. Constantinescu said that OW050 was already closed in Geotracker and requested the document name be changed. Mr. Duke said they discussed calling it SD031B. Ms. Constantinescu approved the SD031B name change.
- MOVED TO HISTORY:
  - No Further Action Soil ROD for Old Skeet Range (TS060 MRA)
  - 2018 Annual GRISR

## **2. CURRENT PROJECTS**

### **Treatment Plant Operation and Maintenance Update**

#### **South Base Boundary Groundwater Treatment Plant, September 2019 (see Attachment 3)**

The South Base Boundary Groundwater Treatment Plant (SBBGWTP) performed at 99.8% uptime, and 7.8 million gallons of groundwater were extracted and treated in September 2019. All treated water was discharged to Union Creek. The average flow rate for the SBBGWTP was 160.9 gallons per minute (gpm). Electrical power usage was 20,384 kilowatt hours (kWh), and approximately 16,684 pounds of CO<sub>2</sub> were created (based on DOE calculation). Approximately 0.9 pound of volatile organic compounds (VOCs) was removed in September. The total mass of VOCs removed since startup of the system is 520.4 pounds.

Troubleshooting activities were performed on three extraction wells. The backwash transfer pump was disassembled and cleaned, the pump impeller was also cleaned. Neither resulted in system downtime.

No optimization activities were conducted in September 2019.

#### **Central Groundwater Treatment Plant, September 2019 (see Attachment 4)**

The Central Groundwater Treatment Plant (CGWTP) performed at 99.9% uptime with approximately 1,319,490 gallons of groundwater extracted and treated in September 2019. All treated water was discharged to the storm sewer system which discharges to Union Creek. The average flow rate for the CGWTP was 27.2 gpm. Electrical power usage was 2,658 kWh for all equipment connected to the Central Plant, and approximately 2,855 pounds of CO<sub>2</sub> were generated. Approximately 2.4 pounds of

VOCs were removed from groundwater by the treatment plant in September. The total mass of VOCs removed since the startup of the system is 11,531 pounds.

A new float switch was installed in the Oil Spill Area (OSA) vault. Extraction wells remained operational. The Site DP039 subgrade biogeochemical reactor continued to operate in September 2019.

No optimization activities occurred at the CGWTP in September 2019.

### **LF007C Groundwater Treatment Plant, September 2019 (Attachment 5)**

The Subarea LF007C Groundwater Treatment Plant (LF007C GWTP) performed at 100% uptime with approximately 205,782 gallons of groundwater extracted and treated in September 2019. All treated water was discharged to the Duck Pond for beneficial reuse. The average flow rate was 4.3 gpm. Approximately  $7.4 \times 10^{-4}$  pound of VOCs was removed from groundwater by the treatment plant in September 2019. The total mass of VOCs removed since the startup of the system is 174.4 pounds. There was no electrical power usage statistics, because this plant operates on solar power only.

No optimization activities are reported for the month of September 2019.

Mr. Duke noted that while the LF007C GWTP and extraction systems are still accessible for O&M, the monitoring wells located offbase are not currently accessible because the Air Force's LF007 easement has expired. The Air Force is working on getting a new easement, which has been complicated by a change of land ownership. Ms. Burke and Ms. Constantinescu offered regulatory agency support for getting access to the sites for sampling and groundwater elevation measurements if the Air Force continues to encounter difficulties in purchasing an access agreement.

### **ST018 Groundwater (MTBE) Treatment Plant, September 2019 (see Attachment 6)**

Site ST018 (MTBE) Treatment Plant (ST018 GWTP) performed at 97.4% uptime with approximately 213,000 gallons of groundwater extracted in September 2019. All groundwater was discharged to the Fairfield – Suisun Sewer District. The average flow rate for the ST018 GWTP was 4.7 gpm. Electrical power usage for the month was 115 kWh for all equipment connected to the ST018 GWTP. The total CO<sub>2</sub> discharge equivalent equates to approximately 85 pounds. Approximately 0.01 pound of MTBE, BTEX, VOCs, and TPH was removed in September by the treatment plant, and approximately 0.01 pound of MTBE-only was removed from groundwater. The total BTEX, MTBE and TPH mass removed since the startup of the system is 48.4 pounds, and the total MTBE mass removed since startup of the system is 11.8 pounds.

Note: Electrical power use at the ST018 GWTP is only for the alarm system and a pump that pushes influent tank water to the Fairfield-Suisun Sanitary Sewer line. The four groundwater extraction pumps in the system are all solar powered.

The pump from one extraction well was replaced due to damage. A cracked fitting was also replaced. The system shut down on 30 September due to a malfunctioning pressure sensor, which was recalibrated. The system restarted with no issue.

No optimization activities are reported for the month of September 2019.

Ms. Constantinescu noted that the cost per pound of MTBE removal was getting quite high and suggested the Air Force consider looking at transitioning the site to MNA.

### **3. Presentations:**

#### **A) Site SS015 Optimized EVO Delivery via Solar-powered Organic Carbon Injection System (see Attachment 7)**

Mr. Gamlin presented a reprise of his overview of an optimized emulsified vegetable oil (EVO) delivery method using a solar-powered organic carbon injection method. Please refer to Attachment 7 for the full briefing; highlights from this month's presentation and discussion are as follows:

- Ms. Constantinescu asked what the residence time is; Mr. Gamlin responded approximately 5 days for 4 drums. He noted that total organic carbon can be included as part of the monitoring, and it can be sampled between the drums and tracked over the course of the injections.
- Ms. Constantinescu said that research has shown that warming the water enhanced bacterial growth and suggested considering warming the water as part of the design. Mr. Gamlin agreed and noted that he had employed a few low cost methods (such as wrapping black material around the tubing and/or increasing tubing length to prolong sun exposure) to use thermal absorption to increase injection water temperature. He added that warming the water will also improve total organic carbon solubility and therefore performance.
- Ms. Burke and Ms. Constantinescu asked if this change in design (not remedy) needs to be documented. Mr. Gamlin replied that it will be evaluated and reported in the 2019 GRISR. He added that the ROD didn't specify use of a specific delivery method because there are many kinds of pumps and many ways to complete the injections depending on the amendment used. The delivery method is the only change; it's not a fundamental change in design, so it really is only a field adjustment.
- EPA, the Water Board, and DTSC all agreed with going forward with performing a pilot test of this injection method at Site SS015. Ms. Royer took the action item to include progress of this pilot test in future meetings during the program update.

## **B) Site LF008 Remedial Action Completion Report (see Attachment 8)**

Ms. Royer provided an overview of the Site LF008 Remedial Action Completion Report (RACR) in support of the document that is currently in regulatory review. Please refer to Attachment 8 for the full briefing.

## **C) Fourth Five-Year Review Report Status (see Attachment 9)**

Mr. Anderson reported on the status of the Fourth Five-Year Review (FYR) Report and the proposed path forward. Please refer to Attachment 9 for the full briefing; highlights from the discussion are summarized as follows:

- The agencies still don't agree with several of the Air Force's responses to their comments.
- There is a need to get the document to the public.
- There is limited time and funds remaining in the Tetra Tech and Jacobs contracts to come to agreement on what sampling must be conducted, completing the agreed-upon sampling, and receiving meaningful results that can be reported on to adequately respond to agency comments, and incorporate into a final document to be released to the public.
- The Air Force proposes completing the limited amount of sampling recommended in the draft FYR to evaluate if vapor intrusion mitigation systems continue to be protective of human health and the environment, and see if any future action is needed.
- The next contract will be an Optimized Remediation Contract (ORC). AFCEC is soliciting regulatory agency input into these contracts, and scoping for the Travis AFB is to be scheduled in the second or third quarter of 2020. Feedback will be used to develop the statement of objectives, a key component for the Request for Proposal. Mr. Duke and Mr. Anderson are proposing that the more encompassing comments and requests for sampling in the FYR be reserved for this scoping discussion so that they can be included in the ORC RFP, and that there is ample time and funding to address all outstanding Five-Year Review concerns.
- Ms. Burke agreed that there is a need to get a document to the public that incorporates whatever the Air Force is willing to incorporate at this time, and is amenable to finding a way agreeable to the Air Force and other agencies to state that not all concerns were addressed but will be resolved prior to the 5<sup>th</sup> FYR.
- Ms. Constantinescu asked if the Air Force plans to indicate which proposed actions address which specific comments, or if they will just state what they are planning to do. Mr. Anderson noted that typically comments are responded to in the next Five-Year Review; right now the Air Force is proposing work that addresses the protectiveness of the VI remedies, which is not responding to a specific comment received. He said that the Air Force can develop a cover letter that states that the agencies provided comments but as of yet, not all of them have been adequately responded to, but that this version of the report is a first step in the resolution. Ms. Burke noted that an addendum to the Five-Year Review Report may be needed.



- Ms. Burke noted that EPA and likely other agencies will need an agreement on responding to agency recommendations before they can bring specific recommendations to the ORC scoping meeting.
- The tentative plan of action resulting from this discussion is as follows:
  - 1- Agree on what work needs to be completed, or at least a summary of work that is agreed is necessary and where disagreements remain.
  - 2- Publish a version of the document to the public to fulfill requirements, post it to the website and indicate what comments are still outstanding or not addressed.
  - 3- Prioritize the work to be conducted under the current PBR vs the forthcoming ORC. Prepare a work plan and schedule for the first phase of field work, which will be conducted under the current PBR contract.
  - 4- Conduct the work.
- The Air Force will begin developing a cover letter with a schedule itemizing work that will be conducted under the current PBR, work that will be conducted later under the ORC, and a timeline for addressing outstanding comments.

#### **D) Program Update: Activities Completed, In Progress, and Upcoming (see Attachment 10)**

Ms. Royer reported on the status of fieldwork and documents that have been completed, are in progress, or upcoming. Please refer to Attachment 10 for the full briefing.

#### **E) Triad Discussion of Gore Sorber Survey Near Former OW050 Location (see Attachment 11)**

Mr. Chakurian reported on the investigation planned for the recently identified POCO site near closed Site OW050 (which meeting attendees agreed during the MMDS discussion, would be referred to in the future as Site SD031B). Please refer to Attachment 11 for the full briefing. Highlights of the discussion are as follows:

- The objective of the presentation was to gain Water Board concurrence to complete the first of three planned phases of field work ahead of work plan submittal to ensure sufficient time remained in the contract to perform all of the planned fieldwork. The Gore Sorbers will be used as a screening tool to select quantitative sample collection locations.
- The investigation will be conducted in three phases:
  - Phase 1: two rounds of Gore Sorber surveys
    - 50 samples biased towards potential sources
    - Up to 50 samples to determine the likely extent of the hot spot areas identified in Round 1

- Phase 2: drilling to collect soil, soil gas, and grab groundwater samples from areas identified as hot spots during the Gore Sorber sampling
- Phase 3: install and sample monitoring wells based on Phase 2 results.
- Ms. Constantinescu agreed that the Water Board can expedite their review of the proposed Round 1 Gore Sorber locations, and suggested sending a cover letter with the presentation and a figure stating that a work plan will be send to the Agency for review following completion of the Round 1 Gore Sorber field work. She agreed the Water Board can review the proposed Round 1 Gore Sorber locations in two weeks if she receives it within a week.
- Ms. Constantinescu and Mr. Chakurian discussed relocating proposed sample GS-7 to the west, where historical detections of petroleum along an inactive jet fuel line were found during the EIOU RI.
- Ms. Constantinescu also suggested placing a sample where the sanitary sewer bends (near GS-23).
- Mr. Duke noted that the Air Force has already requested USFWS approval to conduct the work outside of the normal field season.

#### **4. New Action Item Review**

1. Mr. Wray or Ms. Royer to include the progress of the optimized EVO delivery via solar-powered organic carbon injection system pilot test at Site SS015 during future monthly program updates.
2. Air Force to develop a cover letter discussing a proposed schedule for additional phases of sampling for the Fourth Five Year Review, and planned path forward for comment resolution.
3. Mr. Chakurian to provide the Water Board with the figure presented during the Triad discussion, showing updated sampling locations, as well as the cover letter for the planned work, by 6 November 2019.

#### **5. PROGRAM ISSUES/UPDATE**

Ms. Merrie Schilter-Lowe will be retiring at the end of the month. For now, Lt Rachel Brinegar will serve as the Base Public Affairs Officer (PAO) and her duties currently include the PA support of the Environmental Restoration Program.

#### **6. Action Items**

Item #	Responsible	Action Item Description	Due Date	Status
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1.	Monika O'Sullivan	Ms. O'Sullivan to provide updates on PFOS and PFOA as she becomes aware of them.	Ongoing	Open
2.	Lonnie Duke	Mr. Duke will continue to provide design and construction information for the KC-46 Hangar for agency input ahead of the Air Force/Civil Engineering awarding the construction contract.	Ongoing	Open
3.	Mr. Wray and Ms. Royer	Mr. Wray or Ms. Royer to include the progress of the optimized EVO delivery via solar-powered organic carbon injection system pilot test at Site SS015 during future monthly program updates.	Ongoing	Open
4.	Mr. Duke and Mr. Anderson	Mr. Duke and Mr. Anderson to develop a cover letter discussing a proposed schedule for additional phases of sampling for the Fourth Five Year Review, and planned path forward for comment resolution.	4 November 2019	Open
5.	Mr. Chakurian	Mr. Chakurian to provide the Water Board with the figure presented during the Triad discussion, showing updated sampling locations, as well as the cover letter for the planned work, by 6 November 2019.	6 November 2019	Open

TRAVIS AIR FORCE BASE  
ENVIRONMENTAL RESTORATION PROGRAM  
RESTORATION PROGRAM MANAGER'S MEETING

The RPM face-to-face meeting is scheduled for 9:30 AM PST on 16 October 2019.  
**The call-in number is 1-866-203-7023. Enter the Participation code 5978-75-9736 then enter #.**

AGENDA

1. ADMINISTRATIVE

- A. INTRODUCTIONS
- B. PREVIOUS MEETING MINUTES
- C. ACTION ITEM REVIEW
- D. MASTER MEETING AND DOCUMENT SCHEDULE REVIEW

2. CURRENT PROJECTS

TREATMENT PLANT OPERATION AND MAINTENANCE UPDATE

3. PRESENTATIONS

- A. SS015 OPTIMIZED EVO DELIVERY VIA SOLAR-POWERED ORGANIC CARBON INJECTION SYSTEM
- B. LF008 REMEDIAL ACTION COMPLETION REPORT
- C. FOURTH FIVE YEAR REVIEW
- D. PROGRAM UPDATE:  
DOCUMENTS & ACTIVITIES COMPLETED, IN PROGRESS AND PLANNED

4. NEW ACTION ITEM REVIEW

5. PROGRAM/ISSUES/UPDATE

TRIAD GORE SORBER SURVEY NEAR FORMER OW050 LOCATION

NOTES: AFTER THE RPM MEETING, BASED ON THE DISCUSSION DURING THE REVIEW OF THE MASTER MEETING AND DOCUMENT SCHEDULE, WE ALLOW TIME TO HOLD A SEPARATE SPLINTER MEETING TO DISCUSS RESPONSES TO AGENCY COMMENTS ON THOSE DOCUMENTS THAT ARE IN PROGRESS, OR OTHER ISSUES IF NEEDED. ALL PARTICIPANTS ARE WELCOME TO PARTICIPATE.

**(2019)**  
**Annual Meeting and Teleconference Schedule**

<b>Monthly RPM Meeting<sup>1</sup></b> <b>(Begins at time noted)</b>	<b>RPM Teleconference</b> <b>(Begins at time noted)</b>	<b>Restoration Advisory Board</b> <b>Meeting</b> <b>(Begins at 7:00 p.m.)</b> <b>(Poster Session at 6:30 p.m.)</b>
—	01-16-19	—
02-13-19	—	—
—	03-20-19	—
04-18-19 (Thursday 2:00 PM)	—	04-18-19
—	05-15-19	—
06-19-19	—	—
—	07-17-19	—
08-21-19	—	—
—	09-18-19	—
10-16-19	—	May through October <sup>2</sup>
—	11-20-19	—
—	—	—

<sup>1</sup> Note: Meetings and teleconferences will be held at 09:30 AM on the third Wednesday of each month unless otherwise noted.

<sup>2</sup> Note: Tentative RAB tour(s) during construction season.

**(2020)**  
**Annual Meeting and Teleconference Schedule**

<b>Monthly RPM Meeting<sup>1</sup></b> <b>(Begins at time noted)</b>	<b>RPM Teleconference</b> <b>(Begins at time noted)</b>	<b>Restoration Advisory Board</b> <b>Meeting</b> <b>(Begins at 7:00 p.m.)</b> <b>(Poster Session at 6:30 p.m.)</b>
—	01-15-20	—
02-19-20	—	—
—	03-18-20	—
04-16-20 (Thursday 2:00 PM)	—	04-16-20
—	05-20-20	—
06-17-20	—	—
—	07-15-20	—
08-19-20	—	—
—	09-16-20	—
10-21-20	—	May through October <sup>2</sup>
—	11-18-20	—
—	—	—

<sup>1</sup> Note: Meetings and teleconferences will be held at 09:30 AM on the third Wednesday of each month unless otherwise noted.

<sup>2</sup> Note: Tentative RAB tour(s) during construction season.

## Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS		
Life Cycle	Community Relations Plan Update Travis AFB, Glenn Anderson CH2M, Jill Dunphy	Amendment to the NEWIOU Soil ROD for the Travis AFB ERP Sites SS016 and SD033 Travis AFB, Glenn Anderson CH2M, Latonya Coleman
<b>Scoping Meeting</b>	NA	NA
Predraft to AF/Service Center	08-23-16	02-28-18
AF/Service Center Comments Due	09-07-16	03-30-18
Draft to Agencies	09-28-16 (03-22-18)	06-22-18
Draft to RAB	09-28-16 (03-22-18)	06-22-18
Agency Comments Due	10-28-16 (04-27-18)	08-22-18
<b>Response to Comments Meeting</b>	<b>TBD</b>	<b>09-06-18</b>
Agency Concurrence with Remedy	NA	NA
Public Comment Period	NA	NA
<b>Public Meeting</b>	<b>NA</b>	<b>NA</b>
Response to Comments Due	TBD	08-29-19 (09-16-19)
Draft Final Due	TBD	08-29-19 (10-07-19)
Final Due	TBD	09-30-19 (11-06-19)

<b>PRIMARY DOCUMENTS</b>		
<b>Life Cycle</b>	<b>Site SS016 Remedial Design/Remedial Action Work Plan</b> <b>Travis AFB, Glenn Anderson</b> <b>CH2M, Doug Berwick</b> <b>CAPE, Meg Greenwald</b>	<b>Site SD031 Soil Remedial Investigation/Feasibility Study</b> <b>Travis AFB, Glenn Anderson</b> <b>CH2M, Rick Sturm</b>
<b>Scoping Meeting</b>	NA	NA
Predraft to AF/Service Center	06-04-18	05-24-19
AF/Service Center Comments Due	06-18-18	06-10-19
Draft to Agencies	07-31-18	09-12-19
Draft to RAB	07-31-18	09-12-19
Agency Comments Due	08-30-18	11-11-19
<b>Response to Comments Meeting</b>	<b>09-19-18</b>	<b>11-20-19</b>
Agency Concurrence with Remedy	NA	NA
Public Comment Period	NA	NA
<b>Public Meeting</b>	NA	NA
Response to Comments Due	10-24-18	12-05-19
Draft Final Due	10-24-18	12-05-19
Final Due	11-06-19	01-06-20



PRIMARY DOCUMENTS			
Life Cycle	Potrero Hills Annex Travis, Glenn Anderson		
	FS	Proposed Plan	ROD
<b>Scoping Meeting</b>	<b>180 days after Water Board Order Rescinded</b>	<b>+470 days</b>	<b>+735 days</b>
Predraft to AF/Service Center	+ 270 days	+530 days	+ 915 days
AF/Service Center Comments Due	+ 300 days	+560 days	+ 975 days
Draft to Agencies	+330 days	+590 days	+ 1035 days
Draft to RAB	+ 330 days	+590 days	+ 1035 days
Agency Comments Due	+390 days	+650 days	+ 1095 days
<b>Response to Comments Meeting</b>	<b>+ 405 days</b>	<b>+665 days</b>	<b>+ 1110 days</b>
Agency Concurrence with Remedy	NA	NA	+ 1130 days
Public Comment Period	NA	+735 to 765 days	NA
<b>Public Meeting</b>	<b>NA</b>	<b>+745 days</b>	<b>NA</b>
Response to Comments Due	+430 days	+695days	+ 1190 days
Draft Final Due	+430 days	+695 days	+ 1190 days
Final Due	+460 days	+725 days	+ 1250 days

INFORMATIONAL DOCUMENTS			
Life Cycle	Quarterly Newsletter (October 2019) Travis, Glenn Anderson	Fourth Five-Year Review Report for Multiple Groundwater, Soil, and Sediment Sites Travis AFB, Glenn Anderson Tetra Tech, Joachim Eberharter	Site SS046 Remedial Action Completion Report and Well Decommissioning Work Plan Travis AFB, Glenn Anderson CH2M, Doug Berwick CAPE, Meg Greenwald
<b>Scoping Meeting</b>	NA	NA	NA
Predraft to AF/Service Center	09-18-19	03-14-18	04-15-19
AF/Service Center Comments Due	NA	05-22-18	04-22-19
Draft to Agencies	10-08-19	06-05-18	05-09-19
Draft to RAB	NA	06-05-18	05-09-19
Agency Comments Due	10-22-19	07-20-18	06-10-19
<b>Response to Comments Meeting</b>	<b>10-23-19</b>	<b>TBD</b>	<b>06-19-19</b>
Response to Comments Due	10-23-19	TBD	07-12-19 (09-20-19)
Draft Final Due	NA	NA	NA
Final Due	10-24-19	TBD	07-12-19 (09-20-19)
Public Comment Period	NA	NA	NA
<b>Public Meeting</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>

INFORMATIONAL DOCUMENTS				
Life Cycle	2018 Annual Site LF007 Corrective Action Management Unit Inspection, Monitoring, and Maintenance Report  Travis AFB, Milton Clare CH2M, Levi Pratt	Site LF008 Remedial Action Completion Report  Travis AFB, Glenn Anderson CH2M, Latonya Coleman	Site SD043 Site Closure Report  Travis AFB, Glenn Anderson CH2M, Levi Pratt	Site SS046 Well Decommissioning and Site Closeout Tech Memo  Travis AFB, Glenn Anderson CH2M, Doug Berwick CAPE, Meg Greenwald
<b>Scoping Meeting</b>	NA	NA	NA	NA
Predraft to AF/Service Center	05-31-19	07-10-19	06-12-19	09-04-19
AF/Service Center Comments Due	06-14-19	07-24-19	06-28-19	09-18-19
Draft to Agencies	08-15-19	10-07-19	08-06-19	10-15-19
Draft to RAB	08-15-19	10-07-19	08-06-19	10-15-19
Agency Comments Due	09-16-19	11-06-19	10-07-19	11-15-19
<b>Response to Comments Meeting</b>	<b>10-02-18</b>	<b>11-20-19</b>	<b>10-16-19</b>	<b>11-20-19</b>
Response to Comments Due	10-16-19 (10-09-19)	12-09-19	11-01-19	12-06-19
Draft Final Due	NA	NA	NA	NA
Final Due	10-16-19 (10-09-19)	12-09-19	11-01-19	12-06-19
Public Comment Period	NA	NA	NA	NA
<b>Public Meeting</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>

INFORMATIONAL DOCUMENTS	
Life Cycle	<b>Recently Identified POCO Investigation Near Closed Site OW050 Work Plan</b> <b>Travis, Glenn Anderson</b> <b>CH2M, Tony Chakurian</b>
<b>Scoping Meeting</b>	<b>NA</b>
Predraft to AF/Service Center	<b>11-08-19</b>
AF/Service Center Comments Due	<b>11-22-19</b>
Draft to Agencies	<b>12-12-19</b>
Draft to RAB	<b>12-12-19</b>
Agency Comments Due	<b>01-31-20</b>
<b>Response to Comments Meeting</b>	<b>02-19-20</b>
Response to Comments Due	<b>03-04-20</b>
Draft Final Due	<b>NA</b>
Final Due	<b>03-04-20</b>
Public Comment Period	<b>NA</b>
<b>Public Meeting</b>	<b>NA</b>

<b>HISTORY - PRIMARY DOCUMENTS</b>	
<b>Life Cycle</b>	<b>No Further Action Soil ROD for Old Skeet Range (TS060 MRA) Travis AFB, Glenn Anderson</b>
<b>Scoping Meeting</b>	<b>NA</b>
Predraft to AF/Service Center	05-18-18
AF/Service Center Comments Due	06-01-18
Draft to Agencies	6-25-18
Draft to RAB	6-25-18
Agency Comments Due	11-30-18
<b>Response to Comments Meeting</b>	<b>01-16-19</b>
Agency Concurrence with Remedy	NA
Public Comment Period	NA
<b>Public Meeting</b>	<b>NA</b>
Response to Comments Due	06-13-19
Draft Final Due	06-13-19
Final Due	08-21-19 (09-11-19)

<b>HISTORY - INFORMATIONAL DOCUMENTS</b>	
<b>Life Cycle</b>	<b>2018 Annual GRISR Travis AFB, Glenn Anderson CH2M, Leslie Royer</b>
<b>Scoping Meeting</b>	<b>NA</b>
Predraft to AF/Service Center	05-06-19
AF/Service Center Comments Due	05-20-19
Draft to Agencies	06-05-19
Draft to RAB	06-05-19
Agency Comments Due	07-08-19
<b>Response to Comments Meeting</b>	07-17-19
Response to Comments Due	08-30-19 (09-04-19)
Draft Final Due	NA
Final Due	08-30-19 (09-04-19)
Public Comment Period	NA
<b>Public Meeting</b>	<b>NA</b>

# South Base Boundary Groundwater Treatment Plant

## Monthly Data Sheet

Report Number: 227

Reporting Period: 28 August 2019 – 1 October

Date Submitted: 15 October 2019

This monthly data sheet presents information regarding the South Base Boundary Groundwater Treatment Plant (SBBGWTP) and associated remedial process optimization (RPO) activities.

## System Metrics

Table 1 presents operational data from the September 2019 reporting period.

Table 1 – Operations Summary – September 2019				
Initial Data Collection:		8/28/2019 15:00	Final Data Collection:	10/1/2019 11:35
Operating Time:		Percent Uptime:	Electrical Power Usage:	
SBBGWTP:	811 hours	SBBGWTP:	99.8%	SBBGWTP: 20,384 kWh (16,684 lbs CO <sub>2</sub> generated <sup>a</sup> )
Gallons Treated: <b>7.8 million gallons</b>			Gallons Treated Since July 1998: <b>1,144 million gallons</b>	
Volume Discharged to Union Creek: <b>7.8 million gallons</b>			Gallons Treated from Other Sources: <b>0 gallons</b>	
VOC Mass Removed: <b>0.9 lbs<sup>b</sup></b>			VOC Mass Removed Since July 1998: <b>520.4 lbs</b>	
Rolling 12-Month Cost per Pound of Mass Removed: <b>\$15,861<sup>c</sup></b>				
Monthly Cost per Pound of Mass Removed: <b>\$34,282<sup>c</sup></b>				
lbs = pounds				
<sup>a</sup> SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG. Value also includes approximately 1,600 pounds of GHG from GAC change out services averaged to a per month basis.				
<sup>b</sup> Calculated using September 2019 EPA Method SW8260C analytical results.				
<sup>c</sup> Costs include operations and maintenance, carbon change out, reporting, analytical laboratory, project management, and utility costs related to operation of the system.				

Table 2 presents individual extraction well flow rates along with the average system flow during the monthly reporting period.

Table 2 – SBBGWTP Average Flow Rate (gpm) <sup>a</sup> – September 2019							
FT005 <sup>b</sup>				SS029		SS030	
EW01x05	Offline	EW743x05	Offline	EW01x29	Offline <sup>c</sup>	EW01x30	8.5
EW02x05	Offline	EW744x05	Offline <sup>d</sup>	EW02x29	Offline <sup>c</sup>	EW02x30	Offline <sup>d</sup>
EW03x05	Offline	EW745x05	11.5	EW03x29	3.0	EW03x30	11.6
EW731x05	6.8	EW746x05	Offline	EW04x29	6.3	EW04x30	23.4
EW732x05	Offline	EW2291x05	3.2	EW05x29	8.0	EW05x30	8.9
EW733x05	Offline	EW2782x05	4.9	EW06x29	7.7	EW2174x30	8.3
EW734x05	0.4	EW2783x05	8.3	EW07x29	12.8	EW711x30	8.9
EW735x05	10.3	EW2784x05	10.8			MW269x30	0.5
EW736x05	Offline	EW2785x05	8.5				
EW737x05	Offline	EW2786x05	Offline <sup>d</sup>				
EW742x05	Offline						
FT005 Total: 64.7				SS029 Total: 37.8		SS030 Total: 70.1	
SBBGWTP Average Monthly Flow <sup>e</sup> : 160.9 gpm							
<sup>a</sup> Flow rates presented are instantaneous measurements taken at the end of the reporting period.							
<sup>b</sup> Most extraction wells at FT005 were taken offline in accordance with the 2008 Annual Remedial Process Optimization Report for the Central Groundwater Treatment Plant, North Groundwater Treatment Plant, and South Base Boundary Groundwater Treatment Plant.							
<sup>c</sup> Extraction wells taken off line because of persistent fouling of the well pumps and associated discharge piping.							
<sup>d</sup> Extraction wells were operational; however, well was recharging.							
<sup>e</sup> The average SBBGWTP groundwater flow rate was calculated using the Union Creek Discharge Totalizer and dividing it by the total time the system was operational.							
gpm – gallons per minute							
SBBGWTP – South Base Boundary Groundwater Treatment Plant							

Table 3 presents a summary of system shutdowns during the monthly reporting period.

Table 3 – Summary of System Shutdowns					
Location	Shutdown <sup>a</sup>		Restart <sup>a</sup>		Cause
	Date	Time	Date	Time	
SBBGWTP	16 September 2019	09:00	16 September 2019	10:30	Backwashed both 6,000-lb GAC vessels
<sup>a</sup> Shutdown and restart times estimated based on field notes SBBGWTP = South Base Boundary Groundwater Treatment Plant					



## Summary of O&M Activities

Monthly groundwater treatment samples were collected at the SBBGWTP on 3 September 2019. Sample results are presented in Table 4. The total VOC concentration (14.19 µg/L) in the influent sample decreased from the August 2019 sample results (17.56 µg/L). TCE was the primary VOC detected in the influent sample at a concentration of 13 µg/L. In addition, TPH-d and TPH-mo were detected in the influent sample. Cis-1,2-DCE, chloroform, and 1,2-DCA were detected in the midpoint sampling location. No VOCs or TPH were detected in the effluent sample.

On 16 September 2019, the system was shut down for approximately 1.5 hours to backwash the two (2) 6,000-lb GAC vessels. Following the backwashing, the pressure in the lead GAC vessel decreased from 17 psi to 11 psi.

In September 2019, troubleshooting was performed on several extraction wells. The following list presents the maintenance activities and status of those extraction wells:

- EW734x05 – Cleaned and serviced pump. Well is currently on line.
- EW735x05 – Re-attached pump to drop pipe. Installed a new flow meter. Well is currently on line.
- EW2785x05 – Repaired cracked PVC and broken hose. Well is currently on line.

In September 2019, the backwash transfer pump was disassembled and cleaned to improve its output. The pump impeller was cleaned of scale and reinstalled. Cleaning this pump did not result in system downtime.

Figure 1 presents the influent 1,2-DCA and TCE concentrations since January 2017. The 1,2-DCA and TCE concentrations have been sporadic and appear to be dependent on seasonal variation and which wells are actively being extracted during the time of sampling. TCE concentrations have generally been increasing since March 2018, and 1,2-DCA concentrations were elevated between December 2017 and June 2018 and mostly non-detect from July through November 2018. 1,2-DCA concentrations were sporadic between December 2018 and September 2019.

Figure 2 presents a plot of influent VOC concentrations and average flow at the SBBGWTP over the past twelve (12) months. An overall decreasing trend was observed for the VOC influent concentrations in the past 12 months. An overall increasing flow rate trend was observed in the past 12 months, which continued through September 2019.

## Optimization Activities

No optimization activities occurred at the SBBGWTP in September 2019.

## Sustainability

Travis AFB is committed to decreasing the amount of GHG produced directly (waste streams discharging GHG) or indirectly (GHG produced as related to electrical energy consumption) from all systems across Travis AFB. Travis AFB continues to optimize each treatment plant to reduce the amount of electrical energy consumed, and to implement sustainable treatment plant optimization programs, such as taking extraction pumps off line that are no longer necessary for contaminant plume capture.

Figure 3 presents the historical GHG production from the SBBGWTP. In September 2019, the SBBGWTP produced approximately 16,684 pounds of GHG, which includes approximately 1,600 pounds of GHG generated from GAC change out services averaged to a per month basis.

TABLE 4

Summary of Groundwater Analytical Data for September 2019 – South Base Boundary Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	3 September 2019 (µg/L)		
				Influent	Midpoint	Effluent
Halogenated Volatile Organics						
Bromodichloromethane	NA	0.17	0	ND	ND	ND
Chloroform	1.9	0.16	0	ND	0.27 J	ND
1,1-Dichloroethane	0.50	0.22	0	ND	ND	ND
1,2-Dichloroethane	0.50	0.13	0	0.27 J	0.84 J	ND
1,1-Dichloroethene	0.50	0.23	0	ND	ND	ND
cis-1,2-Dichloroethene	0.50	0.15	0	0.92 J	0.54 J	ND
trans-1,2-Dichloroethene	0.50	0.11	0	ND	ND	ND
Tetrachloroethene	0.50	0.20	0	ND	ND	ND
1,1,1-Trichloroethane	0.50	0.16	0	ND	ND	ND
1,1,2-Trichloroethane	0.50	0.27	0	ND	ND	ND
Trichloroethene	0.65	0.16	0	13	ND	ND
Vinyl Chloride	0.90	0.10	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	0.50	0.13	0	ND	ND	ND
Ethylbenzene	0.50	0.15	0	ND	ND	ND
Toluene	0.50	0.25	0	ND	ND	ND
Xylenes	0.50	0.10 – 0.18	0	ND	ND	ND
Methyl Tert Butyl Alcohol	0.50	0.17	0	ND	ND	ND
Other						
Total Petroleum Hydrocarbons – Gasoline	50	10	0	ND	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	5.5	0	63	NM	ND
Total Petroleum Hydrocarbons – Motor Oil	100	32	0	54 J	NM	ND

\* In accordance with current National Pollutant Discharge Elimination System permit number CAG912002, Order number R2-2017-0048.

## Notes:

J = analyte concentration is considered an estimated value due to a detected concentration value between the reporting limit and method detection limit for the contaminant.

NA = not applicable

N/C = number of samples out of compliance with discharge limits.

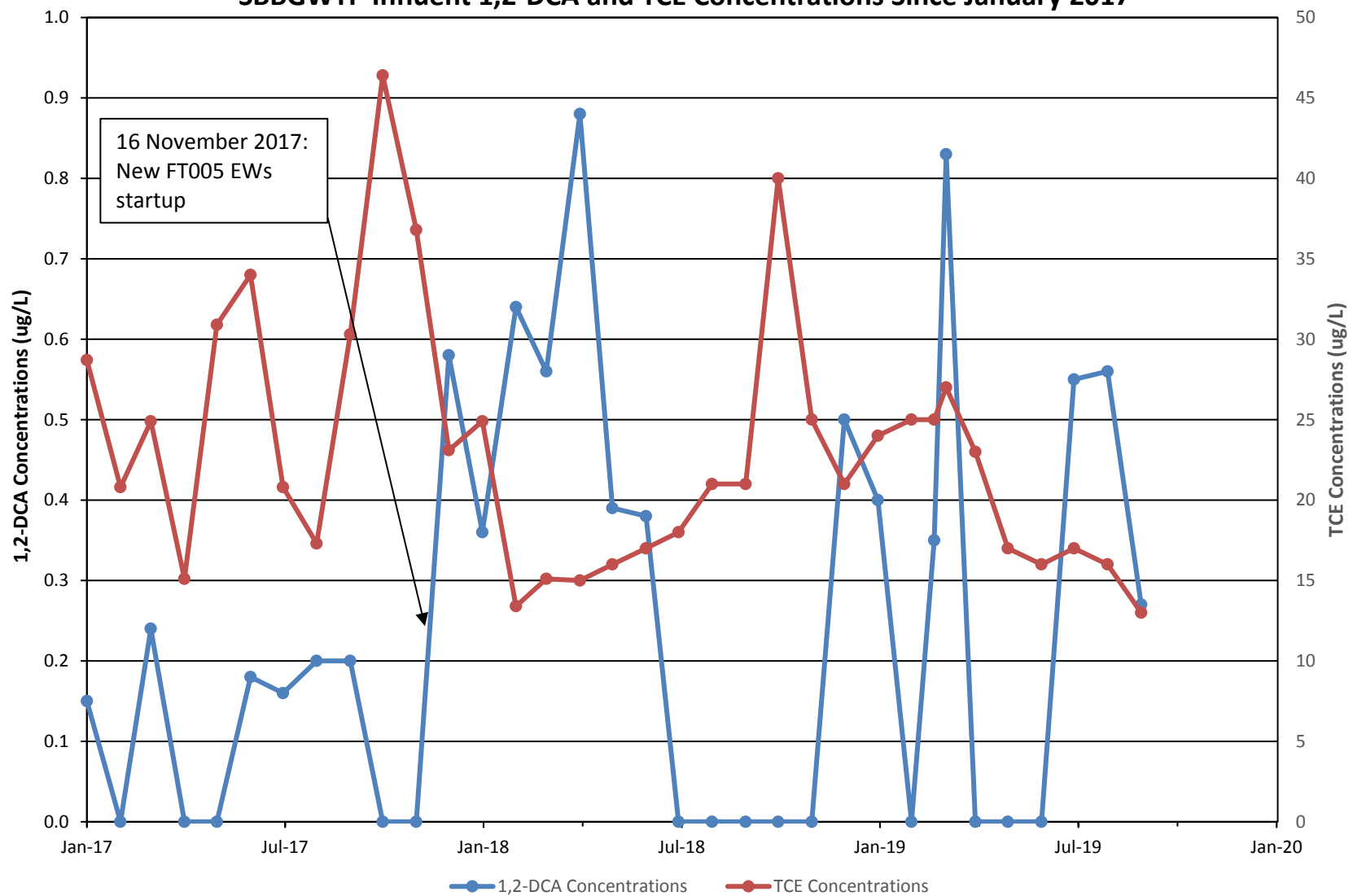
ND = not detected

NM = not measured

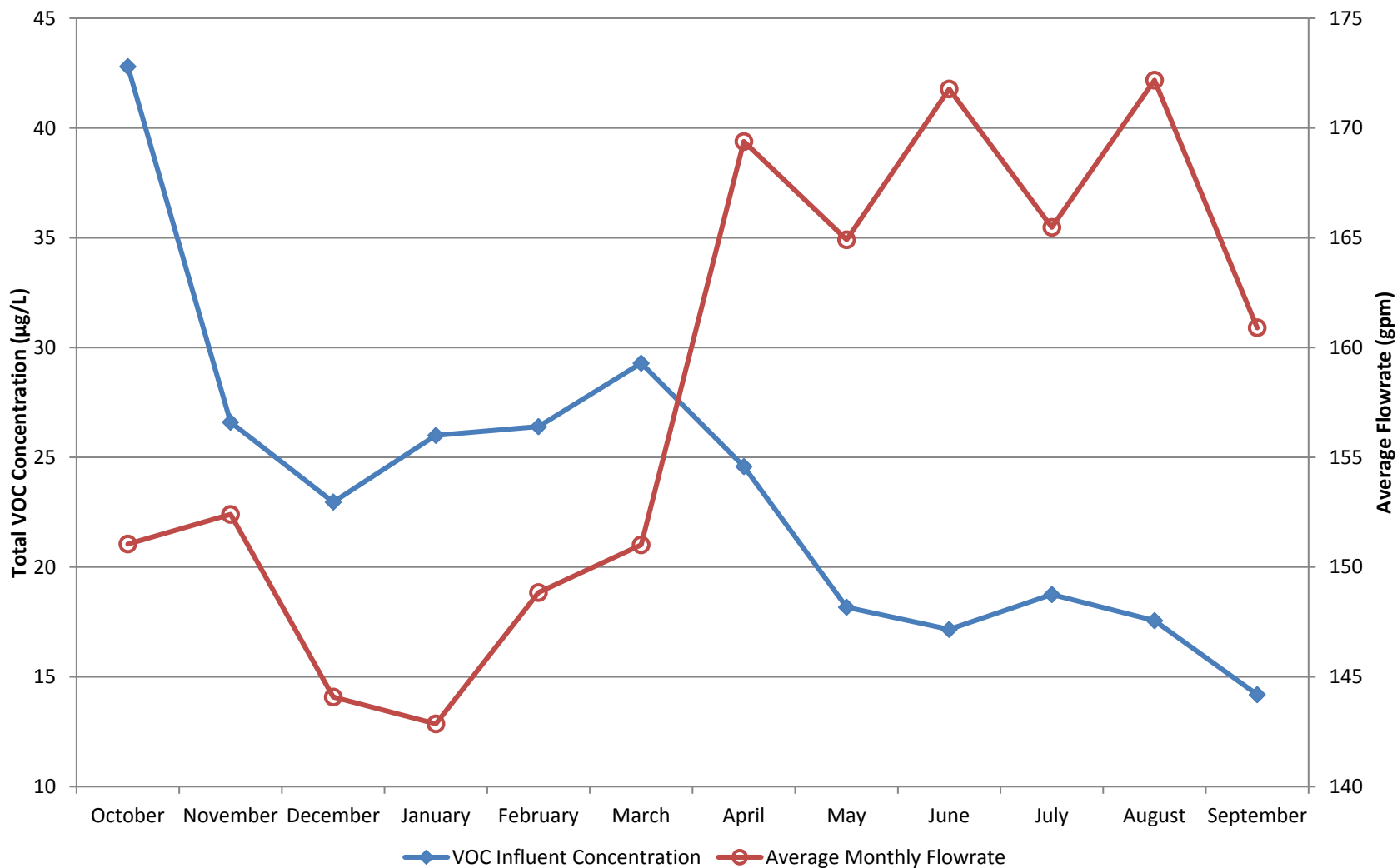
µg/L = micrograms per liter

# Figure 1

SBBGWTP Influent 1,2-DCA and TCE Concentrations Since January 2017

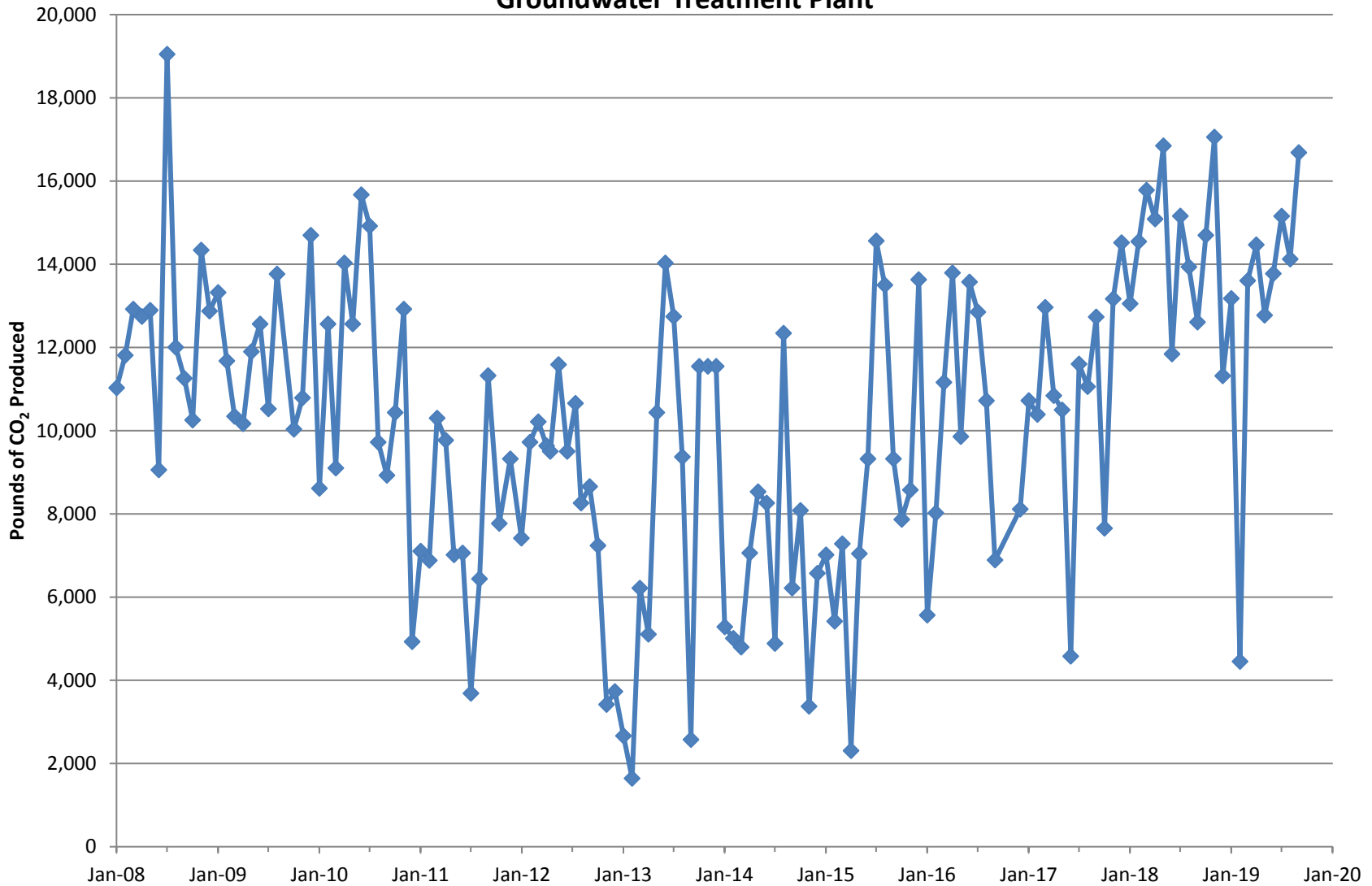


**Figure 2**  
**SBBGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History**



**Figure 3**

**Equivalent Pounds of Carbon Dioxide Produced by the South Base Boundary  
Groundwater Treatment Plant**



# Central Groundwater Treatment Plant Monthly Data Sheet

Report Number: 242

Reporting Period: 28 August 2019 – 1 October 2019

Date Submitted: 15 October 2019

This monthly data sheet presents information regarding the Central Groundwater Treatment Plant (CGWTP) and its associated technology demonstrations. The ongoing technology demonstrations related to the CGWTP include various emulsified vegetable oil (EVO) injections and two (2) bioreactor treatability studies.

## System Metrics

Table 1 presents operational data from the September 2019 reporting period.

Table 1 – Operations Summary – September 2019				
Initial Data Collection:		8/28/2019 14:35	Final Data Collection:	10/1/2019 8:10
Operating Time:		Percent Uptime:	Electrical Power Usage:	
CGWTP:	809 hours	CGWTP:	99.9%	CGWTP: 2,658 kWh (2,855 lbs CO <sub>2</sub> generated <sup>a</sup> )
Gallons Treated (discharge to storm sewer):		Gallons Treated Since January 1996: <b>574.5 million gallons</b>		
<b>1,319,490 gallons</b>				
VOC Mass Removed from groundwater:		VOC Mass Removed Since January 1996:		
<b>2.4 lbs<sup>b</sup></b>		<b>2,845 lbs from groundwater</b>		
		<b>8,686 lbs from vapor</b>		
Rolling 12-Month Cost per Pound of Mass Removed: \$3,415 <sup>c</sup>				
Monthly Cost per Pound of Mass Removed: \$2,338 <sup>c</sup>				
<sup>a</sup> SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG. Value also includes approximately 888 pounds of GHG from GAC change out services averaged to a per month basis.				
<sup>b</sup> Calculated using September 2019 EPA Method SW8260C analytical results.				
<sup>c</sup> Costs include operations and maintenance, carbon change out, reporting, analytical laboratory, project management, and utility costs related to operation of the system.				

Table 2 presents individual extraction well flow rates during the monthly reporting period.

Table 2 – CGWTP Average Flow Rates <sup>a</sup> – September 2019	
Location	Average Flow Rate Groundwater (gpm)
EW001x16	12.4
EW002x16	7.2
EW003x16	0.0
EW605x16	5.7
EW610x16	2.1
CGWTP	27.2
<sup>a</sup> Flow rates calculated by dividing total gallons processed by system operating time for the month or the average of the instantaneous readings. gpm = gallons per minute	

Table 3 presents a summary of shutdowns during the monthly reporting period.

<b>Table 3 – Summary of System Shutdowns</b>					
<b>Location</b>	<b>Shutdown<sup>a</sup></b>		<b>Restart</b>		<b>Cause</b>
	<b>Date</b>	<b>Time</b>	<b>Date</b>	<b>Time</b>	
CGWTP	12 September 2019	13:30	12 September 2019	14:30	Perform maintenance on pump P-301.
-- = Date/Time not recorded					
<sup>a</sup> Shutdown and restart times estimated based on field notes					
CGWTP = Central Groundwater Treatment Plant					

## Summary of O&M Activities

Monthly groundwater treatment samples were collected at the CGWTP on 3 September 2019. Sample results are presented in Table 4. The total VOC concentration (220.83 µg/L) in the September 2019 influent sample has decreased from the August 2019 sample (277.10 µg/L). TCE was the primary VOC detected in the influent sample at a concentration of 180 µg/L. No VOCs were detected in the samples collected after the first and second carbon vessels or in the effluent sample. Travis AFB will continue to monitor influent, midpoint, and effluent concentrations at the CGWTP for carbon breakthrough, though the carbon treatment remained effective in September 2019.

Figure 1 presents a plot of influent concentrations (total VOCs) and the influent flow rate at the CGWTP versus time for the past twelve (12) months. The influent concentrations show an increasing trend over the past 12 months along with a slightly decreasing trend for the flow rate through the treatment plant.

In September 2019, a new float switch was installed in the OSA (Oil Spill Area) vault. The extraction wells remained operational the entire time.

The Site DP039 subgrade biogeochemical reactor (SBGR), also known as a bioreactor, continued operating in September 2019.

## Optimization Activities

No optimization activities occurred at the CGWTP in September 2019.

## Sustainability

Travis AFB is committed to decreasing the amount of GHG produced directly (waste streams discharging GHG) or indirectly (GHG produced as related to electrical energy consumption) from all systems across Travis AFB. Travis AFB continues to optimize each treatment plant to reduce the amount of electrical energy consumed, and to implement sustainable treatment plant optimization programs, such as bioreactors and EVO injection well networks.

Figure 2 presents the historical GHG production from the systems associated with the CGWTP. The CGWTP produced approximately 2,855 pounds of GHG during September 2019.

TABLE 4

Summary of Groundwater Analytical Data for September 2019 – Central Groundwater Treatment Plant

				3 September 2019 (µg/L)			
Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	Influent	After Carbon 1 Effluent	After Carbon 2 Effluent	System Effluent
Halogenated Volatile Organics							
Acetone	NA	1.9 – 3.8	0	ND	ND	ND	ND
Bromomethane	NA	0.21 – 0.42	0	ND	ND	ND	ND
Chloroform	1.9	0.16 – 0.32	0	ND	ND	ND	ND
1,2-Dichlorobenzene	NA	0.15 – 0.30	0	0.35 J	ND	ND	ND
1,3-Dichlorobenzene	NA	0.13 – 0.26	0	0.48 J	ND	ND	ND
1,4-Dichlorobenzene	NA	0.16 – 0.32	0	ND	ND	ND	ND
Bromodichloromethane	NA	0.17 – 0.34	0	ND	ND	ND	ND
1,1-Dichloroethane	0.50	0.22 – 0.44	0	ND	ND	ND	ND
1,2-Dichloroethane	0.50	0.13 – 0.26	0	ND	ND	ND	ND
1,1-Dichloroethene	0.50	0.23 – 0.46	0	ND	ND	ND	ND
cis-1,2-Dichloroethene	0.50	0.15 – 0.30	0	38	ND	ND	ND
trans-1,2-Dichloroethene	0.50	0.15 – 0.30	0	2.0	ND	ND	ND
Tetrachloroethene	0.50	0.20 – 0.40	0	ND	ND	ND	ND
1,1,1-Trichloroethane	0.50	0.16 – 0.32	0	ND	ND	ND	ND
1,1,2-Trichloroethane	0.50	0.27 – 0.54	0	ND	ND	ND	ND
Trichloroethene	0.65	0.16 – 0.32	0	180	ND	ND	ND
Vinyl Chloride	0.90	0.10 – 0.20	0	ND	ND	ND	ND
Non-Halogenated Volatile Organics							
Benzene	0.50	0.16 – 0.32	0	ND	ND	ND	ND
Ethylbenzene	0.50	0.16 – 0.32	0	ND	ND	ND	ND
Toluene	0.50	0.17 – 0.34	0	ND	ND	ND	ND
Total Xylenes	0.50	0.15 – 0.38	0	ND	ND	ND	ND
Methyl Tertiary Butyl Ether	0.50	0.25 – 0.50	0	ND	ND	ND	ND
Other							
Total Petroleum Hydrocarbons – Gasoline (C6 – C10)	50	10	0	ND	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel (C10 – C28)	50	5.5	0	ND	NM	NM	ND
Total Petroleum Hydrocarbons – Motor Oil (C28 – C40)	100	32	0	ND	NM	NM	ND

\* In accordance with current National Pollutant Discharge Elimination System permit number CAG912002, Order number R2-2017-0048.

Notes:

J = analyte concentration is considered an estimated value due to a detected concentration value between the reporting limit and method detection limit for the contaminant.

NA = not applicable

N/C = number of samples out of compliance with discharge limits.

ND = not detected

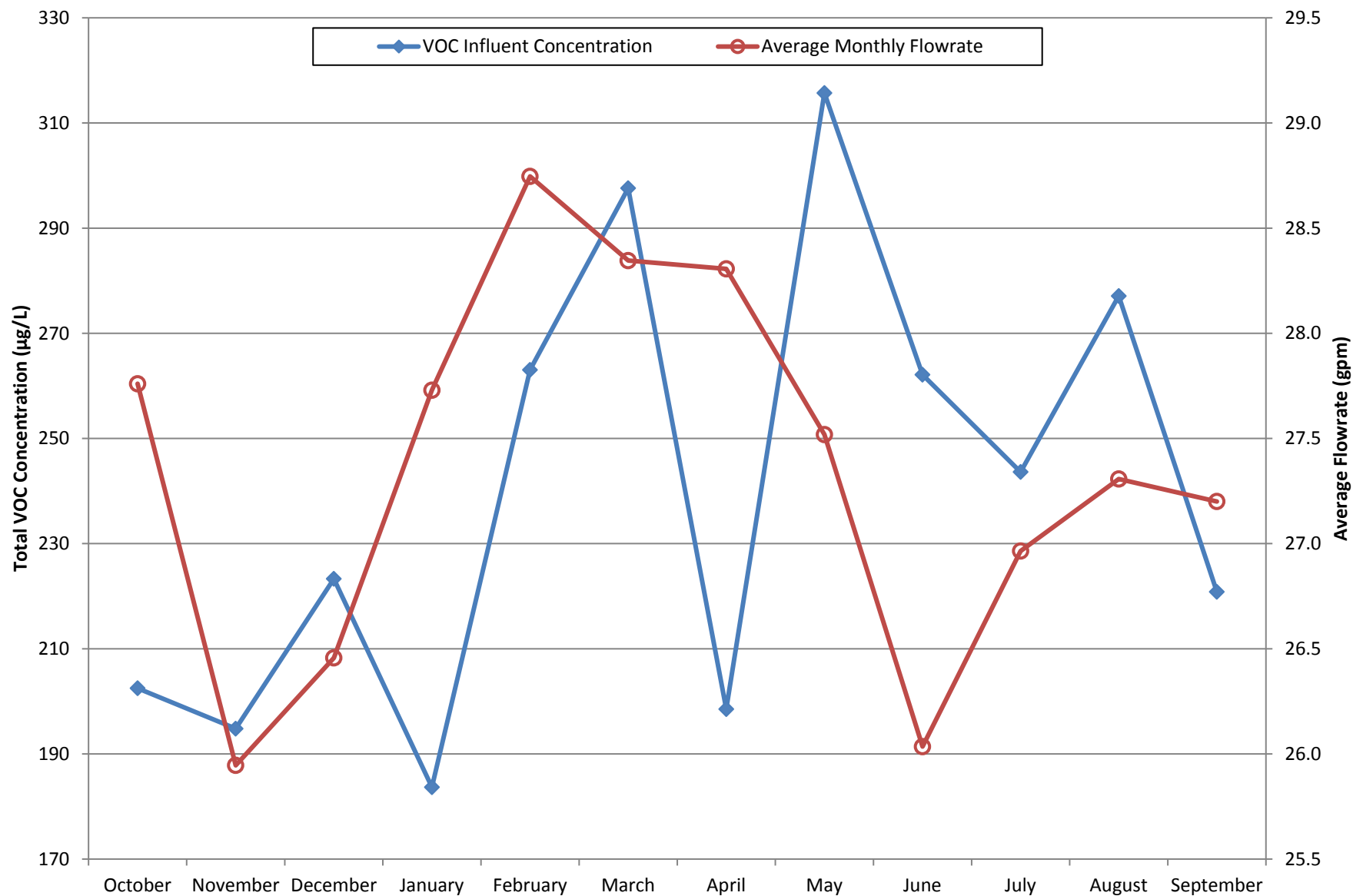
NM = not measured

µg/L = micrograms per liter

mg/L = milligrams per liter

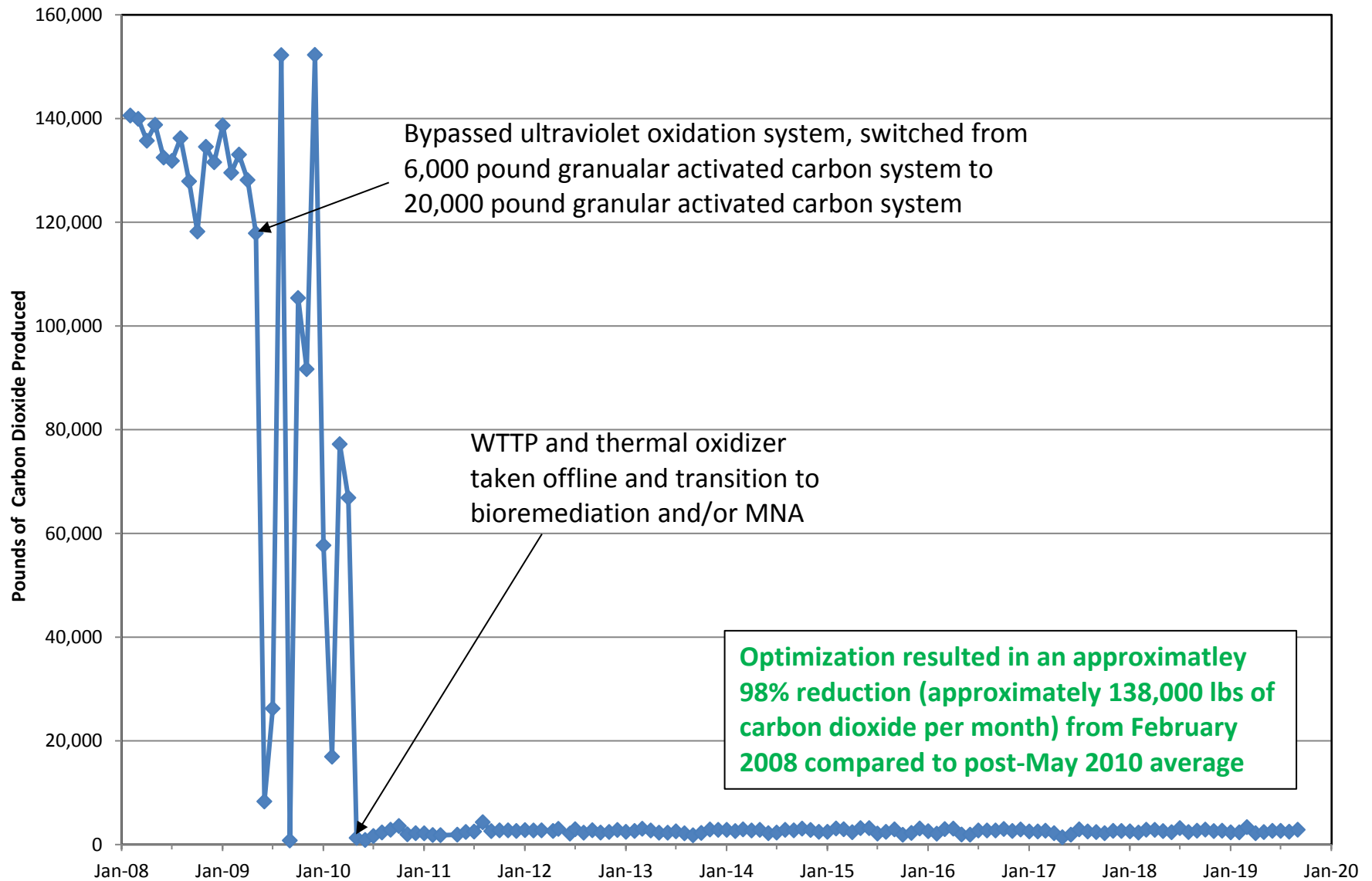


**Figure 1**  
**CGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History**



**Figure 2**

**Equivalent Pounds of Carbon Dioxide Produced by the Central Groundwater Treatment Plant**



# Subarea LF007C Groundwater Treatment Plant

## Monthly Data Sheet

Report Number: 181

Reporting Period: 28 August 2019 – 1 October 2019

Date Submitted: 15 October 2019

This monthly data sheet presents information regarding the Subarea LF007C Groundwater Treatment Plant (LF007C GWTP) and associated remedial process optimization (RPO) activities.

## System Metrics

Table 1 presents operational data from the September 2019 reporting period:

Table 1 – Operations Summary – September 2019			
Initial Data Collection:		8/28/2019 15:30	Final Data Collection: 10/1/2019 9:20
Operating Time:		Percent Uptime:	Electrical Power Usage <sup>a</sup> :
LF007C GWTP:	810 hours	LF007C GWTP	100%
		LF007C GWTP:	0 kWh
Gallons Treated: 205,782 gallons		Gallons Treated Since March 2000: 89.2 million gallons	
Volume Discharged to Duck Pond: 205,782 gallons			
VOC Mass Removed: 7.4 x 10 <sup>-4</sup> pounds <sup>b</sup>		VOC Mass Removed Since March 2000: 174.4 pounds (Groundwater)	
Rolling 12-Month Cost per Pound of Mass Removed: Not Measured <sup>c</sup>			
Monthly Cost per Pound of Mass Removed: Not Measured <sup>c</sup>			
<sup>a</sup> The LF007C GWTP operates on solar power only.			
<sup>b</sup> VOCs from September 2019 influent sample detected by EPA Method SW8260C.			
<sup>c</sup> Value not calculated since measurement does not accurately represent the cost effectiveness of the system.			

Table 2 presents individual extraction well flow rates during the monthly reporting period.

Table 2 – LF007C GWTP Average and Total Flow Rates – September 2019		
Location	Average Flow Rate (gpm) <sup>a</sup>	Total Gallons Processed (gallons)
EW614x07	4.1	200,883
EW615x07	0.5	25,783
LF007C GWTP	4.3	205,782
<sup>a</sup> Flow rates calculated by dividing total gallons processed by system operating time for the month or the average of the instantaneous readings. gpm = gallons per minute		

Table 3 presents a summary of shutdowns during the monthly reporting period.

Table 3 – Summary of System Shutdowns					
Location	Shutdown <sup>a</sup>		Restart <sup>a</sup>		Cause
	Date	Time	Date	Time	
LF007C GWTP	None.	--		--	
-- = Time not recorded <sup>a</sup> Shutdown and restart times estimated based on field notes LF007C GWTP = Subarea LF007C Groundwater Treatment Plant					

## Summary of O&M Activities

Monthly groundwater samples were collected at the LF007C GWTP on 3 September 2019. Sample results are presented in Table 4. TCE (0.43 J µg/L) was detected at the influent sample location. No VOCs were detected in the midpoint and effluent sample locations. In addition, TPH-d (36 µg/L) and TPH-mo (33 J µg/L) were detected in the influent sample location. No TPH was detected in the effluent sample location.

Figure 1 presents a chart of influent concentrations (total VOCs) at the LF007C GWTP versus time for the past twelve (12) months. VOC concentrations, primarily TCE, have been seasonally variable; however, over the last 12 months the trend has been decreasing. The average flow rate through the LF007C GWTP has increased over the last 12 months; however, flow rates have been decreasing since the system startup in June 2019.

## Optimization Activities

No optimization activities occurred at the LF007C GWTP in September 2019.

## Sustainability

Travis AFB is committed to decreasing the amount of GHG produced directly (waste streams discharging GHG) or indirectly (GHG produced as related to electrical energy consumption) from all systems across Travis AFB. Travis AFB continues to optimize each treatment plant to reduce the amount of electrical energy consumed, and to implement sustainable treatment plant optimization programs, such as the solar arrays employed to power the system.

Figure 2 presents the historical GHG production from the systems associated with the NGWTP and LF007C GWTP. The LF007C GWTP is a solar-only operated treatment system and does not generate GHG, with exception of a small amount of GHG generated from changing out the GAC averaged to a per month basis.

TABLE 4

Summary of Groundwater Analytical Data for September 2019 – Subarea LF007C Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	3 September 2019 (µg/L)		
				Influent	After Carbon 1	Effluent
Halogenated Volatile Organics						
Acetone	NA	2.1	0	ND	ND	ND
Bromodichloromethane	5.0	0.29	0	ND	ND	ND
Bromoform	5.0	0.10	0	ND	ND	ND
2-Butanone	5.0	0.35	0	ND	ND	ND
Carbon Tetrachloride	0.5	0.15	0	ND	ND	ND
Chloroform	5.0	0.12	0	ND	ND	ND
Dibromochloromethane	5.0	0.13	0	ND	ND	ND
1,3-Dichlorobenzene	5.0	0.11	0	ND	ND	ND
1,4-Dichlorobenzene	5.0	0.13	0	ND	ND	ND
1,1-Dichloroethane	5.0	0.15	0	ND	ND	ND
1,2-Dichloroethane	0.5	0.22	0	ND	ND	ND
1,1-Dichloroethene	5.0	0.14	0	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.10	0	ND	ND	ND
trans-1,2-Dichloroethene	5.0	0.11	0	ND	ND	ND
Methylene Chloride	5.0	0.35	0	ND	ND	ND
Tetrachloroethene	5.0	0.15	0	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.19	0	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.31	0	ND	ND	ND
Trichloroethene	5.0	0.13	0	0.43 J	ND	ND
Vinyl Chloride	0.5	0.22	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	1.0	0.13	0	ND	ND	ND
Ethylbenzene	5.0	0.15	0	ND	ND	ND
Toluene	5.0	0.25	0	ND	ND	ND
Xylenes	5.0	0.10 – 0.18	0	ND	ND	ND
Other						
Total Petroleum Hydrocarbons – Gasoline	50	10	0	ND	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	5.5	0	36	NM	ND
Total Petroleum Hydrocarbons – Motor Oil	100	32	0	33 J	NM	ND

\* In accordance with current National Pollutant Discharge Elimination System permit number CAG912002, Order number R2-2017-0048.

## Notes:

J = analyte concentration is considered an estimated value due to a detected concentration value between the reporting limit and method detection limit for the contaminant.

NA = not applicable

N/C = number of samples out of compliance with discharge limits.

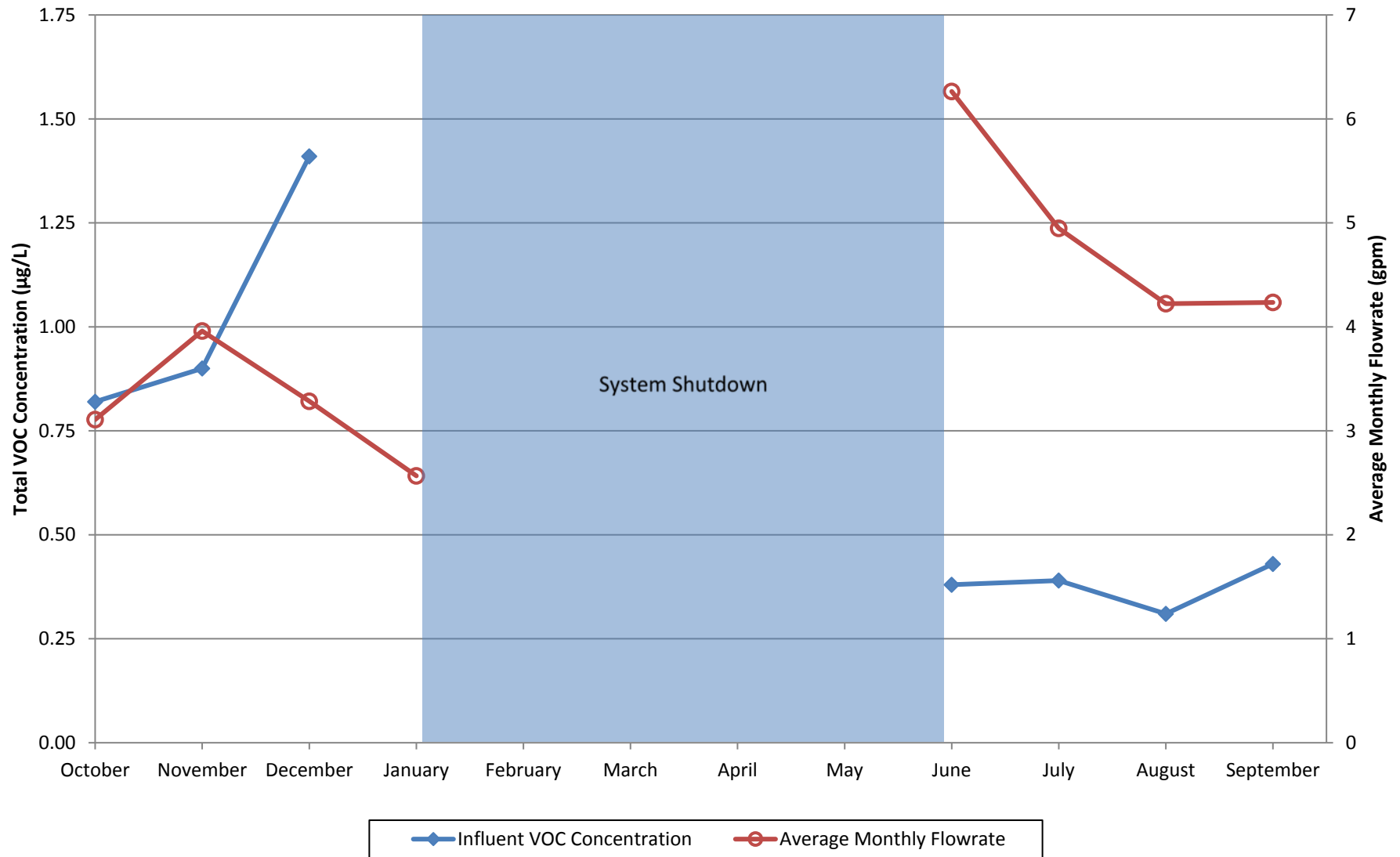
ND = not detected

NM = not measured

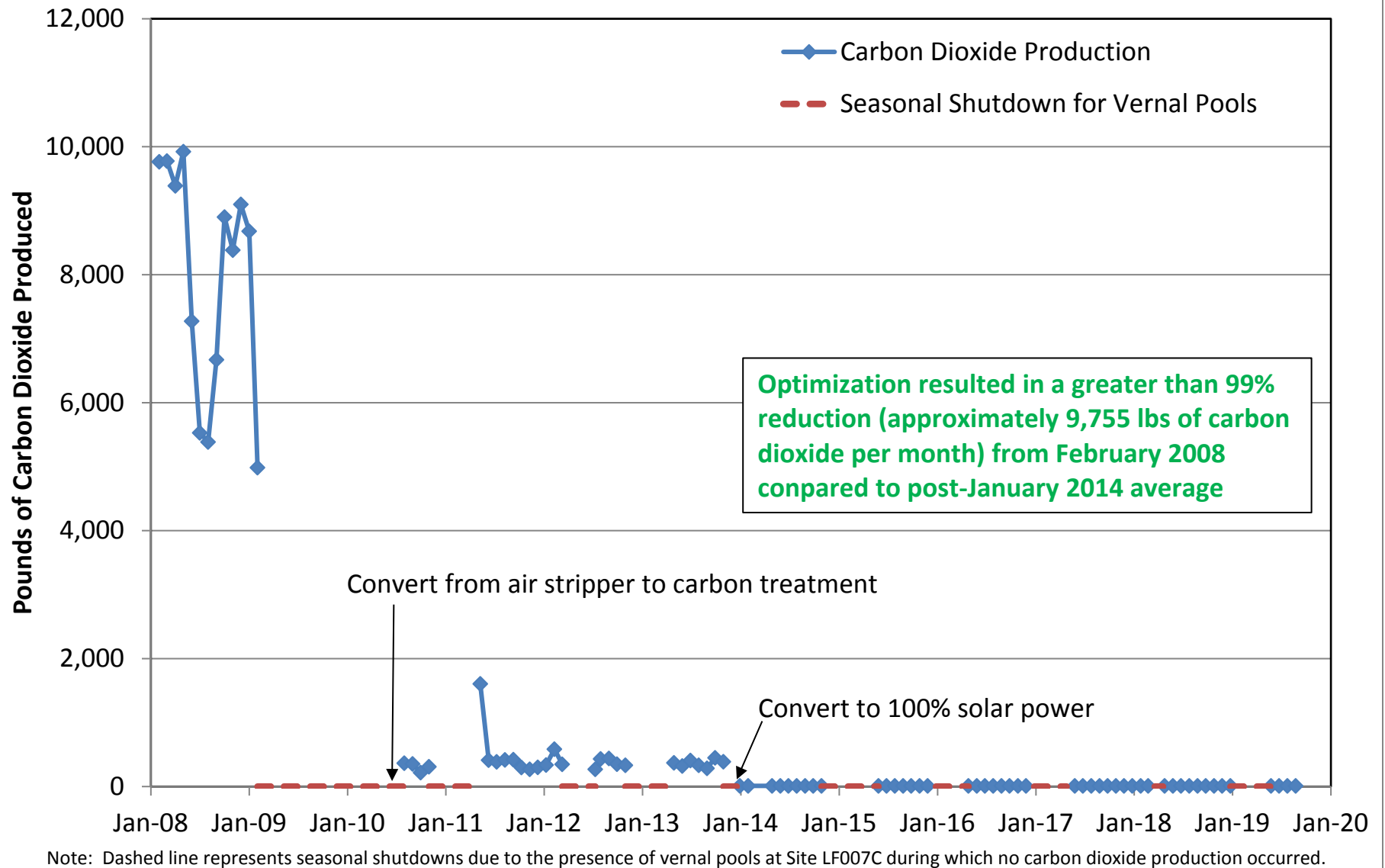
µg/L = micrograms per liter

**Figure 1**

**LF007CGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History**



**Figure 2**  
**Equivalent Pounds of Carbon Dioxide Produced by the NGWTP/LF007C GWTP**



# Site ST018 Groundwater Treatment Plant

## Monthly Data Sheet

Report Number: 103

Reporting Period: 30 August 2019 – 1 October 2019

Date Submitted: 15 October 2019

This monthly data sheet presents information regarding the Site ST018 Groundwater Treatment Plant (ST018GWTP).

## System Metrics

Table 1 presents operation data from the September 2019 reporting period.

Table 1 – Operations Summary – September 2019			
<b>Initial Data Collection:</b>	8/30/2019 8:20	<b>Final Data Collection:</b>	10/1/2019 10:20
Operating Time:		Percent Uptime:	Electrical Power Usage:
<b>ST018GWTP: 750 hours</b>		<b>ST018GWTP: 97.4%</b>	<b>ST018GWTP: 115 kWh (85 lbs CO<sub>2</sub> generated<sup>a</sup>)</b>
Gallons Extracted: <b>213,000 gallons</b>		Gallons Extracted Since March 2011: <b>18.0 million gallons</b>	
Volume Discharged to Sanitary Sewer: <b>213,000 gallons</b>		Final Totalizer Reading: <b>18,049,769 gallons</b>	
Cumulative Volume Discharged to Sanitary Sewer since 1 November 2014: <b>11,553,595 gallons</b>			
MTBE, BTEX, VOC, TPH Mass Removed: <b>0.01 lbs<sup>b</sup></b>		MTBE, BTEX, VOC, TPH Mass Removed Since March 2011: <b>48.4 lbs</b>	
MTBE (Only) Removed: <b>0.01 lbs<sup>b</sup></b>		MTBE (Only) Mass Removed Since March 2011: <b>11.8 lbs</b>	
Rolling 12-Month Cost per Total Pounds of Mass Removed: \$18,217 <sup>bc</sup>			
Monthly Cost per Pound of Mass Removed: \$619,632 <sup>bc</sup>			
<sup>a</sup> SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG. <sup>b</sup> Calculated using September 2019 EPA Method SW8260C and SW8015B analytical results. <sup>c</sup> Costs include operations and maintenance, reporting, analytical laboratory, project management, and utility costs related to operation of the system. kWh = kilowatt hour lbs = pounds			



Table 2 presents individual extraction well flow rates along with the average system flow during the monthly reporting period.

<b>Table 2 – ST018GWTP Average Flow Rates – September 2019</b>		
<b>Location</b>	<b>Average Flow Rate Groundwater (gpm)<sup>a</sup></b>	<b>Hours of Operation</b>
EW2014x18	1.1	680
EW2016x18	0.5	750
EW2019x18	1.1	750
EW2333x18	1.9	750
ST018GWTP	4.7	750
<sup>a</sup> Flow rates calculated by dividing total gallons processed by amount of operating time of the pump/system. gpm = gallons per minute ST018GWTP = Site ST018 Groundwater Treatment Plant		

Table 3 presents a summary of shutdowns during the monthly reporting period.

<b>Table 3 – Summary of System Shutdowns</b>					
<b>Location</b>	<b>Shutdown<sup>a</sup></b>		<b>Restart<sup>a</sup></b>		<b>Cause</b>
	<b>Date</b>	<b>Time</b>	<b>Date</b>	<b>Time</b>	
ST018GWTP	30 September 2019	13:50	1 October 2019	10:15	Pressure sensor malfunctioned.
-- = Time not recorded <sup>a</sup> Shutdown and restart times estimated based on field notes ST018GWTP = Site ST018 Groundwater Treatment Plant					

## Summary of O&M Activities

Monthly groundwater discharge samples were collected at the ST018GWTP on 3 September 2019. Because the extracted groundwater is no longer treated with carbon prior to discharge to the sanitary sewer, only discharge samples are now collected, rather than influent and effluent samples. Results are presented in Table 4. The complete September 2019 laboratory data report is available upon request. The MTBE discharge concentration during the September 2019 sampling event was 5.0 µg/L, which is a decrease from the August 2019 sample result of 42 µg/L. No other VOCs or TPH were detected in the system discharge sample. The low MTBE concentration is consistent with the September 2018 detection of 5.2 µg/L.

The Fairfield-Suisun Sewer District does not currently have a discharge limit for MTBE, but a limit of 6,400 µg/L is advised based on worker health and safety. Travis AFB will continue to monitor discharge contaminant concentrations to maintain compliance with the Fairfield-Suisun Sewer District discharge permit.

In September 2019, the pump from EW2014x18 was removed and inspected. The internal pump components were damaged. The pump was replaced, and the well as restarted without issue. In addition, a cracked fitting was also replaced at EW2014x18.

On 30 September, the system shut down because of a high pressure alarm from the bag filter. Since the bag filters were bypassed, the pressure sensor likely malfunctioned. The sensor was re-calibrated, and the system was restarted without issue.

Figure 1 presents plots of the average flow rate and total extracted contaminant (MTBE, TPH-g, TPH-d, TPH-mo, BTEX, and VOCs) and extracted MTBE concentrations at the ST018GWTP over the past twelve (12) months. The average flow rate through the ST018GWTP has been cyclical with flow rates decreasing during the dry season (summer and fall) and increasing during the rainy season (winter and spring). The overall average flow rates in the past 12 months show an increasing trend with a decreasing trend since April 2019 as expected. The increase flow rate in September 2019 is a result of EW2014x18 being operational. The extracted MTBE concentrations and extracted total concentrations have generally been fluctuating over the past 12 months with an overall decreasing trend.

## Optimization Activities

No optimization activities occurred at the ST018GWTP in September 2019.

## Sustainability

Travis AFB is committed to decreasing the amount of GHG produced directly (waste streams discharging GHG) or indirectly (GHG produced as related to electrical energy consumption) from all systems across Travis AFB. Travis AFB continues to optimize each treatment plant to reduce the amount of electrical energy consumed, and to implement sustainable treatment plant optimization programs, such as the solar arrays employed to power the ST018GWTP system.

Figure 2 presents the historical GHG production from the ST018GWTP. The ST018GWTP produced 85 pounds of GHG during September 2019 and removed 213,000 gallons of water. The amount of GHG produced is directly attributed to the amount of water removed through the system because the only line-power electrical use is for a transfer pump to push the water from the system to the sanitary sewer.

TABLE 4

Summary of Groundwater Analytical Data for September 2019– Site ST018 Groundwater Treatment Plant

Summary of Groundwater Analytical Data for September 2017 - Site 51616 Groundwater Treatment Plant				
Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	3 September 2019 (µg/L)
				System Discharge
Fuel Related Constituents				
Methyl tert-Butyl Ether	6,400	0.25	0	5.0
Benzene	25,000 <sup>a</sup>	0.16	0	ND
Ethylbenzene	25,000 <sup>a</sup>	0.16	0	ND
Toluene	25,000 <sup>a</sup>	0.17	0	ND
Total Xylenes	25,000 <sup>a</sup>	0.19 – 0.34	0	ND
Total Petroleum Hydrocarbons – Gasoline	50,000 <sup>b</sup>	10	0	ND
Total Petroleum Hydrocarbons – Diesel	50,000 <sup>b</sup>	15	0	ND
Total Petroleum Hydrocarbons – Motor Oil	100,000	160	0	ND
Other				
1,2-Dichloroethane	20	0.13	0	ND

\* In accordance with the Fairfield-Suisun Sewer District Discharge Limitations  
Laboratory data available on request.

a – The limit of 25,000 µg/L is a combined limit for BTEX.

b – The limit of 50,000 µg/L is a combined limit for TPH-g and TPH-d.

µg/L = micrograms per liter

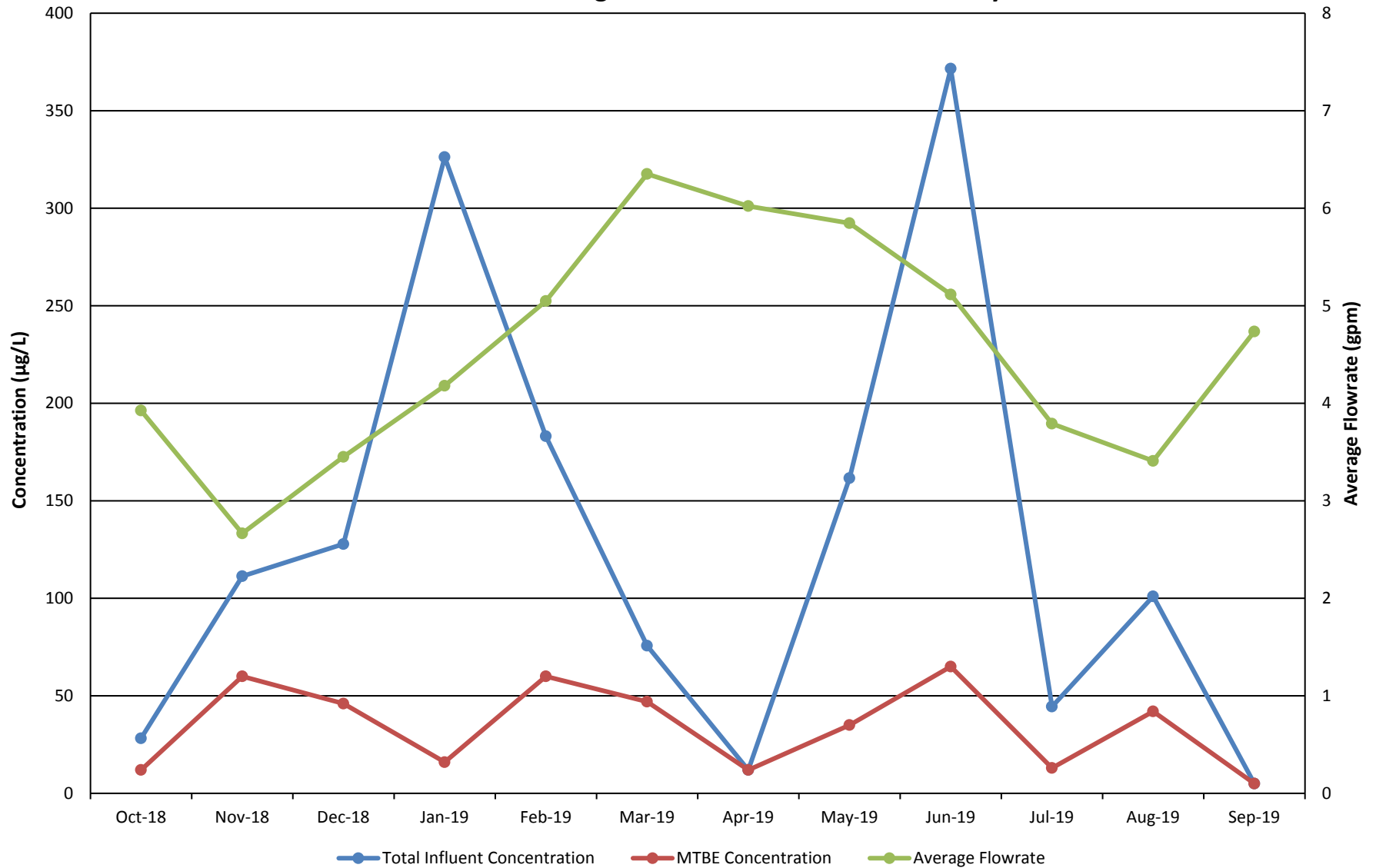
J = analyte concentration is considered an estimated value due to a detected concentration value between the reporting limit and method detection limit for the contaminant.

NA = not applicable

N/C = number of samples out of compliance with discharge limits.

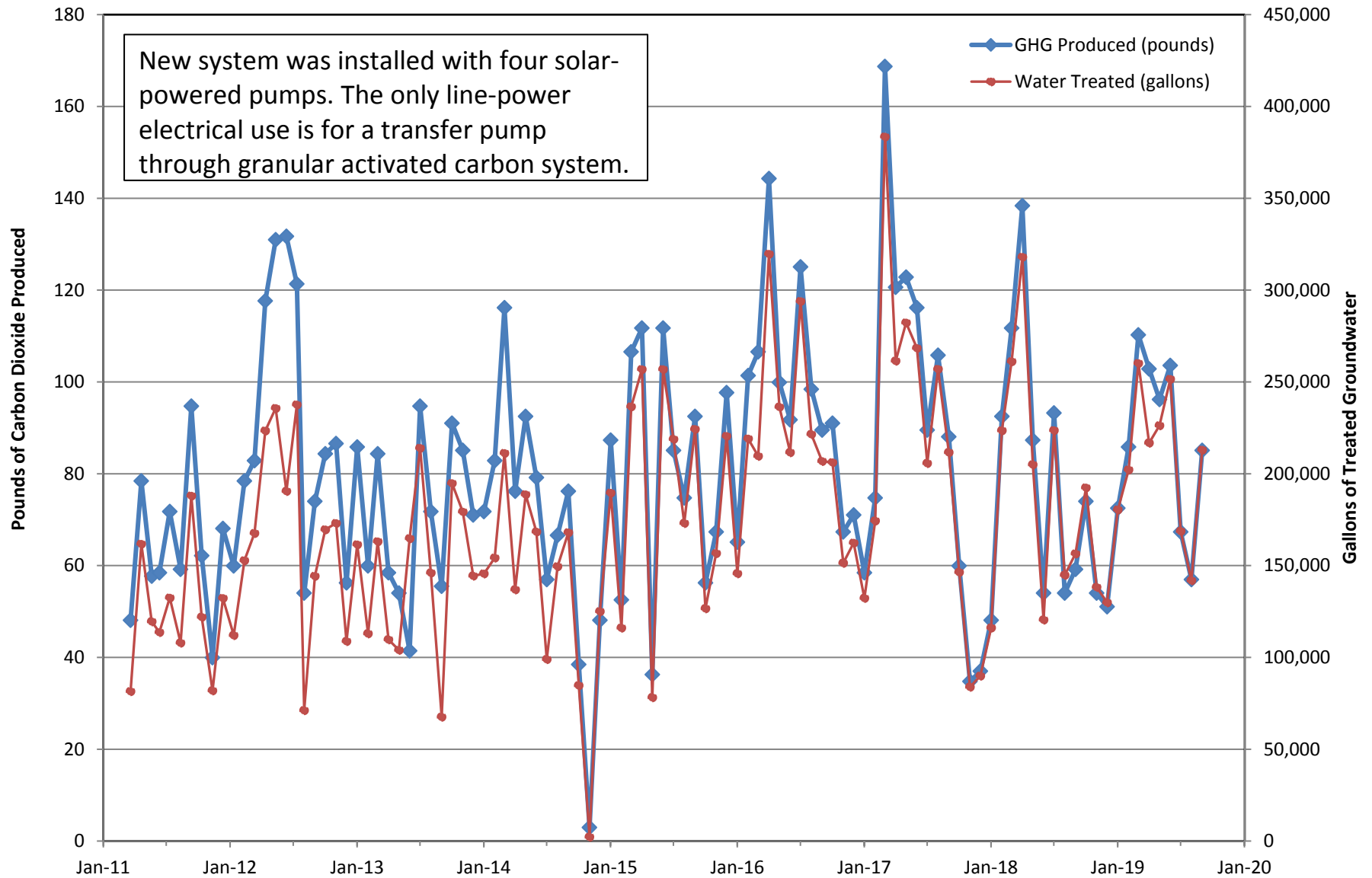
ND = not detected above method detection limit.

**Figure 1**  
**ST018GWTP Total VOC and MTBE Concentrations**  
**and Average Flowrate Twelve Month History**



**Figure 2**

**Equivalent Pounds of Carbon Dioxide Produced by the Site ST018 Groundwater Treatment Plant**



# Site SS015

## Optimized EVO Delivery via Solar-Powered Organic Carbon Injection System

# Typical EVO Injection

- We pump potable water through Dosatron metering system to inject EVO into wells
- It is labor intensive to “babysit” system (takes months to complete), especially if at a low permeability site



# Solar-Powered Organic Carbon – Injection System (SPOC-IS)

Solar-powered peristaltic pump with automated control via float switch system



## Approach:

- EVO drums are loaded with emulsified vegetable oil, mulch, pH buffering amendments, and iron
- Amendment “dosing” happens at low-flow with peristaltic pump by dissolving organic carbon in drums, which keeps viscosity low, instead of directly mixing EVO with Dosatron metering pumps
- More sustainable and more efficient to use extracted groundwater instead of using potable water, and eliminates waste of EVO totes
- Portable between injection wells, scalable, and automated once set up, which will reduce labor burden of typical injections
- Reduces “daylighting” in low-permeability soils

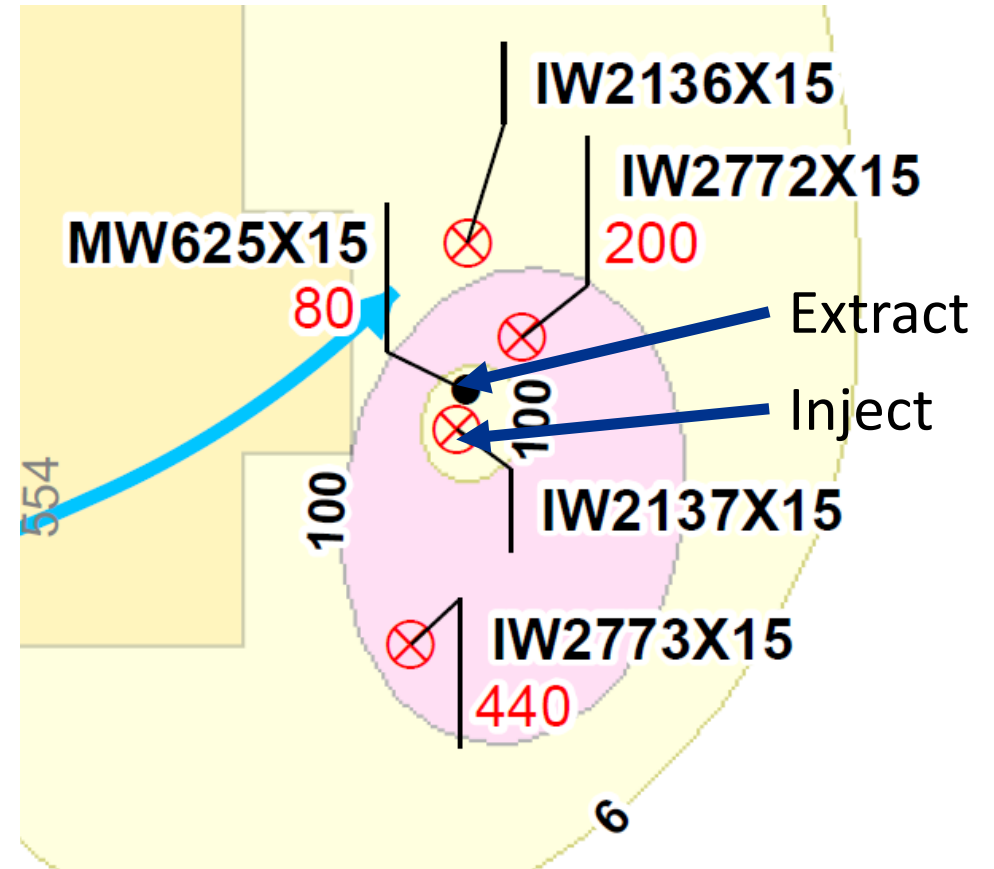
The “logical” way to complete injections to support an aquifer microbial system that can “live long and prosper” ...





# Schedule for New EVO Delivery Approach

- Conduct at one injection well initially
  - IW2137x15 and MW625x15 are closest well pairs, which will speed the performance monitoring period
- Two months of startup, followed by ~80 days at ~100 mL/min to achieve typical 3,000 gallon injection volume
- Present results in GRISR, and if successful, evaluate expansion of new EVO delivery approach to additional injection wells



RPM Meeting  
October 16, 2019

# Site LF008 Remedial Action Completion Report

# Objectives

To provide the results of groundwater monitoring.

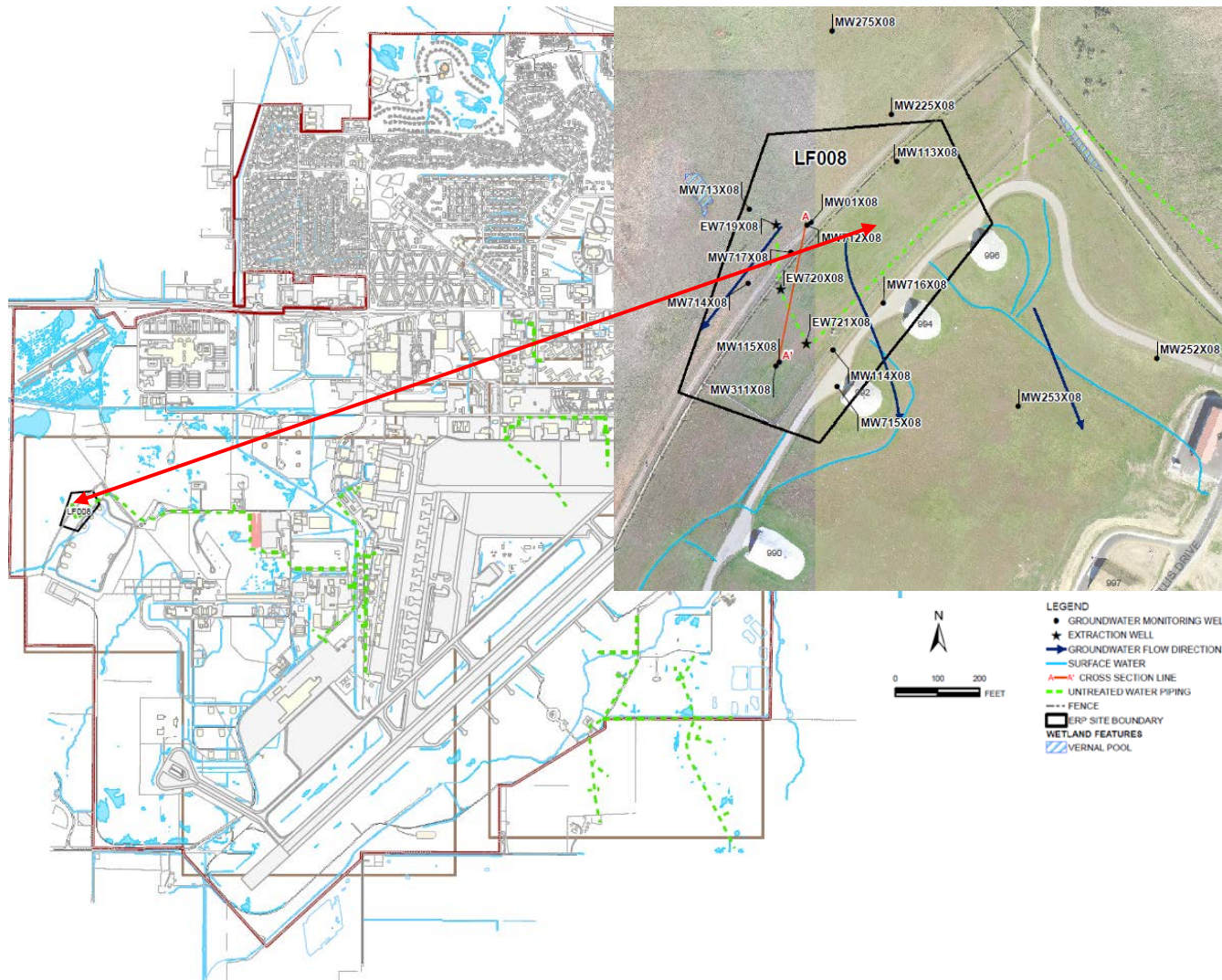
To demonstrate that the RAOs specified in the Groundwater ROD have been attained.

To document response complete status for Site LF008.

# Response Complete

- Response complete (RC) is the term DoD uses to signify achieving these milestones:
  - Initial achievement of the Remedial Action Objectives (RAOs) for a site
  - Documentation of this status in a Remedial Action Completion Report (RACR)
  - Seeking regulatory agreement with initial RAO achievement and the RACR
- After RC, the site may move to Long-term-monitoring (LTM) prior to achieving Site Closeout (SC)
  - Activities in the LTM phase may include monitoring site conditions, implementing and managing land use controls (LUCs), and performing 5-Year Reviews

# Site LF008 Background

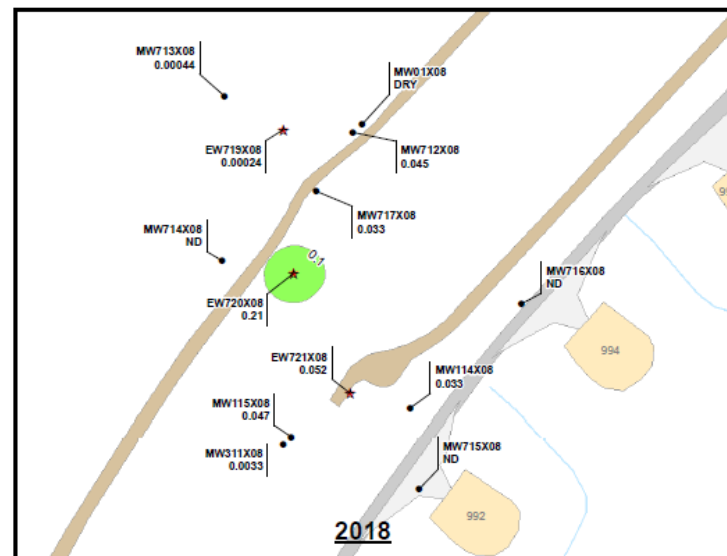
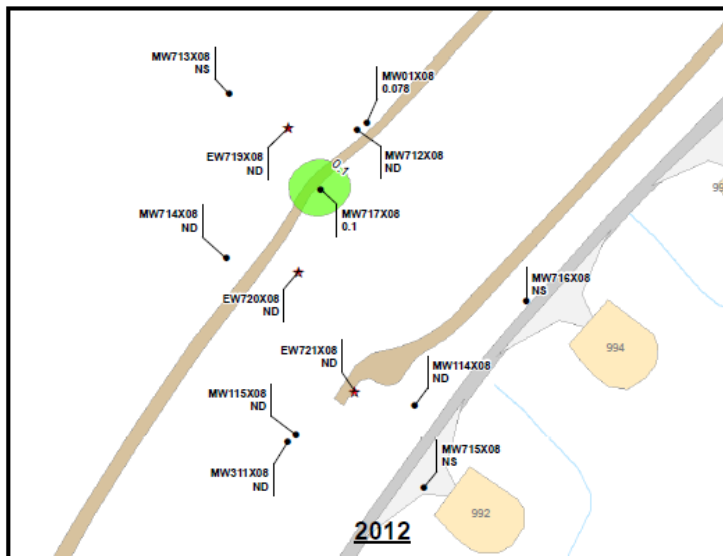
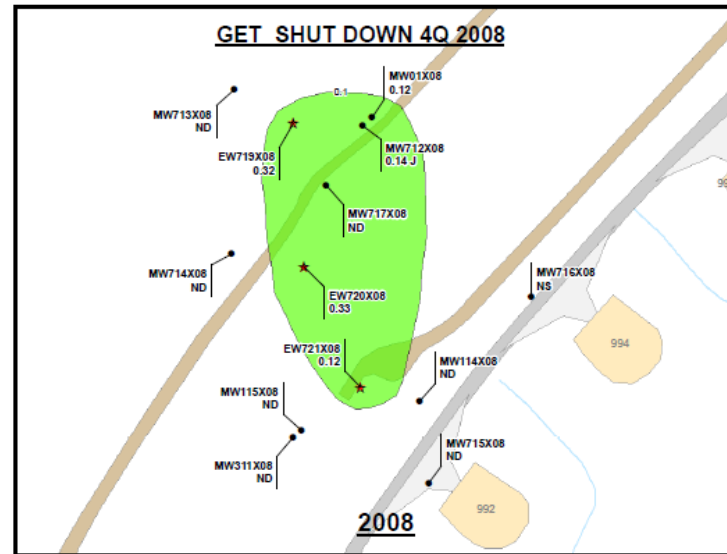
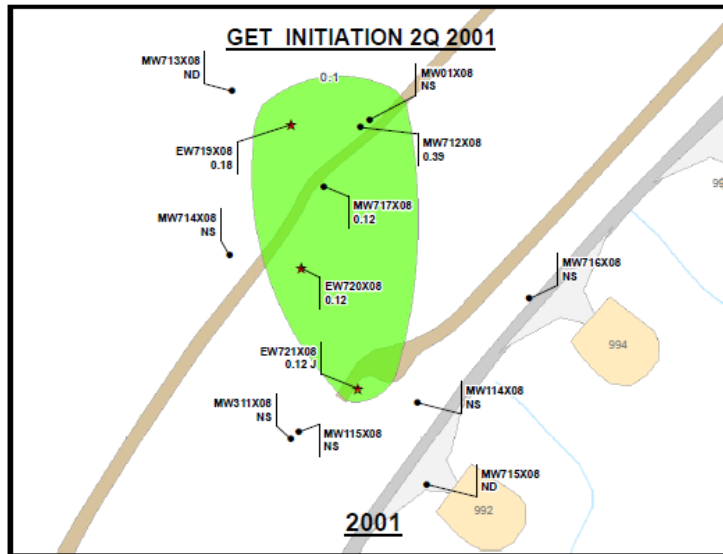


- Located in the western portion of the base
- Inactive historical landfill, also known as Landfill 3
- The source of historical soil and groundwater contamination was unlined trenches used for the disposal of pesticide containers in the early 1970s
- The source was excavated

# Groundwater Contamination Overview

- Aldrin, alpha-chlordane, heptachlor, and heptachlor epoxide were identified as the groundwater COCs in the Groundwater ROD.
- These pesticides have a high affinity to bind to soil and low water solubility (CA Dept of Pesticide Regulation does not consider them potential groundwater contaminants due to their physical properties)
- Prior to the Groundwater ROD, GET was selected as an interim groundwater remedy.
  - During GET operation (2001 to 2008), COC concentrations remained unchanged.
  - The system was shutdown in 2008 for rebound, but no rebound was observed.
  - In response to GET cessation, the pesticide plume decreased.
    - Unexpected because of extremely high affinity of the COCs to bind with soil; no short-term change in plume extent was expected

# Alpha-chlordane concentrations during and after GET operations.



# Groundwater Contamination Overview, cont'd

- In 2012 filter studies demonstrated that pesticide contamination was colloidal in nature. Samples were collected in 2Q12 and 4Q12; pesticides were detected only in non-filtered samples
- Based on 25 years of groundwater monitoring, residual pesticides have been demonstrated to be immobile.
- Long-term monitoring also demonstrated that COCs are not consistently detected.



# Mann-Kendall Trend Analysis

Statistically Significant Mann-Kendall Trend Analysis Results for Site LF008 COCs  
*Site LF008 Remedial Action Completion Report, Travis Air Force Base, California*

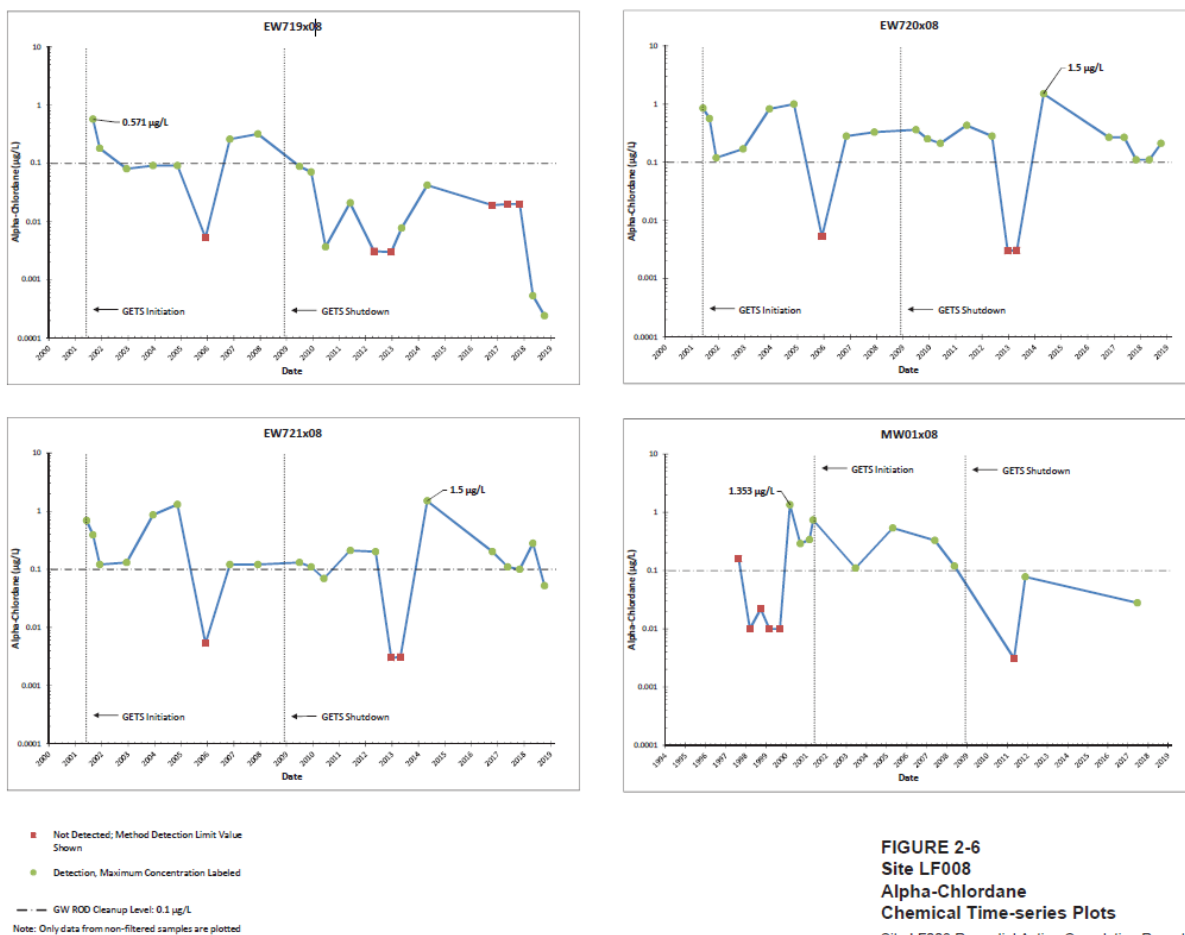
Location	Analyte	Count	S-Statistic	p-Value	Trend
<b>Site: Site LF008</b>					
EW719X08	alpha-Chlordane	21	-111	0.0004	DECREASING
MW712X08	alpha-Chlordane	28	-167	0.0005	DECREASING
MW717X08	alpha-Chlordane	32	-119	0.0268	DECREASING

## **Wells with no significant trends:**

### **Site: Site LF008**

EW720X08	MW252X08
EW721X08	MW253X08
MW01X08	MW275X08
MW113X08	MW311X08
MW114X08	MW713X08
MW114X08	MW714X08
MW115X08	MW715X08
MW225X08	MW716X08

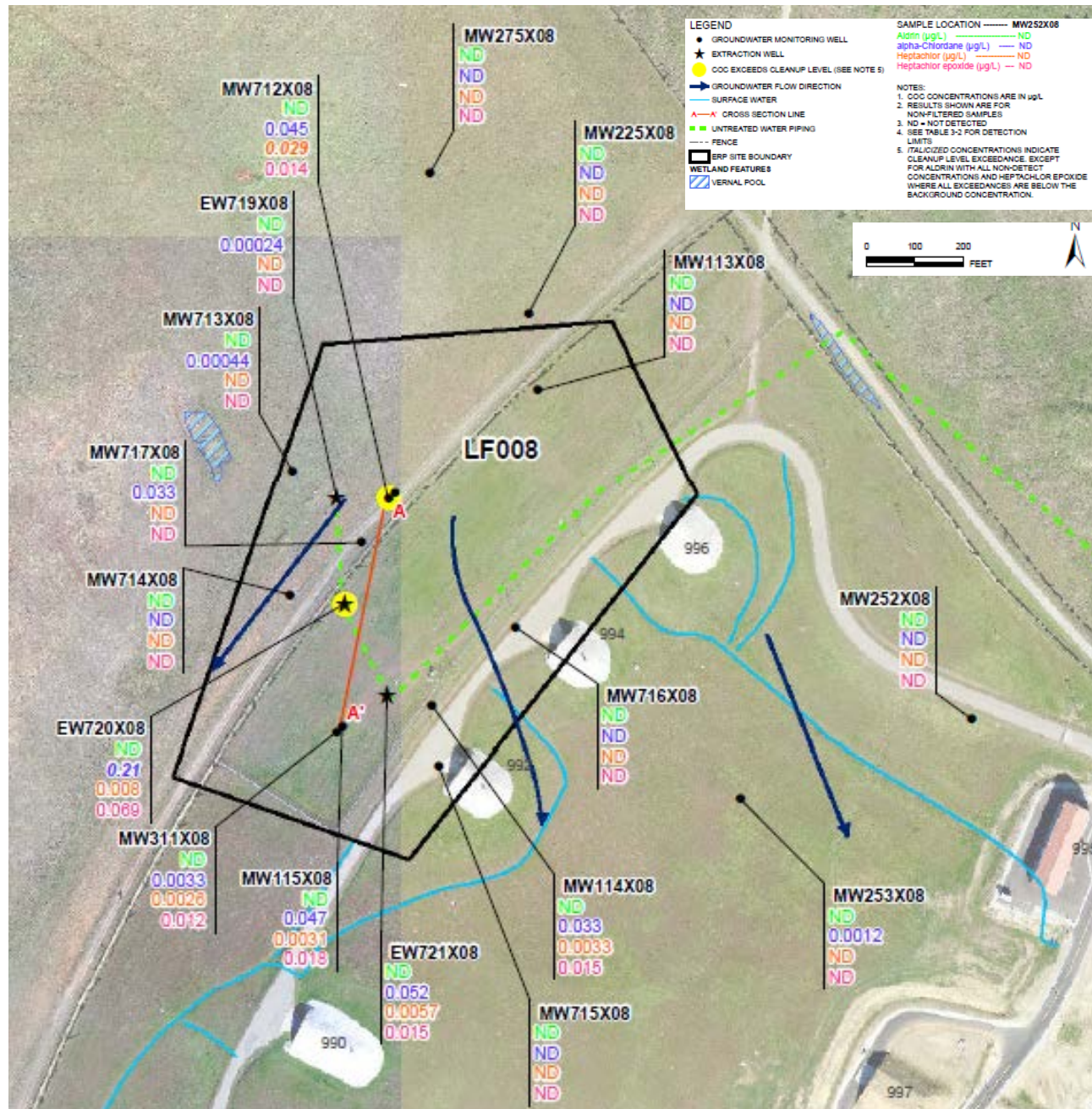
# Alpha-Chlordane Data Variability



**FIGURE 2-6**  
**Site LF008**  
**Alpha-Chlordane**  
**Chemical Time-series Plots**  
 Site LF008 Remedial Action Completion Report  
 Travis Air Force Base, California  
 Page 1 of 5

# Background Calculations

- Pesticide usage was widespread on and around Travis AFB
- Pesticides have been detected in background wells not directly impacted by Site LF008 activities.
- An evaluation of pesticide background concentrations was performed to support the RACR.
- Of the four (4) COCs at Site LF008, background concentrations were estimated for aldrin (0.014 µg/L) and heptachlor epoxide (1.84 µg/L) only.
- Alpha-chlordane and heptachlor were not detected in the background groundwater monitoring wells.



## 4Q18 Unfiltered Groundwater Sampling Results

- Aldrin: non-detect
- Alpha-chlordane: detected above the cleanup level in 1 unfiltered sample (EW720x08)
- Heptachlor: detected above cleanup levels in 1 unfiltered sample (MW712x08)
- Heptachlor epoxide: detected below its background concentration

# Groundwater Exposure Risk

- Of the 4 COCs, no unacceptable risks were observed for aldrin and heptachlor epoxide. Aldrin was not detected in any sample. All heptachlor epoxide concentrations detected were less than the background concentration.
- The exposure point concentrations (EPC) for alpha-chlordane and heptachlor were calculated using ProUCL 5.1 and the results from the 4Q18 unfiltered samples.
- The EPC for alpha-chlordane and heptachlor were less than the cleanup level.

## Risk Assessment Evaluation

*Site LF008 Response Complete Report, Travis AFB, CA*

Analyte	Exposure Point Concentration (ug/L)	Groundwater Cleanup Level	Basis
alpha-Chlordane <sup>a</sup>	0.0688	0.1	State MCL (chlordane)
Aldrin	-- <sup>b</sup>	0.00092	Risk-based (tap water)
Heptachlor	0.0070	0.01	State MCL
Heptachlor epoxide	-- <sup>c</sup>	0.01	State MCL

### Notes:

a: Chlordane RSL used as a surrogate for alpha-Chlordane. Chlordane (technical) is a mixture of alpha-Chlordane, also called cis-Chlordane and other related components.

b: No exposure point concentration provided because aldrin was not detected in groundwater and maximum reporting limit is less than the background UTL.

c: No exposure point concentration provided because maximum detected concentration of heptachloride epoxide is less than the background concentrations UTL.

--: calculation or comparison not applicable due to lack of detects or maximum detected concentration is less than than background UTL.

UTL: upper tolerance limit

# RAO's Achieved and Response Complete

- **RAO 1:** Restrict human exposure (ingestion and direct dermal contact) and reduce concentrations of COCs in groundwater to restore designated beneficial uses. RAO 1 achieved because:
  1. EPCs for alpha-chlordane and heptachlor do not exceed the cleanup levels.
  2. Detections of heptachlor epoxide are below background concentrations, and aldrin was not detected at the site.
  3. Given that COCs are only sporadically detected, and that no human health risk is associated with the site, groundwater is considered to be restored. However, because of poor water quality and low aquifer yield, the groundwater underlying Travis AFB is not used as a water source.

# RAO's Achieved and Response Complete

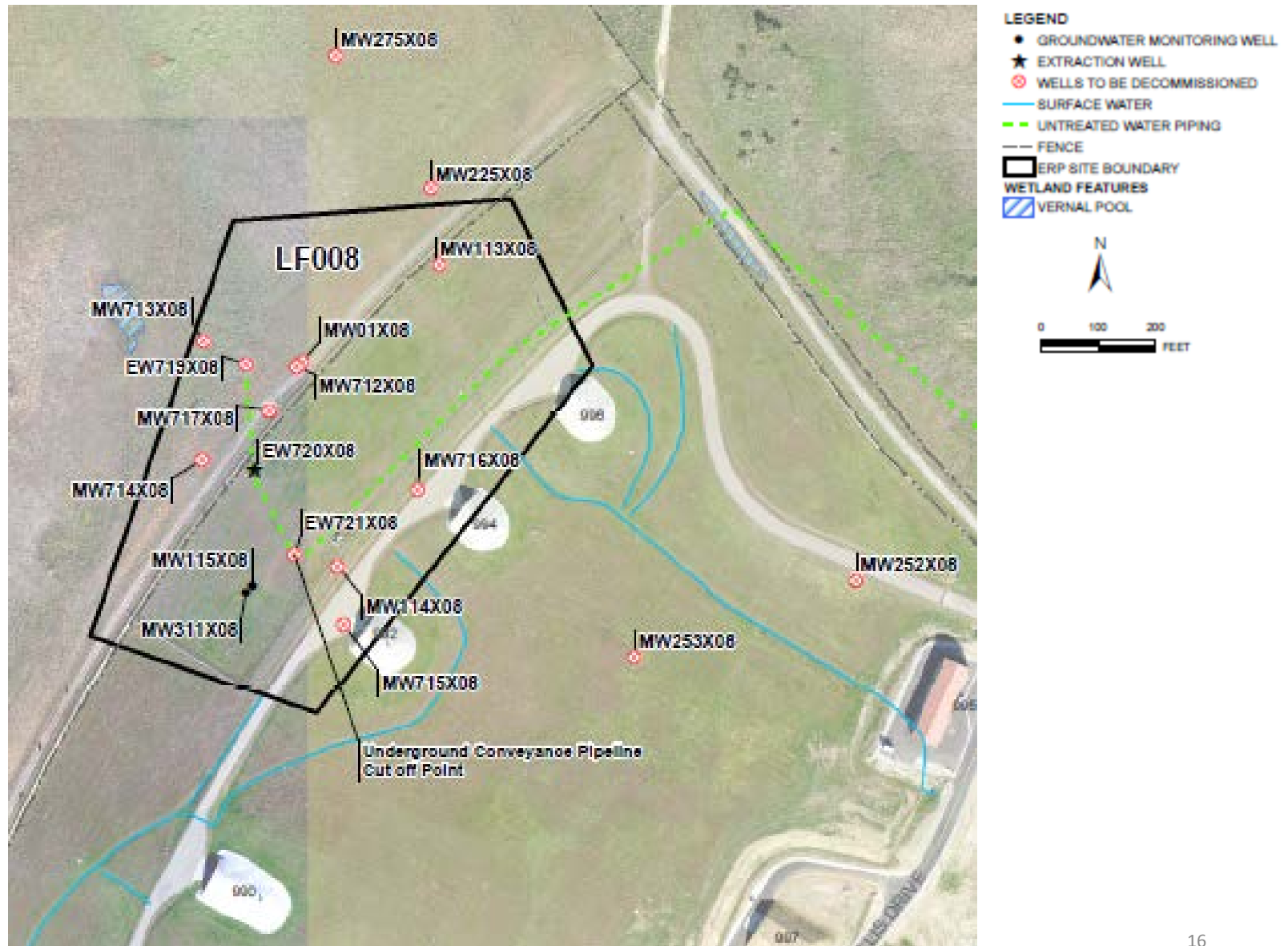
- **RAO 2:** Prevent or minimize further migration of the contaminant plume exceeding cleanup levels.
  - ***RAO 2 Achieved:*** Residual COCs are not migrating because of the colloidal nature of the pesticide contamination, high affinity for soil adsorption, and low aquifer permeability.

# LTM Phase

- Although RAOs have been achieved and residual colloidal contamination does not pose a risk under natural conditions, stressing the aquifer (groundwater extraction) may increase presence of colloids in extracted groundwater
- Groundwater LUCs established in the GW ROD will be maintained to prevent groundwater extraction
- Annual LUC monitoring will continue
- Site LF008 will continue to be included in the 5-Year Reviews
- Three (3) wells will be retained to provide hydraulic data for this area of the base
- The remaining infrastructure (wells and pipelines) will be decommissioned



# Well and Conveyance Pipeline Decommissioning





Questions?



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*Integrity - Service - Excellence*



*Fourth Five-Year Review  
Report Status:*

*Travis Air Force Base*

Lonnie Duke  
October 16, 2019

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# Current Travis AFB FYR Status

- Red Line Revised Draft Version Issued 21 May 2019
- Deferred Protective Statement Issued by EPA on 20 September 2018
  - Need for Land Use Control Implementation Plan
  - Indoor Air Sample Collection/Analysis above GW Sites
  - Protectiveness of Vapor Barriers and Passive Vent Systems in Post-GW ROD New Office Buildings
- FYR Evaluation and Reporting by Tetra Tech
  - Currently Under Second Period of Performance Extension that ends on 30 November 2019
  - Insufficient Funds Available to Extend FYR Contract Further
- HILL/Jacobs PBC Expires in 2021, leaving ~19 Months to Complete Cleanup Actions/POCO RI/O&M/etc.



# Proposed Path Forward to Finalize FYR Report

- Initiate Sample Collection/Analysis at Buildings Overlying Plumes Under Current PBC
  - SS015/Building 554 (Vapor Barrier and Passive Vent System)
  - SS016/Building 38 (Passive Vent System)
  - SD037/Building 837 (Passive Vent System)
  - Report Results and Evaluate Future Actions
- AFCEC is Soliciting Regulatory Input to All Upcoming Optimized Remediation Contracts (ORCs)
  - ORC Scoping Meeting to be Scheduled in 2Q20-3Q20
  - Meeting Feedback to be used to develop Statement of Objectives, a key component of ORC Request for Proposal, and Allow Bidding Contractors to Present Their Best Technical and Cost Effective Restoration Solutions
- Proposed Text Changes Address Initial Field Activities



# Travis AFB Restoration Program

## Program Update

*RPM Meeting*  
*October 16, 2019*

# Completed Documents (1)

- Vapor Intrusion Assessment Update Technical Memorandum
- 2012 CAMU Annual Report
- Old Skeet Range Action Memorandum
- 3<sup>rd</sup> Five-Year Review
- 2012 Annual Groundwater Remediation Implementation Status Report (GRISR)
- Subarea LF007C and Site SS030 Remedial Process Optimization Work Plan
- Pre-Design Site Characterization of SS029 Report
- Old Skeet Range Removal Action Work Plan
- 2013 CAMU Inspection Annual Report
- Groundwater Record of Decision (ROD)
- CG508 POCO Work Plan
- 2013 Annual GRISR
- FT004 Technology Demonstration Work Plan
- Kinder Morgan LF044 Land Use Control Report
- SD031 Technology Demonstration Work Plan
- TA500 Data Gap Investigation Work Plan
- ST018 POCO Work Plan Addendum
- SD037 GW RD/RA Work Plan
- Travis AFB UFP-QAPP
- DP039 Lead Excavation Technical Memo

# Completed Documents (2)

- Proposed Plan for ROD Amendment to WABOU Soil ROD
- Proposed Plan for ROD Amendment to NEWIOU Soil, Sediment, & Surface Water ROD
- SD034 Data Gap Investigation Work Plan
- POCO Investigation Work Plan for Oil-Water Separators
- ST032 POCO Soil Excavation Work Plan
- SD036 GW RD/RA Work Plan
- SS016 GW RD/RA Work Plan
- SS015 GW RD/RA Work Plan
- FT005 Technology Demonstration Work Plan
- 2014 Annual CAMU Monitoring Report
- Old Skeet Range PAH Delineation Report
- ST028 POCO Work Plan
- SS014 POCO TD Work Plan
- CG508 Site Investigation/Site Closure Request Report
- 2014 Annual CAMU Monitoring Report
- DP039 GW RD/RA Work Plan
- SD031 TDCCR
- ST018 POCO CCR
- Site SS030 Groundwater RA CCR
- Sites SD036 and SD037 Groundwater RACCR
- Site SS016 Groundwater RACCR
- Site SS015 Groundwater RACCR
- 2014 Annual GRISR
- Site CG508 Well Decommissioning Work Plan



# Completed Documents (3)

- Data Gap Investigation TM for Soil Sites SD033, SD043, & SS046
- Site FT004 Technology Demonstration Construction Completion Report
- Site SD031 Soil Remedial Investigation Work Plan
- Corrective Action Plan for DERA-Funded Oil Water Separators
- Site ST032 POCO Completion Report
- Site ST028 POCO Completion Report
- 2015 Annual CAMU Monitoring Report
- Site SD031 Remedial Investigation Work Plan
- Site SD034 Technology Demonstration Work Plan
- Site SS016 Soil Data Gaps Investigation Work Plan
- Multi-Site Bioaugmentation Technology Demonstration Work Plan
- Sites ST028 and ST032 POCO Well Decommissioning Work Plan
- Site TS060 Action Memorandum
- 2015 Annual GRISR
- FT005 Technology Demonstration Construction Completion Report
- Site CG508 POCO Well Decommissioning and Site Closeout Technical Memorandum
- Site DP039 Remedial Action Construction Completion Report
- ST028 POCO Well Decommissioning/Site Closeout Technical Memorandum
- Site TS060 Removal Action Work Plan

# Completed Documents (4)

- Multisite Technology Demonstration Construction Completion Report
- SS014 POCO Technology Demonstration Construction Completion Report
- Site LF044 Investigation Work Plan
- Site FT004 POCO Soil Data Gap Investigation Work Plan
- SD034 Technology Demonstration Construction Completion Report
- POCO Evaluation/Closeout Report for DERA-funded oil/water separators OW051, OW053, and OW054
- ST032 POCO Well Decommissioning and Site Closeout Technical Memorandum
- 2016 Annual CAMU Monitoring Report
- Work Plan for Fourth Five-year Review
- 2016 Annual GRISR
- Data Gap Investigation Results, Technical Memorandum for Soil, Sites SD033, SD043, SS046
- TS060 Removal Action Completion Report
- SS035 Site Closure Report
- AOC TA500 Data Gaps Investigation and Closure Report
- Site TS060 No Further Action Proposed Plan
- POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW040, OW047, OW048, OW049, OW050, OW052, OW055, OW056, and OW057

# Completed Documents (5)

- Data Gap Investigation Results, Technical Memorandum for Soil Site SS016
- LF006, SS030, SD031 Aquifer Test Activities Technical Memorandum
- SS015 Soil Sampling Plan
- Monitoring Well Installation Tech Memo for Site DP039, Addendum to the RACCR
- FT005 Extraction System Optimization Tech Memo
- 2017 Annual CAMU Monitoring Report
- LF044 Sediment Sampling Report
- SD043 RD/RA Work Plan
- SS046 RD/RA Work Plan
- Amendment to the WABOU Soil ROD for sites DP039, SD043, and SS046
- EVO Sites FT004, SS015, SD031, & SD036 Optimization Injections Tech Memo
- LF006 Technology Demonstration Work Plan
- AOC TA500 Well Decommissioning and Site Closeout Tech Memo
- SS015 Soil Sampling Results Tech Memo
- LF006 Technology Demonstration Construction Completion Report
- Subarea LF007C TPH Chromatogram Review TM
- 2017 Annual GRISR
- SS014 POCO Subsites 2, 4, and 5 Closure Evaluation Report
- Addendum to the Site SS016 Groundwater RD/RA Work Plan

# Completed Documents (6)

- SD043 Remedial Action Completion Report
- NFA ROD for Old Skeet Range (TS060/TS060A MRA)
- 2018 Annual GRISR
- ***SS046 Remedial Action Completion Report and Well Decommissioning Work Plan***
- ***2018 LF007 CAMU Inspection, Monitoring, and Maintenance Report***

# Completed Field Work (1)

- Replace battery banks at ST018 Groundwater Treatment Plant
- Annual Groundwater Remediation Implementation Program (GRIP) Sampling event
- Well Decommissioning (9 Wells)
- Electrical repairs to FT005 extraction system (well EW01x05)
- Electrical repairs to Site SS029 extraction system
- Site ST018 carbon vessels upgrade
- 2014 GRIP Semiannual Sampling Event
- Pump repairs to Site SS016 well (EW610x16)
- Subsite LF007C optimization upgrades
- 2014 Annual GRIP Sampling Event
- Biological Resource Assessment
- Site CG508 Site Investigation
- Old Skeet Range Characterization Sampling
- 4Q Semiannual GRIP Sampling Event
- SD031 Technology Demonstration Well Installation
- SD037 Well Installation
- SD031 Trench/Conveyance/Power Installation
- SD031 EVO Injection
- ST018 Well Installation
- SS015 Well Installation
- SS016 Well Installation
- Well Development (SD036, SD037)
- ST018 Trench/Conveyance/Power Installation
- SD036 EVO Injection
- Well Development (SS015, SS016)
- Baseline Sampling (SS015, SS016)
- SS014 Data Gap Investigation
- SS016 EVO Injection
- TA500 Data Gaps Investigation

# Completed Field Work (2)

- 2015 Annual GRIP Sampling
- SD037 EVO Injection
- SD034 Data Gaps Investigation
- SS015 EVO Injection
- FT005 Injection Well Installation
- OWS 47, 48, 49 Site Investigations
- SS030 Trench/Conveyance/Power Installation
- FT005 Trench Installation
- FT005 Well Development
- FT004 Well Installation, Well Development, Baseline Sampling
- FT005 Baseline Sampling
- DP039 Well Installation, Well Development, Baseline Sampling
- FT004 EVO Injection
- FT004 Trench/Conveyance/Power Installation
- DP039 Infiltration Trench Installation
- TA500 Groundwater Sampling
- FT005 EVO Injection
- 2016 Q2 GRIP Sampling
- Data Gap Inv. for Soil Sites (SD043, SS046)
- SD031 Remedial Investigation Step-out Sampling (2<sup>nd</sup> round)
- DP039 EVO Injection
- CG508 Well Decommissioning
- SD033 Soil Sampling
- Multi-site Bioaugmentation Well Installation
- SD034 Technology Demonstration Well Installation
- SS014 Bioreactor Installation
- ST028 & ST032 Well Decommissioning

# Completed Field Work (3)

- SS016 Soil Data Gaps Investigation
- SD031 Remedial Investigation Soil Sampling (3<sup>rd</sup> round)
- Oil Water Separators Step-out Drilling
- OW055 Close-in-place
- Q4 2016 GRIP Sampling
- OW040 Soil Excavation/Surface Restoration
- OW057 Soil Excavation/Surface Restoration
- Multi-site Bioaugmentation & EVO Injection
- SD034 Technology Demonstration Bioreactor Installation
- OW050 Soil Sampling at Former Location of OWS
- OW055 Sidewalk Repairs
- SD031 Finish Soil Delineation (NE portion of site)
- Q2 2017 GRIP Sampling Event
- SS015 Optimization: Injection Well Installation
- DP039 Down-gradient Monitoring Well Installation (1<sup>st</sup> round)
- SD036 Optimization: Injection Well Installation
- SD031 Optimization: Injection Well Installation
- OW056 Site Excavation/Closure
- Well Re-development
- TS060 Removal Action

# Completed Field Work (4)

- FT004 POCO Soil Data Gaps Investigation
- LF044 Sediment Sampling
- FT004 EVO Optimization
- DP039 Install downgradient monitoring wells (2<sup>nd</sup> round)
- FT005 – Install Extraction Wells
- DP039 Repair SBGR distribution headers
- Q4 2017 GRIP Sampling
- SD036 EVO Optimization
- SS015 EVO Optimization
- SD031 EVO Optimization
- FT005 Installation of Pumps and Controls in 5 New Extraction Wells
- Q1 2018 GRIP Sampling
- SD037 EVO reinjection
- Q2 2018 GRIP Sampling
- SS015 Soil sampling
- TA500 Well Decommissioning
- FT005 EVO injection
- FT004 POCO Soil Investigation
- 3Q 2018 GRIP Sampling
- LF006 Well Installations and Injections
- 4Q 2018 GRIP Sampling
- SD043 Soil excavation
- 1Q 2019 GRIP Sampling
- 2019 Annual LUC Inspections
- SS046 Soil excavation
- 2Q 2019 GRIP Sampling Event
- Well Re-development (11 wells)
- SD037 Injection Well Installation
- SS046 Well Decommissioning



# Completed Field Work (5)

- 3<sup>rd</sup> Quarter 2019 GRIP Sampling
- SD034 O<sub>2</sub> Enhancement
- ***SS016 SBGR Repairs***

# Documents In-Progress

## CERCLA

- Amendment to the NEWIOU Soil ROD for Sites SS016 and SD033
- Community Relations Plan Update (revised draft)
- 4<sup>th</sup> Five Year Review Report for Multiple Groundwater, Soil, and Sediment Sites
- SS016 RD/RA Work Plan
- SD043 Site Closure Report
- SD031 Soil RI/FS
- ***LF008 Remedial Action Completion Report***
- ***SS046 Well Decommissioning and Site Closeout Tech Memo***

# Documents In-Progress

POCO

- None

# Field Work In-Progress

## CERCLA

- ***SD037 EVO Re-injection***
- ***4<sup>th</sup> Quarter 2019 GRIP Sampling***

## POCO

- None

# Documents Planned

## CERCLA

- None

## POCO

- ***Recently Identified POCO Investigation  
Near Closed Site OW050 Work Plan***

***Dec***

# Field Work Planned

## CERCLA

- SD043 Well and GETS Decommissioning Nov
- SS016 Soil excavation (waiting on ROD amendment) Dec

## POCO

- ***POCO Investigation Near Closed Site OW050*** ***TBD***

Note: Contact Lonnie Duke if you  
would like to observe planned field  
work events

# Petroleum Technology Demonstration Projects (1)

- SS014: Recycled Drywall Subgrade Biogeochemical Reactor (SBGR)
  - Evaluate the effectiveness of sulfate (gypsum from crushed drywall) to enhance anaerobic biodegradation of petroleum in groundwater
  - Installation was completed November 2016
  - Results through ~2.5 years
    - TPH-G: 99% reduction in source area (1,900 to <25 mg/L [non-detect])
    - TPH-D: 99% reduction in source area (5,500 to 76 mg/L)
    - Benzene: 99% reduction in source area (90 to <0.4 mg/L [non-detect])
    - Plume as a whole continues to shrink, so this TD has been quite successful

SBGR = Subgrade Biogeochemical Reactor

**Updates in Green Font**

# Petroleum Technology Demonstration Projects (2)

- SD034: Aerobic “Washboard” Subgrade Biogeochemical Reactor (SBGR)
  - Installed six (6) SBGR trenches in November 2016 to evaluate the effectiveness of an oxygen-enhanced aerobic SBGR on reducing TPH as diesel (TPH-D) in groundwater
  - Below SBGR trench (MW811x34/PZSSAx34) through first 2 years
    - TPH-D baseline 9,600 ug/L was reduced to 40 J ug/L after 15 months, with increase to 890 ug/L at 20 months, then decreased to 100 ug/L at 2 years (decreased to 90 ug/L at 2.5 years). Concentration fluctuations are to be expected as higher concentration areas are flushed as part of the washboard effect. We are evaluating enhancements to the SBGR trenches to maintain treatment efficiency.)
    - TPH-MO baseline 2,300 ug/L was reduced to 89 J ug/L after 15 months, with increase to 760 ug/L at 20 months, then decreased to non-detect at 2 years (remained non-detect at 2.5 years)
  - Plume hot spot monitoring well (MW02x34) through first 2 years
    - TPH-D baseline 8,300 ug/L was reduced to 6,800 ug/L after 15 months, with increase to 13,000 ug/L at 20 months, then decreased to 6,700 ug/L at 2 years and further decreased to 5,500 ug/L at 2.5 years (Concentration fluctuations are to be expected as higher concentration areas are flushed as part of the washboard effect. We are evaluating enhancements to the extraction network to help reductions in this area.)
    - TPH-MO baseline 1,500 ug/L was reduced to 660 J ug/L after 15 months, with non-detect at elevated detection limit at 20 months, then 1,100 ug/L at 2 years and remained 1,100 J ug/L at 2.5 years (Was 72% reduction after 9 months, seeing some fluctuations)
- Aerobic treatment process for this TD has been successful, but additional enhancements are warranted to maintain treatment efficiency (optimization activities are in progress)



# CVOC Technology Demonstration Projects (3)

- **Multisite Bioaugmentation: EVO and KB-1 Plus (No new information)**
  - Evaluate if addition of bioaugmentation substrate to an EVO injection will increase the rate of CVOC degradation
  - Initial injections were completed (Nov 2016)
  - Limited TOC dispersal at SD036, so installed additional injection wells and reinjected with nanoEVO in 2017
  - Too early to evaluate degradation rates; however:
    - ~50-70% TCE reductions at ST027B, but still too early to evaluate if bioaugmentation was beneficial
    - TCE fluctuations at SD036 bioaugmentation area and 99% decrease in the EVO-only area, reinjections and additional injection wells have supported significant reductions to the east of the site (in MW2064Ax36, TCE reduced from 6,400 to 11 ug/L), northeast (in MW2063x36, TCE reduced from 1,000 to 1.8 J ug/L), and to the north (in MW2187x36, TCE reduced from 1,400 to 84 ug/L). Still too early to evaluate if bioaugmentation was beneficial
- **FT005: Distribution of EVO and KB-1 Plus**
  - Evaluate total organic carbon (TOC) dispersion distances and rates for optimizing the remediation of 1,2-dichloroethane (DCA) in groundwater. TD installation completed May 2016. Optimized the GETs in 2017
    - FT005 north area: Slightly elevated TOC and reduced COC concentrations (below MCLs);
    - FT005 central area: Limited TOC increase observed to date in most areas, as injected EVO may be adsorbed to sediments or being consumed faster than spread can be observed. However, MW2292x05 (south of Base boundary) had TOC increase from 1.2 to 20 mg/L between May and October 2018, likely the result of the newly installed extraction wells and the 2018 reinjection in this area.
    - FT005 south area: No TOC increase observed in this control area: Newly installed extraction wells are effectively capturing the remaining 1,2-DCA hot spots, with concentrations now beginning to decrease in these areas
    - New extraction wells are decreasing 1,2-DCA (e.g., 3.6 to 0.91 J; 1.4 to 0.54 J; 5.9 to 3.3; 3.0 to 1.9 ug/L)
    - We don't think distribution of TOC through the aquifer via extraction will be viable, although it is still expected to have had a benefit to remediation as a whole

# CVOC Technology Demonstration Projects (4)

- FT004: Distribution of EVO via SBGR and/or Groundwater Extraction
  - Determine effectiveness of TOC distribution through two different enhanced reductive dechlorination (ERD) approaches: (1) groundwater TOC recirculation using a combination EVO injection, infiltration SBGR trenches, and groundwater extraction; and (2) EVO injection with groundwater extraction
  - Installation completed April 2016
  - COC concentrations declined through year 1
    - ~50% total molar reduction plume-wide through first year
    - Max baseline monitoring well TCE concentration reduced from 560 to 140 µg/L (now decreased to 63 ug/L)
  - Limited TOC dispersal, additional EVO injection conducted with nanoEVO in 2017 to determine if this can enhance TOC dispersal (too early to evaluate results of reinjection)
    - Slight TOC increase (3.5 to 5.4 mg/L) and TCE decrease (previous max well rebounded from 140 to 330 ug/L, and then decreased to 63 ug/L following reinjection)
    - Variable TOC increase and TCE decrease in main plume area monitoring wells
    - In some extraction wells, TCE concentrations are increasing. This indicates additional TCE mass below the vernal pools that is now being pulled to the extraction wells (recirculation is working, but we are fighting additional TCE mass below the vernal pools, so it will take additional time to see concentration reductions)
    - MW2330x04 maxed out at 640 ug/L in April 2018 and now 49 ug/L in May 2019

**Updates in Green Font**

# CVOC Technology Demonstration Projects (5)

- SD031: EVO distribution via Gravel Chimneys (No new information)
  - Determine if EVO injection and recirculation of groundwater through gravel chimneys can effectively distribute TOC horizontally in the subsurface to support ERD of 1,1-dichloroethene (DCE)
  - Installation completed in April 2015
  - Early indications:
    - Recirculation through chimneys has been successful relative to our design assumptions, TOC increased to >10 mg/L within majority of target area and COCs decreased to below MCLs (most wells ND, max 1,1-DCE reduced from 390 ug/L to ND)
    - 1,1-DCE (primary COC) concentrations have reduced by 99% (was 93%) (sum of key wells within TD area, excluding 2 wells to SW that increased)
    - Total molar concentration (sum of CVOCs) has reduced by 99% (was 84%) (sum of key wells within TD area, excluding 2 wells to SW that increased)
    - Four (4) new EVO wells installed to SW to enhance TOC in problem areas (plume being pulled back towards extraction well causing increasing concentrations in this cross-gradient area), conducted reinjection of EVO in 2017
      - 1,1-DCE in SW area where we reinjected: MW568x31 decreased from max of 48 ug/L to ND, MW572x31 decreased from max of 200 to 13 ug/L, and MW574x31 decreased from max of 33 to 8.9 ug/L

**Updates in Green Font**

# Completed Documents (Historical1)

- Basewide Health & Safety Plan (HSP)
- Action Plan
- 2007/2008 GSAP Annual Report
- LF007C RPO Work Plan
- LF008 Rebound Study Work Plan
- SS014 Tier 1 POCO Evaluation Work Plan
- ST027B Site Characterization Work Plan
- SS030 RPO Work Plan
- ST032 POCO Technical Memo
- DP039 Bioreactor Work Plan
- 2008 Annual GWTP RPO Report
- Passive Diffusion Bag (PDB) Technical Memo
- RD/RA QAPP Update
- ST032 Tier 1 POCO Evaluation Work Plan
- Phytostabilization Demonstration Technical Memo
- Model QAPP
- LF008 Rebound Test Technical Memo
- Comprehensive Site Evaluation Phase II Work Plan
- Field Sampling Plan (FSP)
- SS016 RPO Work Plan
- ST018 POCO RA Work Plan
- Vapor Intrusion Assessment Report
- GSAP 2008/2009 Annual Report
- FT005 Data Gap Work Plan
- First, Second, & Third Site DP039 Sustainable Bioreactor Demonstration Progress Reports
- DP039 RPO Work Plan
- SD036/SD037 RPO Work Plan
- ST027B Site Characterization Report
- 2009 GWTP RPO Annual Report
- Natural Attenuation Assessment Report (NAAR)
- Union Creek Sites SD001 & SD033 Remedial Action Report
- CAMU 2008-2009 Monitoring Annual Report

# Completed Documents (Historical 2)

- Phytostabilization Study Report
- 2009/2010 Annual GSAP Report
- SS015 Remedy Optimization Field Implementation Plan
- Sites SS014 and ST032 Tier 1 POCO Evaluation Report
- SD036 Remedy Optimization Field Implementation Plan
- 2010 Annual CAMU Inspection Report
- Site ST018 POCO Baseline Implementation Report
- FT005 Data Gaps Investigation Report
- Comprehensive Site Evaluation Phase II Report
- 2010 Groundwater RPO Annual Report
- Focused Feasibility Study (FFS)
- Site ST027-Area B Human Health Risk Assessment
- Site ST027-Area B Ecological Risk Assessment
- Work Plan for Assessment of Aerobic Chlorinated Cometabolism Enzymes
- 2010/2011 Annual GSAP Report
- Baseline Implementation Report (Sites SS015, SS016, SD036, SD037, and DP039)
- 2011 CAMU Annual Report
- Technical and Economic Feasibility Analysis (TEFA)
- Work Plan for RPO of Sites SS016 and SS029
- Site LF007C Data Gaps Investigation Technical Memorandum
- Technical Memorandum for Assessment of Aerobic Chlorinated Cometabolism Enzymes
- Old Skeet Range Engineering Evaluation/Cost Analysis
- 2011 Groundwater Treatment RPO Annual Report
- Groundwater Proposed Plan (PP)
- FT005 Remedial Action Completion Report
- 2012 GSAP Technical Memorandum<sup>24</sup>

# Completed Field Work (Historical1)

- ST027B Gore Sorber Survey–Phase 1
- ST027B Field Sampling – Phase 2
- GSAP 2008 Semi-annual Event
- ST027B Installation of Wells – Phase 3
- SS014 Site Characterization
- LF008 Rebound Study
- GSAP Annual Sampling Event - 2009
- SS030 Site Characterization–Phase 1
- ST027 Site Characterization -Phase 3
- ST014 Monitor Well Install - Subsite 3
- SD001/SD033 Sediment RA
- SS016 Site Characterization (OSA source area)
- ST018 Site Characterization
- SS030 Site Characterization (Off-base VOC Plume)
- DP039 Site Characterization (for Biobarrier Placement)
- SS014 & ST032 Q1 2010 MNA Sampling (2<sup>nd</sup> of 4 quarterly events)
- SD036 Additional Site Characterization (north & east)
- Therm/Ox System Removal
- SS016 Monitoring Well Installation
- SD037 EVO Injection Well Installation
- DP039 Monitoring Well & Injection Well Installation
- DP039 EVO Injection
- SD037 Monitoring Well Installation
- GSAP 2010 Annual Sampling Event
- SD037 EVO Injection
- SS015 Site Characterization
- South Plant GAC Change-out
- FT005 Data Gap Investigation
- SS016 Position Survey of EW03
- SS016 Bioreactor Installation
- SS016 Bioreactor Baseline Sampling
- DP039 Biobarrier Quarterly Performance Sampling

# Completed Field Work (Historical 2)

- DP039 Bioreactor Quarterly Performance Sampling
- SD037 EVO Quarterly Performance Sampling
- SS015 EVO Baseline Sampling
- SD036 EVO Baseline Sampling
- SS016 Bioreactor Startup
- SD036 Injection Wells Installation
- SS015 Injection Wells Installation
- ST018 GETS Installation
- SD036 EVO Injection
- 2010 Semiannual GSAP
- SS015 EVO Injection
- Quarterly RPO Performance Monitoring (Feb 2011)
- ST018 GETS Startup
- Quarterly RPO Performance Monitoring (May 2011)
- 2011 Annual GSAP Sampling
- SS029 GET Shutdown Test (System Optimization analysis)
- Quarterly RPO Performance Monitoring (Aug 2011)
- Quarterly RPO Performance Monitoring (Nov 2011)
- 2011 Semiannual GSAP Sampling
- LF007C Site Characterization (Wetlands)
- FT005 Soil Remedial Action
- Performance Monitoring SS015 (4<sup>th</sup> Quarterly event)
- Sampling for Assessment of Aerobic Chlorinated Cometabolism Enzymes (Feb 21-22)
- 2012 Annual GSAP Sampling
- CAMU Lysimeter Removal
- LF007C GET System Optimization
- SS029/SS016 System Optimization Analysis
- GSAP Semiannual Sampling Event
- Replace electrical wiring for well field at Site SS030