Final

Travis Air Force Base
Environmental Restoration Program
Restoration Program Manager's
Meeting Minutes
18 September 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) teleconference on 18 September 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
Merrie Schilter-Lowe	Travis AFB/PA
Haekyung Kim (via telephone)	AFCEC/CZRW
Sarah Miller (via telephone)	USACE-Omaha
Paul Gedbaw (via telephone)	USACE-Omaha
Brian Boccellato (via telephone)	USACE-Omaha
Nadia Hollan Burke (via telephone)	EPA
Nikki Thomsen (via telephone)	TechLaw, Inc.
Mike Wray	CH2M/Jacobs
Leslie Royer	CH2M/Jacobs
Jeff Gamlin (via telephone)	CH2M/Jacobs
Jill Dunphy (via telephone)	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 (August 2019)
Attachment 4	CGWTP Monthly Data Sheet (August 2019)
Attachment 5	LF007C Monthly Data Sheet (August 2019)
Attachment 6	ST018 Monthly Data Sheet (August 2019)
Attachment 7	New EVO Delivery Method
Attachment 8	Program Update

1. ADMINISTRATIVE

A. Previous Meeting Minutes

EPA, DTSC and the Water Board had no changes to the August 2019 RPM Meeting Minutes.

B. Action Item Review

Action items from August 2019 were reviewed.

Action Item 1 is ongoing: Ms. O'Sullivan to provide updates on perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). September 2019 update: Ms. O'Sullivan informed the team that the Draft Quality Assurance Project Plan (QAPP) should be submitted to the regulators for review next week. Sampling will likely begin in December 2019. Mr. Duke noted that he has included this work in the joint execution plan (JEP) to request funding for DSMOA funding for 2020-2022. Mr. Duke submitted the JEP to the State for review.

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

September 2019 update: Mr. Duke said that the design for the building has been approved, and the work plan to relocate the monitoring well has been finalized and provided to the construction team. The construction contract should be awarded in December, and work is scheduled to begin in January 2020. The Air Force needs to remove the 100 cubic yards of soil prior to that, and we are still working on the Amendment to the NEWIOU Soil, Sediment and Surface Water Record of Decision that will allow the soil excavation. He asked for a prompt review of the redline strikeout version so that the Draft Final version could be submitted next week. Mr. Duke added that Mr. Sherman has sent a request to the EPA, DTSC, and Water Board legal counsel to review the recently crafted language.

Action Item 3: Air Force or Jacobs to send Outlook invitations to the regulators for future meetings. September 2019 Update: Mr. Wray has sent an Outlook invitation for the remainder of the 2019 meetings to the Water Board, DTSC, and EPA. This action item is now closed.

Action Item 4: Ms. O'Sullivan to request a base pass for Mr. Forrester. September 2019 Update: Ms. O'Sullivan will coordinate a base pass for Mr. Forrester ahead of his next in-person visit. This action item is now closed.

Action Item 5: Ms. Royer to look into ways to make the Groundwater Remediation Implementation Status Report (GRISR) a smaller, more easily reviewable document. September 2019 Update: Mr. Duke, Mr. Wray, and Ms. Royer agreed that upon review for this action item, the document has been streamlined as much as possible; however, agreed that moving the summary from the beginning to the end of the document sections to make it flow better. Ms. Royer added that the document authors will monitor for unnecessary repetition as they write forthcoming versions. This action item is now closed, but it will remain on the meeting summary in order to update the Water Board at the October meeting.

Action Item 6: Mr. Duke and Ms. O'Sullivan to include PFAS in the DSMOA funding. September 2019 Update: PFAS has now been added to DSMOA funding. This action item is now closed.

Action Item 7: The Water Board will issue an NFA letter for Site ST032 before the end of August. The NFA letter has been issued. This action item is now closed.

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 held on Wednesday, 16 October 2019, at 0930.

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, but not likely in 2019.

— Amendment to the NEWIOU Soil, Sediment, and Surface Water Record of Decision (ROD) for the Travis AFB ERP Sites SS016 and SD033: The Response to Comments date was changed to 16 September 2019; the Draft Final due date was changed to 30 September 2019, and the Final due date was changed to 30 October 2019. Mr. Duke asked everyone to keep pushing to get this finalized and signed. Because this supports the planned KC-46 hangar construction, we need to be in the field in November; therefore he considers this **the most critical document on the schedule**, and it has been **delayed for almost a year**.

— No Further Action (NFA) ROD for Old Skeet Range (TS060 and TS060A Munitions Response Sites): The Final due date was changed to 11 September 2019 to reflect actual signature date. The electronic version is ready and will be submitted once the paper copy is in the local administrative record,

— Site SS016 Remedial Design/Remedial Action Work Plan: The final due date was changed to 30 October 2019 so that the document can be revised in accordance with relevant changes in the final NEWIOU ROD Amendment. The revised draft-final will be submitted for regulatory review as a red line/strikeout version. 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): There was no change to the schedule. **This document is important and although not time-critical, must be completed during the current contract**.

— Fourth Five-Year Review Report for Multiple Groundwater, Soil, and Sediment Sites: No change was made to the schedule; the Responses to Comments, Draft Final, and Final due dates remain TBD. The Water Board has approved the Air Force responses to their comments. The Air Force is still working on responses to EPA and DTSC comments. **This document is very important but not critical**.

— Potrero Hills Annex (FS, PP, and ROD): No change was made to the schedule; Mr. Anderson noted that the Water Board is reviewing contractor responses to their comments on the Nurse Slough Property Supplemental Soil and Groundwater Investigation Work Plan.

— Quarterly Newsletter (October 2019): There was no change to the schedule. Mr. Anderson requested input from Ms. Burke for the Viewpoint article in this issue, regarding the EPA transition to electronic data storage and reduction in paper.

— 2018 Annual Groundwater Remediation Implementation Status Report (GRISR): The Responses to Comments and Final due dates were changed to 4 September 2019, to reflect actual completion date. The document will be submitted electronically; one hard copy will be produced for the Administrative Record. Mr. Anderson thanked everyone for the quick turnaround needed to get this document finalized by the end of the fiscal year.

— Site SS046 Remedial Action Completion Report and Well Decommissioning Work Plan: The Response to Comments and Final due dates were changed to 20 September 2019 to reflect actual submittal dates. Mr. Anderson thanked everyone for the quick turnaround.

— 2018 Annual Site LF007 Corrective Action Management Unit Inspection, Monitoring, and Maintenance Report: There was no change to the schedule; the Air Force may be able to finalize this document earlier than scheduled.

— Site LF008 Remedial Action Completion Report: The Draft to Agencies due date was changed to 7 October 2019 to allow additional review time to higher priority documents; the rest of the schedule was changed accordingly.

— Site SD043 Site Closure Report: The Agency Comment due date was changed to 7 October 2019 to allow additional review time for higher priority documents; the rest of the schedule was changed accordingly.

— Site SS046 Well Decommissioning and Site Closeout Tech Memo: The Predraft to Air Force/Service Center due dates were changed to 4 September 2019 and 18 September 2019. The rest of the schedule remained unchanged.

— MOVED TO HISTORY:

— Addendum to the Site SS016 Groundwater Remedial Design/Remedial Action (RD/RA) Work Plan (WP).

— Site SD043 Remedial Action Completion Report

— Site SS014 POCO Subsites 2, 4, and 5 Closure Evaluation Report

2. CURRENT PROJECTS

Treatment Plant Operation and Maintenance Update

South Base Boundary Groundwater Treatment Plant, August 2019 (see Attachment 3)

The South Base Boundary Groundwater Treatment Plant (SBBGWTP) performed at 94.9% uptime, and 6.4 million gallons of groundwater were extracted and treated in August 2019. All treated water was discharged to Union Creek. The average flow rate for the SBBGWTP was 172.2 gallons per minute (gpm). Electrical power usage was 16,926 kilowatt hours (kWh), and approximately 14,125 pounds of CO_2 were created (based on DOE calculation). Approximately 0.9 pound of volatile organic compounds (VOCs) was removed in August. The total mass of VOCs removed since startup of the system is 519.5 pounds.

In August 2019, several system upgrade activities were completed. Details can be found in Attachment 3. Mr. Duke expressed his appreciation to Doug Berwick and his field crew for anticipated efficiencies that will result from these upgrades.

No optimization activities were conducted in August 2019.

Central Groundwater Treatment Plant, August 2019 (see Attachment 4)

The Central Groundwater Treatment Plant (CGWTP) performed at 100% uptime with approximately 1,070,170 gallons of groundwater extracted and treated in August 2019. All treated water was discharged to the storm sewer system which discharges to Union Creek. The average flow rate for the CGWTP was 27.3 gpm. Electrical power usage was 2,163 kWh for all equipment connected to the Central Plant, and approximately 2,489 pounds of CO_2 were generated. Approximately 2.5 pounds of VOCs were removed from groundwater by the treatment plant in August. The total mass of VOCs removed since the startup of the system is 11,528 pounds.

A faulty 24-volt power supply was discovered and replaced in August 2019, and a new power supply was installed. All extraction wells remained operational.

Optimization Activities for CGWTP: The DP039 bioreactor continues to operate in August 2019. No other optimization activities are reported for the month of August 2019.

LF007C Groundwater Treatment Plant, August 2019 (Attachment 5)

The Subarea LF007C Groundwater Treatment Plant (LF007C GWTP) performed at 78.2% uptime with approximately 129,152 gallons of groundwater extracted and treated in August 2019. All treated water was discharged to the Duck Pond for beneficial reuse. The average flow rate was 4.2 gpm. Approximately 3.3×10^{-4} pound of VOCs was removed from groundwater by the treatment plant in August 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.

The LF007C GWTP was shut down on 21 August 2019 to prepare for, and complete, changeout of both carbon vessels. The system was restarted on 26 August 2019, but

shut down again due to high pressures. The system was purged of trapped air on 27 August 2019 and restarted.

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

ST018 Groundwater (MTBE) Treatment Plant, August 2019 (see Attachment 6)

Site ST018 (MTBE) Treatment Plant (ST018 GWTP) performed at 100% uptime with approximately 141,870 gallons of groundwater extracted in August 2019. All groundwater was discharged to the Fairfield – Suisun Sewer District. The average flow rate for the ST018 GWTP was 3.8 gpm. Electrical power usage for the month was 77 kWh for all equipment connected to the ST018 GWTP. The total CO_2 discharge equivalent equates to approximately 57 pounds. Approximately 0.12 pound of MTBE, BTEX, VOCs, and TPH was removed in August by the treatment plant, and approximately 0.05 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 volume of water extracted from extraction well EW2014x18 was unusually low in August and will be inspected in September.

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

3. Presentations:

A) Site SD043 Site Closure Report (see Attachment 7)

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

- Traditional EVO delivery methods are labor-intensive, requiring around-the-clock oversight due to the need to move totes and work with pressurized lines

- EVO injections can take up to several months to complete, particularly at sites with low-permeability aquifers

- This is not always practical at some areas of the base, such as the flightline.

- The solar-powered organic carbon (SPOC) delivery method uses one well with a solar-powered pump, and connects to a series of 55-gallon drums loaded with the EVO

- The solar battery operates a peristaltic pump with a float switch that will shut the system down if the water level gets too high. This system can operate without continual oversight.

- Mulch or various amendments can be added without issue

- The traditional delivery system involves hydraulic fracturing to force water into the subsurface, which may create preferential pathways if the force is too high, rather than allowing the EVO to flow where it naturally wants and needs to go.

- This SPOC delivery method is more sustainable since there is no need to move and/or recycle the totes, the drums can be moved with a drum dolly, and it eliminates waste

- This delivery method is an improvement in sustainability, because it uses native groundwater from the site, potentially increasing the effectiveness of the remedy and any associated amendments, while also reducing the potential for daylighting and eliminating the use of potable water.

- This will be tested at Site SS015 at Travis AFB. It is a low-permeability site where the injections aren't producing the optimal result, so enhancements will be obvious. It is close to the office so it can be monitored easily, and any unanticipated issues can be addressed in a timely manner.

- If the Air Force chooses to utilize this method of delivery for future EVO injections, it is not considered a change in the remedies specified in the RODs; it is considered an enhancement of the current remedy – it is more efficient, safer, and more sustainable/environmentally friendly. The remedy specifies EVO injections, but not the details of the delivery method.

B) Program Update: Activities Completed, In Progress, and Upcoming (see Attachment 8)

Mr. Wray reported on the status of fieldwork and documents that have been completed, are in progress, or upcoming. Please refer to Attachment 8 for the full briefing.

4. New Action Item Review

None

5. PROGRAM ISSUES/UPDATE

None

6. Action Items

Item #	Responsible	Action Item Description	Due Date	Status
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.	Ms. Royer	Ms. Royer to look into ways to make the GRISR a smaller, more easily reviewable document.	18 September 2019	Closed, but leaving as update for Water Board in October

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

The RPM Teleconference is scheduled for 9:30 AM PST on 18 September 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

   A. TREATMENT PLANT OPERATION AND MAINTENANCE UPDATE

3. PRESENTATIONS

   A. OPTIMIZED EVO DELIVERY VIA SOLAR-POWERED ORGANIC CARBON INJECTION SYSTEM
   B. PROGRAM UPDATE:
      DOCUMENTS & ACTIVITIES COMPLETED, IN PROGRESS AND PLANNED

4. NEW ACTION ITEM REVIEW

NOTES: AFTER THE RPM TELECONFERENCE, BASED ON THE DISCUSSION DURING THE REVIEW OF THE MASTER MEETING AND DOCUMENT SCHEDULE, WE WILL 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

Monthly RPM Meeting[1] (Begins at time noted)	RPM Teleconference (Begins at time noted)	Restoration Advisory Board Meeting (Begins at 7:00 p.m.) (Poster Session at 6:30 p.m.)
—	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[2]
—	11-20-19	—
—	—	—

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

[2] Note: Tentative RAB tour(s) during construction season.

(2020)

Annual Meeting and Teleconference Schedule

Monthly RPM Meeting[1] (Begins at time noted)	RPM Teleconference (Begins at time noted)	Restoration Advisory Board Meeting (Begins at 7:00 p.m.) (Poster Session at 6:30 p.m.)
—	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[2]
—	11-18-20	—
—	—	—

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

[2] 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**	**No Further Action Soil ROD for Old Skeet Range (TS060 MRA) Travis AFB, Glenn Anderson**
Scoping Meeting	**NA**	**NA**	**NA**
Predraft to AF/Service Center	08-23-16	02-28-18	05-18-18
AF/Service Center Comments Due	09-07-16	03-30-18	06-01-18
Draft to Agencies	09-28-16 (03-22-18)	06-22-18	6-25-18
Draft to RAB	09-28-16 (03-22-18)	06-22-18	6-25-18
Agency Comments Due	10-28-16 (04-27-18)	08-22-18	11-30-18
Response to Comments Meeting	**TBD**	**09-06-18**	**01-16-19**
Agency Concurrence with Remedy	NA	NA	NA
Public Comment Period	NA	NA	NA
Public Meeting	**NA**	**NA**	**NA**
Response to Comments Due	TBD	08-29-19 (09-16-19)	06-13-19
Draft Final Due	TBD	08-29-19 (09-30-19)	06-13-19
Final Due	TBD	09-30-19 (10-30-19)	08-21-19 (09-11-19)

PRIMARY DOCUMENTS			
Life Cycle	**Site SS016 Remedial Design/Remedial Action Work Plan** **Travis AFB, Glenn Anderson** **CH2M, Doug Berwick** **CAPE, Meg Greenwald**	**Site SD031 Soil Remedial Investigation/Feasibility Study** **Travis AFB, Glenn Anderson** **CH2M, Rick Sturm**	**Fourth Five-Year Review Report for Multiple Groundwater, Soil, and Sediment Sites** **Travis AFB, Glenn Anderson** **Tetra Tech, Joachim Eberharter**
Scoping Meeting	**NA**	**NA**	**NA**
Predraft to AF/Service Center	06-04-18	05-24-19	03-14-18
AF/Service Center Comments Due	06-18-18	06-10-19	05-22-18
Draft to Agencies	07-31-18	09-12-19	06-05-18
Draft to RAB	07-31-18	09-12-19	06-05-18
Agency Comments Due	08-30-18	11-11-19	07-20-18
Response to Comments Meeting	**09-19-18**	**11-20-19**	**TBD**
Agency Concurrence with Remedy	NA	NA	NA
Public Comment Period	NA	NA	NA
Public Meeting	**NA**	**NA**	**NA**
Response to Comments Due	10-24-18	12-05-19	TBD
Draft Final Due	10-24-18	12-05-19	TBD
Final Due	10-30-19	01-06-19	TBD

PRIMARY DOCUMENTS			
	Potrero Hills Annex Travis, Glenn Anderson		
Life Cycle	**FS**	**Proposed Plan**	**ROD**
Scoping Meeting	**180 days after Water Board Order Rescinded**	**+470 days**	**+735 days**
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
Response to Comments Meeting	**+ 405 days**	**+665 days**	**+ 1110 days**
Agency Concurrence with Remedy	NA	NA	+ 1130 days
Public Comment Period	NA	+735 to 765 days	NA
Public Meeting	**NA**	**+745 days**	**NA**
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**	**2018 Annual GRISR Travis AFB, Glenn Anderson CH2M, Leslie Royer**
Scoping Meeting	**NA**	**NA**
Predraft to AF/Service Center	09-18-19	05-06-19
AF/Service Center Comments Due	NA	05-20-19
Draft to Agencies	09-25-19	06-05-19
Draft to RAB	NA	06-05-19
Agency Comments Due	10-10-19	07-08-19
Response to Comments Meeting	**10-17-19**	07-17-19
Response to Comments Due	10-17-19	08-30-19 (09-04-19)
Draft Final Due	NA	NA
Final Due	10-18-19	08-30-19 (09-04-19)
Public Comment Period	NA	NA
Public Meeting	**NA**	**NA**

INFORMATIONAL DOCUMENTS		
Life Cycle	**Site SS046 Remedial Action Completion Report and Well Decommissioning Work Plan** **Travis AFB, Glenn Anderson** **CH2M, Doug Berwick** **CAPE, Meg Greenwald**	**2018 Annual Site LF007 Corrective Action Management Unit Inspection, Monitoring, and Maintenance Report** **Travis AFB, Milton Clare** **CH2M, Levi Pratt**
Scoping Meeting	**NA**	**NA**
Predraft to AF/Service Center	04-15-19	05-31-19
AF/Service Center Comments Due	04-22-19	06-14-19
Draft to Agencies	05-09-19	08-15-19
Draft to RAB	05-09-19	08-15-19
Agency Comments Due	06-10-19	09-16-19
Response to Comments Meeting	**06-19-19**	**10-02-18**
Response to Comments Due	07-12-19 (09-20-19)	10-16-19
Draft Final Due	NA	NA
Final Due	07-12-19 (09-20-19)	10-16-19
Public Comment Period	NA	NA
Public Meeting	**NA**	**NA**

INFORMATIONAL DOCUMENTS			
Life Cycle	**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**
Scoping Meeting	**NA**	**NA**	**NA**
Predraft to AF/Service Center	07-10-19	06-12-19	09-04-19
AF/Service Center Comments Due	07-24-19	06-28-19	09-18-19
Draft to Agencies	10-07-19	08-06-19	10-02-19
Draft to RAB	10-07-19	08-06-19	10-02-19
Agency Comments Due	11-06-19	10-07-19	11-01-19
Response to Comments Meeting	**11-20-19**	**10-16-19**	**11-20-19**
Response to Comments Due	12-09-19	11-01-19	12-06-19
Draft Final Due	NA	NA	NA
Final Due	12-09-19	11-01-19	12-06-19
Public Comment Period	NA	NA	NA
Public Meeting	**NA**	**NA**	**NA**

HISTORY - PRIMARY DOCUMENTS	
Life Cycle	**Addendum to the Site SS016 Groundwater Remedial Design/Remedial Action Work Plan** **Travis AFB, Lonnie Duke** **CH2M, Levi Pratt**
Scoping Meeting	**NA**
Predraft to AF/Service Center	12-12-18
AF/Service Center Comments Due	01-02-19
Draft to Agencies	02-22-19
Draft to RAB	02-22-19
Agency Comments Due	03-25-19
Response to Comments Meeting	**04-18-19**
Agency Concurrence with Remedy	NA
Public Comment Period	NA
Public Meeting	**NA**
Response to Comments Due	06-12-19 (07-02-19)
Draft Final Due	06-12-19 (07-02-19)
Final Due	07-17-19 (08-02-19)

HISTORY - INFORMATIONAL DOCUMENTS		
Life Cycle	**Site SD043 Remedial Action Completion Report** **Travis AFB, Glenn Anderson** **CH2M, Levi Pratt**	**Site SS014 Subsites 2, 4, and 5 POCO Site Closure Evaluation Report** **Travis AFB, Glenn Anderson** **CH2M, Tony Chakurian**
Scoping Meeting	**NA**	**NA**
Predraft to AF/Service Center	03-29-19	04-10-19
AF/Service Center Comments Due	04-12-19	04-24-19
Draft to Agencies	05-08-19	05-02-19
Draft to RAB	05-08-19	05-02-19
Agency Comments Due	06-07-19	06-03-19
Response to Comments Meeting	**06-19-19**	**06-19-19**
Response to Comments Due	07-24-19 (07-23-19)	07-11-19 (07-23-19)
Draft Final Due	NA	NA
Final Due	07-24-19 (07-23-19)	07-11-19 (07-23-19)
Public Comment Period	NA	NA
Public Meeting	**NA**	**NA**

South Base Boundary Groundwater Treatment Plant Monthly Data Sheet

Report Number: 226 **Reporting Period: 1 August 2019 – 28 August 2019** **Date Submitted: 11 September 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 August 2019 reporting period.

Table 1 – Operations Summary – August 2019

Initial Data Collection:	8/1/2019 12:50	**Final Data Collection:**	8/28/2019 15:00
Operating Time:	Percent Uptime:	Electrical Power Usage:	
SBBGWTP: 617 hours	**SBBGWTP:** 94.9%	**SBBGWTP:**	16,926 kWh (14,125 lbs CO_2 generated[a])
Gallons Treated: **6.4 million gallons**		Gallons Treated Since July 1998: **1,136 million gallons**	
Volume Discharged to Union Creek: **6.4 million gallons**		Gallons Treated from Other Sources: **0 gallons**	
VOC Mass Removed: **0.9 lbs**[b]		VOC Mass Removed Since July 1998: **519.5 lbs**	
Rolling 12-Month Cost per Pound of Mass Removed: **$14,122**[c]			
Monthly Cost per Pound of Mass Removed: **$18,865**[c]			

lbs = pounds
[a] 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.
[b] Calculated using August 2019 EPA Method SW8260C analytical results.
[c] 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)[a] – August 2019

FT005[b]				SS029		SS030	
EW01x05	Offline	EW743x05	Offline	EW01x29	Offline[c]	EW01x30	15.3
EW02x05	Offline	EW744x05	3.0	EW02x29	Offline[c]	EW02x30	3.6
EW03x05	Offline	EW745x05	12.0	EW03x29	3.4	EW03x30	11.4
EW731x05	6.5	EW746x05	Offline	EW04x29	5.3	EW04x30	24.2
EW732x05	Offline	EW2291x05	3.8	EW05x29	7.7	EW05x30	18.7
EW733x05	Offline	EW2782x05	4.7	EW06x29	7.6	EW2174x30	8.6
EW734x05	0.8	EW2783x05	7.9	EW07x29	13.3	EW711x30	9.0
EW735x05	11.2	EW2784x05	10.3			MW269x30	0.5
EW736x05	Offline	EW2785x05	1.9				
EW737x05	Offline	EW2786x05	14.3				
EW742x05	Offline						
FT005 Total: 76.4				**SS029 Total: 37.3**		**SS030 Total: 91.3**	
SBBGWTP Average Monthly Flow[d]: 172.2 gpm							

[a] Flow rates presented are instantaneous measurements taken at the end of the reporting period.
[b] 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.*
[c] Extraction wells taken off line because of persistent fouling of the well pumps and associated discharge piping.
[d] 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[a]		Restart[a]		Cause
	Date	Time	Date	Time	
SBBGWTP	6 August 2019	12:00	7 August 2019	12:00	System shut down to allow the glue to cure on the new piping between the new influent tank and 6,000-lb GAC vessels and between the new 2,000-lb GAC vessels and the effluent tank.
SBBGWTP	19 August 2019	8:00	19 August 2019	17:00	Performed carbon change out on lead GAC vessel.

[a] 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 1 August 2019. Sample results are presented in Table 4. The total VOC concentration (17.56 µg/L) in the influent sample decreased from the July 2019 sample results (18.75 µg/L). TCE was the primary VOC detected in the influent sample at a concentration of 16 µg/L. TCE, cis-1,2-DCE, chloroform, and 1,2-DCA were detected in the midpoint sampling location. Cis-1,2-DCE and chloroform were detected in the effluent sample but at concentrations less than the discharge limits.

On 6 August 2019, the system was shut down to allow the glue to cure on the new piping between the newly installed GAC vessels, tanks and the existing 6,000-lb GAC vessels. The system was restarted 24 hours later.

On 19 August 2019, a carbon change out was performed on the lead GAC vessel. Following the change out, the GAC was backwashed and soaked, and the SBBGWTP was restarted the same day, 9 hours later.

In August 2019, equipment upgrade activities were completed at SBBGWTP as discussed in the following section. On 22 August, the four (4) new 2,000-lb GAC vessels were filled with GAC and backwashed. On 26 August, the new GAC vessels were brought on line downstream from the two 6,000-lb GAC vessels.

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 August 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 August 2019.

System Upgrade Activities

The ongoing upgrades to the SBBGWTP were completed on 7 August 2019. The following upgrades have been completed:

- Replaced existing open top 13,000-gallon effluent tank with an 8,100-gallon closed top poly tank.
- Installed a new 10,300-gallon influent tank.
- Installed a new transfer pump from the influent tank with a variable frequency drive for efficient operation.
- Installed a new cyclonic particulate filter to replace existing bag filters.
- Removed the unused air stripper from the SBBGWTP.
- Removed the 1,000-gallon acid tank associated with the air stripper.
- Removed the unused oil/water separator and construction water tank from the SBBGWTP.
- Removed the unused aeration blower from the SBBGWTP.
- Replaced existing remote connectivity hardware with new updated equipment.
- Installed four (4) new 2,000-pound GAC vessels. The vessels were arranged in parallel and used as polish on the back end of the treatment process.

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 August 2019, the SBBGWTP produced approximately 14,125 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 August 2019 – South Base Boundary Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	1 August 2019 (µg/L)		
				Influent	Midpoint	Effluent
Halogenated Volatile Organics						
Bromodichloromethane	NA	0.17	0	ND	ND	ND
Chloroform	1.9	0.16	0	ND	**0.21 J**	**0.17 J**
1,1-Dichloroethane	0.50	0.22	0	ND	ND	ND
1,2-Dichloroethane	0.50	0.13	0	**0.56 J**	**0.49 J**	ND
1,1-Dichloroethene	0.50	0.23	0	ND	ND	ND
cis-1,2-Dichloroethene	0.50	0.15	0	**1.0**	**1.3**	**0.27 J**
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	**16**	**6.2**	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	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	5.5	0	NM	NM	ND
Total Petroleum Hydrocarbons – Motor Oil	100	32	0	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

Figure 1

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

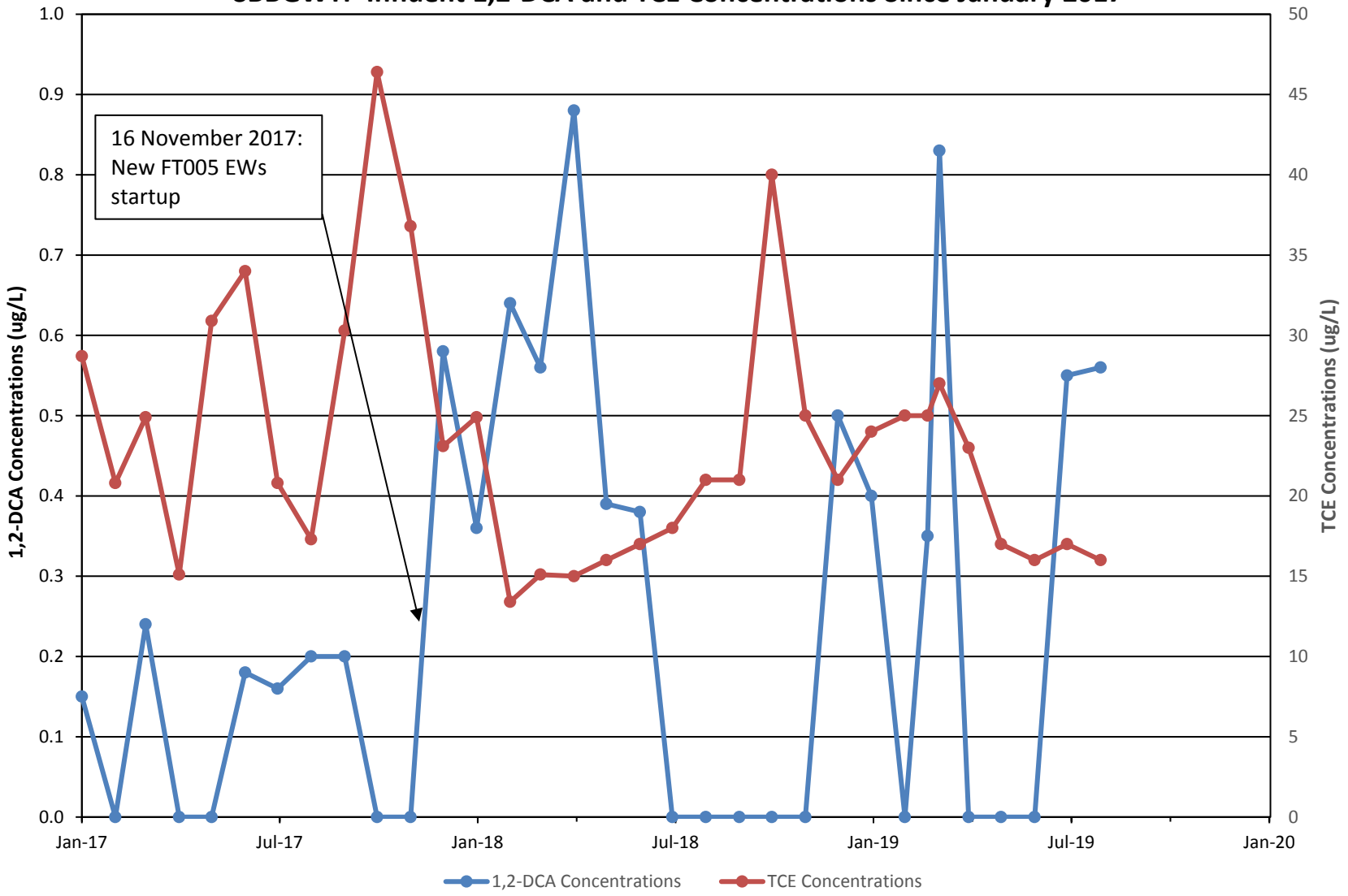


Figure 2

SBBGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History

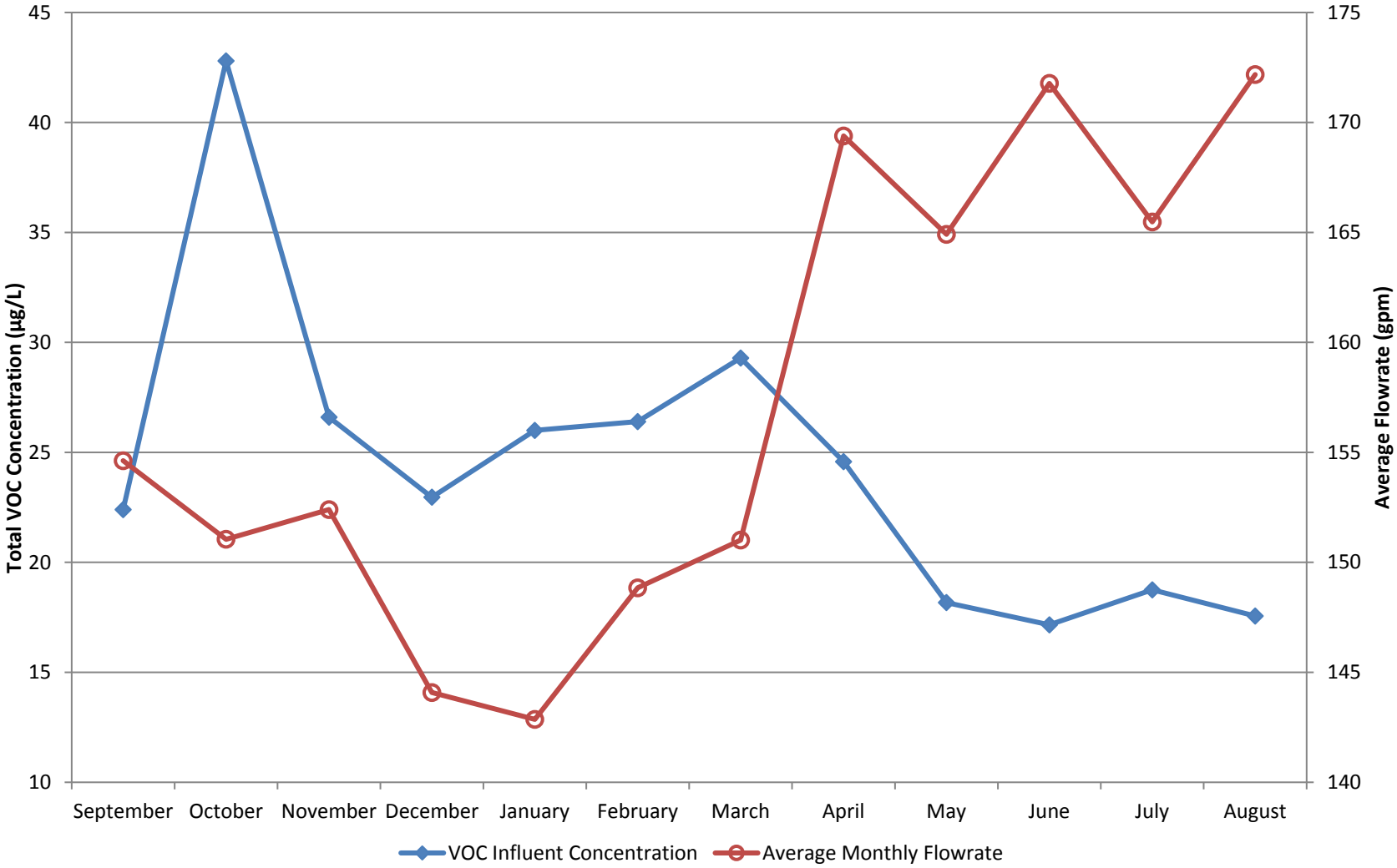
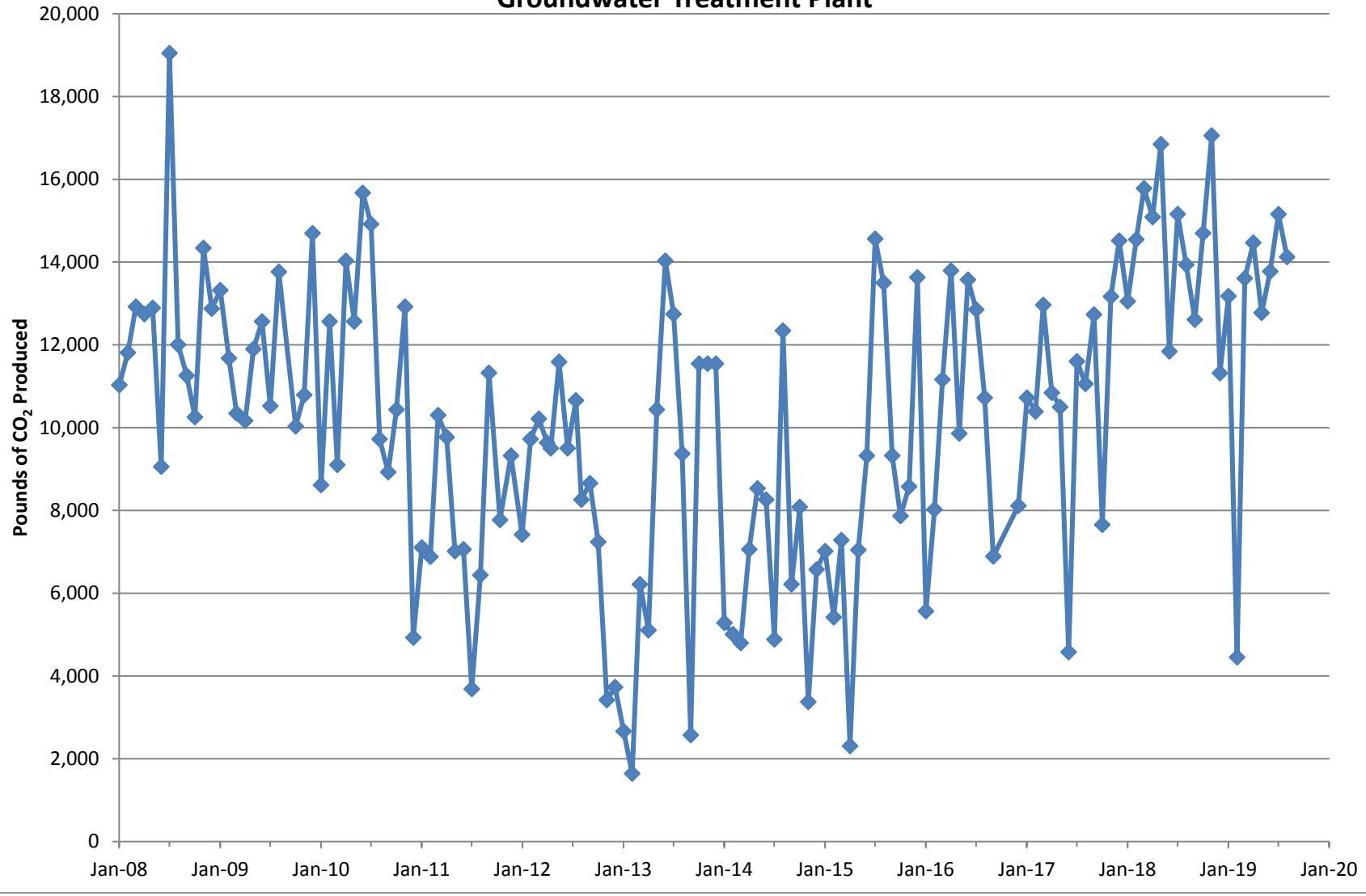


Figure 3

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



Central Groundwater Treatment Plant Monthly Data Sheet

Report Number: 241 **Reporting Period: 1 August 2019 – 28 August 2019** **Date Submitted: 11 September 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 August 2019 reporting period.

Table 1 – Operations Summary – August 2019

Initial Data Collection:	8/1/2019 9:25		**Final Data Collection:**	8/28/2019 14:35	
Operating Time:		Percent Uptime:		Electrical Power Usage:	
CGWTP:	653 hours	**CGWTP:**	100%	**CGWTP:**	2,163 kWh (2,489 lbs CO_2 generated[a])

Gallons Treated (discharge to storm sewer): **1,070,170 gallons**

Gallons Treated Since January 1996: **573.2 million gallons**

VOC Mass Removed from groundwater: **2.5 lbs**[b]

VOC Mass Removed Since January 1996: **2,842 lbs from groundwater**; **8,686 lbs from vapor**

Rolling 12-Month Cost per Pound of Mass Removed: $3,420[c]

Monthly Cost per Pound of Mass Removed: $2,054[c]

[a] 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.
[b] Calculated using August 2019 EPA Method SW8260C analytical results.
[c] 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[a] – August 2019

Location	Average Flow Rate Groundwater (gpm)
EW001x16	12.3
EW002x16	7.2
EW003x16	0.0
EW605x16	5.7
EW610x16	2.2
CGWTP	27.3

[a] 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[a]		Restart		Cause
	Date	Time	Date	Time	
CGWTP	None.	--		--	

-- = Date/Time not recorded
[a] 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 1 August 2019. Sample results are presented in Table 4. The total VOC concentration (277.10 µg/L) in the August 2019 influent sample has increased from the July 2019 sample (243.62 µg/L). TCE was the primary VOC detected in the influent sample at a concentration of 230 µg/L. Vinyl chloride was not detected in the influent sample but was detected in the sample after the first carbon vessel (0.62 J µg/L). No VOCs were detected in the sample collected after the second carbon vessel 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 August 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 August 2019, the totalizers for extraction wells EW605x16 and EW610x16 were not functioning properly. The 24-volt power supply in the OSA (Oil Spill Area) vault was found to be faulty, and a new power supply was installed. The extraction wells remained operational the entire time.

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

Optimization Activities

No optimization activities occurred at the CGWTP in August 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 2,489 pounds of GHG during August 2019.

TABLE 4
Summary of Groundwater Analytical Data for August 2019 – Central Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	1 August 2019 (µg/L) 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	ND	ND	ND	ND
1,3-Dichlorobenzene	NA	0.13 – 0.26	0	ND	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	**44**	ND	ND	ND
trans-1,2-Dichloroethene	0.50	0.15 – 0.30	0	**3.1**	ND	ND	ND
Tetrachloroethene	0.50	0.20 – 0.40	0	**0.54 J**	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	**230**	ND	ND	ND
Vinyl Chloride	0.90	0.10 – 0.20	0	ND	**0.62 J**	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	NM	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel (C10 – C28)	50	5.5	0	NM	NM	NM	ND
Total Petroleum Hydrocarbons – Motor Oil (C28 – C40)	100	32	0	NM	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

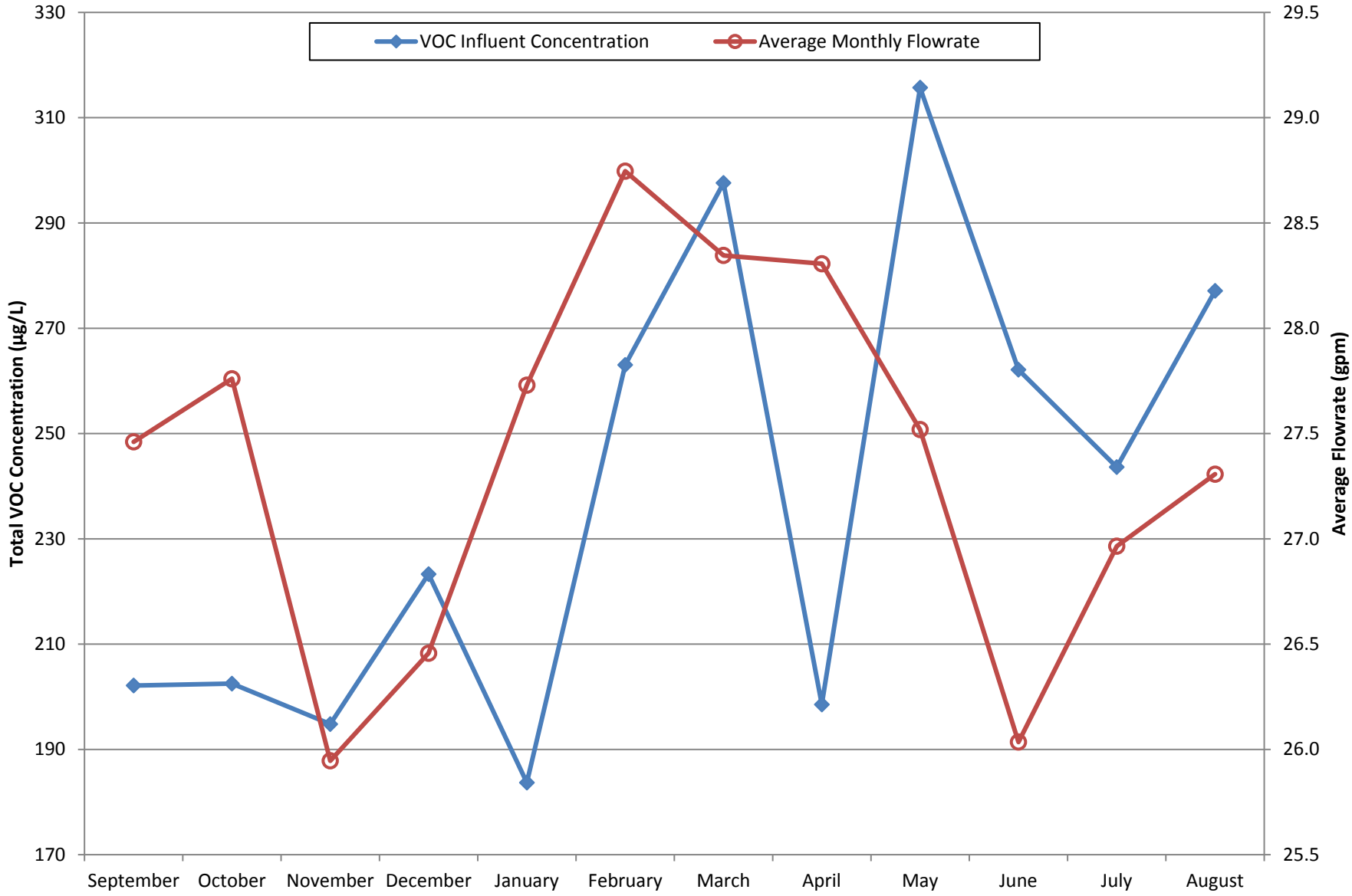
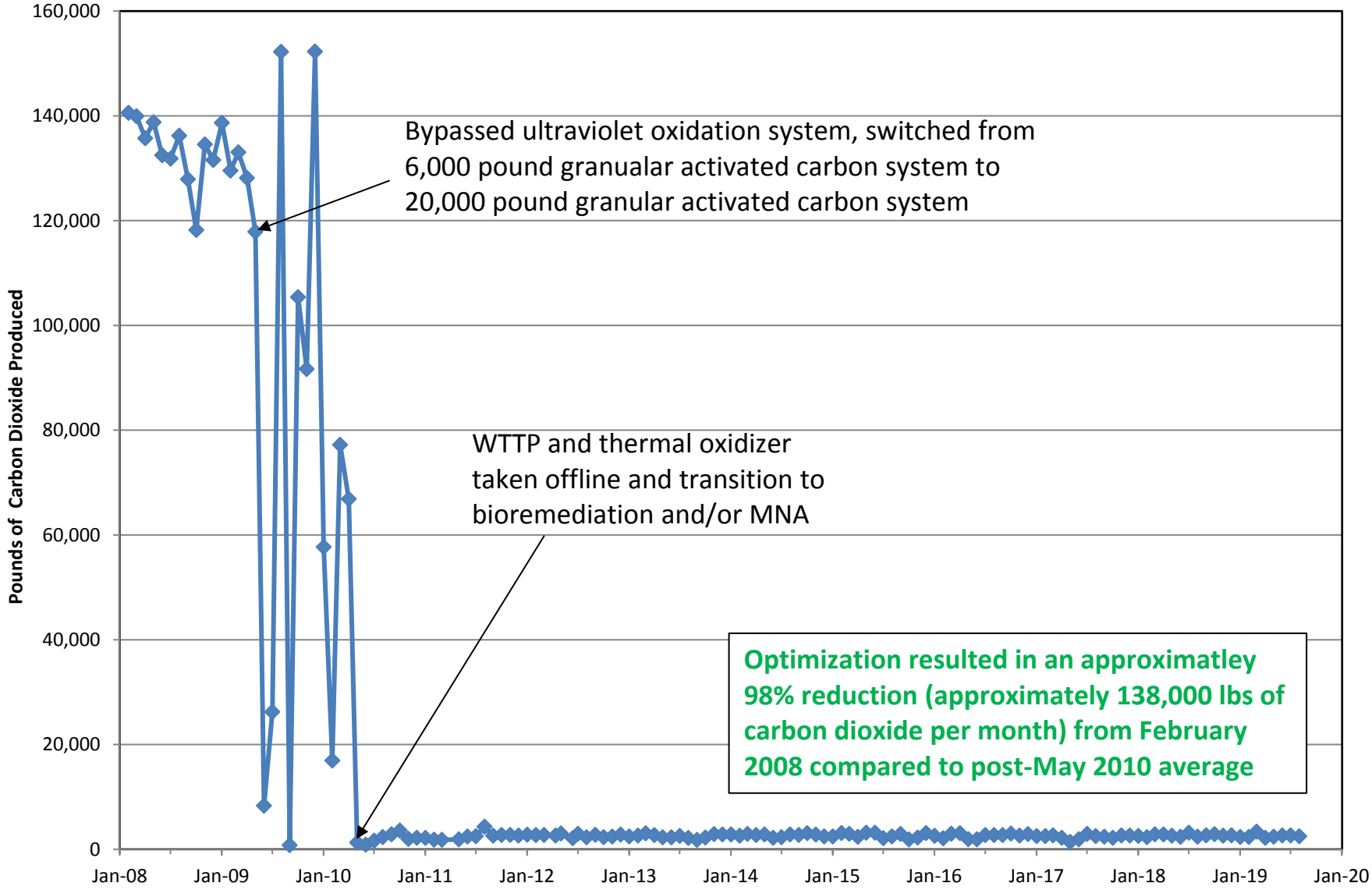


Figure 2

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



Subarea LF007C Groundwater Treatment Plant Monthly Data Sheet

Report Number: 180 **Reporting Period: 1 August 2019 – 28 August 2019** **Date Submitted: 11 September 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 August 2019 reporting period:

Table 1 – Operations Summary – August 2019

Initial Data Collection:	8/1/2019 12:00		**Final Data Collection:**	8/28/2019 15:30	
Operating Time:		Percent Uptime:	Electrical Power Usage[a]:		
LF007C GWTP:	510 hours	**LF007C GWTP**	78.2%	**LF007C GWTP:**	0 kWh
Gallons Treated: **129,152 gallons**			Gallons Treated Since March 2000: **89.0 million gallons**		
Volume Discharged to Duck Pond: **129,152 gallons**					
VOC Mass Removed: **3.3×10^{-4} pounds**[b]			VOC Mass Removed Since March 2000: **174.4 pounds (Groundwater)**		
Rolling 12-Month Cost per Pound of Mass Removed: **Not Measured**[c]					
Monthly Cost per Pound of Mass Removed: **Not Measured**[c]					

[a] The LF007C GWTP operates on solar power only.
[b] VOCs from August 2019 influent sample detected by EPA Method SW8260C.
[c] 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 – August 2019

Location	Average Flow Rate (gpm)[a]	Total Gallons Processed (gallons)
EW614x07	4.1	124,780
EW615x07	0.6	18,620
LF007C GWTP	**4.2**	**129,152**

[a] 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[a]		Restart[a]		Cause
	Date	Time	Date	Time	
LF007C GWTP	21 August 2019	9:00	26 August 2019	10:30	Carbon change out for both lead and lag vessels.
LF007C GWTP	26 August 2019	15:30	27 August 2019	11:45	High pressure at the system.

-- = Time not recorded
[a] 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 1 August 2019. Sample results are presented in Table 4. TCE (0.31 J µg/L) was detected at the influent sample location. TCE (0.42 J µg/L), cis-1,2-DCE (0.17 J µg/L), and vinyl chloride (0.16 J µg/L) were detected in the midpoint sample location. No VOCs were detected in the effluent sample location. However, TPH-d (43 J- µg/L) and TPH-mo (34 J- µg/L) were detected in the effluent sample location at concentrations less than the effluent limitations.

The LF007C GWTP was shut down on 21 August 2019 in preparation for the carbon change out. A change out of both carbon vessels was conducted on 21 August. Following the change out, the vessels were filled with fresh water, and the GAC was soaked for several days. On 26 August, the LF007C GWTP was restarted. Several hours after restart, the system was shut down because of high pressures. On 27 August, the system was purged of trapped air, and the system was restarted.

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 August 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 generates 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 August 2019 – Subarea LF007C Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	1 August 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	**0.17 J**	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	**0.31 J**	**0.42 J**	ND
Vinyl Chloride	0.5	0.22	0	ND	**0.16 J**	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	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	5.5	0	NM	NM	**43 J-**
Total Petroleum Hydrocarbons – Motor Oil	100	32	0	NM	NM	**34 J-**

* 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.
J- = analyte concentration is considered an estimated value, biased low.
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

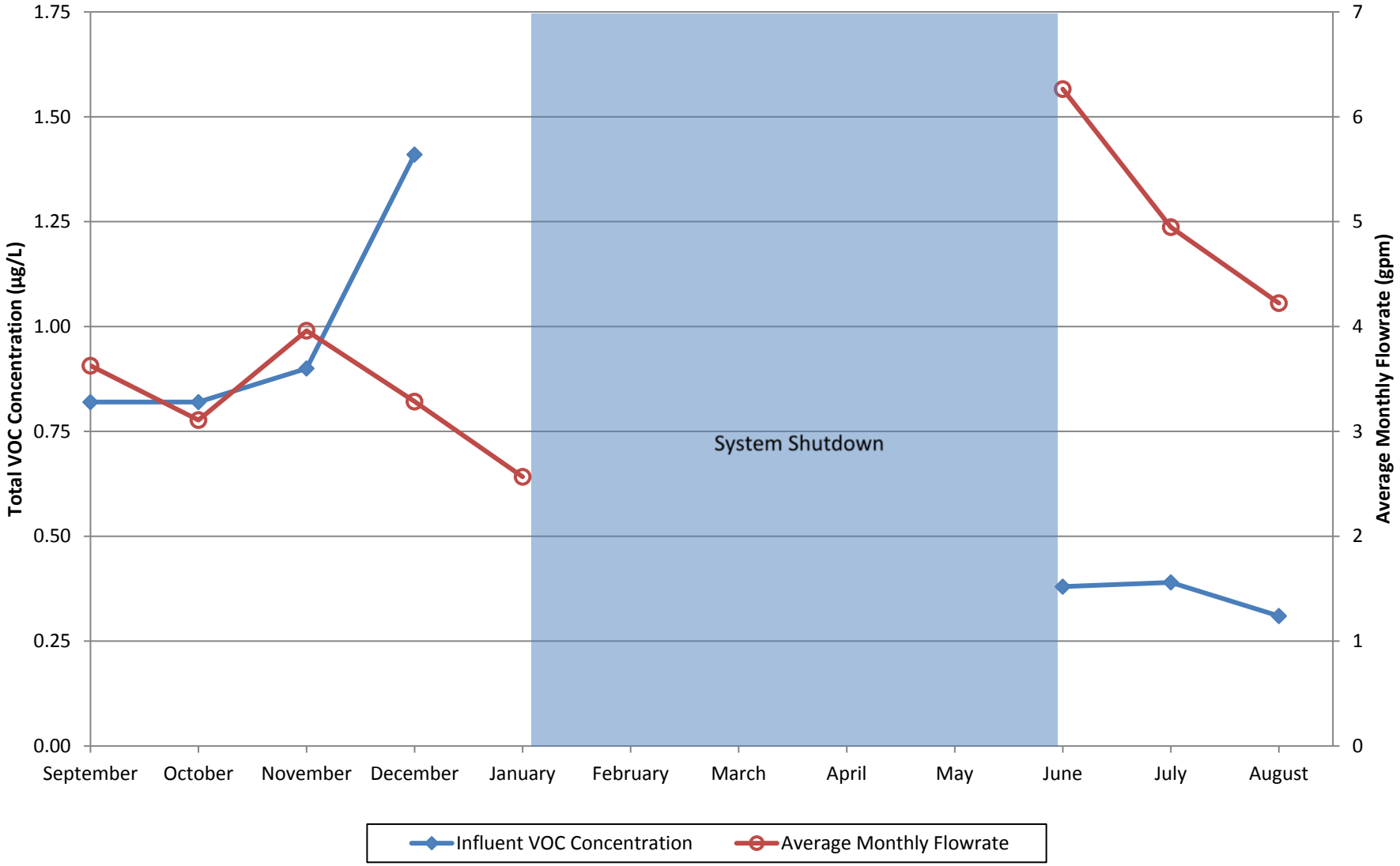
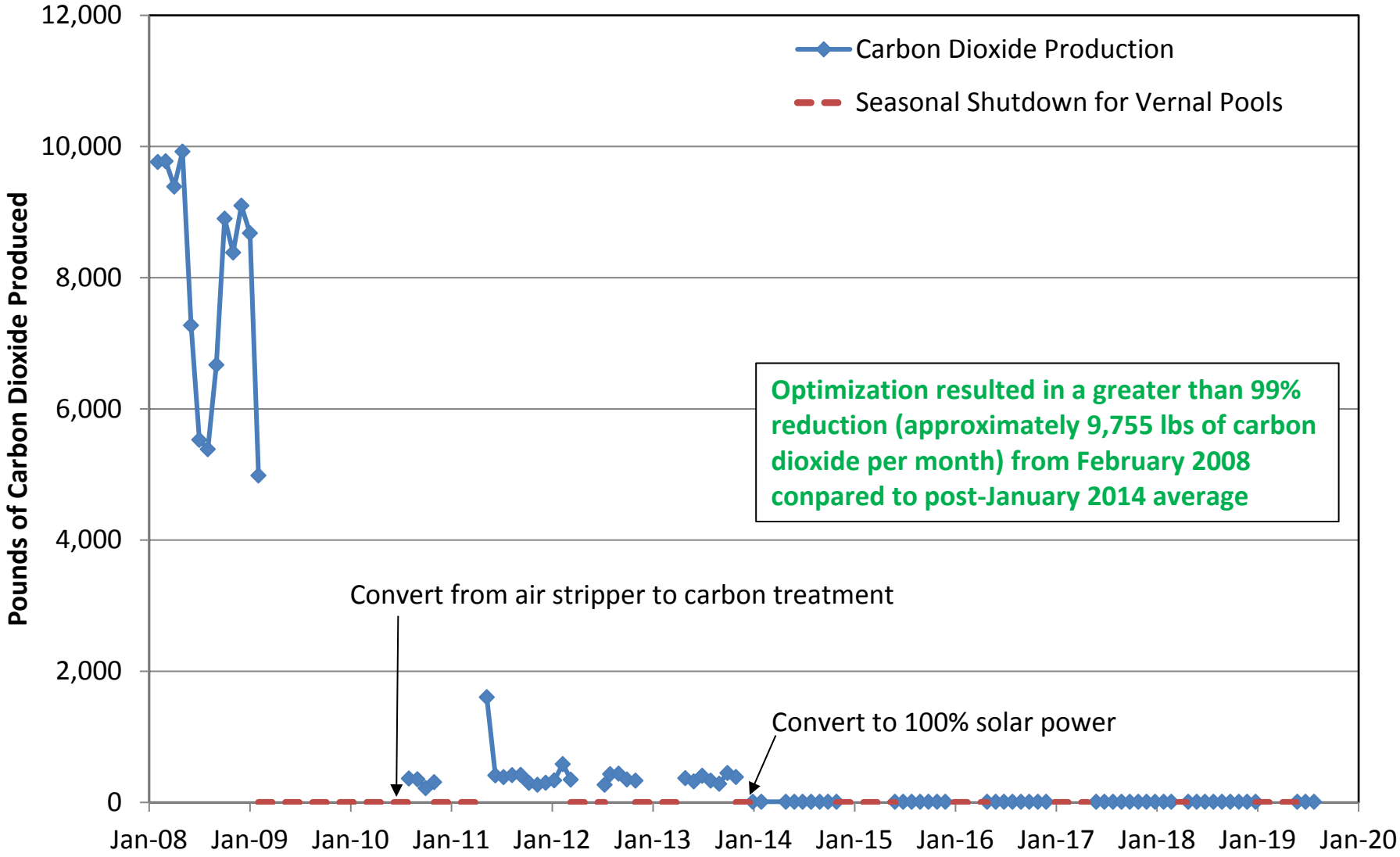


Figure 2

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



Note: Dashed line represents seasonal shutdowns due to the presence of vernal pools at Site LF007C during which no carbon dioxide production occurred.

Site ST018 Groundwater Treatment Plant Monthly Data Sheet

Report Number: 102 **Reporting Period: 1 August 2019 – 30 August 2019** **Date Submitted: 16 September 2019**

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

System Metrics

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

Table 1 – Operations Summary – August 2019

Initial Data Collection: 8/1/2019 10:45	**Final Data Collection:**	8/30/2019 8:20
Operating Time:	Percent Uptime:	Electrical Power Usage:
ST018GWTP: 693 hours	**ST018GWTP: 100**%	**ST018GWTP:** 77 kWh (57 lbs CO_2 generated[a])
Gallons Extracted: **141,870 gallons**	Gallons Extracted Since March 2011: **17.8 million gallons**	
Volume Discharged to Sanitary Sewer: **141,870 gallons**	Final Totalizer Reading: **17,836,769 gallons**	
Cumulative Volume Discharged to Sanitary Sewer since 1 November 2014: **11,340,595 gallons**		
MTBE, BTEX, VOC, TPH Mass Removed: **0.12 lbs**[b]	MTBE, BTEX, VOC, TPH Mass Removed Since March 2011: **48.4 lbs**	
MTBE (Only) Removed: **0.05 lbs**[b]	MTBE (Only) Mass Removed Since March 2011: **11.8 lbs**	
Rolling 12-Month Cost per Total Pounds of Mass Removed: $16,571[bc]		
Monthly Cost per Pound of Mass Removed: $41,289[bc]		

[a] SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG.
[b] Calculated using August 2019 EPA Method SW8260C and SW8015B analytical results.
[c] 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.

Table 2 – ST018GWTP Average Flow Rates – August 2019

Location	Average Flow Rate Groundwater (gpm)[a]	Hours of Operation
EW2014x18	0.0	693
EW2016x18	0.5	693
EW2019x18	1.2	693
EW2333x18	1.7	693
ST018GWTP	3.8	693

[a] 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.

Table 3 – Summary of System Shutdowns

Location	Shutdown[a]		Restart[a]		Cause
	Date	Time	Date	Time	
ST018GWTP	None.	--		--	

-- = Time not recorded

[a] 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 1 August 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 August 2019 laboratory data report is available upon request. The MTBE discharge concentration during the August 2019 sampling event was 42 µg/L, which is an increase from the July 2019 sample result of 13 µg/L. TPH-d, TPH-g, and 1,2-DCA were also detected in the system discharge sample.

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 August 2019, EW2014x18 was operational; however, the volume of water extracted was unusually low. EW2014x18 will be inspected in September.

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 fairly steadily decreasing trend since

April 2019 as expected. The extracted MTBE concentrations and extracted total concentrations have generally been fluctuating over the past 12 months with an overall increasing trend.

Optimization Activities

No optimization activities occurred at the ST018GWTP in August 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 57 pounds of GHG during August 2019 and removed 141,870 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 August 2019– Site ST018 Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	1 August 2019 (µg/L)
				System Discharge
Fuel Related Constituents				
Methyl tert-Butyl Ether	6,400	0.25	0	**42**
Benzene	25,000[a]	0.16	0	ND
Ethylbenzene	25,000[a]	0.16	0	ND
Toluene	25,000[a]	0.17	0	ND
Total Xylenes	25,000[a]	0.19 – 0.34	0	ND
Total Petroleum Hydrocarbons – Gasoline	50,000[b]	10	0	**30**
Total Petroleum Hydrocarbons – Diesel	50,000[b]	15	0	**28 J**
Total Petroleum Hydrocarbons – Motor Oil	100,000	160	0	ND
Other				
1,2-Dichloroethane	20	0.13	0	**1.0**

* 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

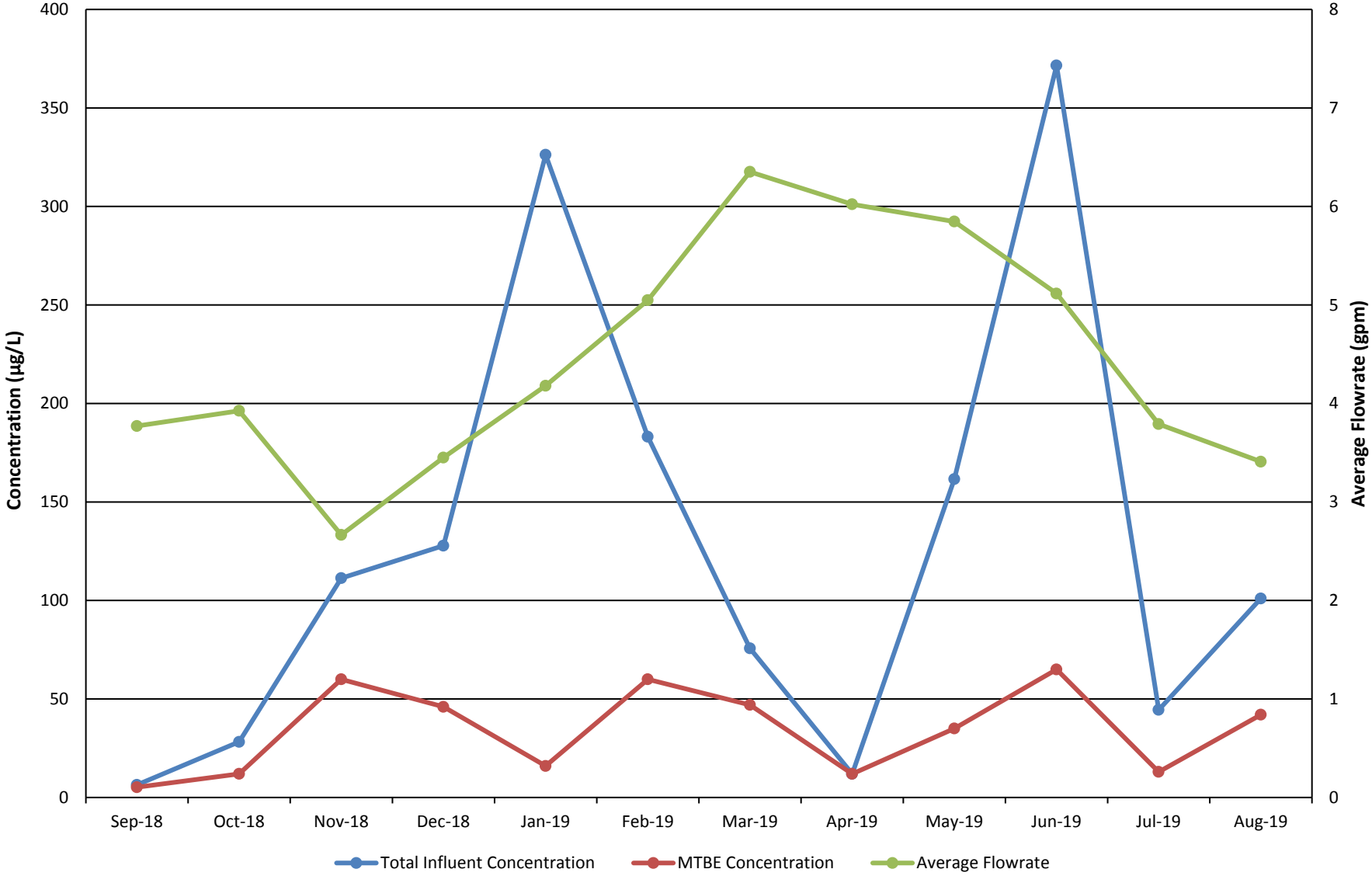
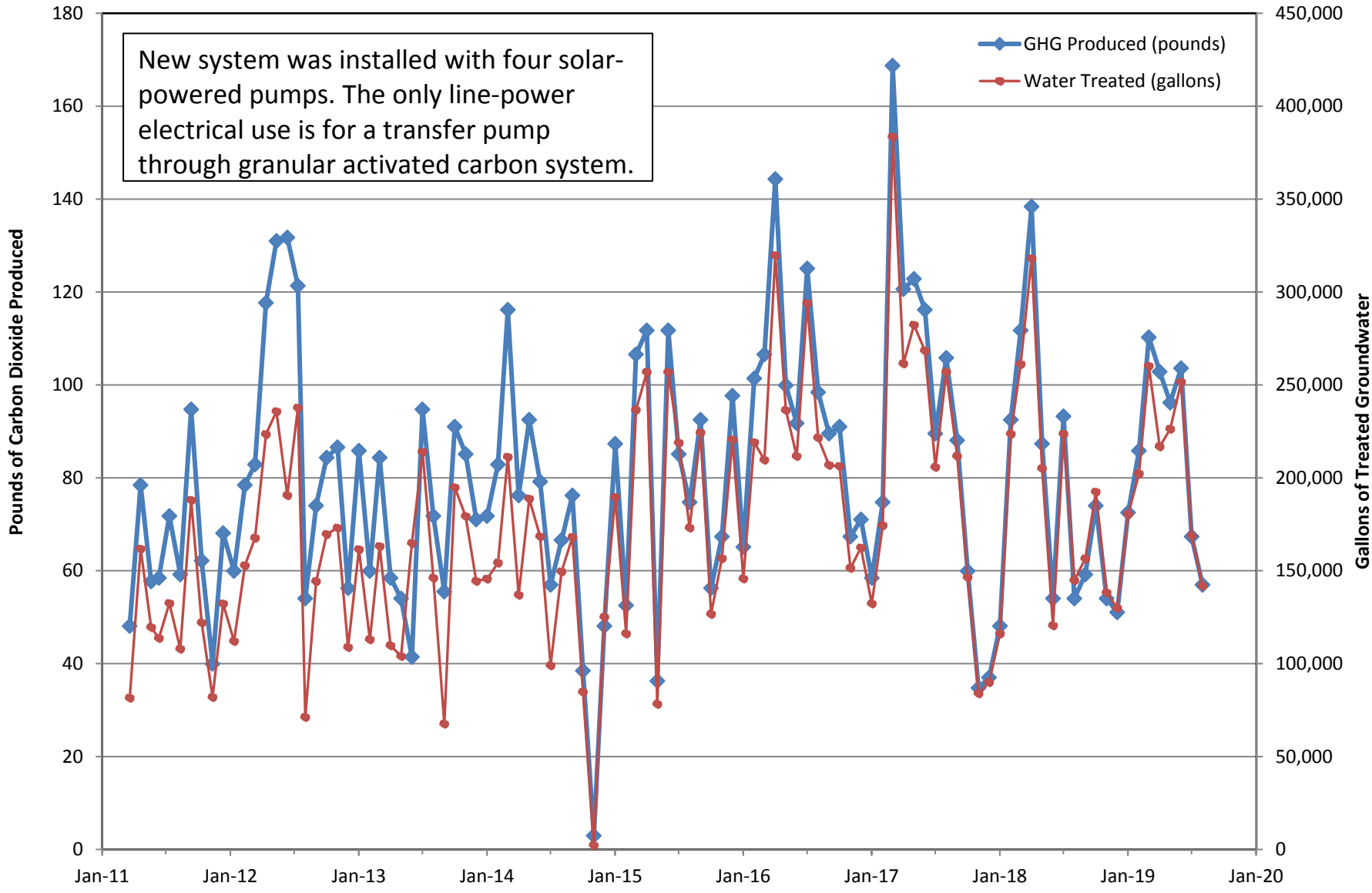


Figure 2

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)

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

CBS Photo Archive via Getty Images

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

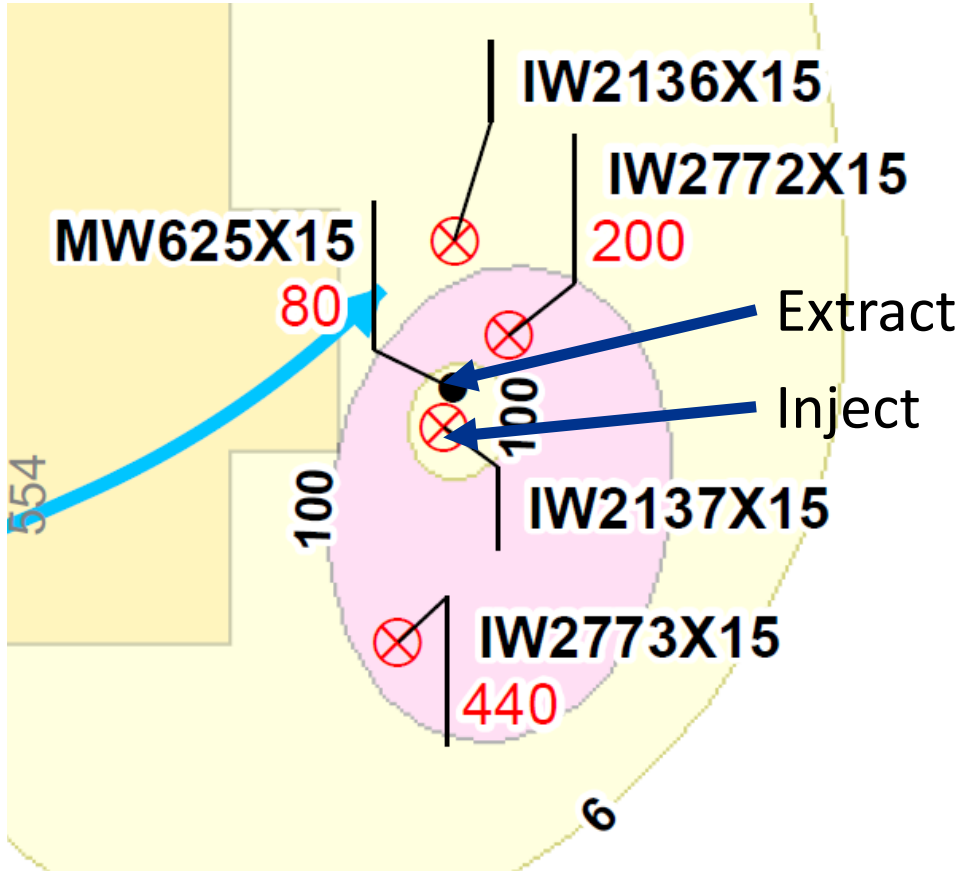
Approach:

- 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

JACOBS

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



Travis AFB
Restoration Program

Program Update

RPM Meeting

September 18, 2019

Completed Documents (1)

- Vapor Intrusion Assessment Update Technical Memorandum
- 2012 CAMU Annual Report
- Old Skeet Range Action Memorandum
- 3rd 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 Optimiz-ation 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***

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 (2nd 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 (3rd 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 (1st 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 (2nd 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)

- 3rd Quarter 2019 GRIP Sampling
- ***SD034 O_2 Enhancement***

Documents In-Progress

CERCLA

- Amendment to the NEWIOU Soil ROD for Sites SS016 and SD033
- Community Relations Plan Update (revised draft)
- 4th Five Year Review Report for Multiple Groundwater, Soil, and Sediment Sites
- SS016 RD/RA Work Plan
- SS046 Remedial Action Completion Report and Well Decommissioning Work Plan
- SD043 Site Closure Report
- 2018 LF007 CAMU Inspection, Monitoring, and Maintenance Report
- ***SD031 Soil RI/FS***

Documents In-Progress

MMRP

- None

POCO

- None

Field Work In-Progress

CERCLA

- None

POCO

- None

Documents Planned

CERCLA

- LF008 Remedial Action Completion Report Oct
- SS046 Well Decommissioning and Site Closeout Tech Memo Oct

POCO

- None

Field Work Planned

CERCLA

- SS016 SBGR Repairs — Sep
- SD037 EVO Re-injection — Sep
- 4th Quarter 2019 GRIP Sampling — Oct
- SD043 Well and GETS Decommissioning — Nov
- SS016 Soil excavation (waiting on ROD amendment) — Dec

POCO

- None

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)

Updates in Green Font

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

Updates in Green Font

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

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 (2nd 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 (4th 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