

**Travis Air Force Base  
Environmental Restoration Program  
Restoration Program Manager's  
Meeting Minutes  
20 April 2017, 1400 Hours**

Mr. Lonnie Duke of the Air Force Civil Engineer Center (AFCEC) Restoration Installation Support Team (IST) conducted the Restoration Program Manager's (RPM) face-to-face meeting on 20 April 2017 at 1400 hours in Building 248 at Travis AFB, California. Attendees included:

Lonnie Duke	AFCEC/CZOW
Glenn Anderson	AFCEC/CZOW
Angel Santiago Jr.	AFCEC/CZOW
Milton 'Gene' Clare	AFCEC/CZOW
Monika O'Sullivan	AFCEC/CZOW
William Hall (via telephone)	AFCEC/CZR
Dezso Linbrunner	USACE-Omaha
Adriana Constantinescu	RWQCB
Ben Fries	DTSC
Nadia Hollan Burke	USEPA
Indira Balkissoon (via telephone)	Techlaw, Inc.
Jeff Gamlin (via telephone)	CH2M
Colleen Reilly	CH2M
Mike Wray	CH2M

Handouts distributed at the meeting, discussions and presentations included:

Attachment 1	Meeting Agenda
Attachment 2	Master Meeting and Document Schedule
Attachment 3	SBBGWTP Monthly Data Sheet (March 2017)
Attachment 4	CGWTP Monthly Data Sheet (March 2017)
Attachment 5	ST018 Monthly Data Sheet (March 2017)
Attachment 6	Presentation: Remedy Optimizations 2017
Attachment 7	Presentation: SS014 Subsite 1 POCO TDCCR
Attachment 8	Presentation: Program Update

## **1. ADMINISTRATIVE**

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

The 15 March 2017 RPM meeting minutes were approved and finalized as written.

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

Action items from March 2017 were reviewed.

Action item 1 is ongoing: Ms. O’Sullivan to provide updates on perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). 20 April 2017: Ms. O’Sullivan said that a Travis AFB site-specific QAPP has been drafted and is currently in internal review. It is scheduled to go out to the regulators for review in mid-May. Ms. O’Sullivan added in order to conduct the fieldwork this season she will be requesting a 30-day review period. Mr. Linbrunner asked if they are using the existing base-wide QAPP or at least utilizing parts of it where it makes sense. Mr. Duke said the QAPP needs to be specific to this type of fieldwork because PFOS/PFOA is so unique.

### **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 meeting, which will be held on Wednesday, 17 May 2017, at 0930 hours.

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

- Site TS060 Removal Action Work Plan: The Final Due date was changed to 31 March 2017 to reflect the actual date.
- Community Involvement Plan (CIP): No change was made to the schedule.
- Work Plan for the Fourth Five-year Review: Scoping Meeting and Predraft to AF/Service Center date was changed to to-be-determined (TBD).
- Potrero Hills Annex (FS, PP, and ROD): No change to the schedule. Ms. Constantinescu said that the Final Cleanup and Abatement Order has been signed and approved.

- Site LF044 Investigation Work Plan: Travis AFB is working on EPA responses to comments (RTCs).
- Site SS016, SD033, SD043, and SS046 Risk Assessment Technical Memorandum: No change to the schedule.
- Site FT004 POCO Soil Data Gap Investigation Work Plan: RTCs and Final Due dates were changed to 05 May 2017. Ms. Constantinescu will send comments on 28 April 2017. Mr. Wray mentioned that the field scheduled is starting in May. Ms. Constantinescu said that the issue can be discussed after the RPM meeting.
- Quarterly Newsletters (April 2017): No change was made to the schedule.
- 2016 Annual GRISR: The Agency Comments Due date changed from 10 July 2017. No other changes were made to the schedule.
- Multi-Site Technology Demonstration Construction Completion Report: Response to Comments Due and Final Due date changed to 22 March 2017 to reflect the actual dates.
- 2016 Annual CAMU Monitoring Report: Draft to Agencies date was changed to 3 May 2017, the rest of the dates were changed accordingly.
- Site SD034 Technology Demonstration Construction Completion Report: Predraft to AF/Service Center date was changed to 23 March 2017, the rest of the dates were changed accordingly.
- POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW051, OW053, and OW054: No change was made to the schedule.
- POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW040, OW047, OW048, OW049, OW052, OW055, and OW057. No change to the schedule.
- Site SS014 Subsite 1 POCO Technology Demonstration Construction Completion Report: Draft to Agencies date was changed to 12 April 2017 to reflect the actual date, and the rest of the dates were changed accordingly.
- Site ST032 POCO Well Decommissioning and Site Closeout Technical Memorandum: New document, populated with all new dates.
- Site ST028 POCO Well Decommissioning and Site Closeout Technical Memorandum: moved to history.

## **2. CURRENT PROJECTS**

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

**South Base Boundary Groundwater Treatment Plant, March 2017 (see Attachment 3)**

The South Base Boundary Groundwater Treatment Plant (SBBGWTP) performed at 100% uptime, and 3.3 million gallons of groundwater were extracted and treated during the month of March 2017. All of the treated water was discharged to Union Creek. The average flow rate for the SBBGWTP was 98.4 gallons per minute (gpm). Electrical power usage was 16,439 kWh, and approximately 12,965 pounds of CO<sub>2</sub> were created (based on DOE calculation). Approximately 1.19 pound of volatile organic compounds (VOCs) was removed in March. The total mass of VOCs removed since startup of the system is 485.2 pounds.

Optimization Activities for SBBGWTP: No optimization activities are reported for the month of March 2017.

#### **Central Groundwater Treatment Plant, March 2017 (see Attachment 4)**

The Central Groundwater Treatment Plant (CGWTP) performed at 83.8% uptime with approximately 1,431,500 gallons of groundwater extracted and treated during the month of March 2017. All treated water was discharged to the storm sewer system. The average flow rate for the CGWTP was 34.1 gpm. Electrical power usage was 2,410 kWh for all equipment connected to the Central Plant, and approximately 2,671 pounds of CO<sub>2</sub> were generated. Approximately 2.80 pounds of VOCs were removed from groundwater by the treatment plant in March. The total mass of VOCs removed since the startup of the system is 11,461 pounds.

Optimization Activities for CGWTP: No optimization activities are reported for the month of March 2017.

Note: The Site DP039 bioreactor is currently undergoing an optimization effort to determine the most effective pulse mode duration to optimize distribution of TOC in the subsurface.

#### **LF007C Groundwater Treatment Plant**

*The LF007C Groundwater Treatment Plant was taken offline as of 16 December 2016, in accordance with the US Fish and Wildlife Service requirements, due to the presence of standing water in the associated vernal pools.*

#### **ST018 Groundwater (MTBE) Treatment Plant, March 2017 (see Attachment 5)**

Site ST018 (MTBE) Treatment Plant (ST018 GWTP) performed at 99.8% uptime with approximately 383,500 gallons of groundwater extracted and treated during the month of March 2017. All treated water was discharged to the sanitary sewer system. The average flow rate for the ST018 GWTP was 7.6 gpm. Electrical power usage for the month was 228 kWh for all equipment connected to the ST018 GWTP. The total CO<sub>2</sub> equivalent, including an estimate for the carbon change-out, equates to approximately

169 pounds. Approximately 0.21 pound of BTEX, MTBE and TPH was removed in March by the treatment plant, and approximately 0.20 pound of MTBE was removed from groundwater. The total BTEX, MTBE and TPH mass removed since the startup of the system is 40.5 pounds, and the total MTBE mass removed since startup of the system is 10.1 pounds.

Note: Electrical power use at the ST018 GWTP is only for the alarm system and a pump that pushes water through the GAC vessels for treatment. The four groundwater extraction pumps in the system are all solar powered.

Optimization Activities for ST018GWTP: No optimization activities to report for the month of March 2017.

Mr. Wray said that Travis AFB will be working with the Fairfield Sanitary Sewer District (FSSD) regarding bypassing the carbon vessels during treatment of the influent within the treatment system. FSSD effluent limitations are very high compared to the detections that have been observed over the years that the system has been operating. The carbon vessels were originally installed, because the system operated under a NPDES permit.

## **Presentation:**

### **EVO Injection Optimization (see Attachment 6)**

Mr. Gamlin reported on the EVO Injection Optimization. See attachment 6 for details. Highlights included:

This presentation is a high level overview of the optimization actions we are planning in 2017 based on analytical data received from the initial performance results at sites: SS015, SD036, SD031 and FT004.

#### **Site SS015 Optimization:**

- Groundwater ROD selected emulsified vegetable oil (EVO) injection and enhanced attenuation (EA).
- The 2015 EVO injections did not reduce the concentrations as quickly as desired. We are planning a more aggressive optimization by installing additional EVO injection wells, as well as using existing injection wells that were installed in 2015. The conditions at this site are very tight given the location and subsurface utilities. However, we believe we can install six (6) more injection wells to get a better EVO radius of influence. The TCE concentrations have gone down some, and it is the DCE concentration that is not reducing as quickly as planned.
- EVO with a smaller droplet size will be used, and this injection event will include bioaugmentation. The work will be completed in a manner consistent with the RD/RA Work Plan.

Ms. Burke asked if bioaugmentation is considered part of the remedy; do we call it optimization or a pilot study. Mr. Gamlin said he considers it an optimization; it is all an enhanced reductive dechlorination (ERD) process.

#### Site SD036 Optimization:

- The Groundwater ROD selected EVO injection and EA.
- The 2016 EVO injection was successful, except that the desired effect was not observed in two areas: MW2064Ax36 and MW2075Ax36 where the concentrations are increasing and TOC did not reach these wells or is insufficient.
- The plan is to install three (3) new injection wells. Injections will be completed consistent with goals of bioaugmentation technology demonstration (TD). We will keep the EVO injections to the technology demonstration (TD) area only at this site.
- EVO with the smaller droplet size will be used to complete work in a manner consistent with the RD/RA Work Plan.

#### Site SD031 Optimization:

- The gravel chimney subgrade biogeochemical reactor (SBGR) technology demonstration is in 1,1-DCE area greater than 20 µg/L.
- The TOC dispersal has been successful to date. The downgradient area at this site has increased above 20 µg/L.
- Install four (4) additional wells for EVO injection consistent with the TD Work Plan and reinject EVO, using the smaller droplet size, in the chimneys because TOC concentrations have decreased below 10 mg/L.

Ms. Balkissoon said this is an MNA remedy site and with the increased concentration how do you know the plume isn't stable? Mr. Gamlin said this is the only site where we had increased concentrations on the downgradient side. This is an MNA remedy site but we are still within the TD footprint. The pumping had just been turned back on after being off for a long time, and Mr. Gamlin thinks we are just moving the concentrations around locally.

#### Sites FT004 Optimization:

- SBGR recirculation trench technology demonstration in the TCE area greater than 20 µg/L.
- There has been limited TOC dispersal, but other indicators are favorable.
- Reinject EVO using the smaller droplet size in ~20 existing injection wells in the TCE areas above ~20 µg/L consistent with TD Work Plan.

Mr. Gamlin mentioned a recent publication featured in Wikipedia that CH2M was invited to write. The article features two SBGR's at Travis AFB. The link is provided below.

## **Site SS014 Drywall SBGR Installation (see Attachment 7)**

Mr. Gamlin reported on Site SS014 Technology Demonstration. Highlights included (see attachment for photos):

The presentation will cover Travis AFB SS014 drywall SBGR installation.

Site SS014 technology demonstration:

- SBGR for remediation of fuel contamination. This design was based on internally-funded CH2M bench scale research. Drywall was used as a safe and sustainable source of sulfate.
- The SBGR is filled with gravel, scraps of drywall, wheat straw, and iron pyrite gravel to support enhanced biodegradation of fuel contamination. The iron pyrite is used to control hydrogen sulfide.
- Gypsum is a good source of sulfate. Dissolved sulfate is good for reducing bacteria that degrade petroleum contamination. Wheat straw is good growth substrate for the sulfate reducing bacteria. Iron pyrite gravel is used as a control method, as the sulfate reducing pathway will generate hydrogen sulfide and methane. And in the presence of iron, the hydrogen sulfide gas will turn into a solid and will precipitate out as iron sulfide.
- Before installation of the SBGR, baseline samples were collected: TPH/diesel was at 5,500 µg/L and TPH/gas 1,900 µg/L. We sampled again in the well that was installed just below the reactor and the analytes were both non-detect. The first performance samples will be collected in April 2017.
- This SBGR is powered by solar panels and is 100 percent off the grid.

Ms. Balkissoon asked if the drywall was sampled before the application. Mr. Gamlin said yes, confirmation samples were collected before installation and analyzed using TCLP and STLC methods for metals.

Ms. Constantinescu asked if we had groundwater quality data downgradient. Mr. Gamlin said yes, we collected baseline samples for the chemicals of concern (COC), and two wells were sampled for sulfate reducing bacteria. We will collect samples later to evaluate if those populations increase.

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

Mr. Wray reported on the status of fieldwork and documents which are completed, in progress, and upcoming. Updates from the briefing this month included:

Newly Completed Documents: Site TS060 Removal Action Work Plan, Multisite Technology Demonstration Construction Completion Report.

Newly Completed Fieldwork: None.

In-Progress Documents (CERCLA): Community Involvement Plan; Site TS060 Removal Action Work Plan; Site LF044 Investigation Work Plan; Multisite Technology Demonstration Construction Completion Report.

In-Progress Documents (POCO): Site FT004 POCO Soil Data Gap Investigation Work Plan; POCO Evaluation/Closeout Report for DERA-funded oil/water separators OW051, OW053, and OW054.

In-Progress Fieldwork (CERCLA): None.

In-Progress Fieldwork (POCO): None.

Planned Documents (CERCLA): 2016 Annual CAMU Monitoring Report (March); SD034 Technology Demonstration Construction Completion Report (April); 2016 Annual GRISR (June); SS016, SD033, SD043, SS046 Risk Assessment Tech Memo (TBD); Work Plan for Fourth Five-year Review (TBD).

Planned Documents (POCO): Site SS014 POCO Technology Demonstration Construction Completion Report (March); POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW040, OW047, OW048, OW049, OW052, OW055, and OW057 (March); ST032 POCO Well Decommissioning and Site Closeout Technical Memorandum (April).

Fieldwork Planned (CERCLA): Q2 2017 GRIP Sampling Event (April); DP039 Installation of Down-gradient Monitoring Wells (May); SD031 Finish Soil Delineation (NE portion of site) (May); Site LF044 Sediment Sampling (2017); Site TS060 Removal Action (2017).

Fieldwork Planned (POCO): Site FT004 POCO Soil Data Gap Investigation (2017); OW055 Sidewalk Repairs (2017); OW056 Site Excavation/Closure (2017); OW050 Soil Sampling a Former Location of OWS (May).

### **Technology Demonstration Projects:**

- SS014: Recycled Drywall Subgrade Biochemical Reactor “SBGR”.
  - Evaluate the effectiveness of sulfate (gypsum from crushed drywall) to enhance anaerobic biodegradation of petroleum in groundwater.



- Installation to be completed November 2016.
  - Too early to evaluate performance data.
- Multisite Bioaugmentation: EVO and KB-1 Plus.
  - Evaluate if addition of bioaugmentation substrate to an EVO injection will increase the rate of CVOC degradation.
  - Injections not complete yet (Nov 2016).
  - Too early to evaluate performance data.
- SD034: Washboard SBGR.
  - Evaluate the effectiveness of an oxygen-enhanced aerobic SBGR on reducing TPH as diesel (TPH-D) in groundwater.
  - Installation to be completed November 2016.
  - Installed six (6) SBGR trenches, In process of evaluating need/constructability of installing the 7<sup>th</sup> trench.
  - Too early to evaluate performance data.
- 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.
  - Installation completed May 2016.
  - Too early to evaluate performance data.
- 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.
  - Too early to evaluate performance data.
- SD031: EVO distribution via Gravel Chimneys.
  - 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:
  - Reducing conditions have initiated as expected throughout the TD area and are supporting anaerobic degradation.
  - TOC concentrations are increasing at several wells.
  - 1,1-DCE (primary COC) concentrations have reduced by 57% (sum of key wells within TD area).
  - Total Molar concentration (sum of CVOCs) has reduced by 49% (sum of key wells within TD area).
  - Recirculation through chimneys has been successful relative to our design assumptions.

#### 4. New Action Item Review

None

## 5. PROGRAM/ISSUES/UPDATE

Mr. Duke announced that the Travis AFB Environmental Restoration Program won the General Thomas D. White Award. And... the crowd went wild!

## 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

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

The RPM face-to-face is scheduled for 2:00 PM PST on 20 April, 2017. **The call-in number is 1-866-203-7023. Enter the Participation code 5978-75-9736 then #.**

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. PROGRAM UPDATE:  
DOCUMENTS & ACTIVITIES COMPLETED, IN PROGRESS AND PLANNED
- B. REMEDY OPTIMIZATIONS 2017
- C. SS014 SUBSITE 1 POCO TDCCR

4. NEW ACTION ITEM REVIEW

5. PROGRAM/ISSUES/UPDATE

MEETING SCHEDULE

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.

**(2017)**  
**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>
—	01-18-17	—
02-15-17	—	—
—	03-15-17	—
04-20-17 (Thursday 2:00 PM)	—	04-20-17
—	05-17-17	—
06-21-17	—	—
—	07-19-17	—
08-16-17	—	—
—	09-20-17	—
10-19-17 (Thursday 2:00 PM)	—	10-19-17 <sup>2</sup>
—	11-15-17	—
—	—	—

<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 date in lieu of RAB meeting.

## Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS			
Life Cycle	Site TS060 Removal Action Work Plan Travis AFB, Glenn Anderson CH2M HILL, Doug Berwick CAPE, Meg Greenwald	Community Involvement Plan Travis AFB, Glenn Anderson CH2M HILL, Jill Dunphy	Work Plan for the Fourth Five- year Review Travis AFB, Glenn Anderson Tetrattech, Joachim Eberharter
<b>Scoping Meeting</b>	NA	NA	TBD
Predraft to AF/Service Center	04-14-16	08-23-16	TBD
AF/Service Center Comments Due	04-28-16	09-07-16	TBD
Draft to Agencies	06-20-16	09-28-16	TBD
Draft to RAB	06-20-16	09-28-16	TBD
Agency Comments Due	07-27-16	10-28-16 (11-28-16)	TBD
<b>Response to Comments Meeting</b>	<b>08-17-16</b>	<b>TBD</b>	<b>TBD</b>
Agency Concurrence with Remedy	NA	NA	NA
Public Comment Period	NA	NA	NA
<b>Public Meeting</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>
Response to Comments Due	03-10-17	TBD	TBD
Draft Final Due	03-10-17	TBD	TBD
Final Due	04-10-17 (03-31-17)	TBD	TBD

## Travis AFB Master Meeting and Document Schedule

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

## Travis AFB Master Meeting and Document Schedule

SECONDARY DOCUMENTS		
Life Cycle	Site LF044 Investigation Work Plan Travis AFB, Glenn Anderson CH2M HILL, Doug Berwick CAPE, Meg Greenwald	Sites SS016, SD033, SD043, and SS046 Risk Assessment Technical Memorandum Travis AFB, Glenn Anderson CH2M HILL, Tony Chakurian
<b>Scoping Meeting</b>	NA	NA
Predraft to AF/Service Center	04-26-16	TBD
AF/Service Center Comments Due	05-10-16	TBD
Draft to Agencies	06-27-16	TBD
Draft to RAB	06-27-16	TBD
Agency Comments Due	07-28-16	TBD
<b>Response to Comments Meeting</b>	<b>08-17-16</b>	<b>TBD</b>
Response to Comments Due	08-31-16 (05-23-17)	TBD
Draft Final Due	NA	NA
Final Due	08-31-16 (05-23-17)	TBD
Public Comment Period	NA	NA
<b>Public Meeting</b>	<b>NA</b>	<b>NA</b>

## Travis AFB Master Meeting and Document Schedule

SECONDARY POCO DOCUMENTS	
Life Cycle	Site FT004 POCO Soil Data Gap Investigation Work Plan Travis AFB, Glenn Anderson CH2M HILL, Doug Berwick CAPE, Meg Greenwald
<b>Scoping Meeting</b>	NA
Predraft to AF/Service Center	06-03-16
AF/Service Center Comments Due	06-17-16
Draft to Agencies	07-19-16
Draft to RAB	07-19-16
Agency Comments Due	08-19-16
<b>Response to Comments Meeting</b>	<b>09-21-16</b>
Response to Comments Due	10-06-16 (05-05-17)
Draft Final Due	NA
Final Due	10-06-16 (05-05-17)
Public Comment Period	NA
<b>Public Meeting</b>	NA



## Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS		
Life Cycle	Quarterly Newsletters (April 2017) Travis, Glenn Anderson	2016 Annual GRISR Travis AFB, Glenn Anderson CH2M HILL, Leslie Royer
<b>Scoping Meeting</b>	NA	NA
Predraft to AF/Service Center	NA	04-21-17
AF/Service Center Comments Due	NA	05-22-17
Draft to Agencies	03-28-17	06-07-17
Draft to RAB	NA	06-07-17
Agency Comments Due	04-11-17	07-10-17
<b>Response to Comments Meeting</b>	<b>TBD</b>	<b>07-19-17</b>
Response to Comments Due	04-12-17	08-02-17
Draft Final Due	NA	NA
Final Due	04-13-17	08-02-17
Public Comment Period	NA	NA
<b>Public Meeting</b>	<b>NA</b>	<b>NA</b>

## Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS			
Life Cycle	Multi-Site Technology Demonstration Construction Completion Report Travis AFB, Glenn Anderson CH2M HILL, Renee Caird	2016 Annual CAMU Monitoring Report Travis AFB, Glenn Anderson CH2M HILL, Levi Pratt	Site SD034 Technology Demonstration Construction Completion Report Travis AFB, Glenn Anderson CH2M HILL, Levi Pratt
<b>Scoping Meeting</b>	NA	NA	NA
Predraft to AF/Service Center	12-15-16	02-09-17	03-23-17
AF/Service Center Comments Due	01-13-17	02-24-17	04-06-17
Draft to Agencies	01-27-17	05-03-17	04-25-17
Draft to RAB	01-27-17	05-03-17	04-25-17
Agency Comments Due	02-27-17	06-05-17	05-25-17
<b>Response to Comments Meeting</b>	<b>03-15-17</b>	<b>06-21-17</b>	<b>06-21-17</b>
Response to Comments Due	03-29-17 (3-22-17)	07-07-17	07-06-17
Draft Final Due	TBD	NA	NA
Final Due	03-29-17 (3-22-17)	07-07-17	07-06-17
Public Comment Period	NA	NA	NA
<b>Public Meeting</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>

## Travis AFB Master Meeting and Document Schedule

INFORMATIONAL POCO DOCUMENTS		
Life Cycle	POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW051, OW053, and OW054 Travis AFB, Glenn Anderson CH2M HILL, Doug Berwick	POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW040, OW047, OW048, OW049, OW052, OW055, and OW057 Travis AFB, Glenn Anderson CH2M HILL, Doug Berwick
<b>Scoping Meeting</b>	NA	NA
Predraft to AF/Service Center	11-07-16	02-01-17
AF/Service Center Comments Due	11-21-16	02-15-17
Draft to Agencies	01-19-17	03-23-17
Draft to RAB	01-19-17	03-23-17
Agency Comments Due	02-21-17	04-24-17
<b>Response to Comments Meeting</b>	<b>03-15-17</b>	<b>05-17-17</b>
Response to Comments Due	04-04-17	06-01-17
Draft Final Due	NA	NA
Final Due	04-04-17	06-01-17
Public Comment Period	NA	NA
<b>Public Meeting</b>	<b>NA</b>	<b>NA</b>

## Travis AFB Master Meeting and Document Schedule

INFORMATIONAL POCO DOCUMENTS		
Life Cycle	Site SS014 Subsite 1 POCO Technology Demonstration Construction Completion Report Travis AFB, Glenn Anderson CH2M HILL, Levi Pratt	Site ST032 POCO Well Decommissioning and Site Closeout Technical Memorandum Travis AFB, Glenn Anderson CH2M HILL, Doug Berwick
<b>Scoping Meeting</b>	NA	NA
Predraft to AF/Service Center	03-01-17	04-27-17
AF/Service Center Comments Due	03-15-17	05-11-17
Draft to Agencies	04-12-17	05-26-17
Draft to RAB	04-12-17	05-26-17
Agency Comments Due	05-12-17	06-26-17
<b>Response to Comments Meeting</b>	05-17-17	07-19-17
Response to Comments Due	06-15-17	08-04-17
Draft Final Due	NA	NA
Final Due	06-15-17	08-04-17
Public Comment Period	NA	NA
<b>Public Meeting</b>	NA	NA

## Travis AFB Master Meeting and Document Schedule

HISTORY	
Life Cycle	Site ST028 POCO Well Decommissioning and Site Closeout Technical Memorandum Travis AFB, Glenn Anderson CH2M HILL, Doug Berwick
<b>Scoping Meeting</b>	<b>NA</b>
Predraft to AF/Service Center	11-11-16
AF/Service Center Comments Due	11-28-16
Draft to Agencies	01-13-17
Draft to RAB	01-13-17
Agency Comments Due	02-13-17
<b>Response to Comments Meeting</b>	<b>02-15-17</b>
Response to Comments Due	03-01-17 (02-28-17)
Draft Final Due	NA
Final Due	03-01-17 (02-28-17)
Public Comment Period	NA
<b>Public Meeting</b>	<b>NA</b>

# South Base Boundary Groundwater Treatment Plant Monthly Data Sheet

Report Number: 197

Reporting Period: 27 February 2017 – 3 April 2017

Date Submitted: 12 April 2017

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 March 2017 reporting period.

Table 1 – Operations Summary – March 2017					
Initial Data Collection:		2/27/2017 15:45	Final Data Collection:	4/3/2017 14:20	
Operating Time:		Percent Uptime:	Electrical Power Usage:		
SBBGWTP:	839 hours	SBBGWTP:	100%	SBBGWTP:	16,439 kWh (12,965 lbs CO <sub>2</sub> generated <sup>a</sup> )
Gallons Treated: 5.0 million gallons			Gallons Treated Since July 1998: 966 million gallons		
Volume Discharged to Union Creek: 5.0 million gallons			Gallons Treat From Other Sources: 0 gallons		
VOC Mass Removed: 1.19 lbs <sup>b</sup>			VOC Mass Removed Since July 1998: 485.2 lbs		
Rolling 12-Month Cost per Pound of Mass Removed: \$11,240 <sup>c</sup>					
Monthly Cost per Pound of Mass Removed: \$12,090 <sup>c</sup>					
lbs = pounds					
<sup>a</sup> SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG. Value also includes approximately 800 pounds of GHG from GAC change out.					
<sup>b</sup> Calculated using March 2017 EPA Method SW8260C analytical results.					
<sup>c</sup> Costs include operations and maintenance, 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> – March 2017							
FT005 <sup>b</sup>				SS029		SS030	
EW01x05	Offline	EW736x05	Offline	EW01x29	3.8	EW01x30	12.9
EW02x05	Offline	EW737x05	Offline	EW02x29	3.9	EW02x30	4.6
EW03x05	Offline	EW742x05	Offline	EW03x29	4.2	EW03x30	6.5
EW731x05	5.5	EW743x05	5.8	EW04x29	2.0	EW04x30	24.4
EW732x05	Offline	EW744x05	Offline <sup>c</sup>	EW05x29	25.0	EW05x30	18.1
EW733x05	Offline	EW745x05	Offline <sup>c</sup>	EW06x29	Offline <sup>c</sup>	EW2174x30	9.8
EW734x05	Offline <sup>c</sup>	EW746x05	Offline	EW07x29	12.7	EW711x30	Offline <sup>c</sup>
EW735x05	1.2	EW2291x05	5.6				
FT005 Total: 18.1				SS029 Total: 51.6		SS030 Total: 76.3	
SBBGWTP Average Monthly Flow <sup>d</sup> : 98.4 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> These extraction wells are offline due to pump or other malfunction.							
<sup>d</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	None.	--		--	None.
-- = Time not recorded <sup>a</sup> Shutdown and restart times estimated based on field notes SBBGWTP = South Base Boundary Groundwater Treatment Plant					

## Summary of O&M Activities

Analytical data from the 1 March 2017 sampling event are presented in Table 4. The total VOC concentration (28.75 µg/L) in the influent sample has increased from the February 2017 sample results (22.32 µg/L). TCE (24.9 µg/L), cis-1,2-DCE (1.43 µg/L), 1,2-DCA (0.24 µg/L), and chloroform (0.23 µg/L) were detected at the influent sampling location. No VOCs were detected at the midpoint and effluent sampling locations. Acetone was detected in all three treatment plant samples; however, acetone is a common laboratory contaminant and not likely a contaminant of concern.

In March 2017, troubleshooting was performed on several Site FT005, SS029, and SS030 extraction wells. The following list presents the maintenance activities and status of several extraction wells:

- Periodically in March, all the SS030 wells were temporarily shut down to replace communication/signal wires.
- On 7 March, all the SS029 wells were temporarily shut down to replace communication and power wires at EW07x29.
- EW734x05 – Installed a new pump; however, the extraction well remains off line while troubleshooting the wiring faults.
- EW743x05 – Well is currently operating; however, its pressure transducer needs to be replaced.
- EW745x05 – Off line because of low flow. Possible flow meter malfunction.
- EW06x29 – Off line because of communication failure.
- EW07x29 – Installed new conduit and power wires. Well is currently operating.
- EW03x30 – Replaced flow meter fitting. Well is currently operating.
- EW04x30 – Installed new piping, transducer and signal wires. Well is currently operating.
- EW711x30 – Replaced a section of corroded signal wires; however, additional troubleshooting is required. Well remains off line.

Figure 1 presents a plot of influent concentrations and average flow at the SBBGWTP over the past twelve (12) months. An overall decrease in the VOC influent concentration has been observed in the past twelve months; however, the flow rate has remained relatively steady.

## Optimization Activities

No optimization activities occurred at the SBBGWTP in March 2017.

## 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 2 presents the historical GHG production from the SBBGWTP. In March 2017, the SBBGWTP produced approximately 12,965 pounds of GHG, which includes approximately 800 pounds of GHG generated from changing out the GAC.



TABLE 4

Summary of Groundwater Analytical Data For March 2017 – South Base Boundary Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	1 March 2017 (µg/L)		
				Influent	Midpoint	Effluent
Halogenated Volatile Organics						
Acetone	NA	1.0	0	1.95 J	2.04 J	2.79 J
Bromodichloromethane	NA	0.15	0	ND	ND	ND
Carbon Tetrachloride	0.5	0.15	0	ND	ND	ND
Chloroform	5.0	0.15	0	0.23 J	ND	ND
Chloromethane	NA	0.15	0	ND	ND	ND
1,1-Dichloroethane	5.0	0.15	0	ND	ND	ND
1,2-Dichloroethane	0.5	0.15	0	0.24 J	ND	ND
1,1-Dichloroethene	5.0	0.15	0	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.15	0	1.43	ND	ND
trans-1,2-Dichloroethene	5.0	0.15	0	ND	ND	ND
Methylene Chloride	5.0	0.15	0	ND	ND	ND
Tetrachloroethene	5.0	0.15	0	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.15	0	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.15	0	ND	ND	ND
Trichloroethene	5.0	0.15	0	24.9	ND	ND
Vinyl Chloride	0.5	0.15	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	1.0	0.15	0	ND	ND	ND
Ethylbenzene	5.0	0.15	0	ND	ND	ND
Toluene	5.0	0.15	0	ND	ND	ND
Xylenes	5.0	0.15 – 0.30	0	ND	ND	ND
Other						
Total Petroleum Hydrocarbons – Gasoline	50	35	0	ND	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	24	0	ND	NM	ND
1,4-Dioxane	NA	0.084	0	NM	NM	ND

\* In accordance with Appendix B of the Travis AFB South Base Boundary Groundwater Treatment Plant Operations and Maintenance Manual (CH2M HILL, 2004).

## 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

mg/L = milligrams per liter

NA = not applicable

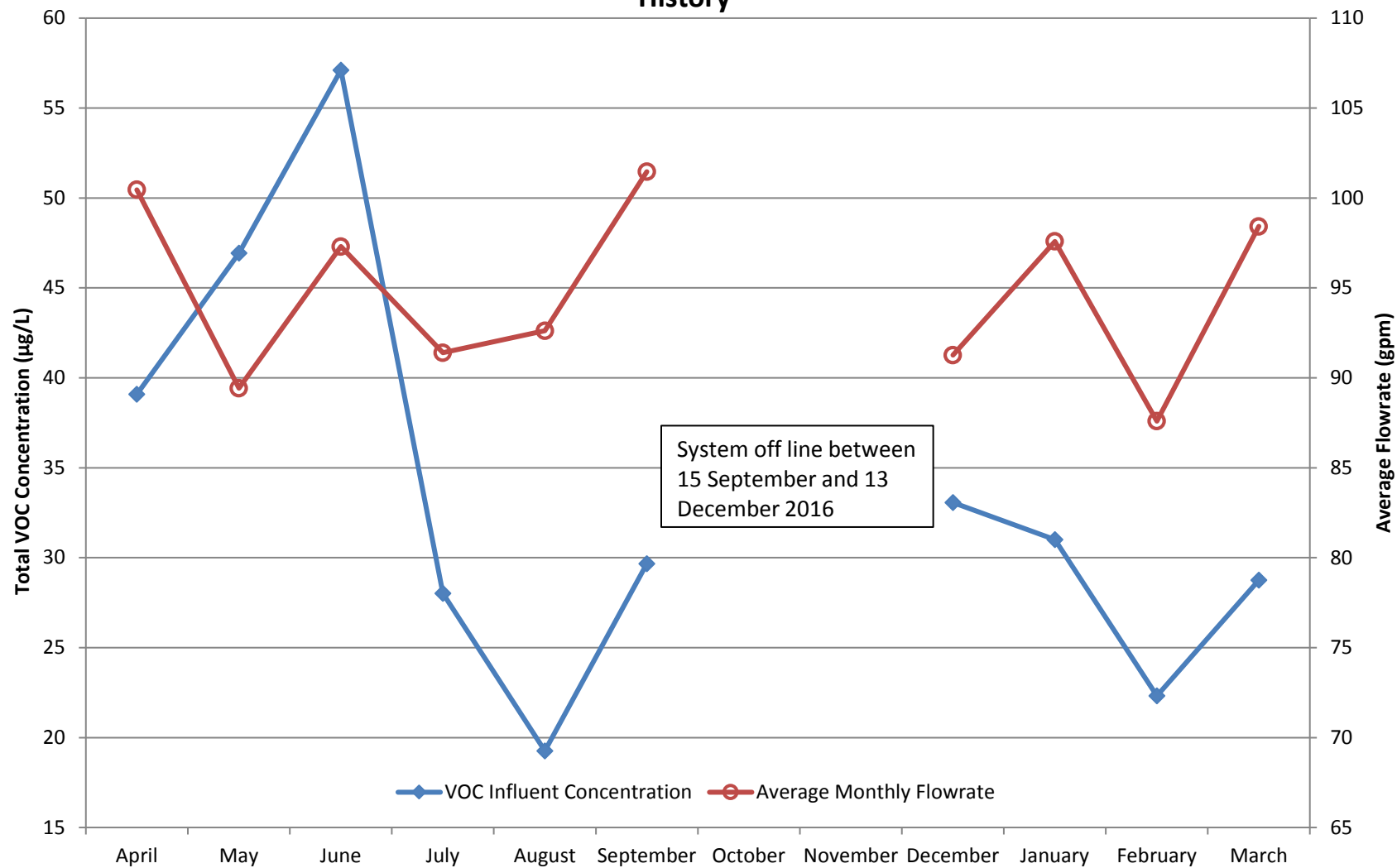
N/C = number of samples out of compliance with discharge limits

ND = not detected

NM = not measured

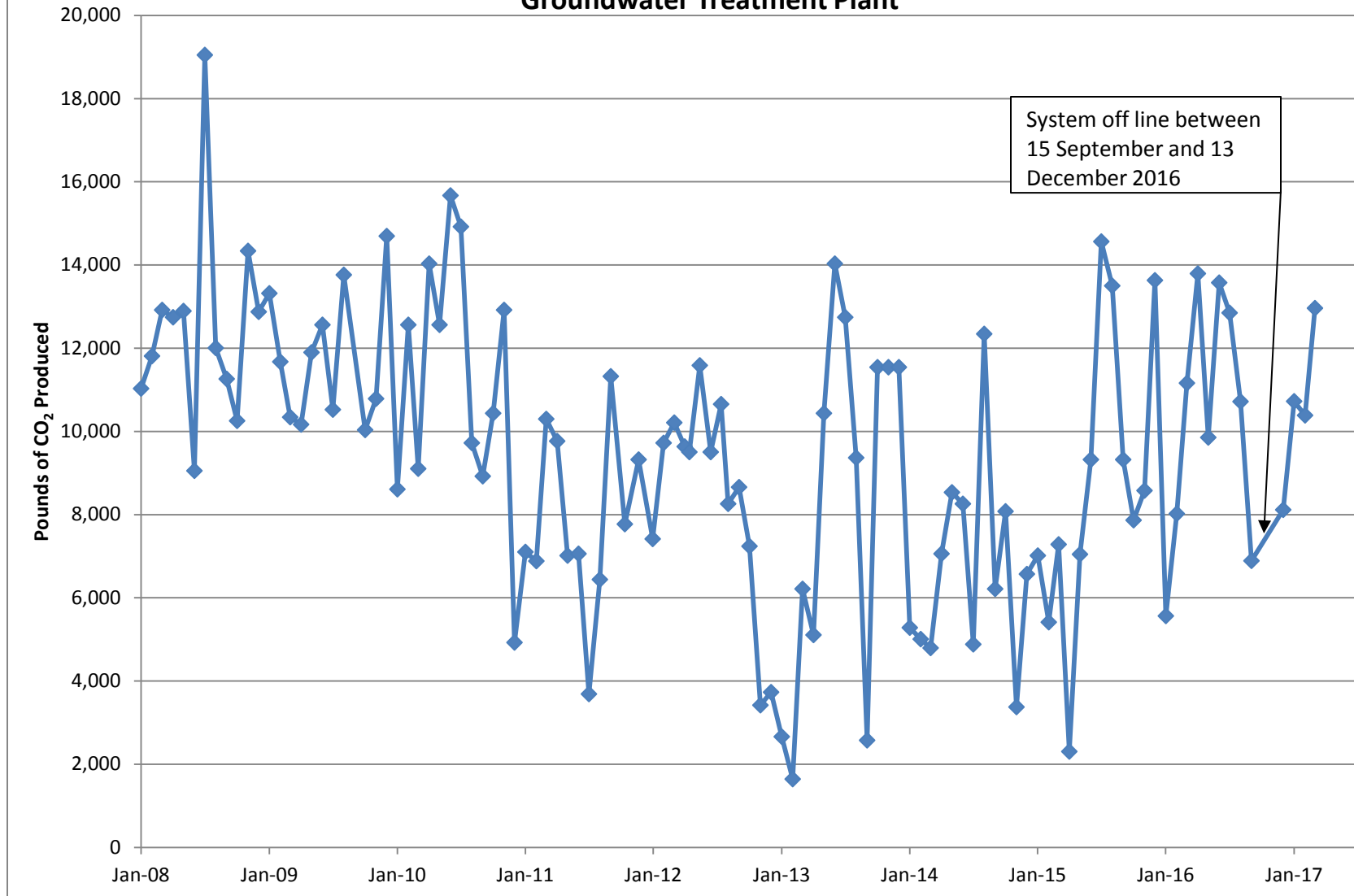
µg/L = micrograms per liter

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



**Figure 2**

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



# Central Groundwater Treatment Plant Monthly Data Sheet

Report Number: 212

Reporting Period: 27 February 2017 – 3 April 2017

Date Submitted: 12 April 2017

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 March 2017 reporting period.

Table 1 – Operations Summary – March 2017				
Initial Data Collection:		2/27/2017 14:20	Final Data Collection:	4/3/2017 10:00
Operating Time:		Percent Uptime:	Electrical Power Usage:	
CGWTP:	700 hours	CGWTP:	83.8%	CGWTP: 2,410 kWh (2,671 lbs CO <sub>2</sub> generated <sup>a</sup> )
Gallons Treated (discharge to storm sewer):		Gallons Treated Since January 1996: <b>539.2 million gallons</b>		
<b>1,431,500 gallons</b>				
VOC Mass Removed from groundwater:		VOC Mass Removed Since January 1996:		
<b>2.80 lbs<sup>b</sup></b>		<b>2,775 lbs from groundwater</b>		
		<b>8,686 lbs from vapor</b>		
Rolling 12-Month Cost per Pound of Mass Removed: \$2,337 <sup>c</sup>				
Monthly Cost per Pound of Mass Removed: \$2,151 <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.				
<sup>b</sup> Calculated using March 2017 EPA Method SW8260C analytical results.				
<sup>c</sup> Costs include operations and maintenance, 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> – March 2017	
Location	Average Flow Rate Groundwater (gpm)
EW001x16	14.2
EW002x16	11.3
EW003x16	0.1
EW605x16	6.5
EW610x16	3.0
CGWTP	34.1
<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	17 March 2017	19:00	20 March 2017	16:20	Unknown.
CGWTP	20 March 2017	17:00	23 March 2017	10:40	High water level in influent tank.
CGWTP	27 March 2017	09:00	27 March 2017	09:30	Install new hour meter.
-- = 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 samples were collected at the CGWTP on 1 March 2017. Sample results are presented in Table 4. The total VOC concentration (235.11 µg/L) in the March 2017 influent sample has decreased from the February 2017 sample (257.70 µg/L). TCE was the primary VOC detected in the influent sample at a concentration of 200 µg/L. Cis-1,2-DCE (5.40 µg/L) was detected in the sample collected after the first carbon vessel. Vinyl chloride was detected at a trace concentration in the sample collected after the second carbon vessel. No VOC constituents were detected in the effluent sample. Acetone was detected in all four treatment plant samples; however, acetone is a common laboratory contaminant and not likely a contaminant of concern. Travis AFB will continue to monitor influent, midpoint, and effluent concentrations at the CGWTP for carbon breakthrough, though the carbon treatment remained effective in March 2017.

The CGWTP shut down three (3) times in March 2017. Because of a malfunctioning hour meter, it is unknown when the system was shut down the first two times; an approximate shut down time was estimated. In both instances, the CGWTP was reset and the system was restarted without issue. The third shutdown was to install a new hour meter.

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 concentration has displayed a slightly decreasing trend over the past year. However, the overall flow rate through the treatment plant has increased over the past 12 months.

The Site DP039 subgrade biogeochemical reactor (SBGR), also known as a bioreactor, continued to operate in a “pulsed mode” in an effort to optimize distribution of total organic carbon (TOC). During this optimization effort, the pulsed mode operation will consist of three (3) different time scales: one week, two week, and four week pulsed modes. Samples will be collected after each round of pulsed mode operation. This will help determine which duration of each pulsed mode cycle of the SBGR is most effective.

On 7 March, the bioreactor completed the first round of the four-week operational cycle (four weeks on, four weeks off, four weeks on). The bioreactor will remain off line for four weeks. Groundwater samples will be collected from several DP039 monitoring wells after the twelve-week test in May 2017.

## Optimization Activities

No optimization activities occurred at the CGWTP in March 2017. As discussed above, the Site DP039 bioreactor is currently undergoing an optimization effort to determine the most effective pulse mode duration to optimize distribution of TOC in the subsurface.

# 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 2,671 pounds of GHG during March 2017. This is an increase from the February 2017 amount of 2,535 pounds.

TABLE 4

Summary of Groundwater Analytical Data for March 2017 – Central Groundwater Treatment Plant

				1 March 2017 (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	1.0	0	2.90 J	2.48 J	1.70 J	3.10 J
Carbon Tetrachloride	0.5	0.15	0	ND	ND	ND	ND
Chloroform	5.0	0.15	0	ND	ND	ND	ND
Chloromethane	NA	0.15	0	ND	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.15	0	29.5	5.40 J	ND	ND
1,2-Dichlorobenzene	5.0	0.15	0	ND	ND	ND	ND
1,3-Dichlorobenzene	5.0	0.15	0	ND	ND	ND	ND
1,4-Dichlorobenzene	5.0	0.15	0	ND	ND	ND	ND
1,1-Dichloroethane	5.0	0.15	0	ND	ND	ND	ND
1,2-Dichloroethane	0.5	0.15	0	ND	ND	ND	ND
1,1-Dichloroethene	5.0	0.15	0	0.39 J	ND	ND	ND
Methylene Chloride	5.0	0.15	0	ND	ND	ND	ND
Methyl tert-Butyl Ether	1.0	0.15	0	ND	ND	ND	ND
Tetrachloroethene	5.0	0.15	0	0.25 J	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.15	0	ND	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.15	0	ND	ND	ND	ND
trans-1,2-Dichloroethene	5.0	0.15	0	2.07	ND	ND	ND
Trichloroethene	5.0	0.15 – 1.5	0	200	ND	ND	ND
Vinyl Chloride	0.5	0.15	0	ND	ND	0.18 J	ND
Non-Halogenated Volatile Organics							
Benzene	1.0	0.15	0	ND	ND	ND	ND
Ethylbenzene	5.0	0.15	0	ND	ND	ND	ND
Toluene	5.0	0.15	0	ND	ND	ND	ND
Total Xylenes	5.0	0.15 – 0.30	0	ND	ND	ND	ND
Other							
Total Petroleum Hydrocarbons – Gasoline	50	35	0	ND	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	24.1	0	ND	NM	NM	ND
Total Petroleum Hydrocarbons – Motor Oil	50 (trigger)	24.1	0	ND	NM	NM	ND
1,4-Dioxane	NA	0.081	0	NM	NM	NM	ND

\* In accordance with Appendix G of the Travis AFB Central Groundwater Treatment Plant Operations and Maintenance Manual (URS Group, Inc., 2002).

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

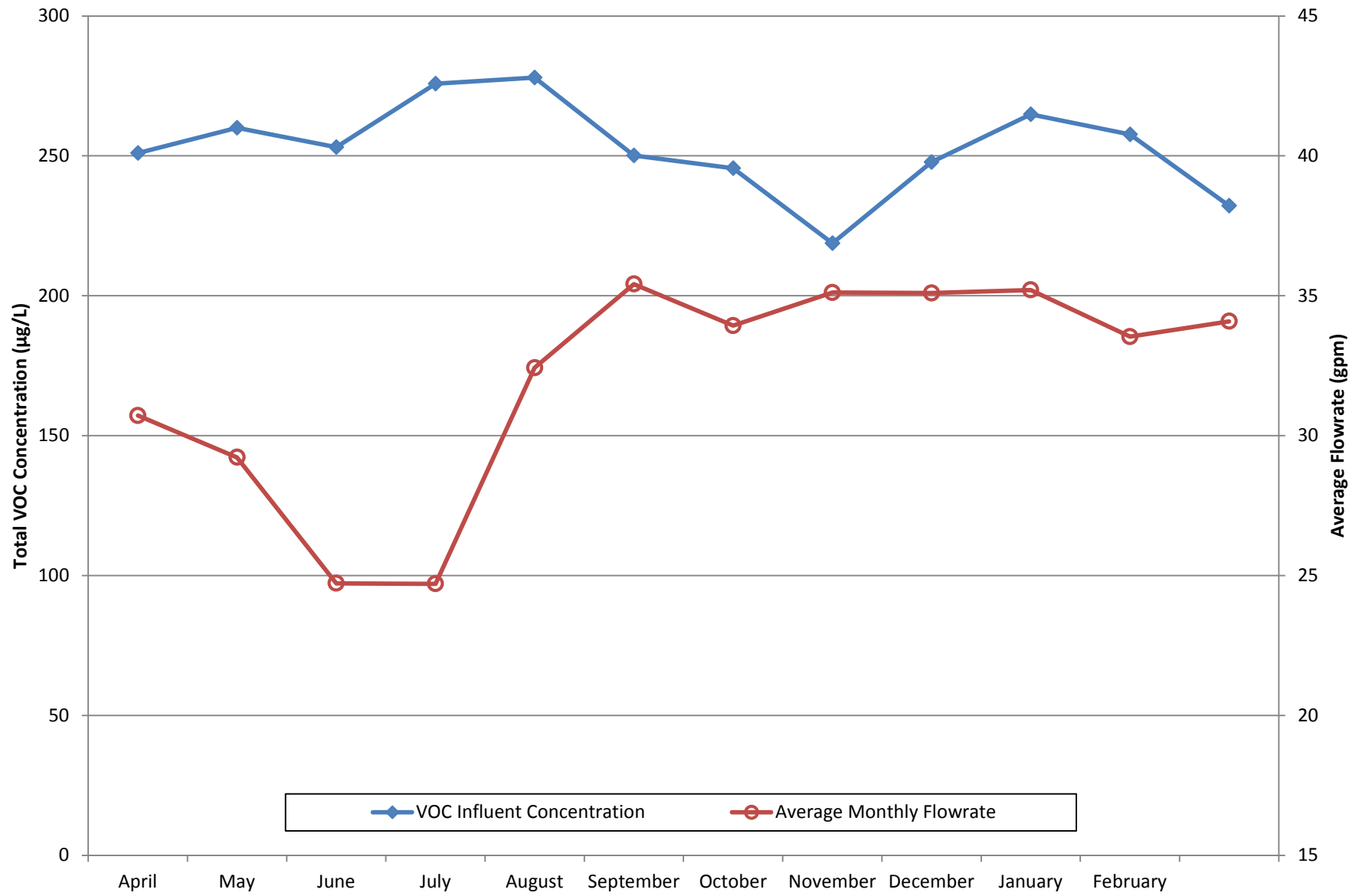
Table 5 presents a twelve month summary of the Site DP039 bioreactor recirculation well pulsing dates.

<b>Table 5 – Summary of DP039 Bioreactor “Pulsed Mode” Operations</b>		
<b>Location</b>	<b>Pulse-on Date</b>	<b>Pulse-off Date</b>
MW750x39	11 March 2016	28 March 2016
	8 April 2016	22 April 2016
	4 May 2016	13 May 2016
	27 May 2016	17 June 2016
	1 July 2016	19 July 2016
	2 August 2016	12 August 2016
	26 August 2016	8 September 2016
	10 October 2016	17 October 2016
	25 October 2016	2 November 2016
	29 November 2016	13 December 2016
	27 December 2016	10 January 2017
	7 February 2017	7 March 2017
MW = Monitoring Well		



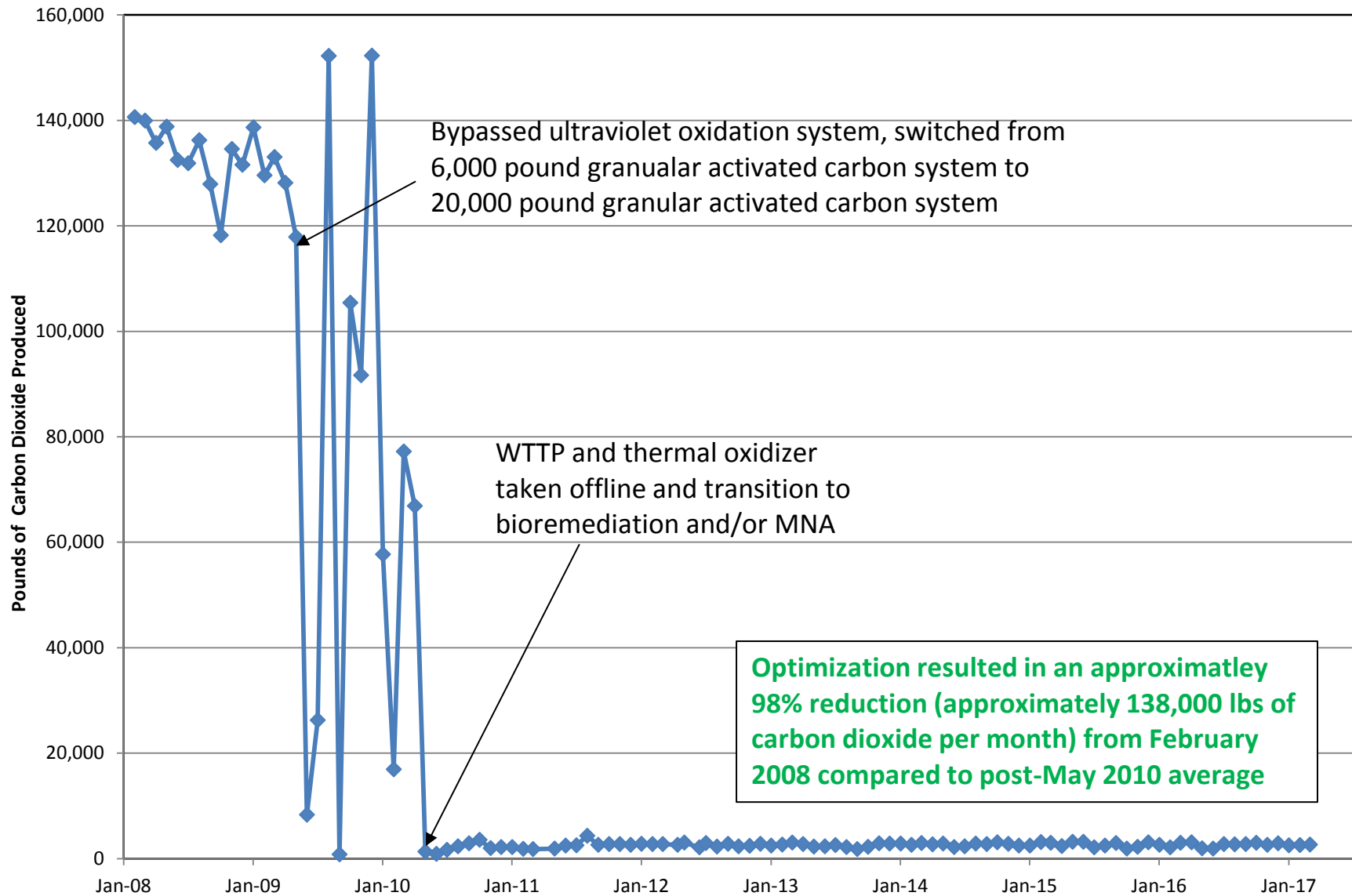
**Figure 1**

**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**



# Site ST018 Groundwater Treatment Plant

## Monthly Data Sheet

Report Number: 073

Reporting Period: 27 February 2017 – 3 April 2017

Date Submitted: 12 April 2017

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

## System Metrics

Table 1 presents operation data from the March 2017 reporting period.

**Table 1 – Operations Summary – March 2017**

<b>Initial Data Collection:</b> 2/27/2017 13:30	<b>Final Data Collection:</b> 4/3/2017 13:30
Operating Time:	Percent Uptime:
<b>ST018GWTP:</b> 838 hours	<b>ST018GWTP:</b> 99.8%
	Electrical Power Usage:
	<b>ST018GWTP:</b> 228 kWh (169 lbs CO <sub>2</sub> generated <sup>a</sup> )
Gallons Treated: <b>383,500 gallons</b>	Gallons Treated Since March 2011: <b>12.2 million gallons</b>
Volume Discharged to Sanitary Sewer: <b>383,500 gallons</b>	Final Totalizer Reading: <b>12,152,089 gallons</b>
Cumulative Volume Discharged to Sanitary Sewer since 1 November 2014: <b>5,655,915 gallons</b>	
MTBE, BTEX, VOC, TPH Mass Removed: <b>0.21 lbs<sup>b</sup></b>	MTBE, BTEX, VOC, TPH Mass Removed Since March 2011: <b>40.5 lbs</b>
MTBE (Only) Removed: <b>0.20 lbs<sup>b</sup></b>	MTBE (Only) Mass Removed Since March 2011: <b>10.1 lbs</b>
Rolling 12-Month Cost per Total Pounds of Mass Removed: \$18,024 <sup>bc</sup>	
Monthly Cost per Pound of Mass Removed: \$27,714 <sup>bc</sup>	

<sup>a</sup> SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG.

<sup>b</sup> Calculated using March 2017 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 – March 2017</b>		
<b>Location</b>	<b>Average Flow Rate Groundwater (gpm)<sup>a</sup></b>	<b>Hours of Operation</b>
EW2014x18	1.3	604
EW2016x18	1.5	838
EW2019x18	2.1	762
EW2333x18	2.1	838
Site ST018 GWTP	7.6	838
<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	9 March 2017	07:45	9 March 2017	09:45	Repair drop pipe at EW2014x18.
-- = 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 treatment samples were collected at the ST018GWTP on 1 March 2017. Results are presented in Table 4. The complete March 2017 laboratory data report is available upon request. The influent concentration for MTBE during the March 2017 sampling event was 64.5 J µg/L, which is an increase from the February 2017 sample result of 53.9 µg/L. Benzene (0.36 J µg/L), ethylbenzene (0.19 J µg/L), m,p-xylene (1.72 J µg/L), o-xylene (0.38 J µg/L), 1,2-DCA (0.99 J µg/L) and TCE (0.18 J µg/L) were also detected in the influent sample. MTBE was detected after the second carbon vessel sampling location and in the system effluent sampling location at concentrations of 1.09 J µg/L and 1.94 J µg/L, respectively. No TPH-g, TPH-d, or other fuel-related constituents were detected in any of the treatment plant samples. During the time of the sampling, EW2014x18 was off line.

All concentrations of TPH are well below the Fairfield-Suisun Sewer District effluent limitation of 50,000 µg/L, or 100,000 µg/L for TPH-mo. Additionally, the Fairfield-Suisun Sewer District does not currently have a local 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 influent contaminant concentrations and will reinstate groundwater treatment as necessary to maintain compliance with the Fairfield-Suisun Sewer District discharge permit.

Figure 1 presents plots of the average flow rate and influent total contaminant (MTBE, TPH-g, TPH-d, TPH-mo, BTEX, and VOCs) and MTBE concentrations at the ST018GWTP over the past twelve (12) months. The average flow rate through the ST018GWTP has been steadily decreasing between April 2016 and January

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2017; however, flow rates increased in February and March 2017. The total influent concentrations has been decreasing since April 2016, which was largely because of the TPH-g concentration. The MTBE concentration in the system influent has generally been decreasing slightly over the past 12 months, although there was an increase in February and March 2017.

On 9 March 2017, EW2014x18 was inspected and the effluent piping from the extraction pump within the well was found to have been disconnected. The drop pipe was re-connected and the well was restarted without issue. The ST018GWTP was shut down for approximately 2 hours during this repair. In addition, EW2019x18 was periodically off line in March because the well was recharging.

## Optimization Activities

No optimization activities occurred at the ST018GWTP in March 2017.

## 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 228 pounds of GHG during March 2017 and treated 383,500 gallons of water, which was a significant increase from February 2017 (101 pounds, treating 174,370 gallons). The amount of GHG produced is directly attributed to the amount of water treated through the system because the only line-power electrical use is for a transfer pump through the GAC system.

TABLE 4

Summary Of Groundwater Analytical Data for March 2017– Site ST018 Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	1 March 2017 (µg/L)			
				Influent	After Carbon 1	After Carbon 2	System Effluent
Fuel Related Constituents							
Methyl tert-Butyl Ether	6,400	0.15	0	64.5 J	NM	1.09 J	1.94
Benzene	25,000 <sup>a</sup>	0.15	0	0.36 J	NM	ND	ND
Ethylbenzene	25,000 <sup>a</sup>	0.15	0	0.19 J	NM	ND	ND
Toluene	25,000 <sup>a</sup>	0.15	0	ND	NM	ND	ND
Total Xylenes	25,000 <sup>a</sup>	0.15 – 0.30	0	2.10 J	NM	ND	ND
Total Petroleum Hydrocarbons – Gasoline	50,000 <sup>b</sup>	35	0	ND	ND	NM	ND
Total Petroleum Hydrocarbons – Diesel	50,000 <sup>b</sup>	24	0	ND	ND	NM	ND
Total Petroleum Hydrocarbons – Motor Oil	100,000	24	0	ND	ND	NM	ND
Other							
Acetone	NA	1.0	0	ND	NM	1.8 J	ND
1,2-Dichloroethane	20	0.15	0	0.99 J	NM	ND	ND
Trichloroethene	20	0.15	0	0.18 J	NM	ND	ND

\* In accordance with the Fairfield-Suisun Sewer District Effluent 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

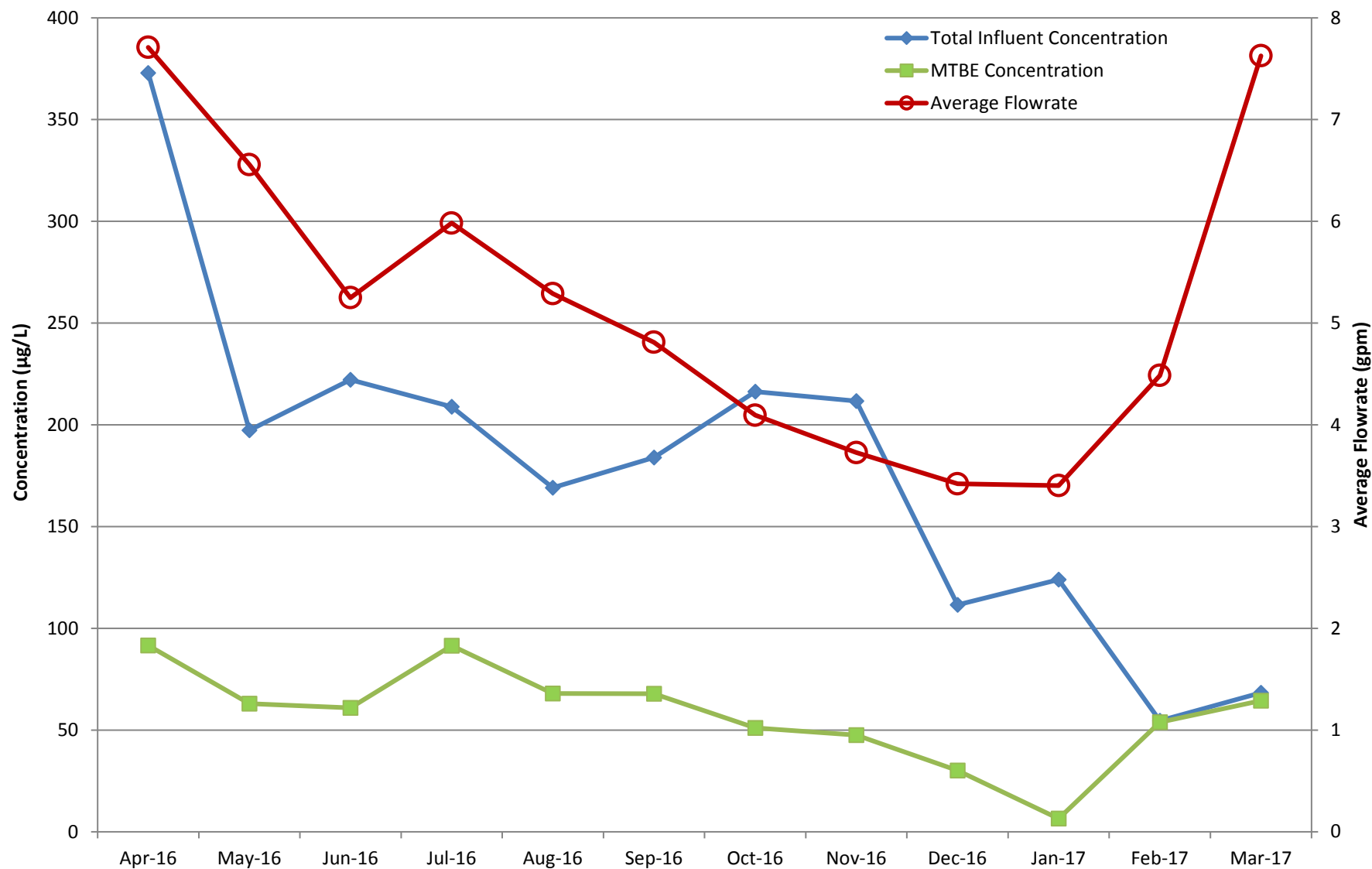
NA = not applicable

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

ND = not detected above method detection limit

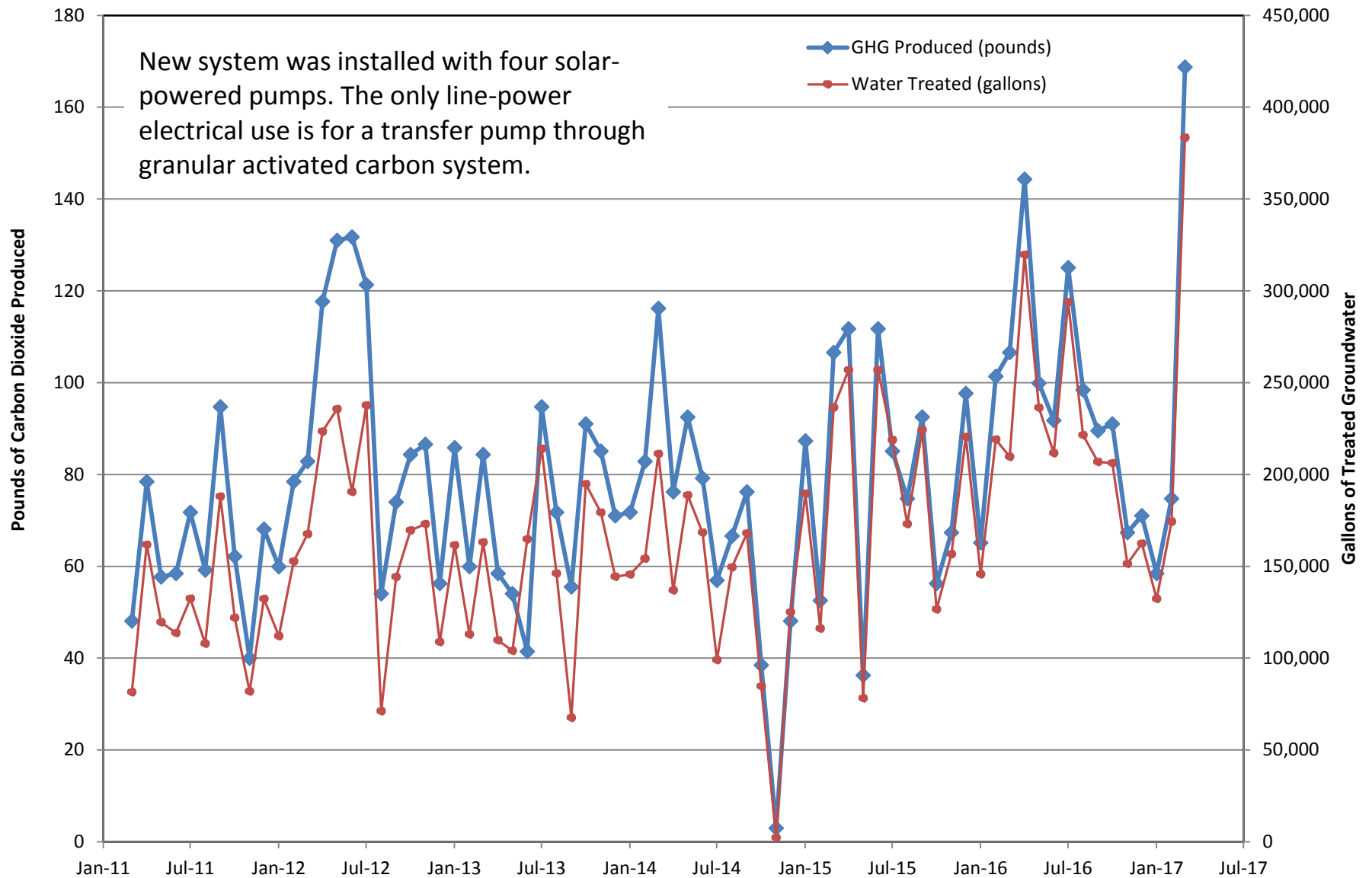
NM = not measured this month

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



## Figure 2

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





## EVO Injection Optimization RPM Triad Discussion



Delivering Sustainable Solutions to Complex Local Challenges, Worldwide

## Presentation Overview

- We are planning optimization actions in 2017 based on initial performance results at sites:
  - SS015
  - SD036
  - SD031
  - FT004



2

## SS015 Background

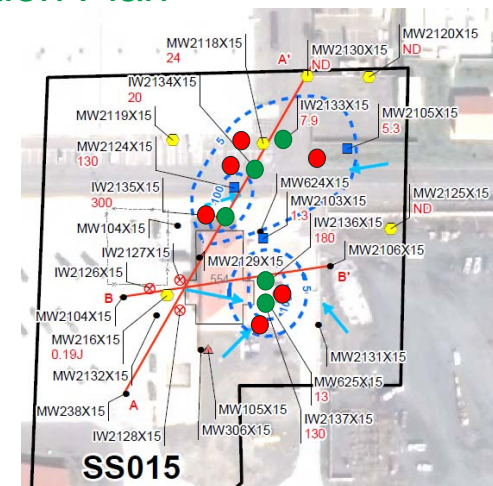
- Groundwater ROD selected EVO injection and EA
- 2015 EVO injection did not reduce concentrations as quickly as desired
  - We are planning for aggressive optimization
  - Install additional EVO injection wells
  - Complete additional injections in 2017



3

## SS015 Injection Plan

- New Injection Well (Red dot)
- Existing Injection Well (Green dot)
- Use EVO with smaller droplet size and include bioaugmentation
- Complete work in a manner consistent with RD/RA Work Plan



4

## SD036 Background

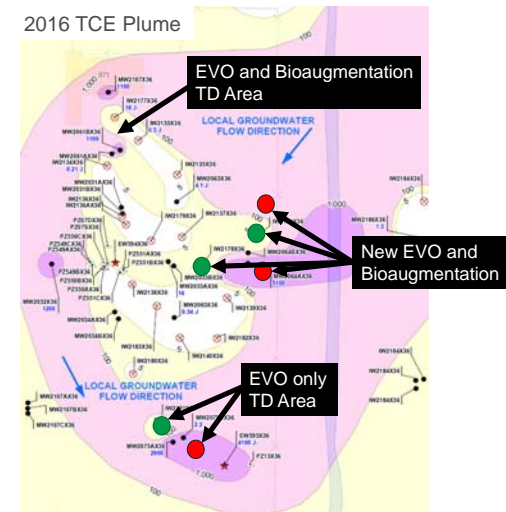
- Groundwater ROD selected EVO injection and EA
- 2016 EVO injection successful, except desired effect not observed in two areas
  - MW2064Ax36 concentrations are increasing and TOC did not reach this well
  - MW2075Ax36 also increasing and insufficient TOC



5

## SD036 Injection Plan

- Install 3 new injection wells
- Inject in 3 new injection wells
- Recomplete injections consistent with goals of Bioaugmentation TD
- Use EVO with smaller droplet size
- Complete work in a manner consistent with RD/RA Work Plan



6

## SD031 Background

- Gravel Chimney SBGR Technology Demonstration in 1,1-DCE area greater than 20 ug/L
- TOC dispersal has been successful to date
- Downgradient area has increased above 20 ug/L
  - Install 4 additional wells for EVO injection consistent with TD Work Plan
  - Reinject EVO in chimneys since TOC concentrations have decreased below 10 mg/L

7

## Site SD031 Recirculation Layout

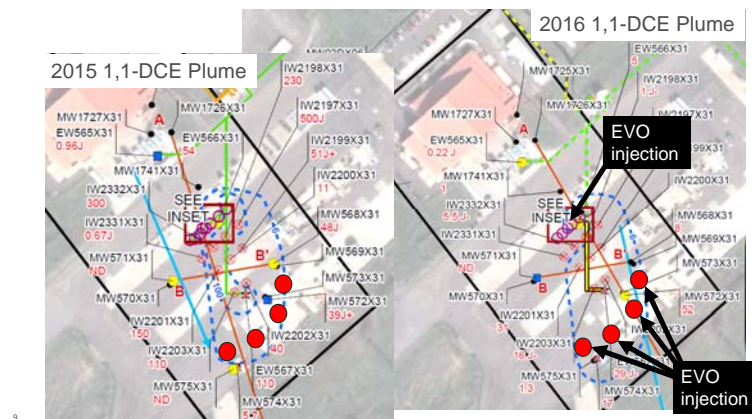
- Infiltration Chimneys
- Injection Wells
- Extraction Wells



8

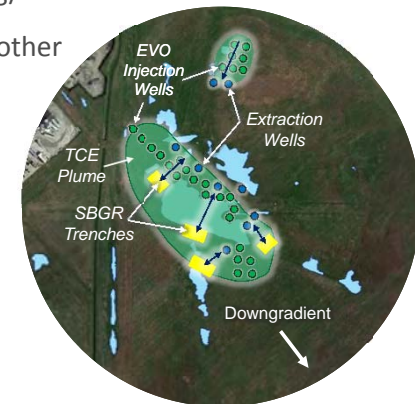
## SD031 Injection Plan

- Install 4 new injection wells
- Use EVO with smaller droplet size



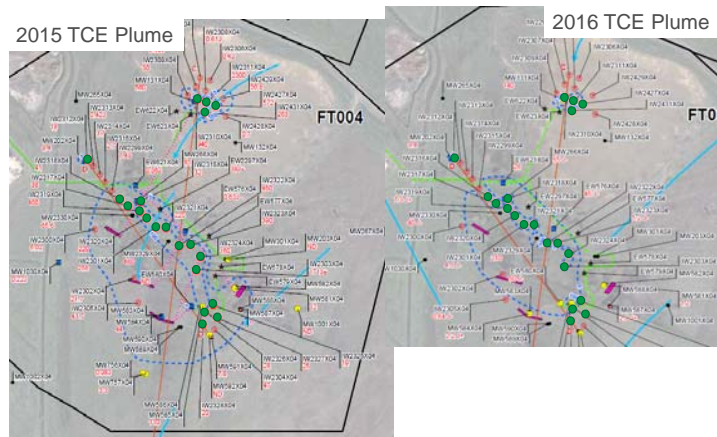
## FT004 Background

- SBGR Recirculation Trench Technology Demonstration in TCE area greater than 20 ug/L
- Limited TOC dispersal, but other indicators are favorable
  - Reinject EVO with smaller droplet size in ~20 existing wells in TCE areas above ~20 ug/L consistent with TD Work Plan



## FT004 Injection Plan

- Recomplete injections in existing wells
- Use EVO with smaller droplet size



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## Travis AFB SS014 Drywall SBGR Installation



April 2017

ch2m:

## Site SS014 Technology Demonstration

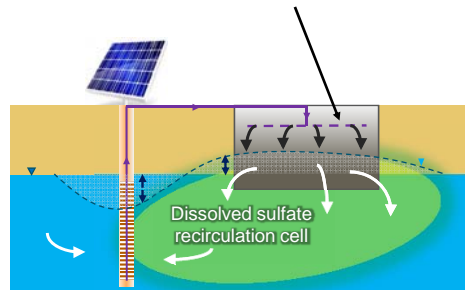
- Subgrade biogeochemical reactor (SBGR) for remediation of fuel contamination
  - Design based on internally-funded CH2M bench-scale research
  - Drywall as a safe and sustainable source of sulfate





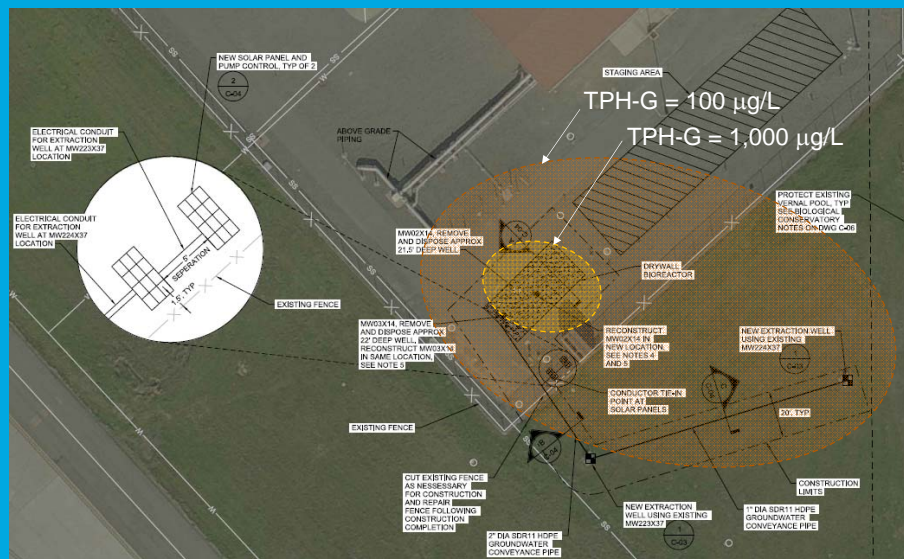
## Drywall SBGR

SBGR is filled with gravel, scraps of drywall, wheat straw, and iron pyrite gravel to support enhanced biodegradation of fuel contamination



3

## Drywall SBGR Layout





Site Prior to Construction



5

Excavation of Fuel Contaminated Soil



6

Crushed Drywall from  
Recycling Facility



7

Drywall and Gravel Backfill



Backfill with Gravel, Drywall, Straw, and Pyrite



8



## SBGR Backfill



## Installation of Infiltration Pipe



## Geotextile Placement Prior to Surface Soil Backfill



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## Surface Completion and Piezometer Vault Construction



12

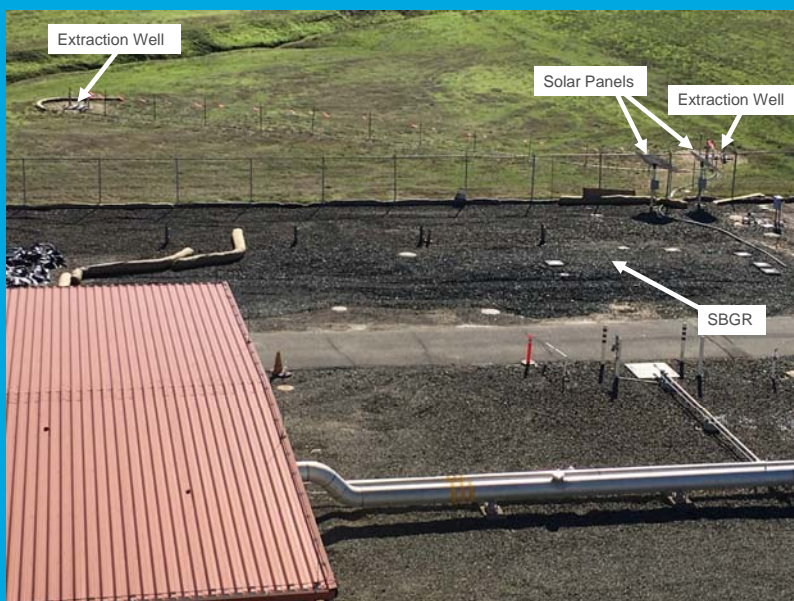


## Solar Panels



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## Completed Site Overview



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# Travis AFB Restoration Program

## Program Update

*RPM Meeting*

*April 20, 2017*

## 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

3

## 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**

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## Completed Documents (4)

- **Multisite Technology  
Demonstration Construction  
Completion Report**

5

## Completed Field Work (1)

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

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## 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

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## 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

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## Documents In-Progress

### CERCLA

- Community Involvement Plan
- Site LF044 Investigation Work Plan

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## Documents In-Progress

### POCO

- Site FT004 POCO Soil Data Gap Investigation Work Plan
- POCO Evaluation/Closeout Report for DERA-funded oil/water separators OW051, OW053, and OW054
- ***SS014 POCO Technology Demonstration Construction Completion Report***

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## Field Work In-Progress

### CERCLA

- None

### POCO

- None

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## Documents Planned

### CERCLA

- |   |     |
|---|-----|
| • 2016 Annual CAMU Monitoring Report                            | May |
| • SD034 Technology Demonstration Construction Completion Report | Apr |
| • 2016 Annual GRISR   | Jun |
| • SS016, SD033, SD043, SS046 Risk Assessment Tech Memo          | TBD |
| • Work Plan for Fourth Five-year Review                         | TBD |

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## Documents Planned

### POCO

- POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW040, OW047, OW048, OW049, OW052, OW055, and OW057 TBD
- ST032 POCO Well Decommissioning and Site Closeout Technical Memorandum May

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## Field Work Planned

### CERCLA

- Q2 2017 GRIP Sampling Event Apr
- DP039 Installation of Down-gradient Monitoring Wells May
- SD031 Finish Soil Delineation (NE portion of site) May
- FT004 EVO Optimization May
- TS060 Removal Action Jun
- SS015 EVO Optimization Jun
- SD036 EVO Optimization Jul
- SD031 EVO Optimization Aug
- LF044 Sediment Sampling 2017

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

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## Field Work Planned

### POCO

- |   |     |
|---|-----|
| • OW055 Sidewalk Repairs                        | May |
| • OW056 Site Excavation/Closure                 | May |
| • OW050 Soil Sampling at Former Location of OWS | May |
| • FT004 POCO Soil Data Gaps Investigation       | Jun |

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

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## Technology Demonstration Projects (1)

- SS014: Recycled Drywall SBGR
  - Evaluate the effectiveness of sulfate (gypsum from crushed drywall) to enhance anaerobic biodegradation of petroleum in groundwater
  - Installation was completed November 2016
  - Too early to evaluate performance data
- Multisite Bioaugmentation: EVO and KB-1 Plus
  - Evaluate if addition of bioaugmentation substrate to an EVO injection will increase the rate of CVOC degradation
  - Injections were completed (Nov 2016)
  - Too early to evaluate performance data
- SD034: Washboard SBGR
  - Evaluate the effectiveness of an oxygen-enhanced aerobic SBGR on reducing TPH as diesel (TPH-D) in groundwater
  - Installation was completed November 2016
  - Installed six (6) SBGR trenches. In process of evaluating need/constructability of installing the 7<sup>th</sup> trench
  - Too early to evaluate performance data

\* SBGR = Subgrade Biogeochemical Reactor

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## Technology Demonstration Projects (2)

- 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
  - Installation completed May 2016
  - Too early to evaluate performance data
- 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
  - Too early to evaluate performance data

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## Technology Demonstration Projects (3)

- SD031: EVO distribution via Gravel Chimneys
  - 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:
    - Reducing conditions have initiated as expected throughout the TD area and are supporting anaerobic degradation
    - TOC concentrations are increasing at several wells
    - 1,1-DCE (primary COC) concentrations have reduced by 57% (sum of key wells within TD area)
    - Total Molar concentration (sum of CVOCs) has reduced by 49% (sum of key wells within TD area)
    - Recirculation through chimneys has been successful relative to our design assumptions

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## 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

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## 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 Memorandum20

## 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

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## 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

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