Final

Travis Air Force Base
Environmental Restoration Program
Restoration Program Manager's
Teleconference Minutes

19 August 2015, 1300 Hours

Mr. Mark Smith, of the Air Force Civil Engineer Center (AFCEC) Restoration Installation Support Team (IST), conducted the Restoration Program Manager's (RPM), on 19 August 2015 at 1300 hours, in Building 248 at Travis AFB, California. Attendees included:

• Mark Smith	AFCEC/CZOW
• Glenn Anderson	AFCEC/CZOW
• Lonnie Duke	AFCEC/CZOW
• Merrie Schilter-Lowe	Travis AFB FSS/PA
• William Hall (via telephone)	AFCEC/CZRW
• Dezso Linbrunner	USACE-Omaha
• David Elias (via telephone)	California Regional Water Quality Control Board (RWQCB)
• John Hart (via telephone)	California Department of Toxic Substances Control (DTSC)
• Nadia Hollan Burke	United States Environmental Protection Agency (USEPA)
• Indira Balkissoon	Techlaw, Inc
• Mehrdad Javaherian	Endpoint
• Chris Bason	J.C. Palomar
• Mike Wray	CH2M
• Paul Townley	CH2M
• Jeff Gamlin	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 (July 2015)
• Attachment 4	CGWTP Monthly Data Sheet (July2015)
• Attachment 5	Subarea LF007C Monthly Data Sheet (July 2015)
• Attachment 6	ST018 Monthly Data Sheet (July 2015)

- Attachment 7 Presentation: Program Update: Activities Completed, In Progress and Upcoming
- Attachment 8 Presentation: Vapor Energy Generator (VEG) Soil Remediation Technology
- Attachment 9 Presentation: Site TA500 Closure

1. ADMINISTRATIVE

A. Previous Meeting Minutes

The 15 July 2015 RPM meeting minutes were approved and finalized as written.

B. Action Item Review.

Action items from July were reviewed.

Action item 1 will remain open: AFCEC's Travis Restoration Support Team and Travis AFB will continue to pursue opportunities for the beneficial reuse of treated water. Due date will remain TBD to ensure this action item remains visible. 19 August 2015: No update.

Action item 2 is ongoing: Mr. Smith to provide updates on PFOS and PFOA as he becomes aware of them. 19 August 2015: Ms. Burke said EPA received a copy of the preliminary assessment report.

Action item 3 is closed: Ms. Constantinescu to provide information about the water quality data that must be provided and met in order to allow the use of treated water during EVO injection. Travis AFB has received approval of this request from the RWQCB.

Action item 4 is open: Ms. Constantinescu will schedule a site visit of the twelve (12) oil water separator sites (OWS) when she is available. 19 August 2015: No update.

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, held on Wednesday, 16 September 2015 at 1300. Mr. Smith proposed to cancel the 18 November 2015 RPM meeting and asked the regulators to provide their opinion at the next RPM meeting in September.

— Community Involvement Plan: Draft to Agencies was changed to 30 October 2015 the rest of the dates were changed accordingly.

— Site DP039 Remedial Design/Remedial Action Work Plan: The Response to Comments (RTC) Due was changed to 2 July 2015 to reflect the actual date, the rest of the dates were changed accordingly.

— Amendment to the NEWIOU Soil, Sediment, and Surface Water Record of Decision: No change to the schedule.

— Amendment to the Soil Record of Decision for the WABOU: No change to the schedule.

— Potrero Hills Annex (FS, PP, and ROD): No change to the schedule. Mr. Anderson said that he and Mr. Duke visited the site while the field investigation was underway. The monitoring wells were being installed using a rotosonic drill rig. Mr. Anderson said there isn't a lot of water, given the drought, and the concern is the possibility of brackish water having an impact on analysis of perchlorate. He noted that the lab can dilute the sample if needed. Ms. Yemia Hashimoto is the RWQCB representative who was also on site.

— Corrective Action Plan for Oil Water Separators 40, and 50 through 57: New document all dates are to be determined (TBD).

— Quarterly Newsletter (October 2015): The Draft to Agencies date changed to 6 October 2015 to reflect the fourth quarter of the year, the rest of the dates were changed accordingly.

— 2014 Annual GRISR: No change was made to the schedule. RWQCB and DTSC requested additional review time due to vacation schedules. Travis AFB requested that the comments are received no later than 8 September 2015 and for the regulators to concentrate on wells they want sampled and analyzed first, so those wells can be included in the 4Q15 sampling event starting on 12 October 2015. Mr. Linbrunner said, as the Contracting Officer Representative (COR) and Program Manager (PM) of this contract, it is necessary to express the importance of trying to keep the documentation review time on schedule and to try and avoid the thirty (30) to sixty (60) day delays. The contract is under an integrated master schedule (IMS), milestone payment schedule (MPS), and minimum performance objective (MPO), that AFCEC utilizes as the contractors "score card" as to how they are performing; are they meeting their contractual obligations. Out or the forty one (41) sites; twenty six (26) of them are site closure (SC). If we continue to have delays with the documentation review – it will start to interfere with the contractors contractual obligations. It is very important to try and meet the due dates on the master meeting and document schedule (MMDS).

— Site SD031 Technology Demonstration Construction Completion Report: The RTC Due date was changed to 13 August 2015 to reflect the actual date. The final due date was changed to 21 August 2015.

— Sites SD036 and SD037 Remedial Action Construction Completion Report: The draft to agencies date was changed to 30 July 2015 to reflect the actual date. Agency comments due date was changed to 31 August 2015.

— Site ST018 POCO Construction Completion Report: The draft to agencies was changed to 5 August 2015 to reflect the actual date. The Agency Comments Due date was changed to 4 September 2015.

— Site SS016 Groundwater Remedial Action Construction Completion Report: The Predraft to AF/Service Center date was changed to 24 July 2015, the rest of the dates were changed accordingly.

— Site SS015 Remedial Action Construction Completion Report: The Predraft to AF/Service Center date was changed to 4 August 2015, the rest of the dates were changed accordingly. The dates were revised to ease some of the documentation overload burden.

— Site SS030 Remedial Action Construction Completion Report: No change was made to the schedule.

— 2014 Annual CAMU Monitoring Report: Moved to history.

— POCO Site ST028 Data Gap Investigation Work Plan: Moved to history.

2. CURRENT PROJECTS

Treatment Plant Operation and Maintenance Update

South Base Boundary Groundwater Treatment Plant, July 2015 (see Attachment 3)

The South Base Boundary Groundwater Treatment Plant (SBBGWTP) performed at 100% uptime, and 3.51 million gallons of groundwater were extracted and treated during the month of July 2015. All of the treated water was discharged to Union Creek. The average flow rate for the SBBGWTP was 73.54 gallons per minute (gpm). Electrical power usage was 18,600 kWh, and approximately 25,482 pounds of CO_2 were created (based on DOE calculation). Approximately 1.88 pounds of volatile organic compounds (VOCs) were removed in July. The total mass of VOCs removed since startup of the system is 463.7 pounds.

Optimization Activities for SBBGWTP: No optimization activities are reported for the month of July 2015.

The new SS030 extraction well will be online soon. When work starts, there will be an open trench. Since the tenants usually have horses in the field, they have been asked if they can corral the horses during the project. The field crew will need to first contact the tenants at the house to let them know about the open trench and how long the fieldwork will be conducted. If they don't get a response, they are to notify Mr. Smith who will contact the property owner.

Central Groundwater Treatment Plant, July 2015 (see Attachment 4)

The Central Groundwater Treatment Plant (CGWTP) performed at 100% uptime with approximately 1.05 million gallons of groundwater extracted and treated during the month of July 2015. All treated water was discharged to the storm drain. The average flow rate for the CGWTP was 26.2 gpm. Electrical power usage was 1,654 kWh for all equipment connected to the Central Plant, and approximately 2,267 pounds of CO_2 were generated. Approximately 2.06 pounds of VOCs were removed from groundwater by the treatment plant in July. The total mass of VOCs removed since the startup of the system is 11,411 pounds.

Optimization Activities for CGWTP: No optimization activities are reported for the month of July 2015.

LF007C Groundwater Treatment Plant, July 2015 (see Attachment 5)

Subarea LF007C Treatment Plant (LF007CGWTP) performed at 31% uptime with approximately 40,362 gallons of groundwater extracted and treated during the month of July 2015. The average flow rate at the NGWTP was 4.58 gpm, and electrical power use was 0 kWh for all the equipment connected to the North plant; and 0 pounds of CO_2 was generated; this system is 100 percent off of the power grid. Approximately $4.24x10^{-3}$ pounds of VOCs were removed from the groundwater in July. The total mass of VOCs removed since the startup of the system is 174.34 pounds.

Optimization Activities for LF007CGWTP: No optimization activities to report for the month of July 2015.

Site ST018 Groundwater (MTBE) Treatment Plant, July 2015 (see Attachment 6)

The Site ST018 (MTBE) Treatment Plant (ST018 GWTP) performed at 90% uptime with approximately 218,830 gallons of groundwater extracted and treated during the month of July 2015. All treated water was diverted to the sanitary sewer. The average flow rate for the ST018 GWTP was 5.77 gpm. Electrical power usage for the month was 115 kWh for all equipment connected to the ST018 GWTP, which equates to approximately 158 pounds of CO_2. Approximately 0.36 pound of BTEX, MTBE and TPH was removed from groundwater in July by the treatment plant. Approximately 0.24 pound of MTBE was removed from groundwater. The total BTEX, MTBE and TPH mass removed since the startup of the system is 32.1 pounds, and the total MTBE mass removed since startup of the system is 7.5 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 extraction pumps in the system are all solar powered.

Program Update: Activities Completed, In Progress and Upcoming (see Attachment 7)

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

Newly Completed Documents: DP039 GW RD/RA Work Plan, SD031 Technology Demonstration Construction Completion Report.

Newly Completed Field Work: FT005 Injection Well Installation.

In-Progress Documents (CERCLA): 2014 Annual GRISR, Sites SD036 and SD037 Remedial Action Construction Completion Report.

In-Progress Documents (POCO): ST018 POCO Construction Completion Report.

In-Progress Field Work: FT005 Injection Well Installation and Baseline Sampling, FT004 Well Installation, Well Development and Baseline Sampling, DP039 Well Installation, Well Development and Baseline Sampling.

Upcoming Documents (CERCLA): Community Involvement Plan (October), Amendment for NEWIOU Soil Sediment, and Surface Water ROD (TBD), Amendment for WABOU Soil ROD (TBD), SS016 Groundwater Remedial Action Construction Completion Report (August), SS015 Remedial Action Construction Completion Report (September), Site SS030 Remedial Action Construction Completion Report (October).

Upcoming Documents (POCO): Corrective Action Plan for OWSs 40, and 50-57 (TBD).

Field Work Planned (CERCLA): SS030 Trench/Conveyance/Power Installation (August), FT005 Trench Installation (August), FT004 Trench/Conveyance/Power Installation (September), FT004 EVO Injection (September), FT005 EVO Injection (September), DP039 Infiltration Trench Installation (September), DP039 EVO Injection (September).

Field Work Planned (POCO): SS014 Bioreactor Installation (August), OWS 47, 48 and 49 Site Investigations (August).

Presentations:

Presentation: Vapor Energy Generator (VEG) Soil Remediation Technology (see Attachment 8)

Mr. Javaherian/Endpoint Environmental presented on the Vapor Energy Generator (VEG) soil remediation technology. For details see attachment 8.

The VEG system is a patented, mobile in-situ and ex-situ technology used to remediate soils for unrestricted reuse, and for enhanced recovery of oil and non-aqueous phase liquids (NAPLs). Relying on a highly efficient, patented vapor generator, the ex-situ component of the technology thermally treats soils within a fully enclosed chamber while eliminating emissions through the use of filters. The technology is also fully sustainable, relying on vapors generated through thermal treatment of soils to serve as fuel "synthetic gas" for operation of the system; this significantly reduces operational costs relative to other thermal treatment options.

Various In-Situ and Ex-Situ Applications/Attributes:

- Enhanced oil recovery: Unclog and recover refined oil from old, abandoned, and/or frozen aboveground pipelines. Enhanced crude oil recovery from deep oil wells, In-situ LNAPL (gasoline and diesel) mobilization and recovery.

- Onsite soil remediation for unrestricted reuse: Full range of TPH, waste oils, crude oils, refined oils, VOCs, SVOCs (BTEX, MTBE, TCE, PCE, VC, PAHs), pesticides, and PCBs (removal is at 99.8%). Munitions constituents, TNT, RDX, HDX, etc.

- Easily transportable, mobile system for onsite applications. Treats 30 cubic yards of soil per hour. Completed 3,000 cubic yards cleanup in less than 10 days. Captures all vapor and combustion heat generated. Provides complete control over target temperature and soil residence time through the treatment chamber. Induced vapors are recycled as fuel to operate system. Use of recycled water eliminates potable water use. Propane use increases clean energy production by 250%. Indirect fire, low temperature thermal treatment process (no incineration, so no dioxins/furans generated).

Benefits:

- Eliminates offsite transport and landfill disposal of soils and associated costs. Eliminates landfill waste generator liability. Eliminates need to import fill soils to sites. Allows for unrestricted reuse of soils and eliminates land use controls (LUC). Significantly reduces remediation costs (typically 50 to 90% reduction). Reduces remediation carbon footprint by approximately 80%.

Applications and Success Stories VEG Ex-Situ Remediation System:

- Application on over 25 remediation projects across the US completed. Over 14 bench-scale and 15 pilot tests across the US. Over 12,000 soil treatment runs targeting petroleum hydrocarbons, chlorinated solvents, PCBs, pesticides and arsenic.

- Treatment of gasoline, diesel, jet fuel, motor oil, MGP wastes (PAHS), and VOCs to non-detect levels. PCBs and pesticides to below RSLs and non-detect levels.

Samples are collected post treatment and are directed by the regulatory agencies review process. The time the samples are collected after treatment depends on the temperature of treatment. The temperature is determined by chemical of concern (COC) and/or moisture in the soils.

Mr. Javaherian provided applications and success stories of the VEG in-situ remediation cleanup. (See attachment 8 for detailed information and sample results).

Presentation: Site TA500 Closure (see Attachment 9)

Mr. Gamlin reported on the Site TA500 Closure. For details see attachment 9.

Mr. Gamlin began with Site TA500 background. Drinking water storage and treatment site where hydrofluorosilicic acid was used to fluoridate water.

Two hydrofluorosilicic acid spills:

- Pinhole leak in a 4,000 gallon AST was discovered in 1989, and 53 gallons of hydrofluorosilicic stored in a 55 gallon drum was spilled in 1992.

- The AST was removed by Travis AFB in 1992, and the soil was excavated (28 x 15 feet wide by 3 feet deep excavation near drum spill).

- Previous investigation: four (4) soil borings were drilled in 1996 and four (4) more soil borings in 2009. (only one location exceeded the soil RSL of 3,100 mg/kg in 1996).

- Groundwater samples were collected from ten (10) locations, one (1) in 1996 and nine (9) in 2009. Near the drum spill, fluoride was detected at 547J mg/L at 5 feet bgs (perched zone). Going down into the aquifer at 16 feet bgs, the result was 109J mg/L. The sample location was from an open borehole and with the perched zone we believe it to be biased high from cross contamination. Near the AST, fluoride was detected at 12.1 mg/L at 5-6 feet bgs in the perched zone. All the other samples were below the California MCL of 2 mg/L.

- Slide four (4) shows the spill area and the boring locations with the depth and fluoride concentrations. Slide five (5) is a cross section that was created by another contractor and it is not very representative of the site. The bedrock is much shallower than what is interpreted. (see attachment 9 for details).

- Fluorosilicate anion is not expected to persist in the environment; it readily dissociates to hydrogen gas, fluoride ions and hydrated silica. When pH is below 6, fluoride absorbs to aluminum and iron oxides; it sticks to the soil. It has low mobility due to absorption and natural attenuation.

Data Gaps Investigation:

- Refined vertical and horizontal extent of the contamination. Installed nine (9) soil borings, a perched zone was not identified, most likely due to the current drought.

- Installed six (6) monitoring wells (MWs), including an additional well in the former spill area to confirm the 500 mg/L isoconcentration line, not indicated in the work plan (WP). (Slide 8 is a map that shows soil boring and monitoring wells location and the associated concentration levels.

- The highest fluoride concentration found in the soil samples collected was 280 mg/kg, which is well below the RSL of 3,100 mg/kg. The groundwater sample results are all well below the California MCL of 2 mg/L. The J flag in the groundwater results indicates the concentration is estimated, because it is well below the MDL.

The investigation results demonstrate residual fluoride has naturally attenuated. We will re-sample one more time during the wet season of 2015/2016, and if the results are all below the fluoride MCL, Travis AFB will recommend site closure.

Ms. Burke asked when you look at natural attenuation, and what might happen to it, do you look at the mass balance and the by-products that might be in the groundwater? Is there any way to tell with this type of contaminant? Mr. Gamlin said that a certain mass of fluoride has now transitioned into a mineral phase. Ms. Balkissoon asked if the groundwater samples were filtered. Mr. Gamlin replied that the groundwater samples were not filtered. Mr. Anderson said it was a fork truck that punctured the 55 gallon drum and that the cleanup response time was almost immediate. The fiberglass above ground storage tank had a very slow leak over a period of time. Mr. Elias asked why we are proposing to use high purge volumes verses normal low flow sampling? Mr. Gamlin said the rationale is to not potentially miss a pocket of fluoride adjacent to the well when we resample in the winter, maybe the perched zone gets re-established. Mr. Elias said the three purge volumes will purge the sand pack; if you are trying to pull the water from the formation you will probably need to do more than that. Mr. Elias will discuss this issue with Ms. Constantinescu.

4. New Action Item Review

None

5. PROGRAM/ISSUES/UPDATE

A. January 2016 RPM meeting is tentatively scheduled for 20 January 2016. Travis AFB is working on the 2016 RPM calendar which isn't quite ready yet.

B. RAB training will be held on 3 September 2015, from 2-4 PM, at 3690 Hilborn Rd, Fairfield, CA. Mr. Smith said that he asked Ms. Schilter-Lowe if she would be able stimulate interest in recruiting some new RAB members, and Ms. Schilter-Lowe was able to get nine (9) people potentially interested in becoming RAB members. Eight (8) out of the nine (9) will be attending the RAB training, as well as some existing RAB members.

6. Action Items

Item #	Responsible	Action Item Description	Due Date	Status
1.	Travis AFB	AFCEC's Travis Restoration Team and Travis AFB will continue to pursue opportunities for the beneficial reuse of treated water. Current possibilities include: Rerouting treated water from the central plant to the duck pond or as irrigation as an energy reduction project with the intent of reducing on-base water usage. Due date will remain TBD to ensure this action item remains visible. Update: Mr. Duke informed the group that Travis AFB is considering the use of treated water during EVO injection at Site FT005 as opposed to potable water. New Action Item 5 added as a follow-up.	TBD	Open
2.	Mark Smith	Mr. Smith to provide updates on PFOS and PFOA as he becomes aware of them. Update: Mr. Smith stated that he has received the final preliminary assessment report from AFCEC. Direction from AFCEC for follow on steps has not yet been provided.	Ongoing	Open
3.	Adriana Constantinescu	Ms. Constantinescu will schedule a site visit of all the oil water separator sites (OWS), when she is available.	TBD	Open

TRAVIS AIR FORCE BASE
ENVIRONMENTAL RESTORATION PROGRAM
RESTORATION PROGRAM MANAGER'S MEETING
BLDG 248 Conference Room
19 August 2015, 1:00 P.M.
AGENDA

1. ADMINISTRATIVE

   A. Previous Meeting Minutes
   B. Action Item Review
   C. Master Meeting and Document Schedule Review

2. CURRENT PROJECTS

   A. Treatment Plant Operation and Maintenance Update
   B. Field Work Update (Field Manager Perspective)

3. PRESENTATIONS

   A. Program Update:
      Documents & Activities Completed, In Progress and Upcoming
   B. Vapor Energy Generator (VEG) Soil Remediation Technology
   C. Site TA500 Closure

4. NEW ACTION ITEM REVIEW

5. PROGRAM/ISSUES/UPDATE

   A. Meeting Schedule
   B. RAB Training – 3 Sept 2015, 2-4 pm, 3690 Hilborn Road, FF

NOTES: For those of you calling in, please dial 1-866-203-7023. Enter the Participation code 5978-75-9736, followed by #.

(2015)
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.)
01-21-15	—	—
02-18-15	—	—
—	03-18-15	—
04-23-15 (Thursday 2:00 PM)	—	04-23-15
—	05-27-15	—
	06-17-15 (start at 12:00)	—
—	07-15-15 (1:00 to 3:00)	—
08-19-15 (1:00 to 3:00)	—	—
—	09-16-15 (1:00 to 3:00)	—
11-05-15 (Thursday 2:00 PM)		11-05-15
—	11-18-15 (Propose to Cancel November Meeting)	—
—	—	—

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

Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS				
Life Cycle	**Community Involvement Plan Travis AFB, Mark Smith CH2M HILL, Tricia Carter**	**Site DP039 Remedial Design/Remedial Action Work Plan Travis AFB, Glenn Anderson CH2M HILL, Leslie Royer**	**Record of Decision Amendment to the NEWIOU Soil, Sediment, and Surface Water Record of Decision Travis AFB, Glenn Anderson CH2M HILL, Loren Krook**	**Record of Decision Amendment to the Soil Record of Decision for the WABOU Travis AFB, Glenn Anderson CH2M HILL, Loren Krook**
Scoping Meeting	**NA**	**NA**	**TBD**	**TBD**
Predraft to AF/Service Center	NA	01-15-14	TBD	TBD
AF/Service Center Comments Due	NA	01-29-15	TBD	TBD
Draft to Agencies	10-30-15	03-03-15	TBD	TBD
Draft to RAB	10-30-15	03-03-15	TBD	TBD
Agency Comments Due	11-30-15	04-02-15	TBD	TBD
Response to Comments Meeting	**12-15-15**	**05-27-15**	**TBD**	**TBD**
Agency Concurrence with Remedy	NA	NA	NA	NA
Public Comment Period	NA	NA	NA	NA
Public Meeting	**NA**	**NA**	**NA**	**NA**
Response to Comments Due	01-15-16	07-02-15	TBD	TBD
Draft Final Due	01-15-16	07-02-15	TBD	TBD
Final Due	02-15-16	08-03-15	TBD	TBD

Travis AFB Master Meeting and Document Schedule

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

Travis AFB Master Meeting and Document Schedule

SECONDARY DOCUMENTS	
Life Cycle	**Corrective Action Plan for Oil Water Separators 40, and 50 through 57** **Travis AFB, Lonnie Duke** **CH2M HILL, Doug Berwick**
Scoping Meeting	**NA**
Predraft to AF/Service Center	TBD
AF/Service Center Comments Due	TBD
Draft to Agencies	TBD
Draft to RAB	TBD
Agency Comments Due	TBD
Response to Comments Meeting	**TBD**
Response to Comments Due	TBD
Draft Final Due	NA
Final Due	TBD
Public Comment Period	NA
Public Meeting	**NA**

Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS				
Life Cycle	**Quarterly Newsletters (October 2015) Travis, Glenn Anderson**	**2014 Annual GRISR Travis AFB, Lonnie Duke CH2M HILL, Leslie Royer**	**Site SD031 Technology Demonstration Construction Completion Report Travis AFB, Lonnie Duke CH2M HILL, Leslie Royer**	**Sites SD036 and SD037 Remedial Action Construction Completion Report Travis AFB, Glenn Anderson CH2M HILL, Leslie Royer**
Scoping Meeting	**NA**	**NA**	**NA**	**NA**
Predraft to AF/Service Center	NA	04-24-15	04-23-15	06-24-15
AF/Service Center Comments Due	NA	05-22-15	05-07-15	07-08-15
Draft to Agencies	10-06-15	06-10-15	05-21-15	07-30-15
Draft to RAB	NA	06-10-15	05-21-15	07-30-15
Agency Comments Due	10-20-15	08-10-15	06-22-15	08-31-15
Response to Comments Meeting	**TBD**	**08-19-15**	**07-15-15**	**09-16-15**
Response to Comments Due	10-21-15	09-02-15	08-13-15	09-30-15
Draft Final Due	NA	NA	NA	NA
Final Due	10-23-15	09-02-15	08-21-15	09-30-15
Public Comment Period	NA	NA	NA	NA
Public Meeting	**NA**	**NA**	**NA**	**NA**

Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS				
Life Cycle	Site ST018 POCO Construction Completion Report Travis AFB, Lonnie Duke CH2M HILL, Leslie Royer	Site SS016 Groundwater Remedial Action Construction Completion Report Travis AFB, Glenn Anderson CH2M HILL, Leslie Royer	Site SS015 Remedial Action Construction Completion Report Travis AFB, Glenn Anderson CH2M HILL, Leslie Royer	Site SS030 Remedial Action Construction Completion Report Travis AFB, Lonnie Duke CH2M HILL, Leslie Royer
Scoping Meeting	**NA**	**NA**	**NA**	**NA**
Predraft to AF/Service Center	07-10-15	07-24-15	08-28-15	09-09-15
AF/Service Center Comments Due	07-24-15	08-07-15	09-14-15	09-23-15
Draft to Agencies	08-05-15	08-21-15	09-28-15	10-07-15
Draft to RAB	08-05-15	08-21-15	09-28-15	10-07-15
Agency Comments Due	09-04-15	09-21-15	10-28-15	11-06-15
Response to Comments Meeting	**09-16-15**	**10-22-15**	**11-05-15**	**11-18-15**
Response to Comments Due	10-06-15	11-06-15	11-19-15	12-04-15
Draft Final Due	NA	NA	NA	NA
Final Due	10-06-15	11-06-15	11-19-15	12-04-15
Public Comment Period	NA	NA	NA	NA
Public Meeting	**NA**	**NA**	**NA**	**NA**

Travis AFB Master Meeting and Document Schedule

HISTORY		
Life Cycle	**2014 Annual CAMU Monitoring Report** **Travis AFB, Lonnie Duke** **CH2M HILL, Ashley Shaddy**	**POCO Site ST028 Data Gap Investigation Work Plan** **Travis AFB, Lonnie Duke** **CH2M HILL, Doug Berwick**
Scoping Meeting	**NA**	**NA**
Predraft to AF/Service Center	03-17-15	03-18-15
AF/Service Center Comments Due	03-31-15	04-01-15
Draft to Agencies	04-15-15	04-22-15
Draft to RAB	04-15-15	04-22-15
Agency Comments Due	05-15-15	05-22-15
Response to Comments Meeting	**05-27-15**	**05-27-15**
Response to Comments Due	07-07-15	07-10-15
Draft Final Due	NA	NA
Final Due	07-07-15	07-10-15
Public Comment Period	NA	NA
Public Meeting	**NA**	**NA**

South Base Boundary Groundwater Treatment Plant Monthly Data Sheet

Report Number: 179 **Reporting Period: 25 June 2015 – 28 July 2015** **Date Submitted: 13 August 2015**

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 July 2015 reporting period.

Table 1 – Operations Summary – July 2015

Initial Data Collection:	06/25/2015 11:45	**Final Data Collection:**	07/28/2015 14:15
Operating Time:	Percent Uptime:	Electrical Power Usage:	
SBBGWTP: 794 hours	**SBBGWTP:** 100%	**SBBGWTP:**	18,600 kWh[a] (25,482 lbs CO_2 generated[b])
Gallons Treated: **3.51 million gallons**		Gallons Treated Since July 1998: **899 million gallons**	
Volume Discharged to Union Creek: **3.51 million gallons**			
VOC Mass Removed: **1.88 lbs**[c]		VOC Mass Removed Since July 1998: **463.7 lbs**	
Rolling 12-Month Cost per Pound of Mass Removed: $2,689[d]			
Monthly Cost per Pound of Mass Removed: $2,551			

lbs = pounds

[a] Power use estimated from previous usage due to unreliable readings in July 2015.

[b] Based on Department of Energy estimate that 1 kilowatt hour generated produces 1.37 pounds of GHG.

[c] Calculated using July 2015 EPA Method SW8260B analytical results.

[d] 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)[a,b]

FT005[b]				SS029		SS030	
EW01x05	Offline[c]	EW736x05	Offline	EW01x29	0.3	EW01x30	9.8
EW02x05	0.2	EW737x05	Offline	EW02x29	3.5	EW02x30	0.2
EW03x05	Offline	EW742x05	Offline	EW03x29	1.9	EW03x30	2.5
EW731x05	Offline	EW743x05	Offline	EW04x29	Offline[c]	EW04x30	33.5
EW732x05	Offline	EW744x05	Offline	EW05x29	4.0	EW05x30	1.7
EW733x05	Offline	EW745x05	Offline	EW06x29	4.9	EW06x30	Dry
EW734x05	1.5	EW746x05	Offline	EW07x29	1.7	EW711x30	2.2
EW735x05	1.9						
FT005 Total:	**3.6**			**SS029 Total:**	**16.3**	**SS030 Total:**	**49.9**

SBBGWTP Average Monthly Flow[d]: 73.54 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] These extraction wells are offline due to pump or other malfunction.
[d] The average SBBGWTP groundwater flow rate was calculated using the Union Creek Discharge Totalizer and dividing it by the total time in the reporting period.
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	NA	--			

-- = Time not recorded
[a] Shutdown and restart times estimated based on field notes.
NA = not applicable
SBBGWTP = South Base Boundary Groundwater Treatment Plant

Summary of O&M Activities

Analytical data from the 9 July 2015 sampling event are presented in Table 4. The total VOC concentration (64.3 µg/L) in the influent sample increased from the June 2015 sample results (61.4 µg/L). Acetone and chloromethane (not shown in Table 4, at concentrations of 3.15 µg/L and 0.17 J µg/L, respectively), cis-1,2-DCE (4.01 µg/L), TCE (56.6 µg/L), trans-1,2-DCE (0.18 J µg/L), and chloroform (0.16 J µg/L) were detected at the influent sampling location. 1,2-DCA was detected at a concentration of 0.3 J µg/L at the midpoint location. Acetone (4.34 µg/L) and chloromethane (0.31 J µg/L) were detected at the effluent sampling location. Travis AFB will continue to monitor effluent samples for detections of acetone and chloromethane.

Figure 1 presents a plot of influent concentrations and average flow at the SBBGWTP over the past twelve (12) months. The average flow rate at the SBBGWTP increased slightly in July 2015 to 73.5 gpm from the June 2015 flow rate of 68.1 gpm, which was due to an increase in the number of operating hours in July 2015.

Troubleshooting activities continued at extraction wells EW734x05 and EW735x05 on 17 July 2015. The corroded effluent hose barb at well EW734x05 was replaced and the well was brought back online. The pressure transducer and flow meter at well EW735x05 were replaced and the well was brought back online. The variable frequency drive at EW01x05 was experiencing repeated overload faults which has resulted in prolonged downtime of its associated pump. EW01x05 continued to be evaluated in July 2015, and is expected to be brought back on line in August 2015. A fan motor was replaced in the SBBGWTP ventilation system on 23 July 2015, allowing fresh air in the control room of the Plant.

Extraction well EW07x29 continued to experience reduced flow in July 2015, which was likely a result of a communications error from the pressure transducer in the well. A new pressure transducer was ordered and will be installed in August 2015.

Optimization Activities

No optimization activities were performed in July 2015.

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. The SBBGWTP produced approximately 25,482 pounds of GHG during July 2015. This amount is much higher than the June 2015 amount of 15,782 pounds of GHG, which is due to the increased runtime (794 hours in July as opposed to 648 in June 2015).

TABLE 4
Summary of Groundwater Analytical Data For July 2015 – South Base Boundary Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	9 July 2015 (µg/L)		
				Influent	Midpoint	Effluent
Halogenated Volatile Organics						
Carbon Tetrachloride	0.5	0.14	0	ND	ND	ND
Chloroform	5.0	0.16	0	0.16 J	ND	ND
1,1-Dichloroethane	5.0	0.50	0	ND	ND	ND
1,2-Dichloroethane	0.5	0.15	0	ND	0.3 J	ND
1,1-Dichloroethene	5.0	0.19	0	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.19	0	4.01	ND	ND
trans-1,2-Dichloroethene	5.0	0.33	0	0.18 J	ND	ND
Methylene Chloride	5.0	0.66	0	ND	ND	ND
Tetrachloroethene	5.0	0.21	0	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.14	0	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.20	0	ND	ND	ND
Trichloroethene	5.0	0.19	0	56.6	ND	ND
Vinyl Chloride	0.5	0.18	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	1.0	0.17	0	ND	ND	ND
Ethylbenzene	5.0	0.22	0	ND	ND	ND
Toluene	5.0	0.14	0	ND	ND	ND
Xylenes	5.0	0.23 – 0.5	0	ND	ND	ND
Other						
Total Petroleum Hydrocarbons – Gasoline	50	8.5	0	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	50	0	NM	NM	ND
Total Suspended Solids (mg/L)	NE	1.0	0	2.4 J	NM	NM

* 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
N/C = number of samples out of compliance with discharge limits
ND = not detected
NE = not established
NM = not measured
µg/L = micrograms per liter

Figure 1
SBBGWTP Total VOC Influent Concentrations and Average Flowrate
Twelve Month History
Travis Air Force Base, California

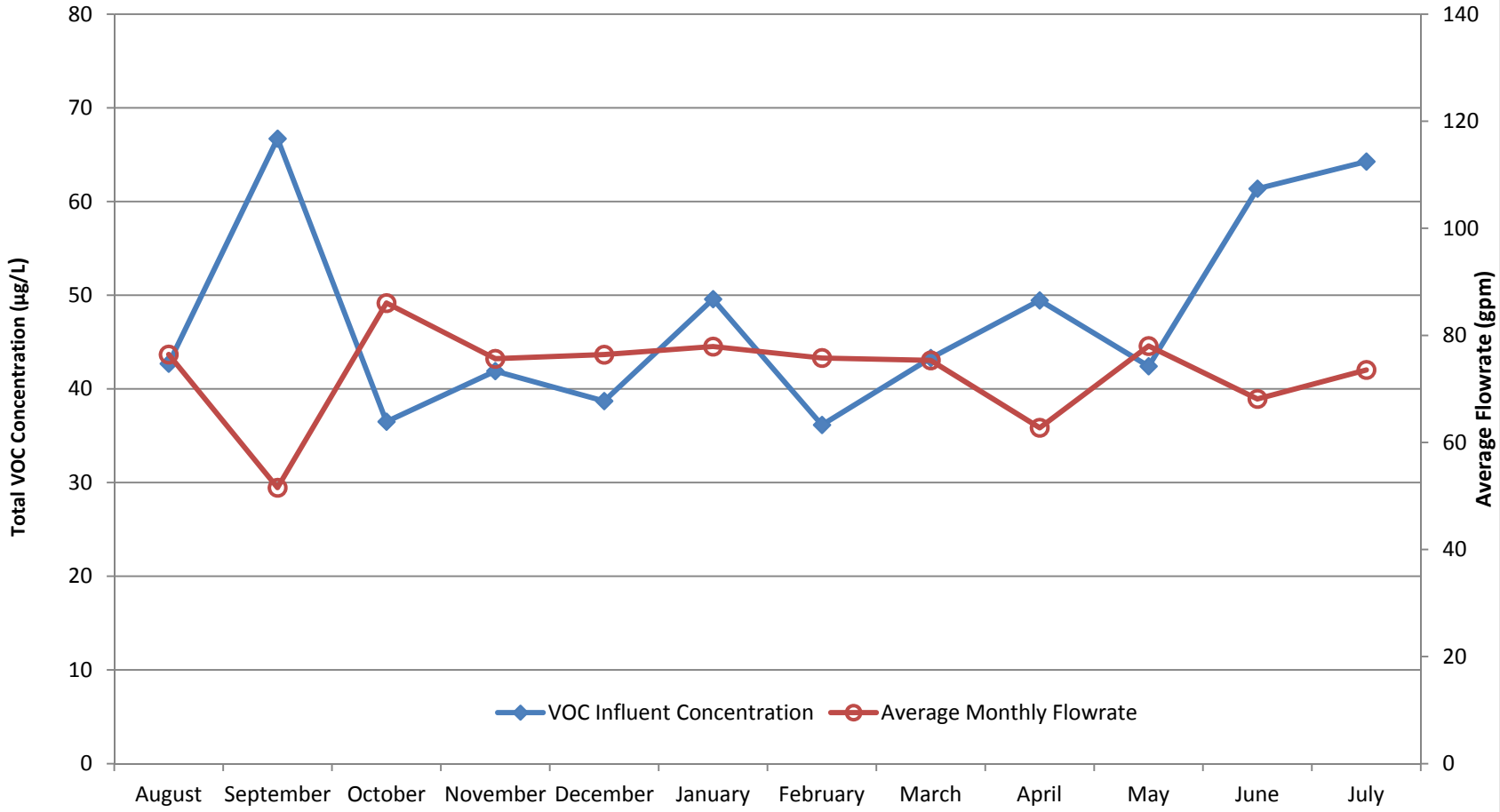
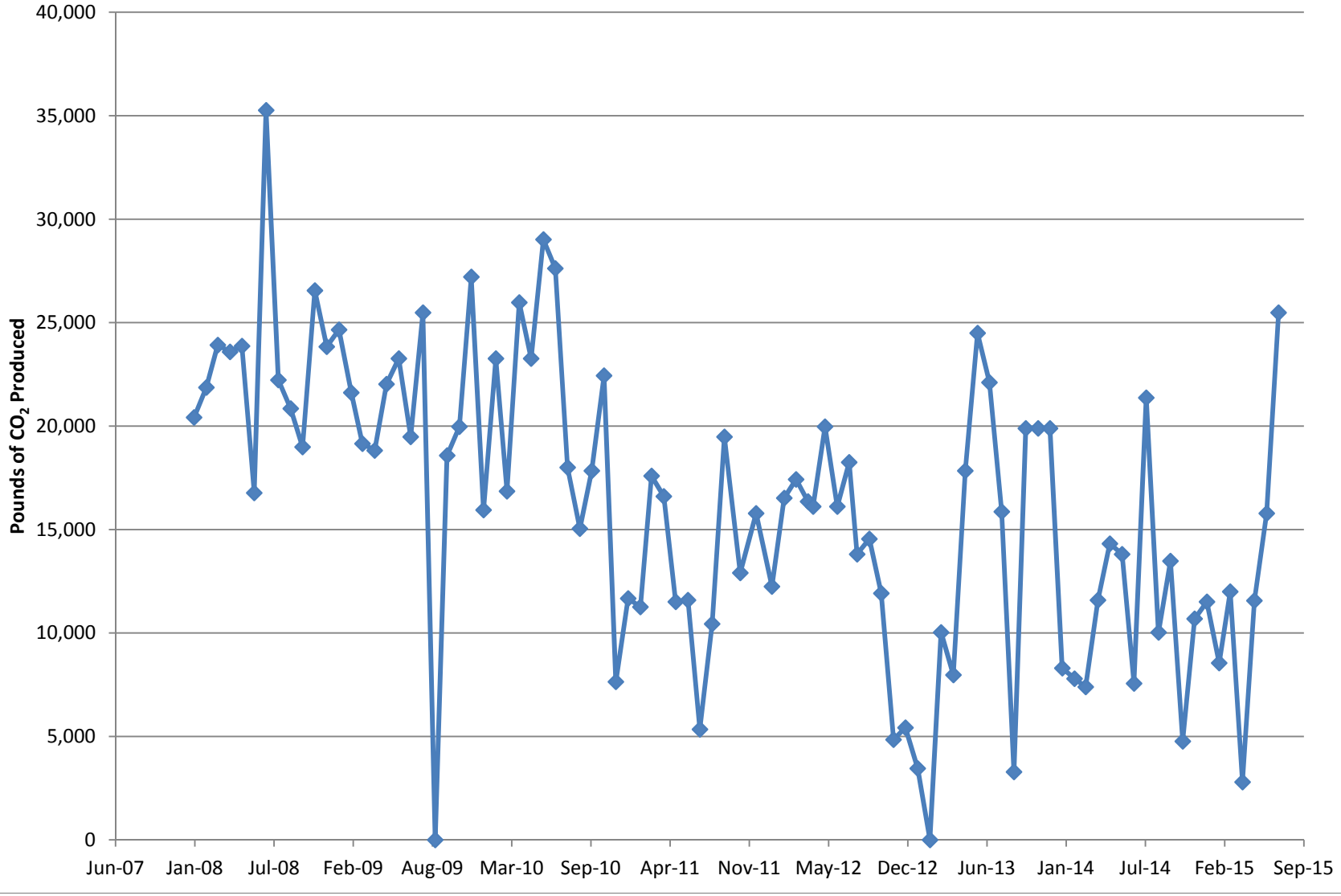


Figure 2

Equivalent Pounds of CO_2 Produced by the South Base Boundary Groundwater Treatment Plant



Central Groundwater Treatment Plant Monthly Data Sheet

Report Number: 192 **Reporting Period: 30 June 2015 – 28 July 2015** **Date Submitted: 13 August 2015**

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 July 2015 reporting period.

Table 1 – Operations Summary – July 2015

Initial Data Collection:	06/30/2015 13:00	**Final Data Collection:**	07/28/2015 09:23		
Operating Time:		Percent Uptime:		Electrical Power Usage:	
CGWTP:	668 hours	**CGWTP:**	100%	**CGWTP:**	1,654 kWh (2,267 lbs CO_2 generated[a])

Gallons Treated: **1,049,810 gallons**

Gallons Treated Since January 1996: **514 million gallons**

VOC Mass Removed from groundwater:

2.06 lbs[b]

VOC Mass Removed Since January 1996:

2,725 lbs from groundwater

8,686 lbs from vapor

Rolling 12-Month Cost per Pound of Mass Removed: $850[c]

Monthly Cost per Pound of Mass Removed: $1,749

[a] Based on Department of Energy estimate that 1 kilowatt hour generated produces 1.37 pounds of GHG.
[b] Calculated using July 2015 EPA Method SW8260B analytical results.
[c] Costs include operations and maintenance, reporting, analytical laboratory, project management, and utility costs related to operation of the CGWTP and are reported based on the calendar month.

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

Table 2 – CGWTP Average Flow Rates[a]

Location	Average Flow Rate Groundwater (gpm)
EW01x16	17.0
EW02x16	6.9
EW03x16	1.0[b]
EW605x16	15.0
EW610x16	3.2
CGWTP	26.2

[a] Flow rates calculated by dividing total gallons processed by system operating time for the month.
[b] Flow rate based on instantaneous, end of the month readings for July 2015.

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	
CGTWP	NA	--			

-- = Time not recorded
[a] Shutdown and restart times estimated based on field notes
CGWTP = Central Groundwater Treatment Plant
NA = not applicable

Summary of O&M Activities

Monthly groundwater samples were collected at the CGWTP on 9 July 2015. Sample results are presented in Table 4. The total VOC concentration (235.68 µg/L) in the July 2015 influent sample has decreased from the June 2015 sample (271.1 µg/L). Vinyl chloride was detected at a concentration of 0.23 J µg/L after the first carbon vessel, 0.29 J µg/L after the second carbon vessel, and 0.16 J µg/L at the effluent sampling location. The concentrations of vinyl chloride in July 2015 were all below the June 2015 concentrations of 0.32 J µg/L, 0.62 J µg/L, and 0.24 J µg/L, respective to the locations listed above. All detected concentrations at the effluent sampling location have been below the effluent limitation of 0.5 µg/L. Acetone (not listed in Table 4) was detected in the influent location, after the first carbon vessel, and after the second carbon vessel, at concentrations of 3.08 µg/L, 2.13 µg/L, and 2.65 µg/L, respectively.

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 flow rate through the treatment plant remained consistent in July 2015 at 26.18 gpm, which is a decrease from 32.7 gpm in June 2015.

The malfunctioning flow meter at EW605x16 was replaced with a working unit on 23 July 2015. The pump at EW610x16 shuts off intermittently due to a low water level alarm which may be a false positive. This low water level alarm will be further investigated in August 2015.

The Site DP039 bioreactor continues to operate in a "pulsed mode" in order to improve the rate of remediation and to preserve the amount of total organic carbon being produced within the bioreactor. The "pulsed mode"

operation continued on a two (2) week transition schedule in July 2015. The bioreactor was brought back online from 3 July to 17 July 2015, turned off again, then turned on again on 31 July 2015. The bioreactor is scheduled to be taken offline again on 14 August 2015.

Optimization Activities

No optimization activities occurred at the CGWTP in July 2015.

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 2,267 pounds of GHG during July 2015. This is a decrease from the June 2015 amount of 4,243 pounds, which is consistent with a shorter uptime.

TABLE 4
Summary of Groundwater Analytical Data for July 2015 – Central Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	9 July 2015 (µg/L)			
				Influent	After Carbon 1 Effluent	After Carbon 2 Effluent	System Effluent
Halogenated Volatile Organics							
Carbon Tetrachloride	0.5	0.14	0	ND	ND	ND	ND
Chloroform	5.0	0.16	0	ND	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.19	0	58	ND	ND	ND
1,1-Dichloroethane	5.0	0.5	0	ND	ND	ND	ND
1,2-Dichloroethane	0.5	0.15	0	ND	ND	ND	ND
1,1-Dichloroethene	5.0	0.19	0	0.48 J	ND	ND	ND
Methylene Chloride	5.0	0.66	0	ND	ND	ND	ND
MTBE	1.0	0.5	0	ND	ND	ND	ND
Tetrachloroethene	5.0	0.21	0	0.52	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.14	0	ND	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.2	0	ND	ND	ND	ND
Trichloroethene	5.0	0.19	0	170	ND	ND	ND
trans-1,2-Dichloroethene	5.0	0.33	0	2.67	ND	ND	ND
Vinyl Chloride	0.5	0.18	0	ND	0.23 J	0.29 J	0.16 J
Non-Halogenated Volatile Organics							
Benzene	1.0	0.17	0	ND	ND	ND	ND
Ethylbenzene	5.0	0.22	0	ND	ND	ND	ND
Toluene	5.0	0.14	0	ND	ND	ND	ND
Total Xylenes	5.0	0.23 – 0.5	0	ND	ND	ND	ND
Other							
Total Suspended Solids (mg/L)	NA	10	0	ND	NM	NM	NM

* In accordance with Appendix G of the T*ravis 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

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.

Table 5 – Summary of DP039 Bioreactor "Pulsed Mode" Operations

Location	Pulse On Start Date	Pulse Off Start Date
MW750x39	12 May 2014	12 May 2014
	6 June 2014	20 June 2014
	3 July 2014	24 July 2014
	01 August 2014	15 August 2014
	01 September 2014	12 September 2014
	26 September 2014	30 September 2014[a]
	24 October 2014	7 November 2014
	21 November 2014	4 December 2014
	19 December 2014	January 2, 2015
	16 January 2015	29 January 2015
	13 February 2015	27 March 2015
	10 April 2015	24 April 2015
	8 May 2015	22 May 2015
	5 June 2015	19 June 2015
	3 July 2015	17 July 2015
	31 July 2015	--

[a] = DP039 Bioreactor turned off on 30 September 2014 to replace hose.
-- = Start Date to be determined
CGWTP = Central Groundwater Treatment Plant
MW = Monitoring Well

Figure 1
CGWTP Total VOC Influent Concentrations and Average Flowrate
Twelve Month History
Travis Air Force Base, California

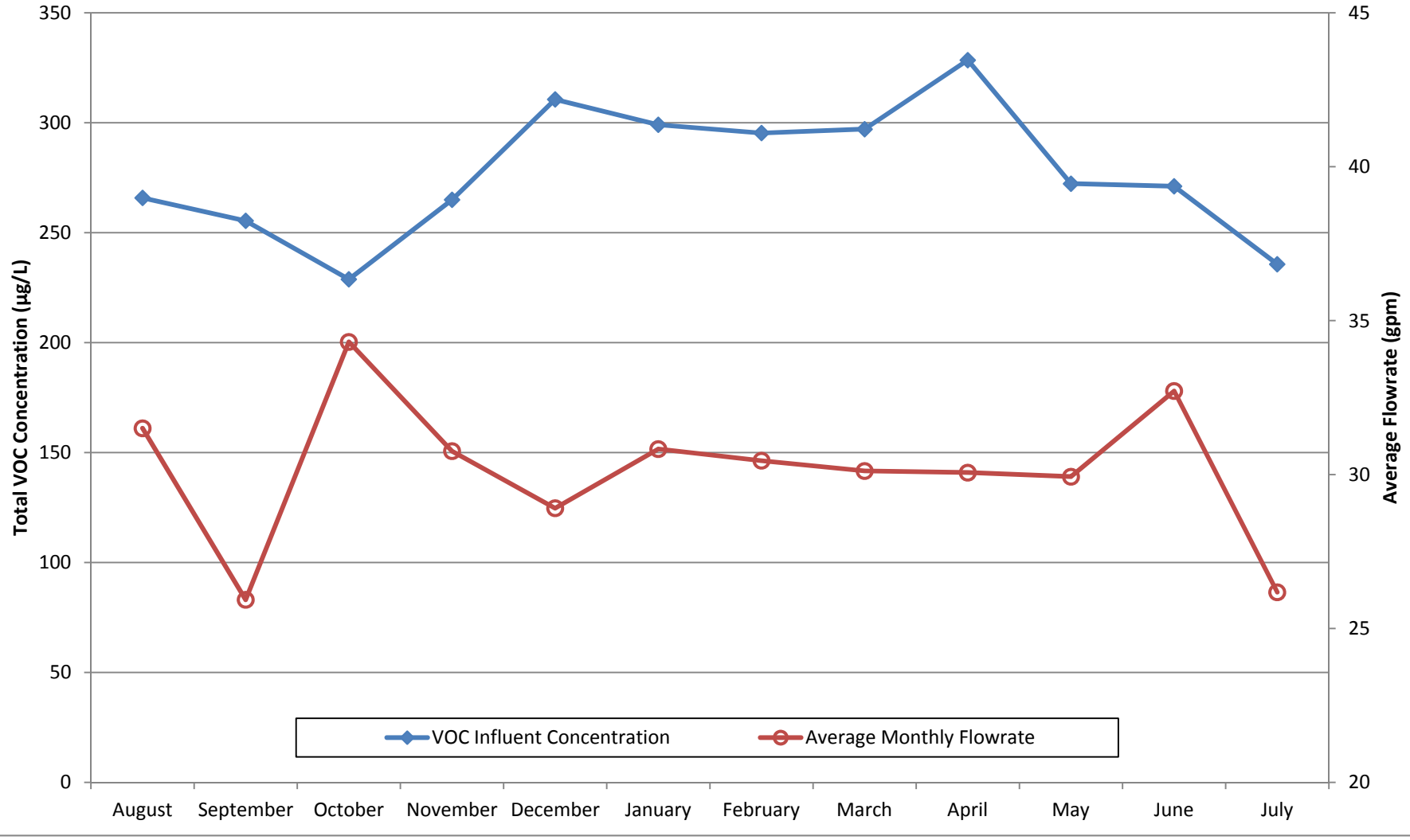
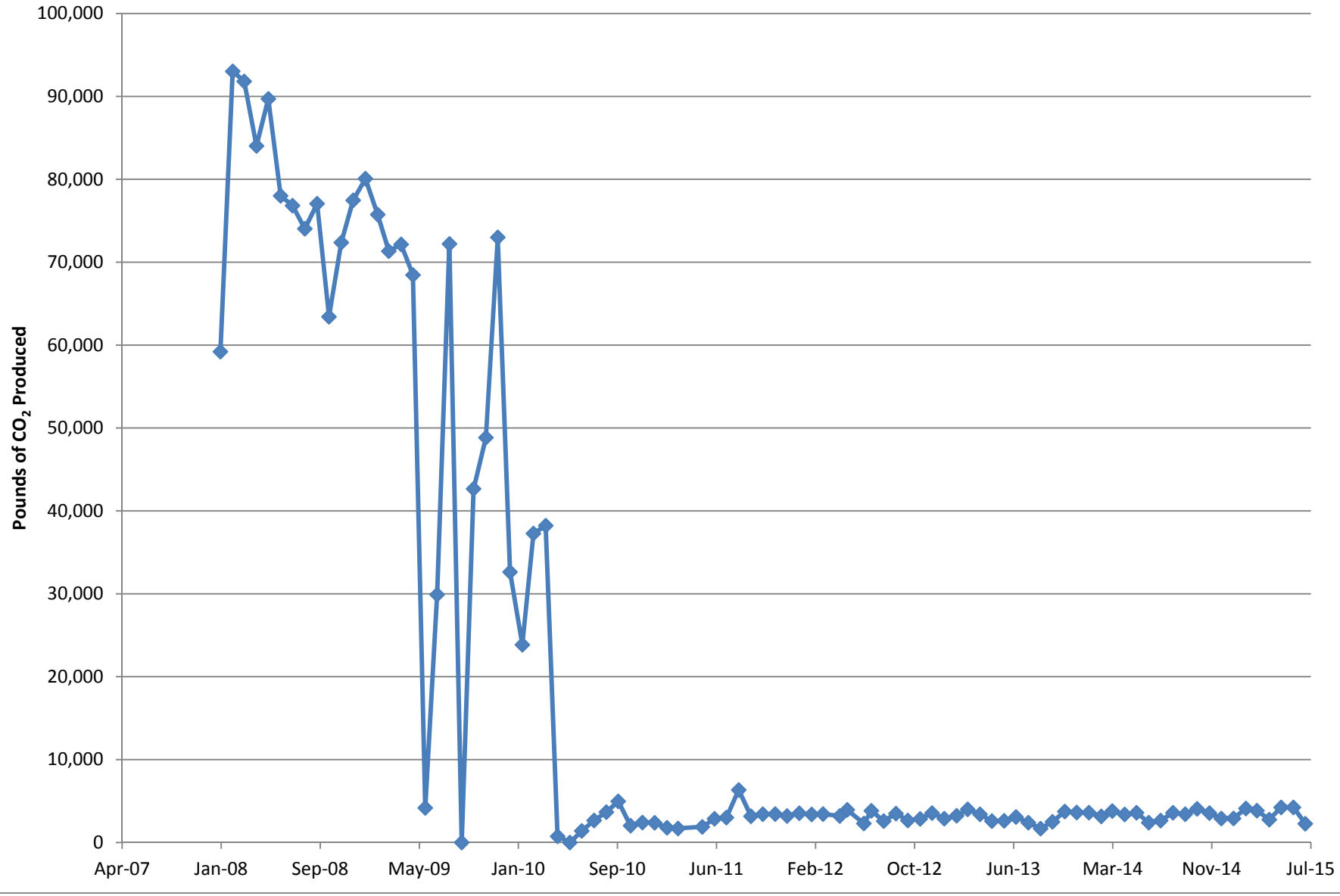


Figure 2

Equivalent Pounds of CO2 Produced by the Central Groundwater Treatment Plant



Subarea LF007C Groundwater Treatment Plant Monthly Data Sheet

Report Number: 146 **Reporting Period: 8 July 2015 – 28 July 2015** **Date Submitted: 13 August 2015**

This monthly data sheet presents information regarding the Subarea LF007C Groundwater Treatment Plant (LF007CGWTP) and associated remedial process optimization (RPO) activities.

System Metrics

Table 1 presents operational data from the July 2015 reporting period:

Table 1 – Operations Summary – July 2015

Initial Data Collection:	07/08/2015 9:22		**Final Data Collection:**	07/28/2015 11:30	
Operating Time:		Percent Uptime:	Electrical Power Usage[a]:		
LF007CGWTP:	147 hours	**LF007CGWTP** 31%	**LF007CGWTP:**	0 kWh	
Gallons Treated: **40,362 gallons**			Gallons Treated Since March 2000: **84.3 million gallons**		
Volume Discharged to Duck Pond: **40,362 gallons**			Volume Discharge to Storm Drain: **0 gallons**		
VOC Mass Removed: **4.24×10^{-3} pounds**[b]			VOC Mass Removed Since March 2000: **174.34 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 LF007CGWTP operates on solar power only.
[b] VOCs from July 2015 influent sample detected by EPA Method SW8260B.
[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 – LF007CGWTP Average and Total Flow Rates – July 2015

Location	Average Flow Rate (gpm)[a]	Total Gallons Processed (gallons)
EW614x07	4.57	40,286
EW615x07[b]	0	0
LF007CGWTP	**4.58**	**40,362**

[a] Average flow rate calculated by dividing the total gallons processed collected from wellhead totalizers by the hours recorded by the system hour meter.
[b] Extraction well currently offline due to insufficient battery power.
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	
LF007CGWTP	Varied	--	Varied	--	System continually shut down due to water in sump; when high water alarm in sump is tripped, the LF007CGWTP system automatically shuts down and is not restarted until technician comes to restart it.

-- = Time not recorded

[a] Shutdown and restart times estimated based on field notes

LF007CGWTP = Subarea LF007C Groundwater Treatment Plant

Summary of O&M Activities

Analytical data from the 9 July 2015 sampling event are presented in Table 4. Acetone (3.33 µg/L, not shown in Table 4), chloromethane (0.19 J µg/L, not shown in Table 4), cis-1,2-DCE (0.21 J µg/L), and TCE (2.59 µg/L) were detected at the influent sample location. Acetone (3.77 µg/L) and chloromethane (0.16 J µg/L) were detected at the midpoint sampling location. Acetone (2.36 µg/L) and TPH-diesel (34.4 J µg/L) were detected in the effluent sample location. No additional constituents were detected at the sampling locations. Although TPH-diesel was detected at the effluent sampling location, its concentration (34.4 µg/L) is less than the effluent limitation as specified in the General NPDES permit (50 µg/L). Travis AFB will continue to monitor effluent concentrations for TPH-diesel as it is not typically detected at this location.

Figure 1 presents a chart of influent concentrations (total VOCs) at the LF007CGWTP versus time for the past twelve months. Analytical data (Table 4) continue to indicate effective treatment of the influent process stream.

The LF007CGWTP (formerly referred to as the North Groundwater Treatment Plant [NGWTP]) was brought back on line on 2 June 2015 after having been taken off line in December 2014 when vernal pools formed at Subarea LF007C.

The anti-siphon valve at the LF007CGWTP experienced a continual drip-leak during July 2015, which slowly filled the sump. The system would then shut off once the sump was full. The anti-siphon valve was cleaned on 28 July 2015, and a new vacuum breaker valve will be installed in August 2015.

The average flow rate through the LF007CGWTP in July 2015 (4.58 gpm) was consistent with the flow rate measured in June 2015 (4.37 gpm). The July 2015 flow rate was consistent with previous flow rates observed in October and November 2014.

Optimization Activities

No optimization activities were performed during July 2015.

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 LF007CGWTP. The LF007CGWTP is now a solar-only operated treatment system and no longer generates GHG.

TABLE 4
Summary of Groundwater Analytical Data For July 2015 – Subarea LF007C Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	9 July 2015 (µg/L)		
				Influent	After Carbon 1	Effluent
Halogenated Volatile Organics						
Bromodichloromethane	5.0	0.15	0	ND	ND	ND
Bromoform	5.0	0.19	0	ND	ND	ND
Carbon Tetrachloride	0.5	0.14	0	ND	ND	ND
Chloroform	5.0	0.16	0	ND	ND	ND
Dibromochloromethane	5.0	0.13	0	ND	ND	ND
1,3-Dichlorobenzene	5.0	0.15	0	ND	ND	ND
1,4-Dichlorobenzene	5.0	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	ND	ND	ND
1,1-Dichloroethene	5.0	0.19	0	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.19	0	0.21 J	ND	ND
trans-1,2-Dichloroethene	5.0	0.33	0	ND	ND	ND
Methylene Chloride	5.0	0.66	0	ND	ND	ND
Tetrachloroethene	5.0	0.21	0	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.14	0	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.2	0	ND	ND	ND
Trichloroethene	5.0	0.19	0	2.59	ND	ND
Vinyl Chloride	0.5	0.18	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	1.0	0.17	0	ND	ND	ND
Ethylbenzene	5.0	0.22	0	ND	ND	ND
Toluene	5.0	0.14	0	ND	ND	ND
Xylenes	5.0	0.23 – 0.5	0	ND	ND	ND
Other						
Total Petroleum Hydrocarbons – Gasoline	50	8.5	0	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	50	0	NM	NM	34.4 J
Total Dissolved Solids (mg/L)	NA	10	0	NM	NM	NM

* In accordance with Appendix G of the *Travis AFB North Groundwater Treatment Plant Operations and Maintenance Manual*, Sites FT004, SD031, and LF007 Area C (URS Group, Inc., 2005).

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
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
LF007CGWTP Total VOC Influent Concentrations and Average Flowrate
Twelve Month History
Travis Air Force Base, California

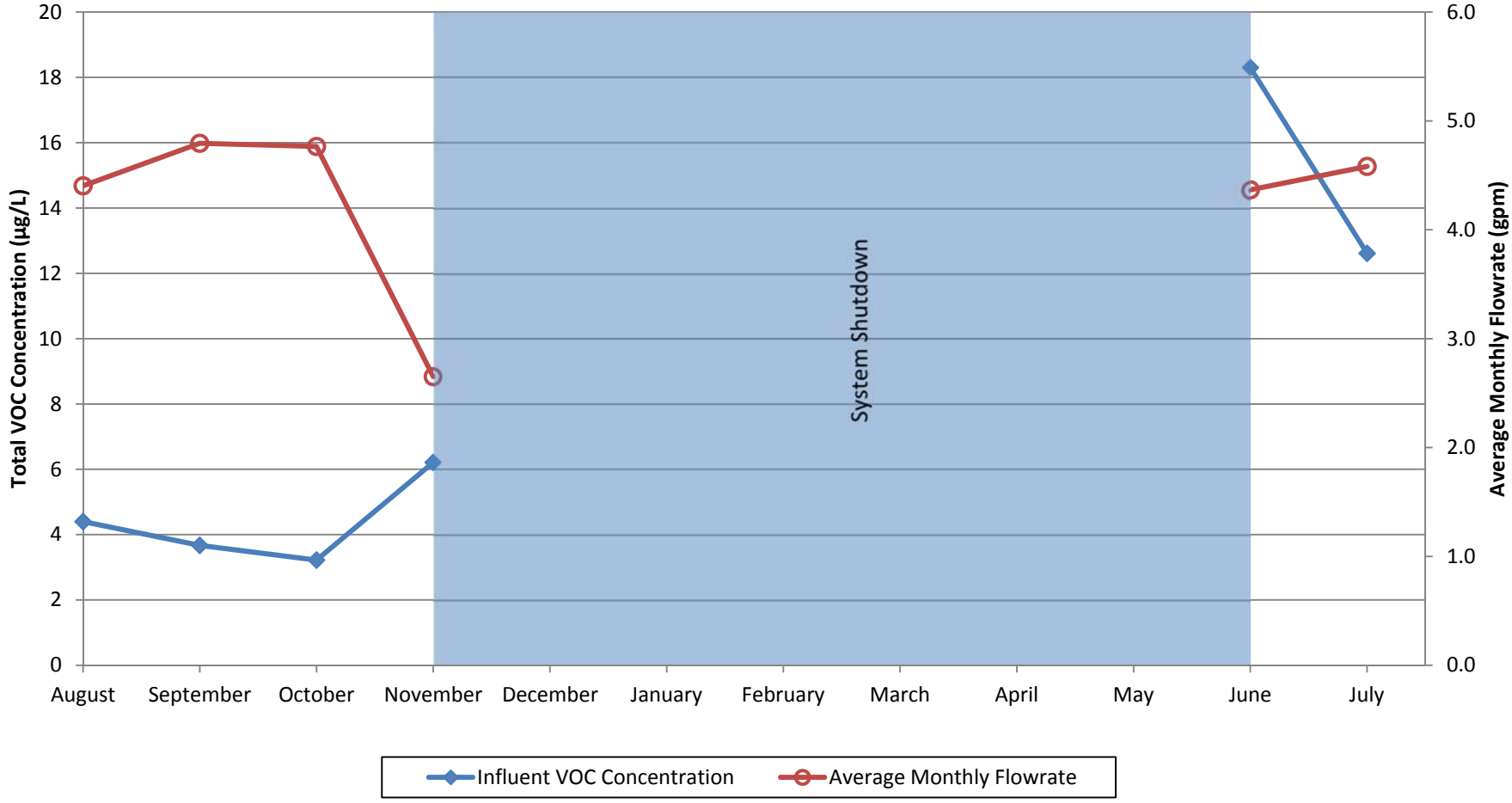
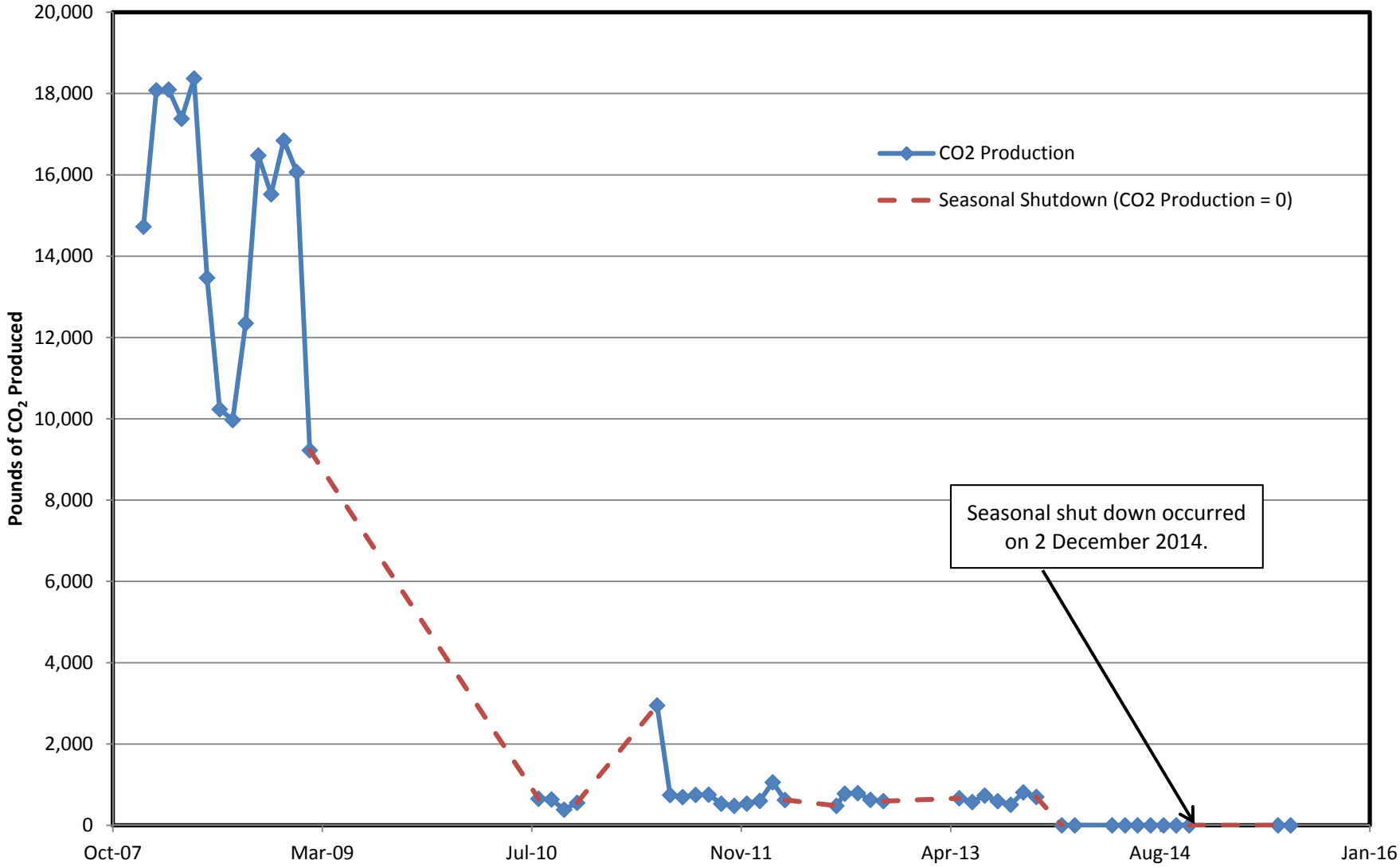


Figure 2

Equivalent Pounds of CO2 Produced by the LF007C Groundwater Treatment Plant



Note: Dashed line represents seasonal shutdowns due to the presence of vernal pools at Site LF007C during which no CO2 production occurred.

Site ST018 Groundwater Treatment Plant Monthly Data Sheet

Report Number: 053 **Reporting Period: 30 June 2015 – 28 July 2015** **Date Submitted: 13 August 2015**

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

System Metrics

Table 1 presents operation data from the July 2015 reporting period.

Table 1 – Operations Summary – July 2015

Initial Data Collection:	06/30/2015 09:00	**Final Data Collection:**	07/28/2015 12:00
Operating Time:		Percent Uptime:	Electrical Power Usage:
ST018GWTP: 632 hours		**ST018GWTP:** 90%	**ST018GWTP:** 115 kWh (158 lbs CO_2 generated[a])
Gallons Treated: **218,830 gallons**		Gallons Treated Since March 2011: **7.98 million gallons**	
Volume Discharged to Sanitary Sewer: **218,830 gallons**		Final Totalizer Reading: **7,863,400 gallons**	
Cumulative Volume Discharged to Sanitary Sewer since 1 November 2014: **1,480,315 gallons**			
BTEX, MTBE, TPH Mass Removed: **0.36 lbs**[b]		BTEX, MTBE, TPH Mass Removed Since March 2011: **32.1 lbs**	
MTBE (Only) Removed: **0.24 lbs**[b]		MTBE (Only) Mass Removed Since March 2011: **7.5 lbs**	
Rolling 12-Month Cost per Total Pounds of Mass Removed: $18,019[c]			
Monthly Cost per Pound of Mass Removed: $9,677			

[a] Based on Department of Energy estimate that 1 kilowatt hour generated produces 1.37 pounds of GHG.

[b] Calculated using July 2015 effluent EPA Method SW8260B 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

Location	Average Flow Rate Groundwater (gpm)[a]	Hours of Operation
EW2014x18	2.1[b]	632
EW2016x18	2.5[b]	632
EW2019x18	2.5[b]	632
EW2333x18	--[c]	632
Site ST018 GWTP	5.77	632

[a] Flow rates calculated by dividing total gallons processed by the hours of operation, from the totalizer and hour meter at each location.
[b] Flow rate taken as instantaneous reading at beginning of the month.
[c] No flow rate readings were taken at EW2333x18; insufficient data to properly calculate flow rate.
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	NR	--	NR	--	Some system downtime due to a broken air release valve in the tertiary GAC vessel, which was bypassed and will be brought back online in August 2015.

[a] Shutdown and restart times estimated based on field notes
-- = time not known
NR = not recorded
ST018GWTP = Site ST018 Groundwater Treatment Plant

Summary of O&M Activities

Monthly groundwater treatment samples were collected at the ST018GWTP on 9 July 2015. Results are presented in Table 4. The complete July 2015 laboratory data report is available upon request.

The influent concentration for MTBE during the July 2015 sampling event was 133 µg/L, which is an increase from the June 2015 sample (100 µg/L). This is likely a direct result from the addition of extraction well EW2333x18, which was brought on line on 3 June 2015. 1,2-DCA (2.48 µg/L), chloromethane (0.21 J µg/L), and acetone (2.98 µg/L) were also detected in the influent sample. TPH-g and TPH-d were also detected at the influent sample location at concentrations of 64.5 J µg/L and 67.1 J µg/L, respectively. These concentrations have decreased from previous months. TPH-d was detected in the midpoint and effluent sample locations at concentrations of 59.7 J µg/L and 32.2 J µg/L, respectively. These concentration are well below the Fairfield-Suisun Sewer District effluent limitation for TPH of 50,000 µg/L. TPH (gas or diesel) is not typically detected at the effluent sampling location. Travis AFB will continue to monitor effluent contaminant concentrations and evaluate the condition of the carbon filter beds. MTBE and acetone were detected in the effluent sample at concentrations of 0.35 J µg/L and 4.79 µg/L, respectively.

Figure 1 presents plots of flow rate and influent total contaminant (TPH-g, TPH-d, MTBE, and BTEX) and MTBE concentrations at the ST018GWTP versus time. The tertiary GAC vessel was off line for most of July 2015, due to a broken air release valve. The threads from the air valve had broken off inside the vessel. Once the broken threads are extracted, the GAC vessel can be brought back online. This work is anticipated to be completed in August 2015.

As shown on Figure 1, the average flow rate through the ST018GWTP has been seasonally variable with a slight increasing trend since the battery upgrade in 2013. July 2015 represents a decreased amount of groundwater treated and discharged by the ST018GWTP from the June 2015 amount, and may be a result of continued drought conditions.

Optimization Activities

No optimization activities occurred at the ST018GWTP in July 2015.

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.

The ST018GWTP produced 158 pounds of GHG during July 2015, which is consistent with 100 percent uptime. The amount of water treated in July 2015 (218,830 gallons) was also consistent with the increased runtime. The amount of GHG produced during June (207 pounds) was representative of typical values observed with months of 100 percent uptime and a higher volume discharged. Figure 2 presents the historical GHG production from the ST018GWTP. The overall GHG generation has been decreasing since a 2014 peak in March, and remains considerably lower than traditional GWTPs since the system is predominantly powered by solar arrays. The previous increasing GHG production reflected an inverse relationship between solar exposure in the fall and winter relative to GHG production.

TABLE 4
Summary Of Groundwater Analytical Data for July 2015 – Site ST018 Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	9 July 2015 (µg/L)			
				Influent	After Carbon 1	After Carbon 2	System Effluent
Fuel Related Constituents							
MTBE	6,400	0.5	0	133	NM	NM	0.35 J
Benzene	25,000[a]	0.17	0	ND	NM	NM	ND
Ethylbenzene	25,000[a]	0.22	0	ND	NM	NM	ND
Toluene	25,000[a]	0.14	0	ND	NM	NM	ND
Total Xylenes	25,000[a]	0.23 – 0.5	0	ND	NM	NM	ND
Total Petroleum Hydrocarbons – Gasoline	50,000[b]	8.5	0	64.5 J	ND	NM	ND
Total Petroleum Hydrocarbons – Diesel	50,000[b]	50	0	67.1 J	59.7 J	NM	32.2 J
Total Petroleum Hydrocarbons – Motor Oil	100,000	160	0	ND	ND	NM	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
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
Quarterly History
Travis Air Force Base, California

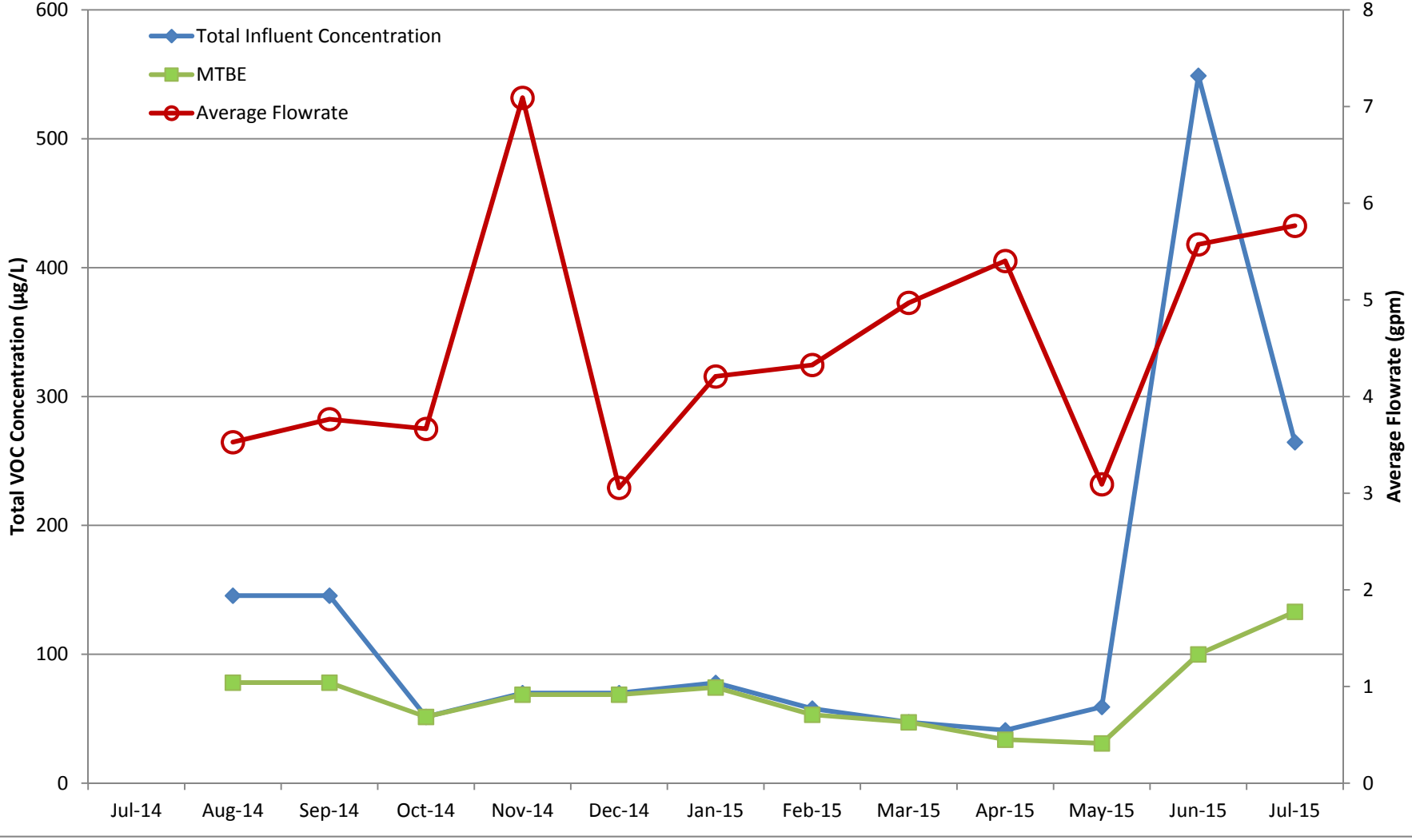
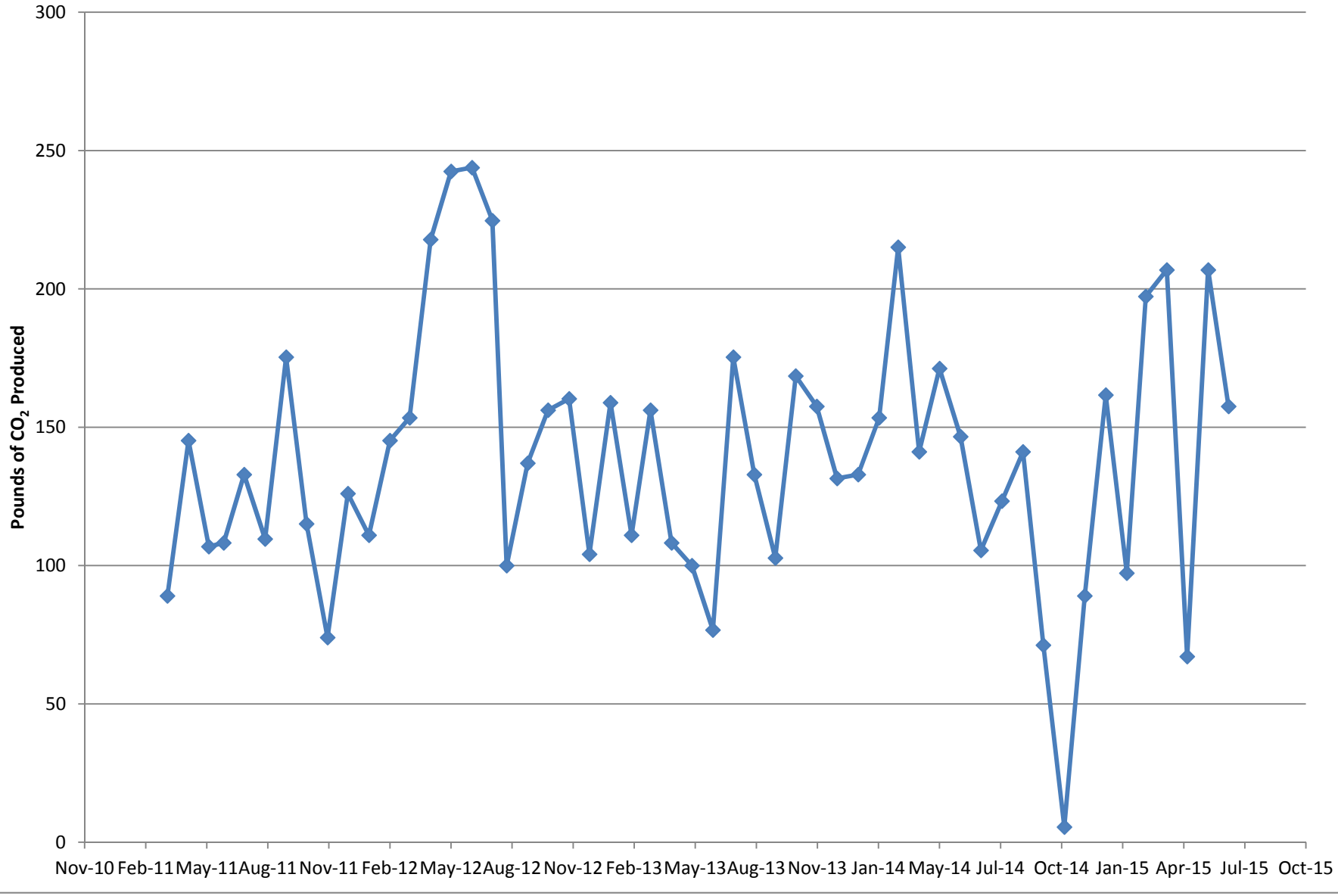


Figure 2

Equivalent Pounds of CO2 Produced by the Site ST018 Groundwater Treatment Plant



Travis AFB
Restoration Program

Program Overview

RPM Meeting

Aug 19, 2015

Completed Documents

- 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 (cont'd)

- 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 Technology Demonstration Work Plan
- CG508 Site Investigation/Site Closure Request Report
- 2014 Annual CAMU Monitoring Report
- ***DP039 GW RD/RA Work Plan***
- ***SD031 Technology Demonstration Construction Completion Report***

Completed Field Work

- 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

- 2015 Annual GRIP Sampling
- SD037 EVO Injection
- SD034 Data Gaps Investigation
- SS015 EVO Injection
- ***FT005 Injection Well Installation***

Documents In-Progress

CERCLA

- 2014 Annual GRISR
- ***Sites SD036 and SD037 Remedial Action Construction Completion Report***

Documents In-Progress

POCO

- ***ST018 POCO Construction Completion Report***

Field Work In-Progress

- FT005 Well Development, Baseline Sampling
- FT004 Well Installation, Well Development, Baseline Sampling
- DP039 Well Installation , Well Development, Baseline Sampling

Documents Planned

CERCLA

• Community Involvement Plan	Oct
• ROD Amendment for NEWIOU Soil, Sediment, and Surface Water ROD	TBD
• ROD Amendment for WABOU Soil ROD	TBD
• Site SS016 Groundwater Remedial Action Construction Completion Report	Aug
• Site SS015 Groundwater Remedial Action Construction Completion Report	Sep
• Site SS030 Remedial Action Construction Completion Report	Oct

Documents Planned

POCO

- ***Corrective Action Plan for OWSs 40, & 50-57***
  TBD

Field Work Planned

CERCLA

- SS030 Trench/Conveyance/Power Installation — Aug
- FT005 Trench Installation — Aug
- FT004 Trench/Conveyance/Power Installation — Sep
- FT004 EVO Injection — Sep
- FT005 EVO Injection — Sep
- DP039 Infiltration Trench Installation — Sep
- DP039 EVO Injection — Sep

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

Field Work Planned

POCO

- SS014 Bioreactor Installation — Aug
- ***OWS 47, 48, 49 Site Investigations*** — ***Aug***

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

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)

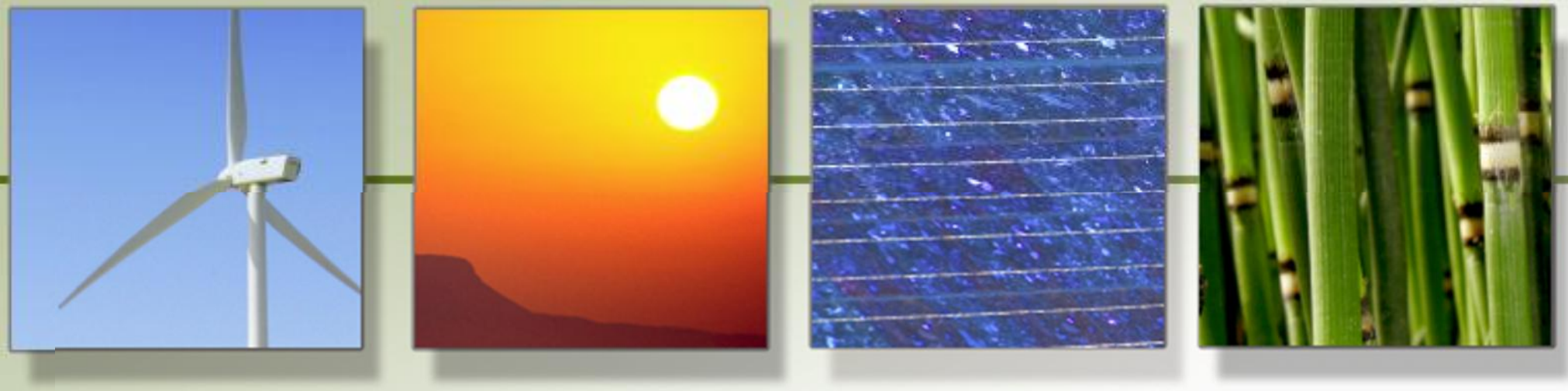
- Phytostabilization Study Report
- 2009/2010 Annual GSAP Report
- SS015 Remedy Optimization Field Implementation Plan
- Sites SS014 and ST032 Tier 1 POCO Evaluation Report
- SD036 Remedy Optimization Field Implementation Plan
- 2010 Annual CAMU Inspection Report
- Site ST018 POCO Baseline Implementation 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 (4^{th} 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



green remediation solutions

VEG Mobile Thermal Desorption Technology

2015

Mehrdad Javaherian, Ph.D., MPH, PE, LEED®GA

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COMPANY OVERVIEW-Endpoint Consulting, Inc.

Patented Green & Sustainable Technologies

– **Waste-to-Energy Conversion**

- Successful application since 2006

–**Green Building Blocks**

- LEED-Certified, light weight building blocks for reduced energy consumption and enhanced safety

–**CO_2 and Diesel Filters**

- Emission-reducing tools for construction/remediation equipment and stationary sources

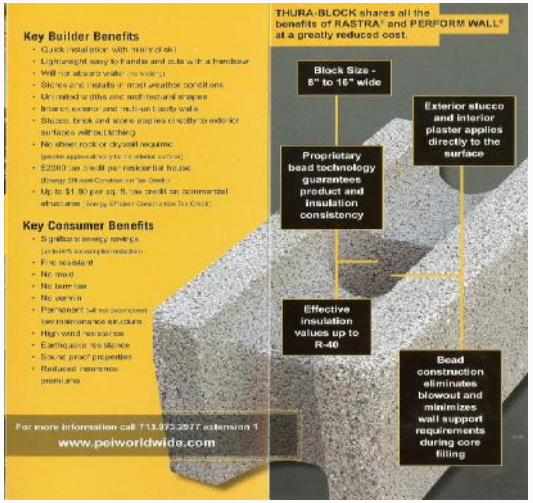
–**Mobile Thermal Desorption Technology**

- Award-winning soil remediation and enhanced oil/NAPL recovery technology

Diesel & CO_2 Filters for Off-Road Engines and Stationary Combustion Sources

Pyrolytic Gasification Technology for Conversion of Waste-to-Energy

VEG Soil Remediation Technology



Manufacturing of Green Building Blocks

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VEG Soil Remediation Technology

VEG In-Situ Soil Remediation System

VEG Ex-Situ Soil Remediation System

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Patented VEG Technology

• **At its core**: A mobile, compact, high efficiency vapor generator

– Air, recycled water and propane used to generate steam at 1300 F°

Various In-Situ and Ex-Situ Applications

• **Enhanced oil recovery**

•Unclog and recover refined oil from old, abandoned, and/or frozen aboveground pipelines.

•Enhanced crude oil recovery from deep oil wells

•In-situ LNAPL (gasoline and diesel) mobilization and recovery

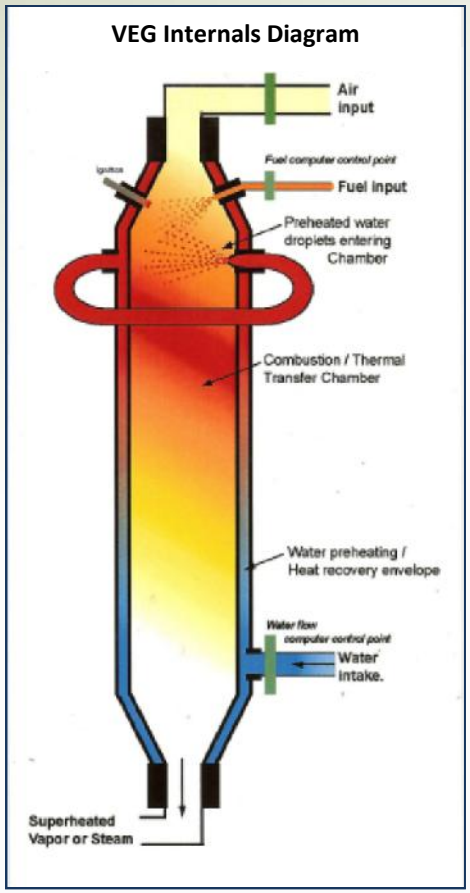
•Onsite soil remediation for unrestricted reuse

• Full range of TPH's, waste oils, crude oils, refined oils

•VOCs and SVOCs- BTEX, MTBE, TCE, PCE, VC, PAHs

•Pesticides and PCBs

•Munitions constituents- TNT, RDX, HDX, etc.



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VEG Ex-Situ Soil Remediation System

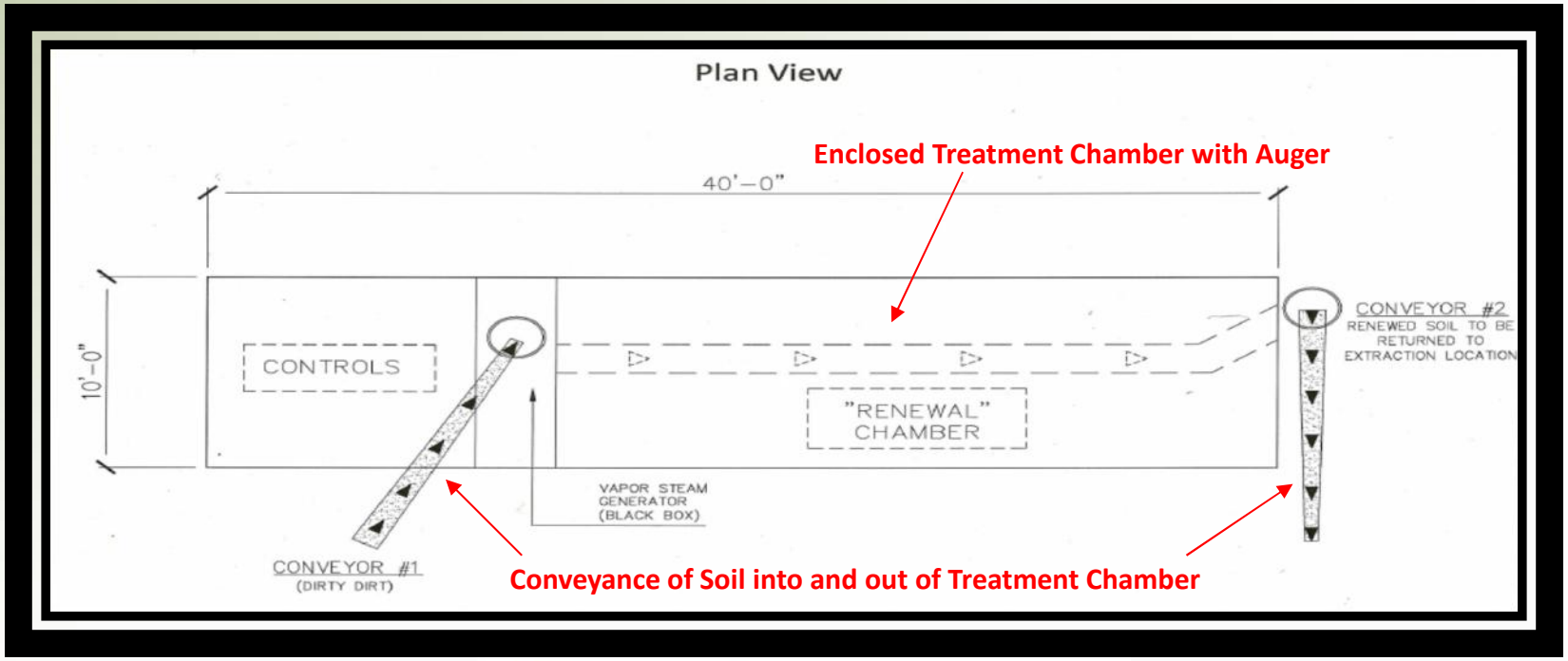
VEG Soil Remediation Technology

– Enclosed, rotational treatment chamber with 20 to 30-inch auger

– Variable-speed hydraulic system: rotates & moves soil through treatment chamber

– Fully enclosed system captures ALL combustion heat generated; **No heat or vapors are lost** to the atmosphere

– VOCs/SVOCs desorbed and passed from soil into the box head space



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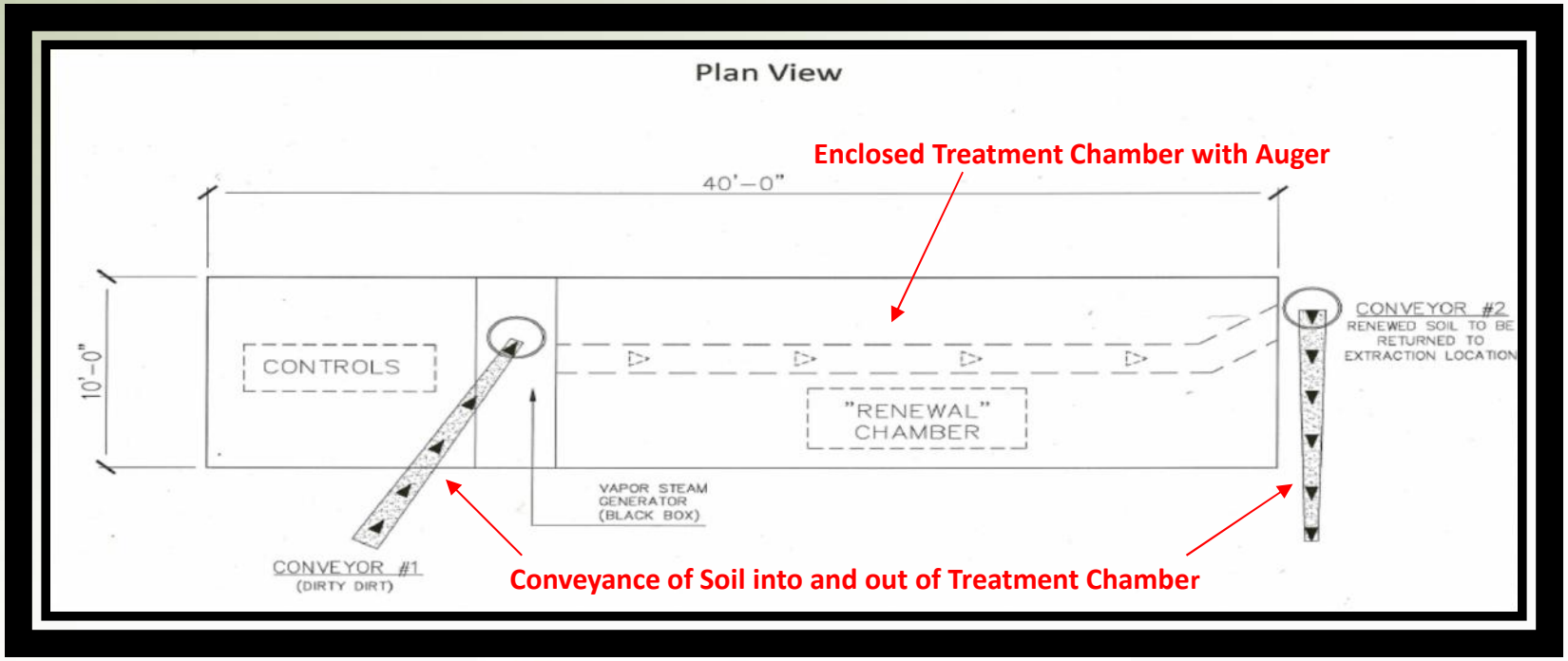
VEG Soil Remediation Technology

- VOC/SVOC vapors vacuumed through a scrubber/filter system for removal of acidic compounds/vapors such as NOx (HNO_3), SOx (H_2SO_4) and HCl (hydrogen chloride).
- Remaining hot vapor stream sent to vapor generator, replacing propane as additional fuel.
- CO_2 emissions reduced through Endpoint's patented CO_2 filter; Hence, NOTHING passes to the atmosphere except low levels of CO_2 below background levels.
- Disposal of a benign, dilute solution of sodium nitrate, sodium bisulfate, and sodium chloride.



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VEG SOIL REMEDIATION TECHNOLOGY

Attributes

- Easily transportable, mobile system for onsite applications,
- Treats >30 yd^3 of soil per hour,
- Complete 3,000 yd^3 cleanup in less than 10 days,
- Enclosed, Emission-Reducing System-
  - Captures all vapor and combustion heat generated
  - Provides complete control over target temperature and soil residence time through treatment chamber
- Induced vapors are recycled as fuel to operate system
- Use of recycled water eliminates potable water use
- Propane use increases clean energy production by 250%
- Indirect-fire, low-temperature thermal treatment process (**NO INCINERATION, NO DIOXINS/FURANS GENERATED**)

Ex-Situ VEG Application for Remediation of Chlorinated Solvents in Soil
USACE ERDC Facility, Vicksburg, MS

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VEG SOIL REMEDIATION TECHNOLOGY

Benefits

- Eliminates offsite transport and landfill disposal of soils & associated costs
- Eliminates landfill waste generator liability
- Eliminates need to import fill soils to site
- Allows for unrestricted reuse of soils and eliminates LUCs
- Results are guaranteed (Ideal for PBCs)
- Significantly reduces remediation costs (typically 50% to 90% reduction)
- Reduces remediation carbon footprint (typically >80% reduction)

Ex-Situ VEG Application for Remediation of Petroleum Hydrocarbons, Industrial Facility, Alameda, CA

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VEG SOIL REMEDIATION TECHNOLOGY

Applications and Success Stories-VEG Ex-Situ Remediation System

- Application on over 25 remediation projects across the US completed
- Over 14 bench-scale and 15 pilot tests across the US
- Over 12,000 soil treatment runs targeting petroleum hydrocarbons, chlorinated solvents, PCBs, pesticides, and arsenic
  - Treatment of gasoline, diesel, jet fuel, motor oil, and MGP wastes (PAHs) to non-detect levels
  - Treatment of VOCs (e.g, benzene, MTBE, TCE, PCE, vinyl chloride) to non-detect levels
  - Treatment of PCBs and pesticides to below RSLs and non-detect levels
  - Ongoing in-situ and ex-situ treatment of munitions constituents, including TNT, RDX, HDX
  - Current Research- Treatment of Perfluoroalkyl (Polyfluorinated alkyl) Compounds (PFCs)

Application Results

Chemical	Pre-VEG Treatment (mg/kg)	Post-VEG Treatment (mg/kg))
TPH-g	150,000	<50
TPH-d	130,000	<50
BTEX	2,500	<0.05
MTBE	500	<0.05
PAHs	10,000	<0.01
TCE/PCE/VC	2000	<0.001
PCBs	50	<0.2
Pesticides	10,000	<0.001
MCs	55,000	<0.015

VEG SOIL REMEDIATION TECHNOLOGY

VEG Application- USACE's ERDC Facility, Vicksburg, MS

- USEPA (Region 4) oversight
- Chlorinated VOCs in Soil and Groundwater
  - PCE/TCE in soil up to 4,400 ug/kg
  - PCE/TCE in groundwater up to 350 ug/L in groundwater
- Construction of Road and Headquarters Building Pending
- USACE: "highest priority project in FY14"

US Army Corps of Engineers®
Engineer Research and Development Center

USACE ERDC-WES Facility, Vicksburg, MS

Remediation Approach

- Enhanced In-Situ Bioremediation of Groundwater
  - Biostimulation & Bioagumentation
  - 3D Microemultion (3DME) & Bio-Dechlor Inoculum (BDI) microbial injections
- In-Situ Chemical Reduction via Abiotic Pathway- Groundwater
  - CRS injections
- Vadose Zone/Capillary Fringe Soil Excavation, Ex-Situ Thermal Treatment via VEG, Soil Backfill and Compaction

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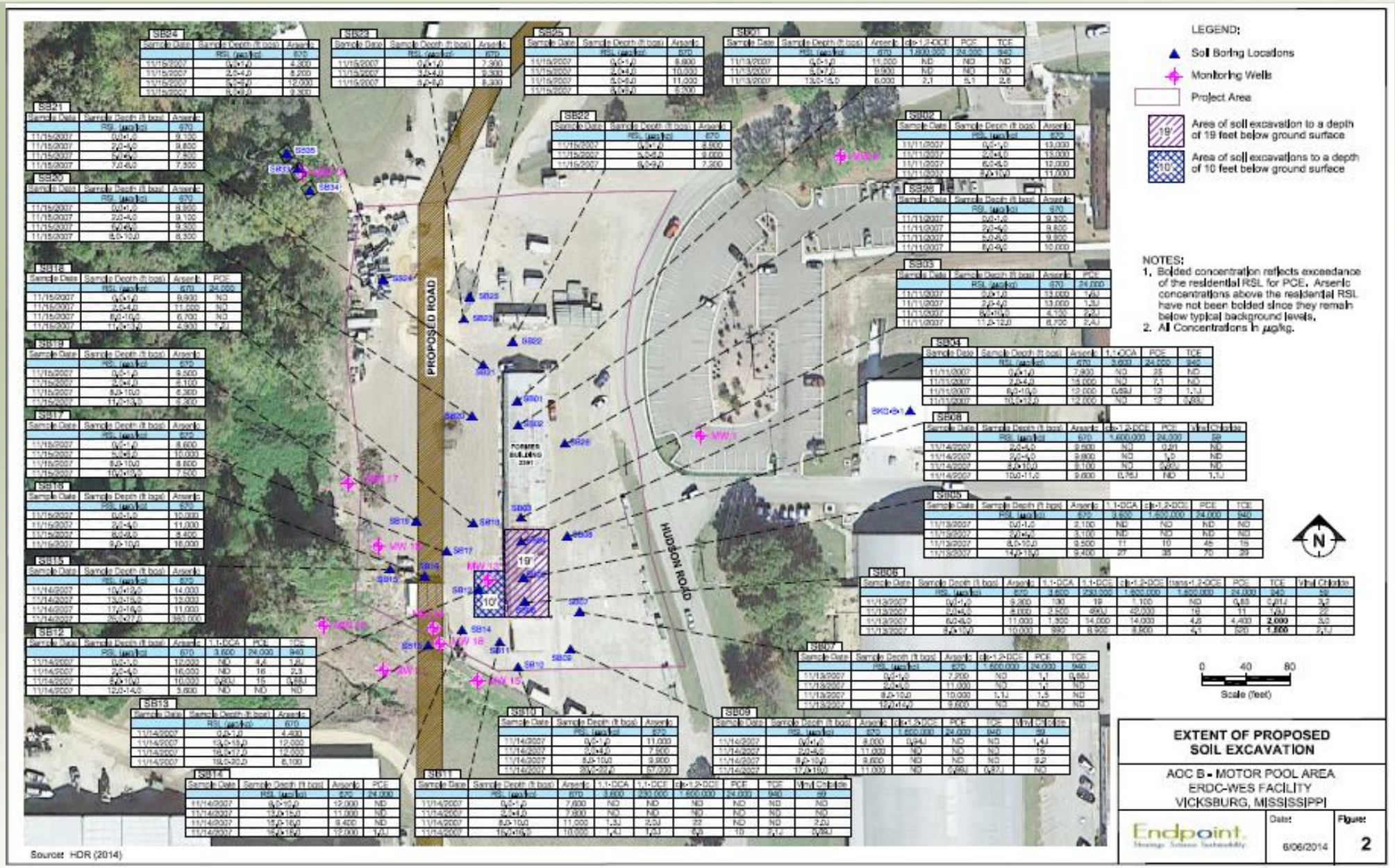
USACE ERDC FACILITY, VICKSBURG, MS- Extent of Groundwater Impacts

USACE ERDC FACILITY, VICKSBURG, MS-Extent of Soil Impacts



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MOBILIZATION OF VEG SYSTEM

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SOURCE AREA EXCAVATION

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SOIL STOCKPILE MANAGEMENT

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INITIATION OF EX-SITU THERMAL TREATMENT

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IMPACTS OF WEATHER ON REMEDIATION APPROACH

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BENEFITS OF SOIL PREPARATION

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IMPORTANCE OF THERMAL MONITORING

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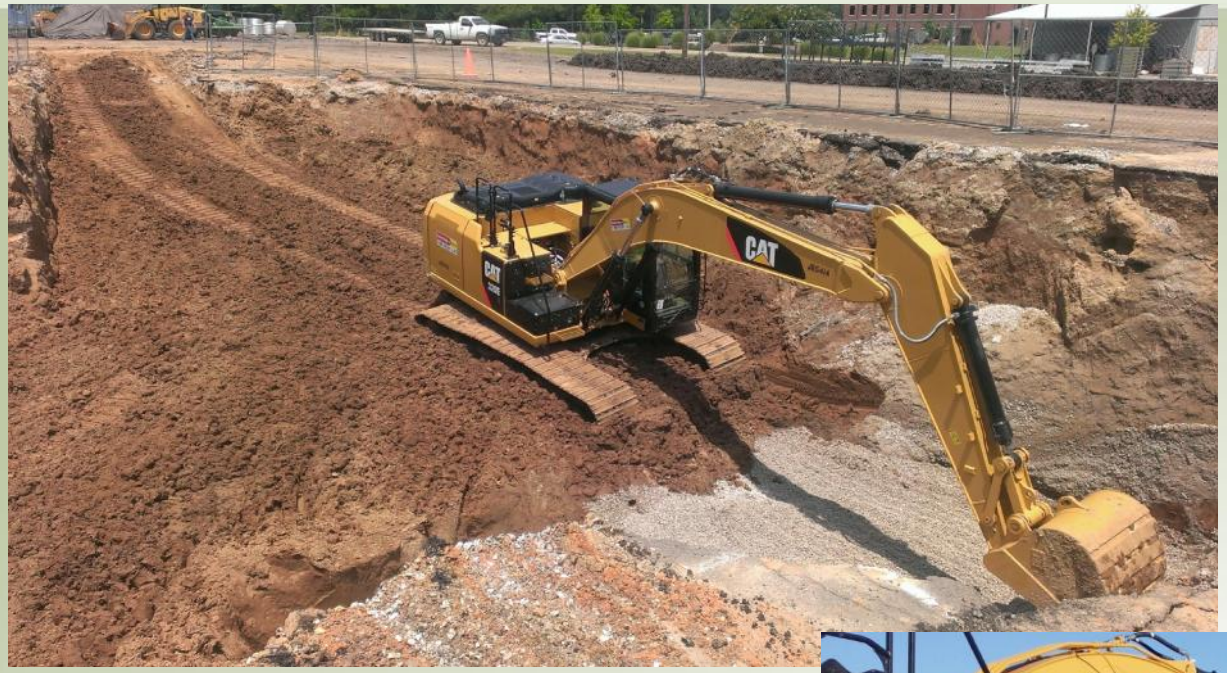
SOIL BACKFILLING AND COMPACTION



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VEG TREATMENT OF IDW DECONTAMINATION WASTES

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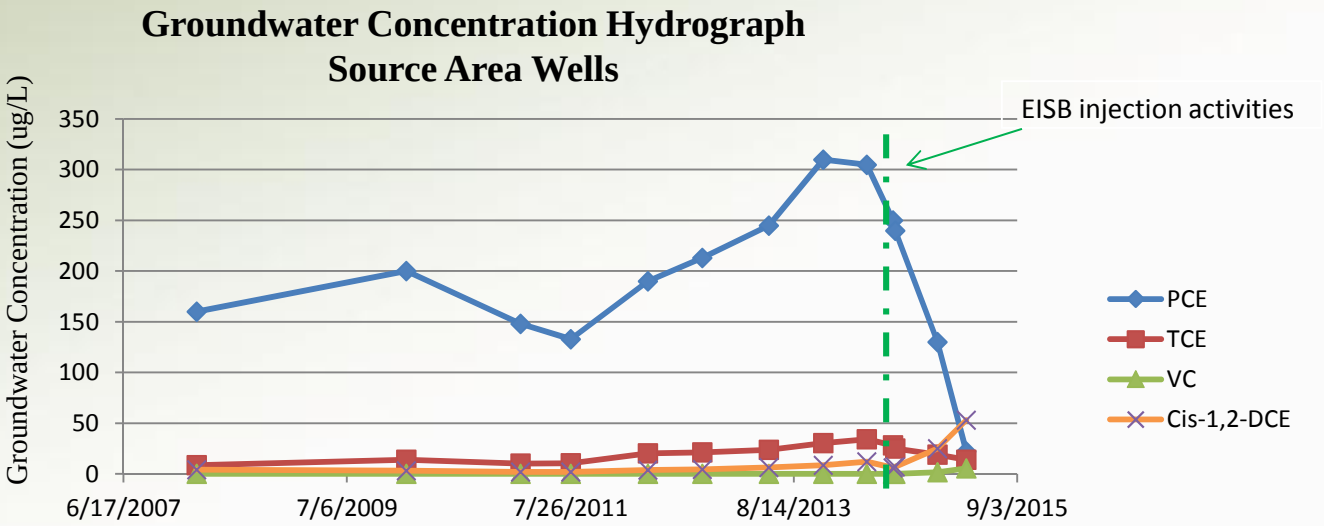
POST-REMEDIATOIN CONDITIONS

Chemical	Maximum Pre-Treatment Soil Concentration (ug/kg)	Post-Treaetment Soil Concentration (ug/kg)
TCE	2,000	<1.2
PCE	4,400	<1.8
Cis-1,2-DCE	2,500	<1.3
1,1-DCA	2,500	<1
Vinyl Chloride	2,200	<1.4



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USACE RECOGNITION

ERDC Newsletter- (November 2014)

US Army Corps of Engineers
BUILDING STRONG®

Site cleanup demonstrates unique technology

Posted 11/18/2014

By Kerry Larsen, ERDC Public Affairs

VICKSBURG, Miss. - Cleanup efforts on the former motor pool site at the U.S. Army Engineer Research and Development Center (ERDC) in Vicksburg, Mississippi, were recently completed and incorporated some new, cutting-edge technology, making the process more environmentally friendly and economical.

The motor pool operation utilized mechanics to perform maintenance and repairs on vehicles and heavy equipment from the early days of the Waterways Experiment Station until 1996, when the station transitioned to leased and rented vehicles and equipment. The motor pool building served a variety of other purposes, including logistics offices, until 2009, after which time it remained empty until its demolition in 2012.

The ERDC enlisted the assistance of the U.S. Army Corps of Engineers (USACE) Omaha District and its Environmental Remediation Branch to conduct a three-phase cleanup project on the motor pool site.

Photos

Twenty-five hundred cubic yards of soil were excavated, treated for contaminants and replaced during recent cleanup efforts on the former motor pool site at the U.S. Army Engineer Research and Development Center in Vicksburg, Miss. The Vapor Energy Generator soil remediation system was used for the project, coordinated by the U.S. Army Corps of Engineers Omaha District. (Photo by U.S. Army Corps of Engineers)

USACE RECOGNITION

USACE Omaha Newsletter- (January 2015)

The Corps
Environment

VOLUME 16, ISSUE 1 JANUARY 2015

Motor pool cleanup demonstrates unique technology

U.S. Army Corps of Engineers Engineer Research and Development Center

Cleanup efforts on the former motor pool site at the U.S. Army Engineer Research and Development Center (ERDC) in Vicksburg, Mississippi, were recently completed and incorporated some new, cutting-edge technology, making the process more environmentally friendly and economical.

The motor pool operation used mechanics to perform maintenance and repairs on vehicles and heavy equipment from the early days of the Waterways Experiment Station until 1996, when the station transitioned to leased and rented vehicles and equipment. The motor pool building served a variety of other purposes, including logistics offices, until 2009, after which time it remained empty until its

friendly. Most significantly, once the contaminated soil is treated — in this case to achieve non-detectable levels for all chemicals of potential concern at the site — the clean-treated soil is then placed back into its original location and compacted for reuse, eliminating the need and expense of offsite transportation and disposal of soils at a landfill.

At ERDC, the need to purchase fill soils was eliminated through full reuse of treated soils, and the organization's liability for contamination was eliminated through complete treatment rather than by

Some 2,500 cubic yards of soil were excavated, treated for contaminants and replaced during cleanup of a former motor pool site at the U.S. Army Engineer Research and Development Center in Vicksburg, Mississippi. The Vapor Energy Generator soil remediation system was used for the project, coordinated by the Omaha District. (Photo by Kerry Larsen)

were above migration to groundwater risk-based screening levels. They were contributing to a small groundwater plume at the site. As such, we understood soils would have to be cleaned up to below migration to groundwater risk-based screening levels.

"It is relatively easy to achieve a large mass reduction of contaminants with a technology when contaminant levels are high, however, it is often difficult to treat contaminated media down to very low levels. We were optimistic that the VEG technology would allow us to treat soils to the very low required levels. The team was especially pleased when we were able to treat the soils down to no detectable contamination, which were even better results than we had originally hoped to achieve," Simpleman added.

The final phase of the cleanup involves routine monitoring of groundwater quality to ensure that the treatment efforts,

USACE RECOGNITION

SAME Omaha Newsletter- (Winter 2015)

Society of SAME American Military Engineers

OmahaPost

Site Cleanup Demonstrates Unique Technology

By: Kerry Larsen, ERDC Public Affairs

VICKSBURG, Miss. - Cleanup efforts on the former motor pool site at the U.S. Army Engineer Research and Development Center (ERDC) in Vicksburg, Mississippi, were recently completed and incorporated some new, cutting-edge technology, making the process more environmentally friendly and economical.

Twenty-five hundred cubic yards of soil were excavated, treated for contaminants and replaced during recent cleanup efforts on the former motor pool site at the U.S. Army Engineer Research and Development Center in Vicksburg, Miss. The Vapor Energy Generator soil remediation system was used for the project, coordinated by the U.S. Army Corps of Engineers Omaha District. (Photo by U.S. Army Corps of Engineers).

SAME Omaha Post General Membership Meeting Follow-up

The VEG Process was the topic of the September 12, 2013 General Membership meeting.

high as 1,100 degrees Fahrenheit into the chamber. As an internal auger rotates the soil, the steam causes contaminants to be released and captured by a vacuum system inside the enclosed treatment chamber. The captured gases are then run through a series of patented acid gas and emission-reducing filters before being routed back to the generator to be burned as fuel to run the treatment system.

Using this process, the plant actually uses less and less fuel as project time goes on. The system operates completely on recycled water, making it environmentally friendly. Most significantly, once the contaminated soil is treated - in this case to achieve non-detectable levels for all chemicals of potential concern at the site - the clean-treated soil is then placed back into its original location and compacted for reuse, eliminating the need and expense of offsite transportation and disposal of soils at a landfill. Using this soil remediation system resulted in the removal and onsite treatment of a significant amount of contaminant mass that otherwise was slated for disposal at a landfill. As a result, fully treated soils were reused onsite without restrictions, generating significant reductions in cost, liability, vehicle traffic through residential areas, and significant reductions in carbon dioxide and other atmospheric emissions that would otherwise have occurred throughout the soil

USACE RECOGNITION

2014 Secretary of the Army Environmental Award Nomination

2014 Secretary of the Army Environmental Awards
Nomination Packet

Narrative

Award Category: Environmental Restoration – Installation

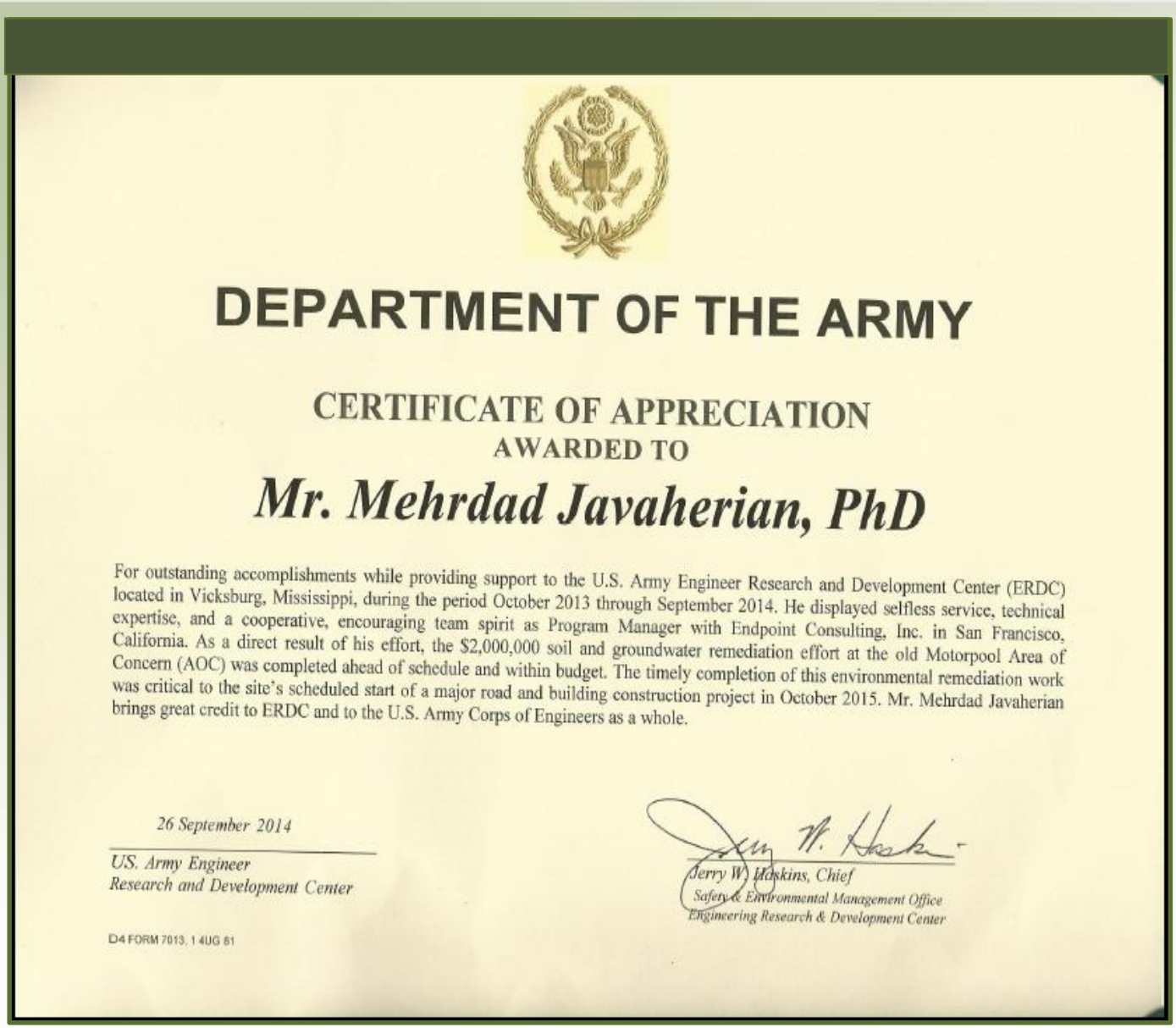
Project Description: Source Area Treatment of Chlorinated Solvent Contaminated Soils and Groundwater using in-situ injections and Vapor Energy Generator at the Waterways Experiment Station, Vicksburg, Mississippi.

Background: AOC B – Motor Pool Area: During the RCRA Facility Motor Pool personnel indicated disposal of waste oils and solvents may have occurred. In 2007, a Membrane Interface Probe (MIP)/Soil Conductivity (SC) assessment was conducted around the Motor Pool Building. Based on results of the MIP assessment, soil samples were collected from 26 soil borings within and around AOC B. Based on the results from the 2007 soil samples, five groundwater wells were installed in 2008 and two deep groundwater wells were installed in 2010. In an effort to define the leading edge of the groundwater plume, two groundwater monitoring wells (MW 20 and MW 21) were installed in April 2012. Groundwater samples have been collected in February 2008, January 2010, February 2011, July 2011; and April 2012 in accordance with USEPA-approved Groundwater Monitoring Plans.

Tetrachloroethene (PCE) and Trichloroethene (TCE) are the primary contaminants of concern, along with the breakdown products of cis-1,2-dichloroethene (DCE) and vinyl chloride (VC). The maximum contaminant level (MCL) of TCE in groundwater is five (5.0) micrograms per liter (µg/L) or parts per billion (ppb). The EPA Residential Regional Screening Level (RSL) for TCE in soil is 910 micrograms per kilogram (µg/kg) or ppb.

USACE RECOGNITION

USACE-ERDC Special Recognition (September 2014)



DEPARTMENT OF THE ARMY

CERTIFICATE OF APPRECIATION
AWARDED TO

Mr. Mehrdad Javaherian, PhD

For outstanding accomplishments while providing support to the U.S. Army Engineer Research and Development Center (ERDC) located in Vicksburg, Mississippi, during the period October 2013 through September 2014. He displayed selfless service, technical expertise, and a cooperative, encouraging team spirit as Program Manager with Endpoint Consulting, Inc. in San Francisco, California. As a direct result of his effort, the $2,000,000 soil and groundwater remediation effort at the old Motorpool Area of Concern (AOC) was completed ahead of schedule and within budget. The timely completion of this environmental remediation work was critical to the site's scheduled start of a major road and building construction project in October 2015. Mr. Mehrdad Javaherian brings great credit to ERDC and to the U.S. Army Corps of Engineers as a whole.

26 September 2014

US. Army Engineer
Research and Development Center

Jerry W. Haskins, Chief
Safety & Environmental Management Office
Engineering Research & Development Center

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Ongoing USACE Applications-

VEG In-Situ & Ex-Situ Treatment of Munitions Constituents

- Sioux Army Depot (SAD), NE
  - **Bench-Scale Testing: Ex-Situ Treatment of MCs in Soil**
  - Bench-scale treatment of MC-impacted soils via VEG ex-situ soil remediation system
  - 300 CY of soils slated for treatment
  - TNT= 55,000,000 ug/kg
  - RDX =11,000,000 ug/kg
  - HMX =1,800,000 ug/kg
  - 2A-4,6-DNT = 3,000,000 ug/kg
  - PETN = 1,700,000 ug/kg
  - PAHs =20,000 ug/kg
  - Determine if ex-situ treatment can reduce MC concentrations to below Residential RSLs or below detection limits
  - Determine optimal treatment temperature and residence time for successful treatment of MCs (for use on in-situ pilot testing at SAD)

Bench-Scale Testing: Ex-Situ Treatment of Munitions Constituents, Manteca, CA

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VEG SOIL REMEDIATION TECHNOLOGY

Ongoing USACE Applications-
Results of Ex-Situ Treatment of MCs

- Sioux Army Depot (SAD), NE

Sample ID	1,3,5-TNB (ug/Kg)	2,4,6-TNT (ug/Kg)	2,6-DNT (ug/kg)	2A-4,6-DNT (ug/Kg)	4A-2,6-DNT (ug/Kg)	RDX (ug/Kg)	HMX (ug/Kg)	PETN (ug/Kg)
Area C West Drum: Pretreatment Concentrations	**140,000**	**55,000,000**	<150,000	**3,000,000**	<500,000	**11,000,000**	**1,800,000**	**1,700,000**
Area C West Drum: Post Treated Concentrations ACW-1 (450 F, 5 minutes)	**79,000**	**2,300,000**	**14,000**	<99,000	<99,000	**55,000**	**20,000**	<99
Area C West Drum: Post Treated Concentration ACW-2 (550 F, 8 minutes)	**77,000**	**1,300,000**	< 30,000	<100,000	<100,000	<400000	<60000	<100
Area C West Drum: Post Treated Concentration ACW-3 (607 F, 8 minutes)	**43,000**	**320,000**	<7,500	**20,000**	<25,000	<99000	<15000	<99
Area C West Drum: Post Treated Concentration ACW-4 (650 F, 8 minutes)	**30,000**	**81,000**	<1,500	**8,100**	**6,600**	<20000	<3,000	<100
Area C West Drum: Post Treated Concentration ACW-5 (750 F, 8 minutes)	<15	<15	<15	<50	<50	<200	<30	<100
Residential RSLs (ug/Kg)	220,000	3,600	360	15,000	15,000	6,100	390,000	13,000
Industrial RSLs (ug/Kg)	3,200,000	51,000	1,500	230,000	230,000	28,000	5,700,000	160,000

ug/Kg = microgram per Kilogram

Red bolded detections reflect exceedance of residential RSLs

Shaded detections reflect exceedance of industrial RSLs

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VEG SOIL REMEDIATION TECHNOLOGY

Ongoing USACE Applications-
Results of Ex-Situ Treatment of PAHs

- Sioux Army Depot (SAD), NE

Sample ID	Benzo (a) anthracene (ug/Kg)	Benzo (b) fluoranthene (ug/Kg)	Benzo (k) fluoranthene (ug/Kg)	Benzo (g,h,i) perylene (ug/Kg)	Benzo (a) pyrene (ug/Kg)	Chrysene (ug/Kg)	Fluoranthene (ug/Kg)	Indeno (1,2,3-cd) pyrene (ug/Kg)	Phenanthrene (ug/Kg)	Pyrene (ug/Kg)
Area C East Drum: Post Treated Concentrations ACE-1 (650 F, 15 minutes)	**13.0**	<70	<70	<70	<70	**20.0**	<70	<70	**24.0**	**14.0**
Area C East Drum: Post Treated Concentrations ACE-2 (750 F, 8 minutes)	**1.8**	**2.9**	**1.6**	**6.2**	**3.4**	**2.6**	**4.6**	**3.2**	**4.1**	**7.0**
Residential RSLs (ug/Kg)	160	160	1,600	NA	16	16,000	240,000	160	NA	180,000
Industrial RSLs (ug/Kg)	2,900	2,900	29,000	NA	290	290,000	3,000,000	2,900	NA	2,300,000

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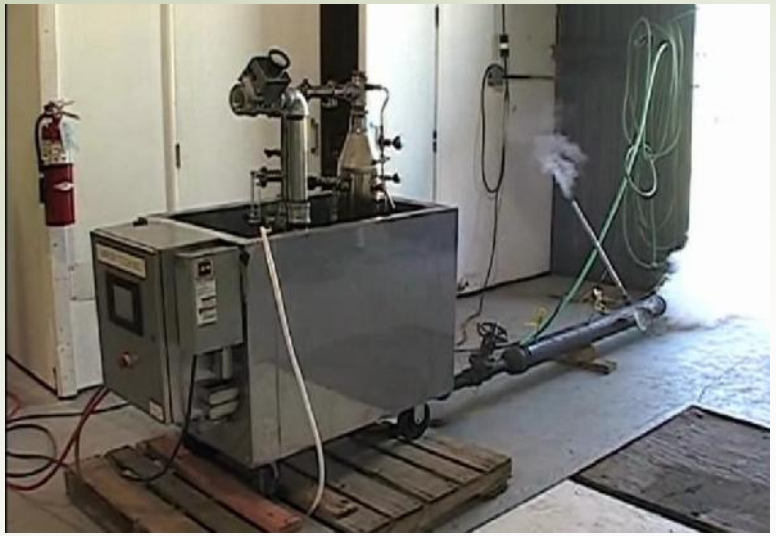
VEG SOIL REMEDIATION TECHNOLOGY

Ongoing USACE Applications-

VEG In-Situ Treatment of Munitions Constituents (MCs)

- **In-Situ Steam Treatment**
- Pilot testing of steam injection for reduction MC concentrations
- Shallow pipeline distribution across 20’ x 20’ x 5’ soil plot
- TNT= 55,000 mg/kg RDX =11,000 mg/kg HMX =1,800 mg/kg PETN = 1,700 mg/kg, PAHs =20 mg/kg
- **Steam-Enhanced Alkaline Hydrolysis**
- Pilot testing of steam injection combined with lime application for enhancing alkaline hydrolysis and treatment of MC concentrations
- Shallow pipeline distribution across 20’ x 20’ x 5’ soil plot
- TNT= 55,000 mg/kg RDX =11,000 mg/kg HMX =1,800 mg/kg PETN = 1,700 mg/kg, PAHs =20 mg/kg



VEG In-Situ Soil Remediation System

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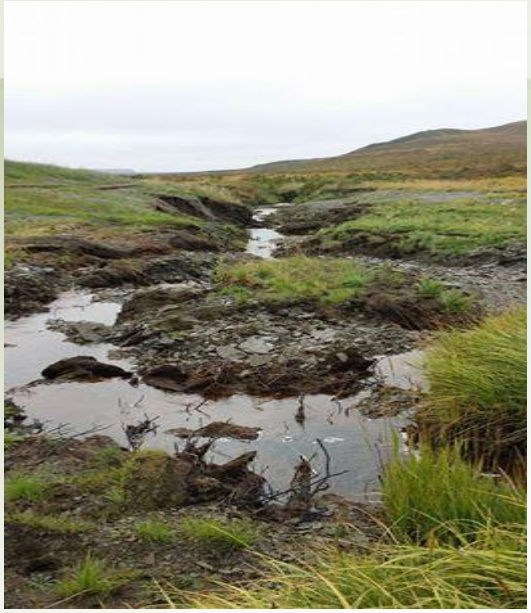
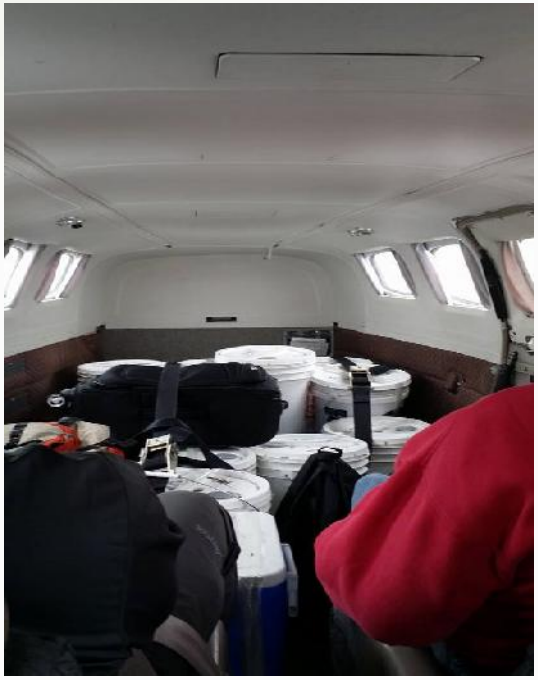
VEG SOIL REMEDIATION TECHNOLOGY

Ongoing USACE and Army National Guard Applications- Ex-Situ Treatment of Sediments

- Umiat Test Well # 9 Site, Umiat, AK (USACE- Alaska District)
  - **Ex-Situ VEG Treatment of PCB-Impacted Sediments**
  - Current PCB impacts in surficial sediments at levels > 10 mg/kg
  - Cleanup goals: Residential soil RSLs
  - Elimination of offsite transport estimated at over $10,000/ton

- Ravenna Army Ammunition Plant, Ravenna, OH (USACE-Louisville District)
  - **Ex-Situ VEG Treatment of PAHs**
  - **Pilot Testing of Lead Stabilization using Steel Slag**
  - 18,000 CY of impacted soils
  - PAH concentrations ~ 1000 mg/kg
  - Lead concentrations ~ 30,000 mg/kg
  - Cleanup goals: Residential Soil RSLs
  - Optimal treatment conditions: T = 660 F and t= 15 minutes





Ex-Situ Treatment of PCBs in Sediments Umiat Test Well #9, Umiat, AK

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Upcoming Army National Guard Applications
In-Situ and Ex-Situ Treatment

- Joint Forces Training Base, Los Alamitos, CA (Army National Guard, USACE)
  - **In-Situ Treatment of Petroleum Hydrocarbons in Soil and Groundwater**
  - 43,000 CY of impacted soils at active sites with overlying structures
  - TPH and BTEX concentrations > residential RSLs
  - Cleanup goals: Residential Soil RSLs
  - Combine in-situ thermal desorption with high-vacuum dual phase extraction.
- Luscious Clay Army National Guard Center, Marietta, GA
  - **Ex-Situ and In-Situ Treatment of Hydrocarbon-Impacted Soils**
  - **In-Situ Enhanced LNAPL Recovery**
  - Various petroleum hydrocarbon contaminated soils beneath former ASTs
  - Ex-situ treatment of top 20 feet of soil column, in-situ treatment of soils below 20 feet bgs.
  - Enhanced recovery of 5 feet of LNAPL product.

Bench-Scale Testing: Ex-Situ Treatment of Organochlorine Pesticides, Manteca, CA

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Applications and Success Stories-VEG In-Situ Remediation System

- Enhanced Oil and LNAPL Recovery
  - **Oil Pipeline, Port of Long Beach, CA**
  - Unclogged 200 yards of oily-clogged pipeline – Port of Long Beach
  - Recovered and recycled 1,000 gallons of oil
  - Recycled 180 yards of pipeline

  - **Enhanced Oil Recovery, Kern County Oil Field, CA**
  - Pipeline decommissioning
  - Mobilized crude oil in 1,000-foot deep oil well (1/2 day)
  - Recovered 3 barrels of crude oil
  - Broader-scale application in Kern County in progress

  - **Enhanced LNAPL Recovery, Chemical Plant, Bakersfield, CA**
  - Ongoing in-situ, LNAPL recovery
  - Recovered over 93 gallons of LNAPL (2 weeks)
  - Site slated for closure (Subject of AGU Presentation- 2012)

VEG Application to Enhanced Oil Recovery- Kern County, CA

VEG SOIL REMEDIATION TECHNOLOGY

Ongoing R&D Applications-

- Ex-Situ Bench-Scale Study to treat PFAs
  - Emerging chemical ubiquitous across all DoD sites
  - Increased regulatory recognition
  - Targeting treatment at temperatures on the order of 1,000 F to 1,500 F

Bench-Scale Testing: Ex-Situ Treatment of PAHs and Petroleum Hydrocarbons in Sediments, Manteca, CA

QUESTIONS?

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TA500 Data Gaps Investigation Conclusions
Travis AFB, California

August 19, 2015

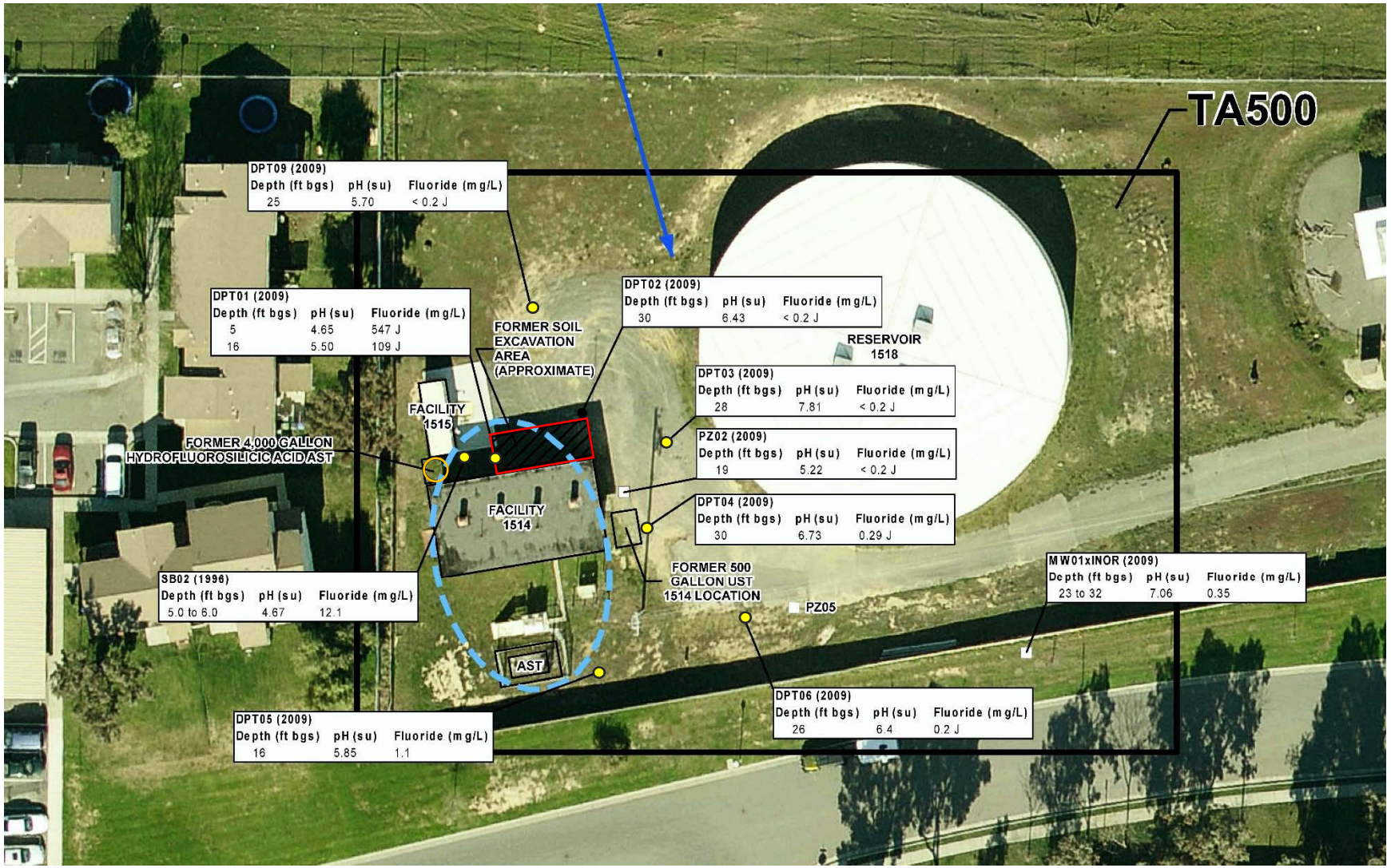
TA500 Site Background

- Drinking Water Storage & Treatment Site
  - Hydrofluorosilicic acid used to fluoridate water
- Two hydrofluorosilicic acid spills
  - Pinhole leak in 4,000-gallon AST in 1989
  - 53 gallons from drum spill in 1992
- AST removed in 1992 and soil was excavated
  - 28 x 15 feet wide by 3 feet deep excavation near drum spill

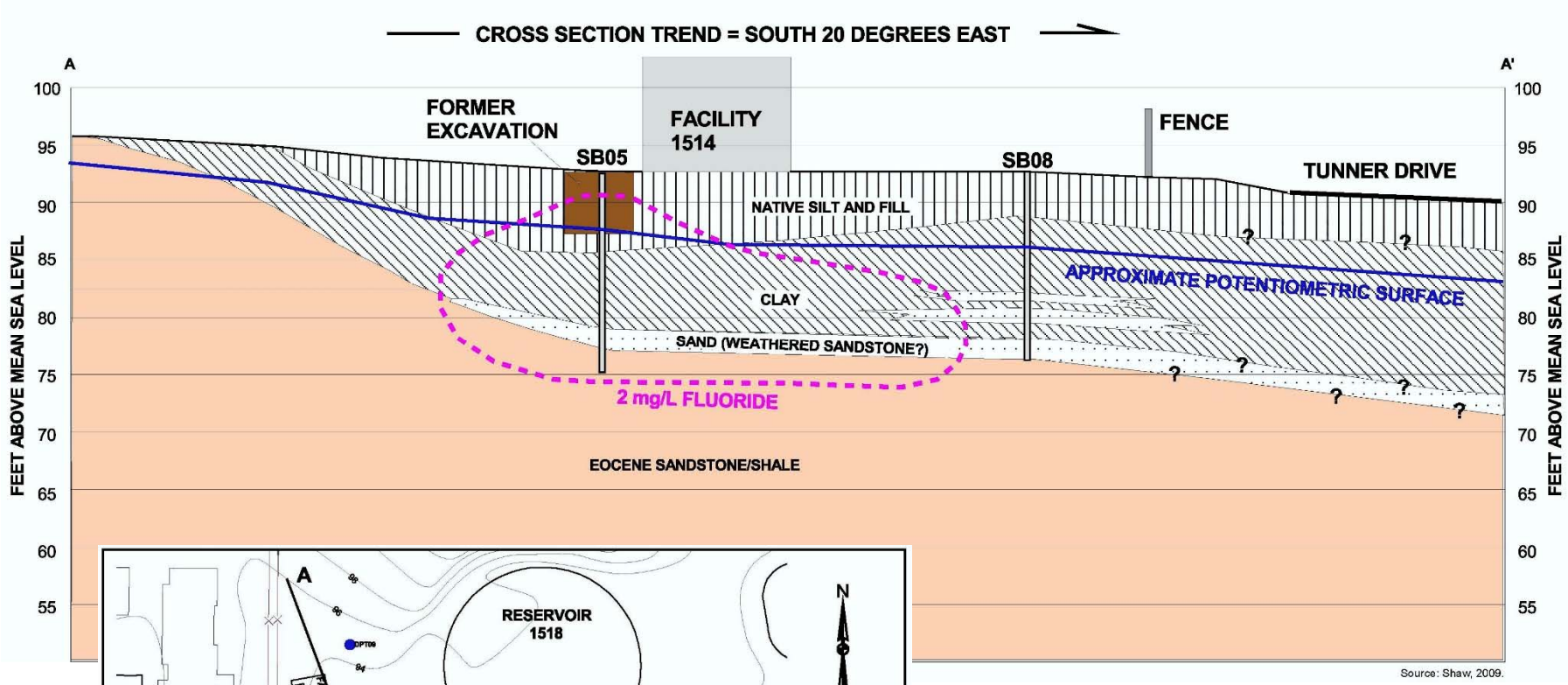
TA500 Site Background (continued)

- Previous investigations
  - Four (4) borings in 1996 and four (4) more in 2009
    - Only one (1) location exceeded soil RSL of 3,100 mg/kg in 1996
  - GW samples from ten (10) locations (1:1996 and 9:2009)
    - Near drum spill, fluoride detected at 547 J mg/L at 5 feet bgs (perched) and 109 J mg/L at 16 feet (open borehole)
    - Near AST, fluoride detected at 12.1 mg/L at 5-6 feet bgs (perched)
    - All other samples below CA MCL of 2 mg/L

TA500 Site Plan



TA500 Cross Section



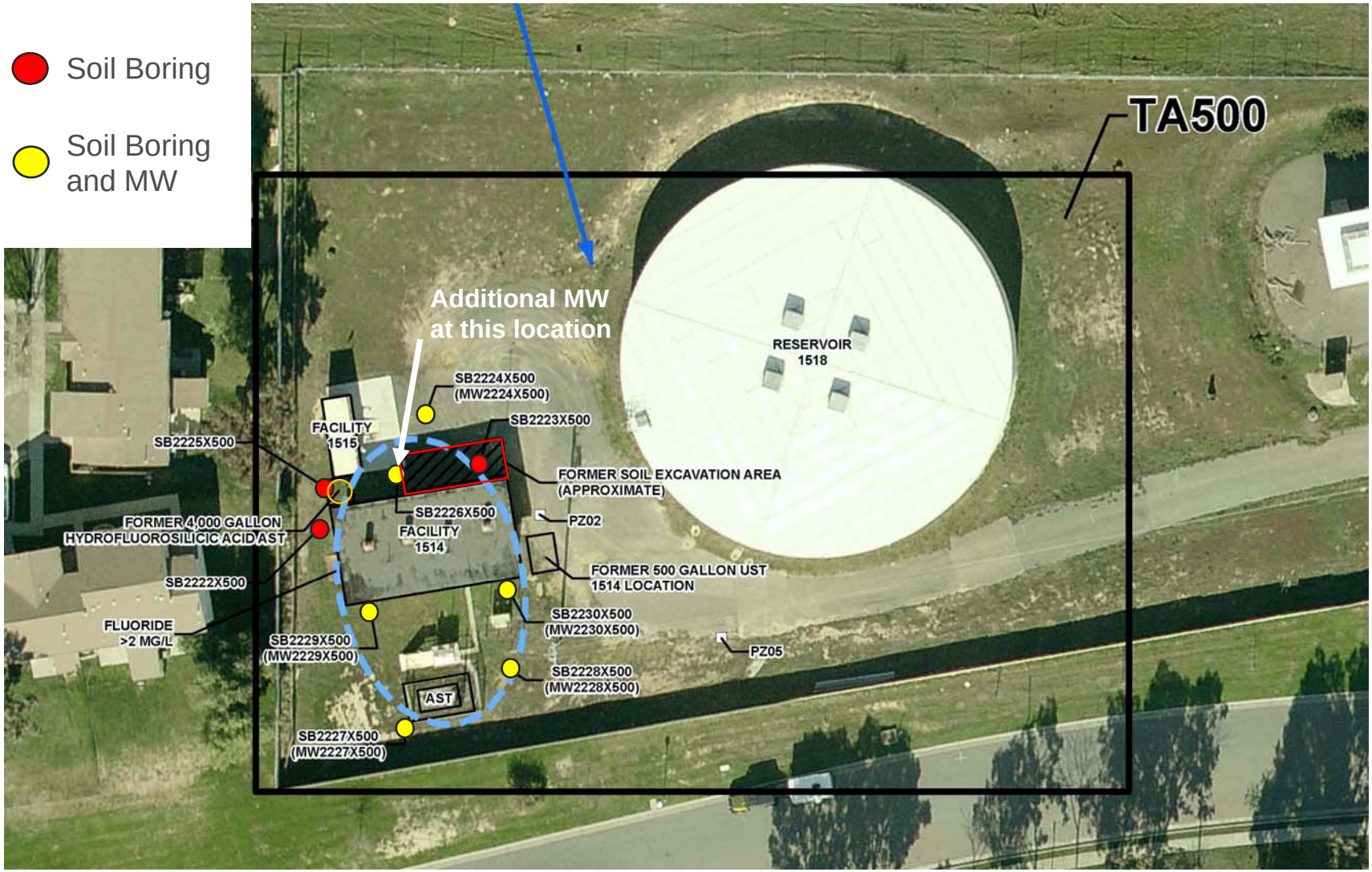
Fluoride Fate and Transport

- Fluorosilicate anion not expected to persist in the environment
  - Readily dissociates to hydrogen gas, fluoride ions, and hydrated silica
  - When pH is below 6, fluoride adsorbs to aluminum and iron oxides
  - Has low mobility due to adsorption and natural attenuation

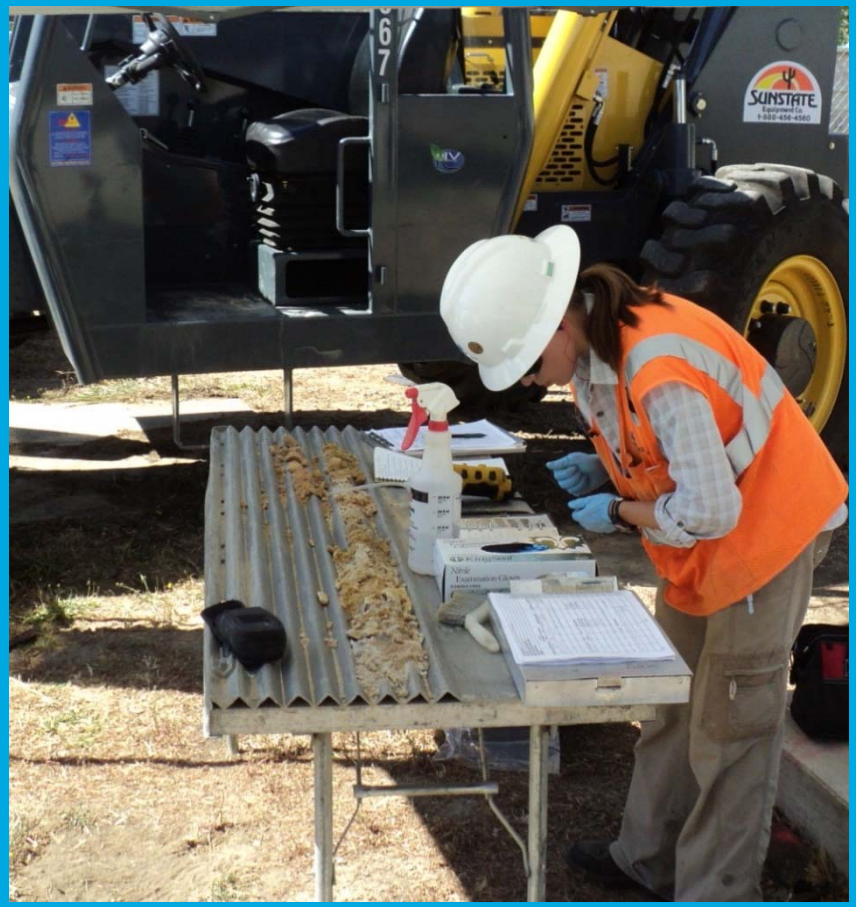
TA500 Data Gaps Investigation
Field Activities

- Refine vertical and horizontal extent of contamination
  - Nine (9) soil boring locations
    - Shallow bedrock encountered
    - No perched zone was identified
  - Six (6) monitoring well locations
    - Work Plan called for five (5) MWs, but we installed an extra well near the former spill area to confirm historical concentrations at this location
  - Analyzed for fluoride and pH (as indicator)

TA500 Investigation Locations



Soil Results



Highest fluoride soil concentration was 280 mg/kg

- From source area boring SB2226 at 2.5 ft bgs

All below RSL of 3,100 mg/kg

Groundwater Results

Boring/Well ID and Fluoride Concentration (mg/L)

SB2223x500 (source area) 0.16 J

MW2224x500 (upgradient) 0.17 J

MW2226x500 (source area) 0.19 J

MW2227x500 (downgradient) 0.69 J

MW2228x500 (downgradient) 0.16 J

MW2229x500 (downgradient) 0.45 J

MW2230x500 (downgradient) <0.10

All below CA MCL of 2 mg/L

TA500 Data Gaps Investigation
Path Forward

- Investigation results demonstrate residual fluoride has naturally attenuated
  - All soil and GW concentrations below regulatory levels
- We will sample site wells again this winter
  - Will use high purge volumes
  - If concentrations remain below CA MCL the site should be closed