



# PANTEX QUARTERLY PROGRESS REPORT

## Remedial Action Progress

### 2nd Quarter 2020

In support of Hazardous Waste Permit #50284 and  
Pantex Plant Interagency Agreement  
September 2020

Pantex Plant  
FM 2373 and U.S. Highway 60  
P.O. Box 30030  
Amarillo, TX 79120

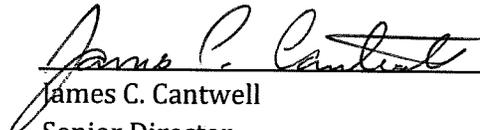




CERTIFICATION STATEMENT

2nd Quarter 2020 Remedial Action Progress Report  
Pantex Plant, September 2020

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

  
James C. Cantwell  
Senior Director  
Environment, Safety and Health  
Consolidated Nuclear Security, LLC

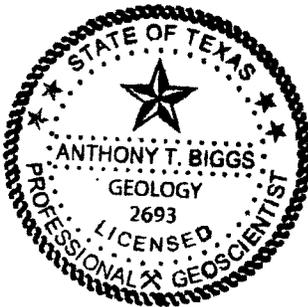
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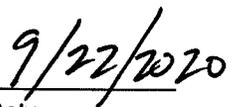
**Quarterly Progress Report  
2nd Quarter 2020  
in Support of Hazardous Waste Permit #50284  
and Pantex Plant Interagency Agreement  
for the Pantex Plant, Amarillo, Texas  
September 2020**

Prepared by  
Consolidated Nuclear Security, LLC  
Management and Operating Contractor  
for the  
Pantex Plant and Y-12 National Security Complex  
under Contract No. DE-NA0001942  
with the  
U.S. Department of Energy  
National Nuclear Security Administration

In accordance with 30 TAC §335.553 (g), this report has been prepared and sealed by an appropriately qualified licensed professional engineer or licensed professional geoscientist.



  
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Environmental Projects  
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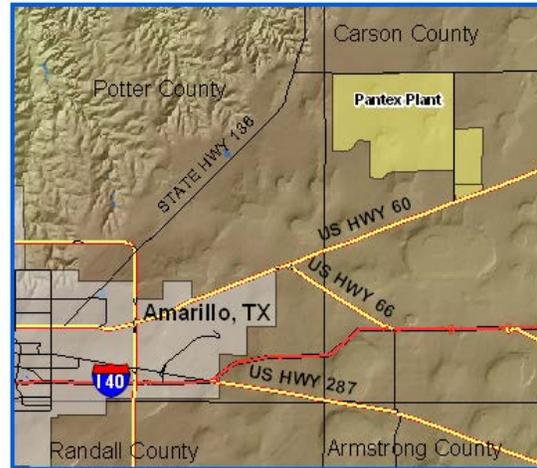
## LIST OF ACRONYMS

µg/L	micrograms per liter
CatOX	catalytic oxidation
COC	contaminant of concern
ClO <sub>4</sub> <sup>-</sup>	perchlorate
Cr(VI)	hexavalent chromium
DCE	dichloroethene
DHC	<i>Dehalococcoides</i> spp.
DNT4A	4-amino-2,6-dinitrotoluene
DO	dissolved oxygen
EVO	emulsified vegetable oil
FGZ	fine-grained zone
FY	fiscal year
FYR	five-year review
GWPS	groundwater protection standard
HE	high explosive
HW-50284	Hazardous Waste Permit #50284
IAG	Interagency Agreement
ISPM	in situ performance monitoring
ISB	in situ bioremediation
Lb	pound
Mgal	million gallons
mV	millivolts
NAPL	non-aqueous phase liquid
ORP	oxidation-reduction potential
P1PTS	Playa 1 Pump and Treat System
PID	photoionization detector
PQL	practical quantitation limit
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
ROD	Record of Decision
SAP	sampling and analysis plan
SEPTS	Southeast Pump and Treat System
SVE	soil vapor extraction
SWMU	Solid Waste Management Unit
TCE	trichloroethene
THF	tetrahydrofuran
TNT	trinitrotoluene
VOC	volatile organic compound
WWTF	wastewater treatment facility



## INTRODUCTION

The Pantex Plant, located in the Texas Panhandle 17 miles northeast of Amarillo, has implemented a response action to remediate perched groundwater and soils. Two types of systems have been installed for the groundwater response action: pump and treat systems in two areas and in situ bioremediation (ISB) systems in three areas. A soil vapor extraction (SVE) system has been installed to remediate volatile organic compounds (VOCs) in soils at the Burning Ground area. This quarterly report addresses progress achieved through implementation of the remedial actions for 2nd Quarter 2020.



This report provides an intermediate data summary for response action systems throughout the year. More intensive data reporting is included in the annual progress reports. The quarterly progress reports address three of the five evaluations included in the annual progress reports: response action effectiveness, uncertainty management, and early detection. The reports provide required information from Hazardous Waste Permit #50284 (HW-50284) CP Table VII and the Pantex Interagency Agreement (IAG).

Maps of the plumes, remedial action systems, sampling locations, and system wells are provided in Appendix A. Graphs of operation and flow rates for the pump and treat systems are provided in Appendix B. Graphs of important parameters for the ISB treatment zone and downgradient wells are provided in Appendix C.

## RESPONSE ACTION EFFECTIVENESS

This quarterly progress report focuses on specific criteria for the pump and treat systems, ISB systems, and a small-scale SVE system. System operation, mass removal, and evaluation of effluent in reference to established operational goals are reported for the pump and treat systems. For the ISB systems, this report evaluates geochemical conditions and availability of food source in the treatment zone and reduction of concentrations of contaminants of concern (COCs) in downgradient performance monitoring wells to evaluate whether the treatment zone is working effectively. System operation, mass removal, and effluent photoionization detector (PID) readings are evaluated for the SVE system.

## PUMP AND TREAT SYSTEMS

The groundwater remedial action at the Pantex Plant includes two pump and treat systems: Southeast Pump and Treat System (SEPTS) and Playa 1 Pump and Treat System (P1PTS). The pump and treat systems are designed to extract water and remove contaminant mass from the water before the effluent is beneficially used by the wastewater treatment facility (WWTF) and irrigation system, for general Plant needs, or for amendment injections at the ISB systems. The systems were also designed to remove water from the perched aquifer to reduce saturated thickness. This reduction in saturated thickness reduces migration of contaminants both vertically and horizontally so that natural breakdown processes can occur over time. Reducing migration provides protection for the underlying High Plains Aquifer (also known as and referred to herein as the Ogallala Aquifer). SEPTS has the capability to inject the treated water back into the perched aquifer when beneficial use is not possible. Operational priorities for the pump and treat systems emphasize beneficial use of water.

SEPTS and P1PTS operation and throughput was impacted in the 2nd Quarter due to the COVID-19 pandemic. In response to an order to cease all non-essential activities, operations of both pump and treat systems were suspended on April 8, 2020. Regulators were notified of the cease of operations. Operation of SEPTS began again on June 24, while P1PTS was kept offline until the beginning of the 3rd Quarter.

The filter bank break that occurred in late June 2017 continues to impact operations of SEPTS and P1PTS. Due to the severity of the break, engineering evaluation, contracting, and major repairs were required to restore the irrigation system. Repairs to the filter bank were completed in May 2019, with startup testing occurring afterward. Testing and repairs continue on the irrigation lines. A portion of the system is expected to be operational by Fall 2020. Meanwhile, Pantex continues to release all WWTF water to Playa 1.

Current and future operations of both systems will be impaired by the restricted flow to the WWTF until the irrigation system is operational or a new TLAP permit is set in place to release more water to Playa 1. The SEPTS system has operated at a higher capacity using injection, release to Playa 1, and intermittent shutdowns of P1PTS to allow full treatment at the system. In calendar year 2020, P1PTS will operate only one week per quarter (unless otherwise noted) to ensure higher recovery

### Pump and Treat System 2<sup>nd</sup> Quarter 2020 Operation

#### *Playa 1 Pump and Treat System (P1PTS)*

Days Operated	0
% Operation Time	0%
Volume Water Treated (Mgal)	0
HE Mass Removal (lbs)	0
Beneficial Use of Water	0%

#### *Southeast Pump and Treat System (SEPTS)*

Days Operated	15
% Operation Time	16%
Volume Water Treated (Mgal)	4.5
HE Mass Removal (lbs)	19.9
Chromium Mass Removal (lbs)	2.5
Beneficial Use of Water	0%

\*Value below operational goals

at the SEPTS system. When P1PTS is operational, SEPTS is operated at a lower capacity to meet permit requirements.

SEPTS was the only system operated in order to optimize capture of water and mass in the southeast area during the limited operational timeframe in 2nd Quarter 2020. The SEPTS wellfield had a number of wells that were not operational during 2nd quarter due to electrical and equipment issues. Pantex has issued a contract to address the problems with the SEPTS wells. Wells are expected to be operational by Fall 2020. Graphs of monthly operation and throughput are

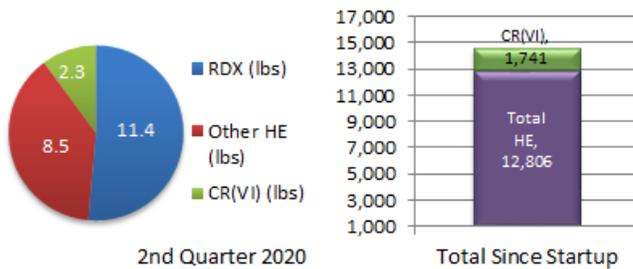


Figure 1. SEPTS Mass Removal

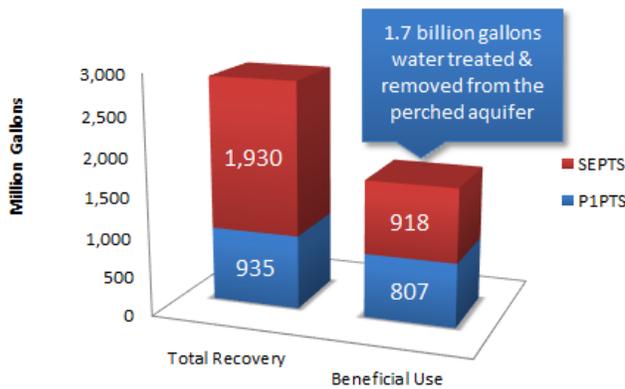


Figure 2. System Recovery and Use

included in Appendix B. About 95% of the treated water was either released to Playa 1 or injected into perched injection wells, with the remainder used for ISB injection. When both systems are operating, Pantex has focused on operating the highest priority wells at SEPTS to continue capture of water along the FM 2373 fence line, at the new wells east of FM 2373, and at the highest plume concentrations to the south on Texas Tech property. Wells on the northern fence line along FM 2373 are demonstrating impact from the reduction in water levels, and continued issues with pumping are expected. P1PTS wells were not operated during 2nd Quarter 2020.

P1PTS primarily treats RDX and SEPTS primarily treats RDX and hexavalent chromium [Cr(VI)]. Figure 1 provides mass removal information for RDX and other high explosives (HEs) and Cr(VI) for the 2nd Quarter, as well as totals since system startup for SEPTS. Though P1PTS

was not operated during the 2nd Quarter, the primary goal of P1PTS is water removal to decrease saturated thickness and remove the head pressure that pushes groundwater out horizontally, with mass removal as a secondary goal. Overall, both systems have removed over 15,200 lbs of HE and chromium contaminants from perched groundwater since operations began.

The total recovery and treatment from both systems since startup has been calculated at about 2.8 billion gallons. Because SEPTS was originally designed to inject treated water, all of the treated water prior to 2005 was injected. However, a significant volume of treated water has been used beneficially since 2005, with a total of over 1.7 billion gallons of treated water beneficially used since startup of the irrigation system. The recovery and beneficial use totals are presented in Figure 2. Currently the systems are releasing water to the WWTF and then to Playa 1 or directly to

injection wells, so majority of the treated water is not currently beneficially used. Evaluation of effluent data from SEPTS indicates that all COCs were treated to levels below the groundwater protection standard (GWPS).

Pantex is currently planning for other irrigation alternatives on the property east of FM 2373 to provide additional long-term use of the treatment system water. Funding has been requested in fiscal year (FY) 2021 to design and construct infrastructure for irrigation of land east of FM 2373 using center pivot sprinklers. Pantex is currently contracting the design of the new irrigation system. Pantex has also identified funding to design and construct three new perched injection wells to the east of Playa 2 and northwest of the Zone 11 ISB. Construction of the injection wells and infrastructure is underway, with the project scheduled to be complete in 2020. These new injection wells will provide a consistent outlet for a portion of the treated water when irrigation is not an available method for beneficial use of the treated water. These wells will also provide a method to inject the treated water without affecting movement and capture of plumes in the southeast area.

Pantex has not observed any current issues with the movement of plumes due to the continued injection of water from the SEPTS, nor due to the shutdown caused by COVID-19. Changes in the plume have been observed, but changes appear to be related to the reduced extraction from the system. Pantex expects to continue injection at SEPTS in the near future, as repairs to the current irrigation system will be limited to two 100-acre plots. Once the three new injection wells are installed and a new irrigation system east of FM 2373 is designed and constructed, the systems will be able to consistently operate at or near capacity.

## ISB SYSTEMS

Three ISB systems (Zone 11 ISB, Southeast ISB, and Southeast ISB Extension) are installed at Pantex. The systems are designed with closely spaced wells to set up a treatment zone in areas of the perched groundwater where pump and treat may not be as effective, or where the area is sensitive to vertical migration of COCs to the Ogallala Aquifer. Amendment is injected into these systems to establish treatment zones where COCs are degraded. Monitoring wells were installed downgradient of the treatment zone to monitor whether the system is effectively degrading the COCs (see maps in Appendix A). The primary COCs at the Zone 11 ISB are trichloroethene (TCE) and perchlorate. The primary COCs at the Southeast ISB are RDX and Cr(VI). The primary COC at the Southeast ISB Extension is RDX.

For the treatment zone wells, this report evaluates whether the conditions are present to degrade the COCs in each area, and evaluates the presence of a continued food source for the microbial

reduction of COCs (see Table 1). Downgradient monitoring wells are evaluated to determine if the ISB systems are effective in degrading the COCs and any breakdown products of the COCs. Graphs of data from sampled treatment zone wells and downgradient in situ performance monitoring (ISPM) wells are included in Appendix C. Table 1 also summarizes ISB system performance.

**Table 1. ISB System Performance**

Treatment Zone Wells			Downgradient Performance Monitoring Wells <sup>6</sup>		
System	Reducing Conditions	Food Source Available	Primary COCs Reduced?	COCs < GWPS?	Degradation Products of COCs Reduced?
<b>Zone 11 ISB<sup>5,6</sup></b>	Mild to strong	Yes	Yes	ClO <sub>4</sub> <sup>-</sup> in 8 of 9 wells TCE in 5 of 9 wells	No <sup>1</sup>
<b>Southeast ISB<sup>6</sup></b>	Mild to strong	Yes	Yes	RDX in 2 of 4 wells <sup>2</sup> Cr(VI) in 4 of 4 wells <sup>2</sup>	No <sup>3</sup>
<b>Southeast ISB Extension</b>	Mild to strong	Yes	Yes	RDX in 2 of 3 wells <sup>4</sup>	No <sup>4</sup>

Mild conditions = oxidation-reduction potential (ORP) of 0 to -50 millivolts (mV)

Strong conditions = ORP < -100 mV and sulfate and nitrate reduced, indicating that conditions are present for reductive dechlorination.

<sup>1</sup> cis-1, 2-Dichloroethene (DCE) concentrations remain above GWPS in four downgradient wells, while vinyl chloride concentrations (final breakdown compound) remain at low concentrations or not detected.

<sup>2</sup> Pantex formerly sampled four downgradient wells at this system. However, one of the wells (PTX06-1123) continues to demonstrate low water conditions and can no longer be sampled. This well had demonstrated complete treatment of HEs and Cr(VI) from October 2012 to August 2015.

<sup>3</sup> PTX06-1153 is currently demonstrating partial treatment. Therefore, the degradation products of RDX are now observed above the GWPS.

<sup>4</sup>This system was injected for the first time in February 2019. The downgradient wells are not expected to demonstrate treatment for at least two years following the first injection.

<sup>5</sup>During 2nd quarter 2020, system TZM wells were not sampled. Values and conditions reported are based on previous quarter's results.

<sup>6</sup>ISPM wells were not sampled in 2nd quarter. All evaluations are based on previous quarter's results.

Note sampling has been reduced to a semi-annual frequency at the ISB systems. Data are not always available for quarterly evaluation. When current data are not available, assumptions about overall system performance are based on historical data.

### **ZONE 11 ISB**

Installation of the Zone 11 ISB remedial action was completed in 2009, and an expansion was completed in early 2015 (see Appendix A maps). Ten injection events have been completed at the current system, with the first injection event occurring in the expansion zone in 2015. The tenth injection event for the ISB was completed in January 2020. As documented in the *2016 Annual Progress Report* (Pantex, 2017), data indicate that moving to a two-year injection frequency in the original portion of the system is appropriate for future injections with emulsified vegetable oil (EVO). However, as presented in the 4th Quarter 2018 Progress Report, Pantex plans to move primarily to the use of a more soluble carbon source, molasses, as studies conducted at the Zone 11

ISB in 2018 indicated that molasses distributed between injection wells at a much higher concentration than EVO. More frequent injections are anticipated for molasses and have been planned annually for the Zone 11 ISB to maintain reducing conditions. Pantex will continue to evaluate the system to ensure appropriate timing of injections with the molasses. Pantex will also continue to evaluate the expansion area to determine if bioaugmentation with *Dehalococcoides* spp. (DHC) is needed to potentially boost the treatment efficiency for TCE. The entire system underwent injection beginning in 4th Quarter 2019 and completed in January 2020. The system was undergoing well rehabilitation and injection during 3rd quarter 2020 and is expected to be complete in November.

The Zone 11 ISB has a well-established treatment zone in the original portion of the system, where injection has occurred since 2009. The expansion area has received three injections, so deeper reducing conditions are likely established at the injection wells. Only injected wells were sampled in the 2nd Quarter. The five sampled injection wells indicate deep reducing conditions are present at the injection points. Deep reducing conditions have not been fully demonstrated at all of the treatment zone monitor wells located between the injection wells in the expansion area. The molasses injection is expected to improve conditions between injection wells. All wells downgradient of the system have indicated arrival of treated water.

Evaluation of historical data in the treatment zone indicates mild to strong reducing conditions across the Zone 11 ISB. Conditions improved at most of the non-injected wells in the expansion area, following the molasses/EVO injection in 2018. Data indicated that due to treatment, concentrations of TCE and its breakdown products are very close to meeting the GWPS in treated water from the original portion of the system. Breakdown products of TCE are close to meeting the GWPS in most locations as well. Historical data also indicates that TCE is continuing to increase on the eastern side of the ISB. Currently, perchlorate and the low concentrations of TCE that occur on the eastern side are treated below GWPS or to non-detect.

Pantex had previously recommended installation of a recirculation system on the west side of the Zone 11 ISB to improve distribution of amendment where TCE occurs. However, more recent water level data indicate changing flow gradients due to the removal of water by the SEPTS. Gradients have changed in portions of the west side of the Zone 11 ISB and is expected to expand over time with the continued removal of water by SEPTS. Flow has changed to the southeast in over half of the Zone 11 ISB, influencing the movement of TCE plumes that continue to move into the ISB. Additionally, some injection wells have been difficult to inject and will likely require replacement for continued treatment. Based on the evaluation of data at the Pilot Study where Newman Zone injections have continued to treat for more than 10 years and data at two wells (PTX06-ISB079 and PTX06-ISB082) in the Zone 11 ISB, Pantex will begin to infill wells rather than replace wells since the Newman Zone appears to distribute approximately 22 ft from the well. In lieu of installing a recirculation system, Pantex is also recommending adding a second row of wells across the southern portion of Zone 11 ISB. Pantex will incorporate the use of Newman Zone or some type of emulsified vegetable oil (EVO) as a long-term solution in areas of the ISB, where closer well spacing occurs. Detailed discussions of this information can be found in the 2016 and 2019 Annual Progress Reports.

### *SOUTHEAST ISB*

The Southeast ISB was installed in 2007. Seven injection events have been completed at this system. The Southeast ISB continues to demonstrate declining water levels at the system; as a result, only 60% of the system was injected during 2019, which included some dry wells to attempt to impact PTX06-1153. A discussion of the injection and issues encountered is provided in the 2019 Annual Progress Report. As recommended in the 2018 Annual Progress Report, Pantex plans to use molasses for all upcoming injection events to improve distribution of amendment thereby improving reducing conditions at the ISBs. With the move to molasses, the next injection event is planned for 2021.

Only injected wells in the Southeast ISB were sampled in the 2nd Quarter. Data indicate that reducing conditions continue at the treatment zone. Downgradient wells were not sampled this quarter, but past data indicate that complete treatment is occurring at all but one well, PTX06-1153. Pantex is continuing to evaluate impacts to PTX06-1153 from the molasses injection in 2019.

In late 2019, injections were completed at the Southeast ISB. Some wells were unable to be injected due to dry or low water (< 1 ft) conditions. The inability to sample or inject into these wells is expected to persist with continued upgradient removal of water by the SEPTS. Evaluation of data indicates that most wells in the Southeast ISB will not contain appreciable water by 2022. By the end of 2019, all downgradient wells had less than 5 ft of water and all wells in the treatment zone had less than 10 ft of water (see Section 2 of the 2019 Annual Report for more discussion). Pantex plans to inject the system in 2021 due to the use of molasses, but further injections may be limited or unnecessary.

### *SOUTHEAST ISB EXTENSION*

The Southeast ISB Extension was installed in 2017 as an extension of the chosen remedy for the southeast perched groundwater. Two injection events have been completed for this system, with the latest injection completed in September 2019, and the first completed in early 2019. Due to the success with distribution of a more soluble carbon (molasses) and the long turnaround needed to order EVO, Pantex began injection at the Southeast ISB Extension using only soluble carbon (molasses), as recommended in the 4th Quarter 2018 Progress Report. Pantex plans to continue injection at this system using only molasses to improve distribution and treatment. Because this system has not been treated with EVO, injections have been scheduled at approximately six to nine months. Pantex started injecting this system in August and completed injections in September.

Only injected wells were sampled during the 2nd quarter 2020. Historical data indicates reducing conditions are beginning to establish in the treatment zone. Sampling results from ISB wells this quarter indicate HEs are not detected. Downgradient wells have not yet demonstrated reduction of COCs, but are expected to demonstrate treatment in approximately 2 years after the first injection.

## BURNING GROUND SVE

The Burning Ground SVE system began operation in 2002 as a large-scale catalytic oxidizer (CatOX) system. Due to a large reduction in VOC concentrations, a small CatOX system has been operating at the Burning Ground SVE system since April 2012. This small-scale system focuses on treating residual non-aqueous phase liquid (NAPL) and soil gas at a single extraction well (SVE-S-20) near the source area.

In response to an order to cease all non-essential activities due to COVID-19, operation of the Burning Ground SVE was suspended on April 8. Regulators were notified of this suspension of operations. Operation of Burning Ground began again on June 29. Overall, the system operated about 10% of the quarter (~ 207 hours of operation). Figure 4 shows mass removal calculated for the 2nd Quarter and since startup for VOCs that historically contribute to the total VOC concentration.

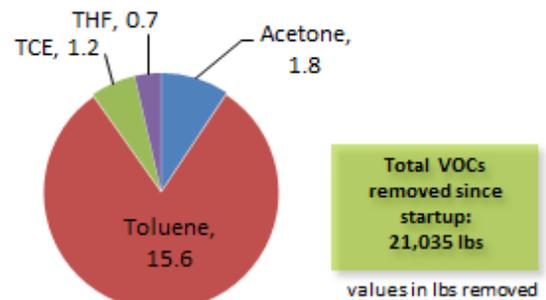


Figure 4. SVE Mass Removal

The system removed ~19 lbs of VOCs during the 2nd quarter, but has removed about 21,000 lbs of VOCs since startup. Based on PID data collected at the system effluent port, system destruction efficiency was at least 97%. The system operated at a higher flow due to the modifications to the system, with the flow increased from 32 standard cubic feet per minute (scfm) in early 2017 to the current level of 44 scfm. The hourly VOC removal rates increased with the increased flow until 4th Quarter 2018. The removal rate declined during 2018, but began to improve over the first 2 quarters of 2019. In the 3<sup>rd</sup> and 4th quarter of 2019, removal rates decreased and continue to remain low in the 2nd quarter 2020. As concentrations continue to drop below 100 ppmv, Pantex is actively working on a detailed plan to pulse the system to determine current recovery efforts of the system. A more detailed discussion is included in the 2019 Annual Report (June 2020).

## UNCERTAINTY MANAGEMENT AND EARLY DETECTION

Uncertainty management and early detection wells are evaluated to determine if there are unexpected conditions in areas where previous groundwater contamination has not been detected or confirmed (Ogallala and perched aquifers), or in previous plume locations where concentrations have fallen below GWPS, background, and the PQL (e.g., perched wells at the Burning Ground and Old Sewage Treatment Plant areas). Indicator COCs are evaluated at the uncertainty management/early detection wells in the quarterly report. A map depicting the wells evaluated is included in Appendix A.

Review of the uncertainty management/early detection data collected during the 2nd Quarter indicates unexpected conditions at one Ogallala Aquifer well, PTX06-1076. No detections exceeded the GWPS in the Ogallala Aquifer uncertainty management/early detection wells sampled during

the 2nd Quarter. There were no unexpected conditions at perched uncertainty management wells in the 2nd Quarter.

A detect of DNT4A was measured at PTX06-1076. At this time, the detect is below the PQL for DNT4A (0.254 µg/L) and the well has been re-sampled to confirm the measurement. The re-sample measurement will be reported at a later date and further actions will be determined in accordance with the Contingency Plan.

### OTHER UNEXPECTED CONDITIONS

Pantex routinely evaluates data as they come in from the laboratory to determine if data are off-trend, at an all-time high, or represent a new detection that may require further sampling or evaluation. Through the well maintenance program, Pantex also inspects wells at least every five years to ensure they are not silting in and to evaluate whether the well remains in contact with the formation. No unexpected conditions were noted in the 2nd Quarter.

### SCHEDULE UPDATE

Pantex provided a detailed schedule of upcoming work in the 2019 Annual Progress Report. An update of the activities scheduled to be started or completed by the publication date of this report is provided below.

Pantex completed the following:

- Phase 1 well drilling at the Offsite ISB system was completed. Drilling of 10 new injection wells and 4 new ISB extraction wells at the leading edge of the plume was completed and sampling of the new wells has been conducted.

Pantex continues progress toward completion of the following items:

- Pantex has contracted for the design and construction of infrastructure and new injection wells for the SEPTS near Playa 2 and work is underway. Design and construction is scheduled to be completed in 2020.
- Pantex continued discussions with neighbors to address future control of the offsite plume and is working towards obtaining a long-term agreement for access to conduct treatment.
- Pantex began contracting for design and construction of the infrastructure (roads, pads, electrical, pump installation for extraction wells) and treatment equipment to support the offsite remedy. Infrastructure will be phased to match system installation over four years. Phase 1 was awarded in August. Phase 1 installation is expected to begin in September.
- Phase 2 infrastructure design and construction is being contracted so that work can begin in October.

- Phase 2 well drilling for the Offsite Remediation System was accelerated and drilling commenced in August. Phase 2 wells will be complete in October.
- Pantex began contracting for the design of the new irrigation system planned to be installed east of FM 2373. The contract is expected to be awarded in late September and design completed in January 2021.

Upcoming work includes the following:

- Injection into the new Offsite ISB is expected to begin in December 2020.
- In late 2020, Pantex will contract and begin evaluating the optimization of the pump and treat systems.

## CONCLUSIONS AND RECOMMENDATIONS FOR CHANGE

The remedial actions continue to operate and meet short-term expectations for cleanup of the perched groundwater in areas under the influence of the remediation systems. Perched water levels are declining, mass is being removed or reduced, and institutional controls provide protection from use of impacted groundwater, while the remedial actions continue to operate to meet long-term goals. Pantex is working to extend treatment systems to areas that are not currently under the influence of the existing remediation systems. Pantex is also working to extend treated water injection and beneficial use to new areas to ensure consistent operation of the pump and treat systems.

The pump and treat systems continue to remove COC mass and water from critical areas in the perched aquifer; thus, decreasing head that drives vertical and lateral movement of perched groundwater. The systems have been impacted by the shutdown of the irrigation system and Pantex is continuing to pursue other options for release or use of the treated water. Pantex will continue to inject and release water to Playa 1 until the irrigation system is repaired or other uses can be constructed. Pantex is designing and installing perched injection wells east of the Playa 2 area, as previously recommended. These wells will help provide a consistent outlet for release of treated water from SEPTS when beneficial use is not possible. Pantex expects to inject up to 150 gpm of treated perched groundwater once construction is complete in 2020. Pantex is also planning to design and construct a center pivot irrigation system east of FM 2373. Funding has been requested for that project in 2021 and contracting has begun for the design.

Monitoring results for areas downgradient of the established ISB systems continue to demonstrate that system treatment has been generally effective. The new Southeast ISB Extension is demonstrating treatment in the treatment zone where injection has occurred, but downgradient wells are not expected to demonstrate treatment for at least 2 years following the first injection (expected in 2021).

COC concentrations meet the GWPS at the Southeast ISB at three downgradient wells. One downgradient well (PTX06-1153) for the Southeast ISB is not responding to treatment as well as

the others. Pantex injected molasses during the recent injection event to attempt better distribution of the amendment and will monitor the results over time to determine if the injection will impact the water moving into that area. Monitoring will continue at PTX06-1153 as described in the SAP. Further recommendations will be made based on evaluation of data over time.

Downgradient wells at the Zone 11 ISB are generally demonstrating treatment. Most downgradient wells meet or are near the GWPS for the primary contaminants and break-down products. A couple of wells indicate slower response to treatment in the newer areas of the ISB. Pantex has changed the injection strategy at the ISB to attempt better distribution of amendment between wells and provide better treatment of TCE. Early data indicate that the injection of a more soluble carbon source (molasses) has distributed widely where injected and that reducing conditions have improved in those areas. It will take two or more years to evaluate the results downgradient. Pantex will continue to evaluate the data and make appropriate recommendations for treatment in the upcoming progress reports. In lieu of installing a recirculation system, Pantex also plans to move toward drilling a second row of wells across the southern portion of the ISB to address higher concentrations of TCE moving into those areas. Wells that can no longer be injected will be infilled with closer spacing wells so that EVO can also be used in those areas. Molasses will continue to be used in the more widely spaced areas of the ISB, with timing of injections planned for 1-2 years.

The SVE system continues to treat soil gas and residual NAPL in the solvent evaporation pit/chemical burn pit area of the Burning Ground, thereby mitigating vertical movement of VOCs to groundwater. Pantex has continued to have problems with completing rebound tests, and has been unable to prepare a path to closure as recommended in the first Five-Year Review (FYR). Therefore, Pantex has evaluated other paths to closure for this system. In May 2017, Pantex completed a modification to six inactive SVE extraction wells surrounding the active extraction well SVE-S-20 to open the wells to ambient air. This modification enhances air flow through the formation while the system is operating. The air flow was increased from 32 scfm to about 44 scfm over time. Evaluation of hourly VOC removal indicates that the mass removal rate initially increased with the increase in influent air flow. Recent data indicate a decline in the mass removal rate as well as a drop in influent gas concentrations. Pantex will continue to evaluate the VOC removal to determine when active removal will no longer be effective. Pantex will provide further recommendations based on review of influent SVE data over time.

The groundwater remedies are considered to be protective for the short-term, as untreated perched groundwater use is controlled to prevent human contact and monitoring data continue to indicate that the remedial actions remain protective of the Ogallala Aquifer.

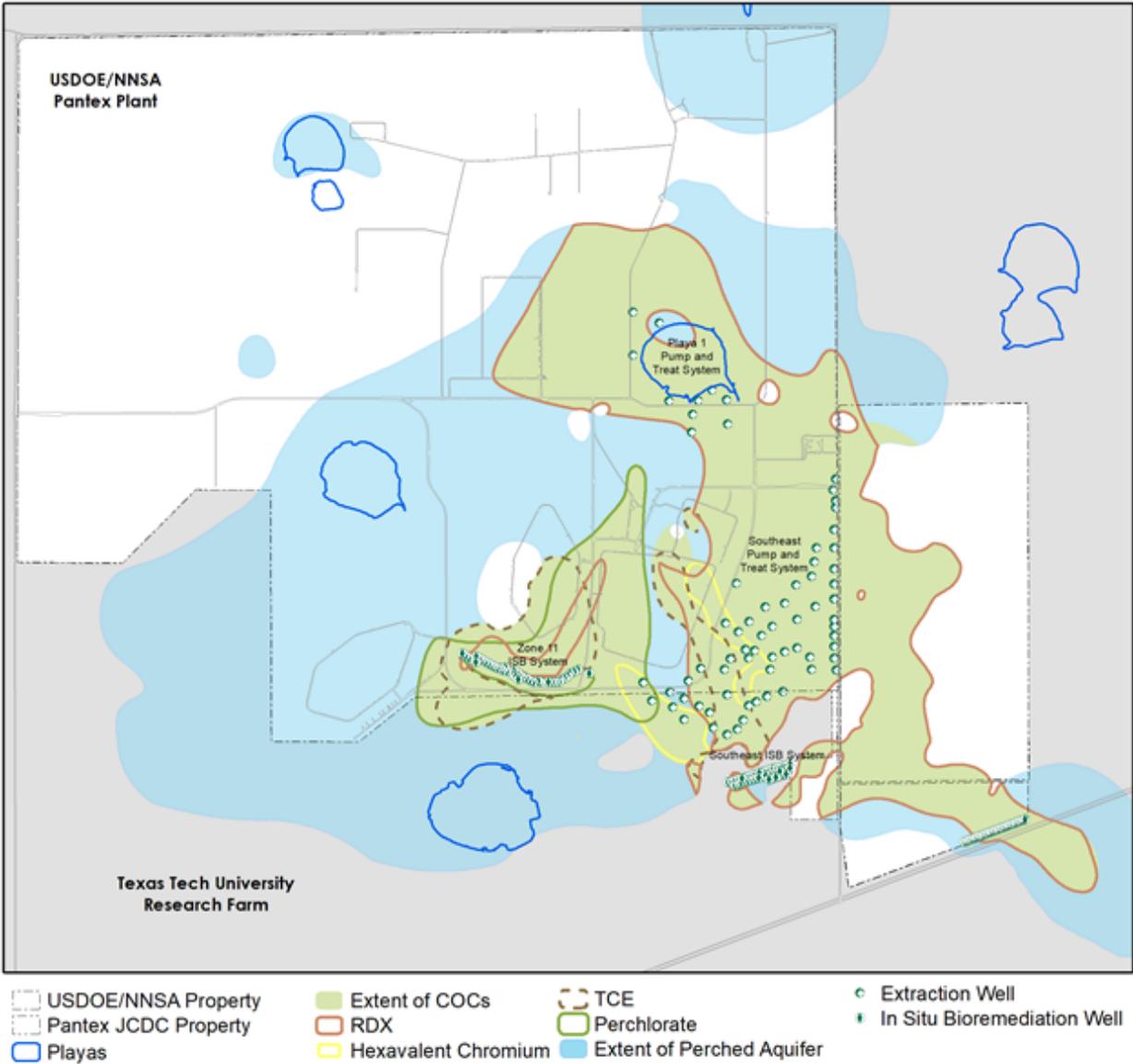
Pantex continues to progress toward cleanup of the southeast lobe of perched groundwater. As recommended in the 2016 Annual Progress Report, Pantex has completed extending the SEPTS operation to that area to address the continued plume movement to the south. Pantex also extended the Southeast ISB to the southeast boundary of the site to prevent further offsite movement of contamination. Wells drilled on a neighboring property in early 2019 indicate that extent of contamination has been found. Pantex has updated the perched groundwater conceptual site model and fate and transport model. Fate and transport modeling has been used to conceptually design a remedial action to address the offsite contamination. Pantex has contracted

for the installation of a new Offsite ISB and pump and treat system to clean up the offsite plume. Phase 1 system installation began in April 2020 and drilling was completed in August. Phase 2 well drilling was accelerated and those wells will be completed in October. Injection is planned in the new wells beginning December 2020.

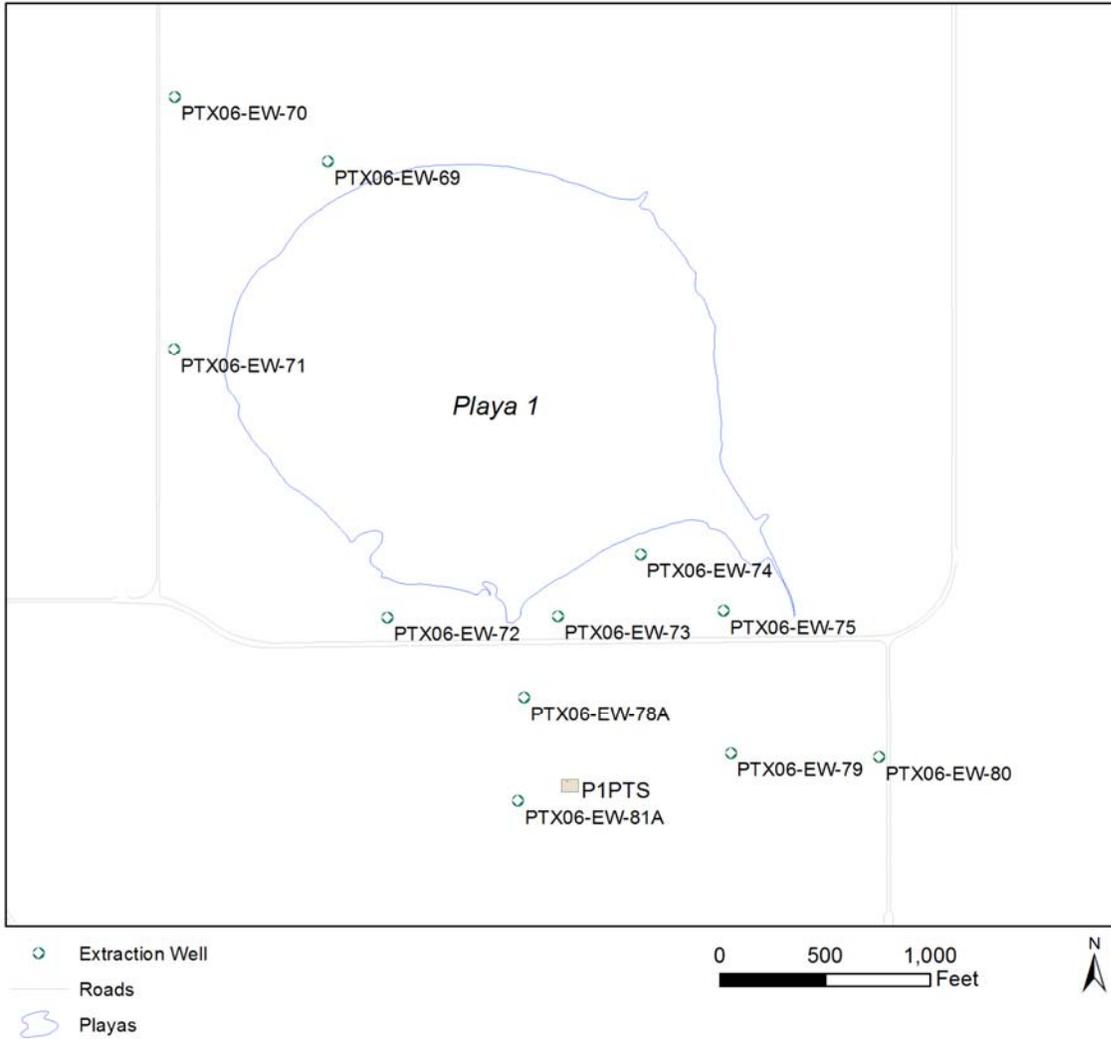
## **Appendix A**

### **Maps**

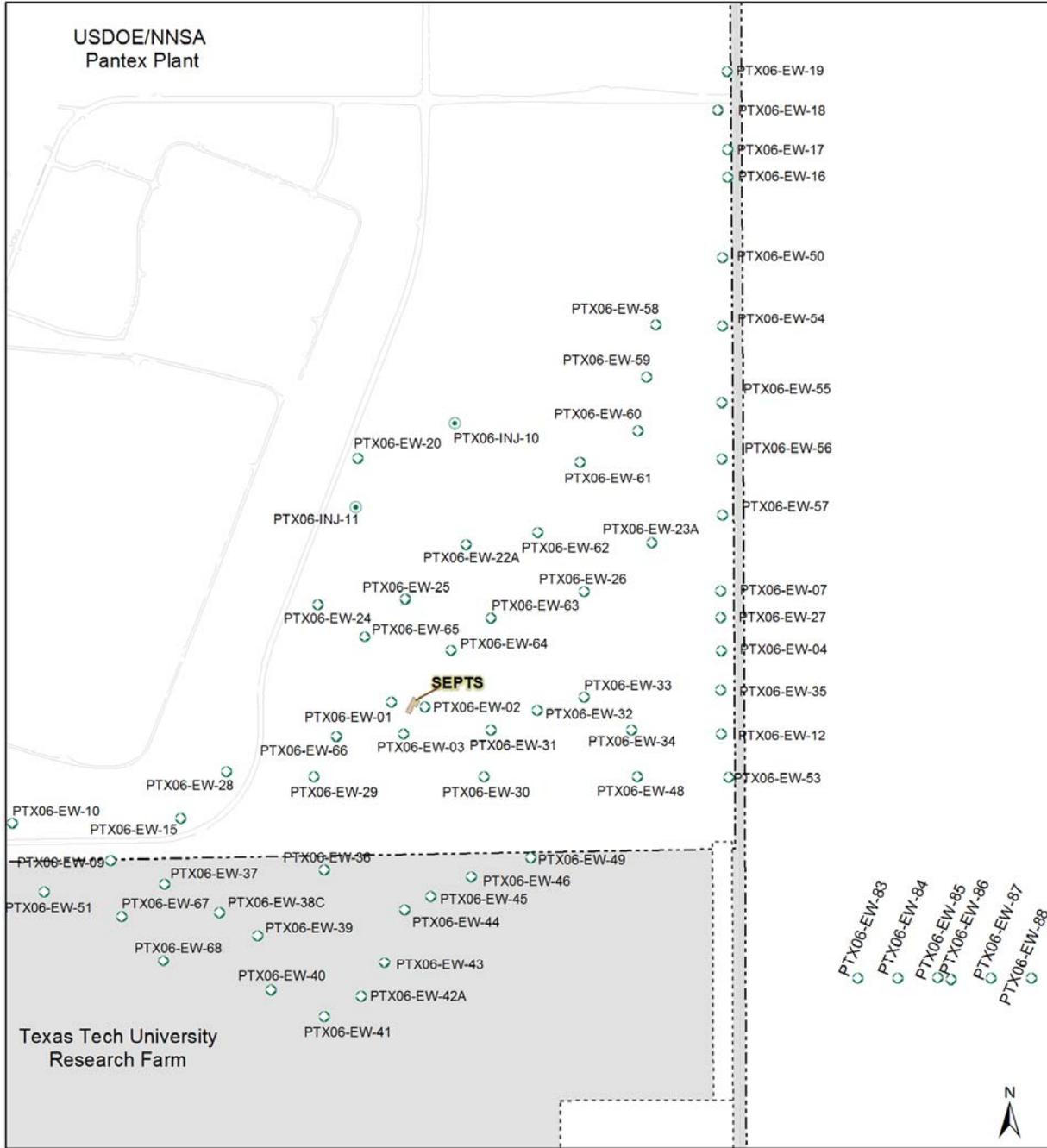




Extent of Perched Groundwater and Contaminant Plumes



Playa 1 Pump and Treat System Wells

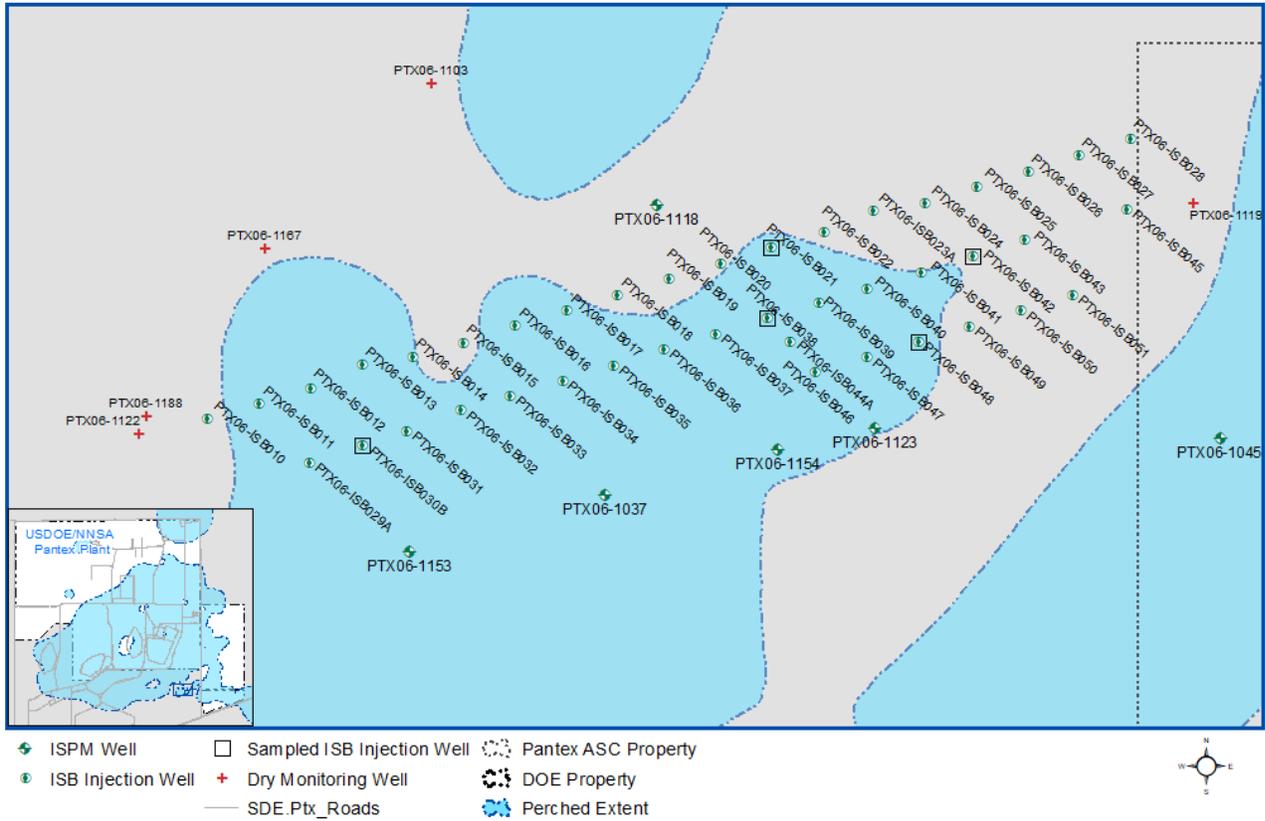


-  Extraction Well
-  Injection Well
-  Pantex ASC LLC Property

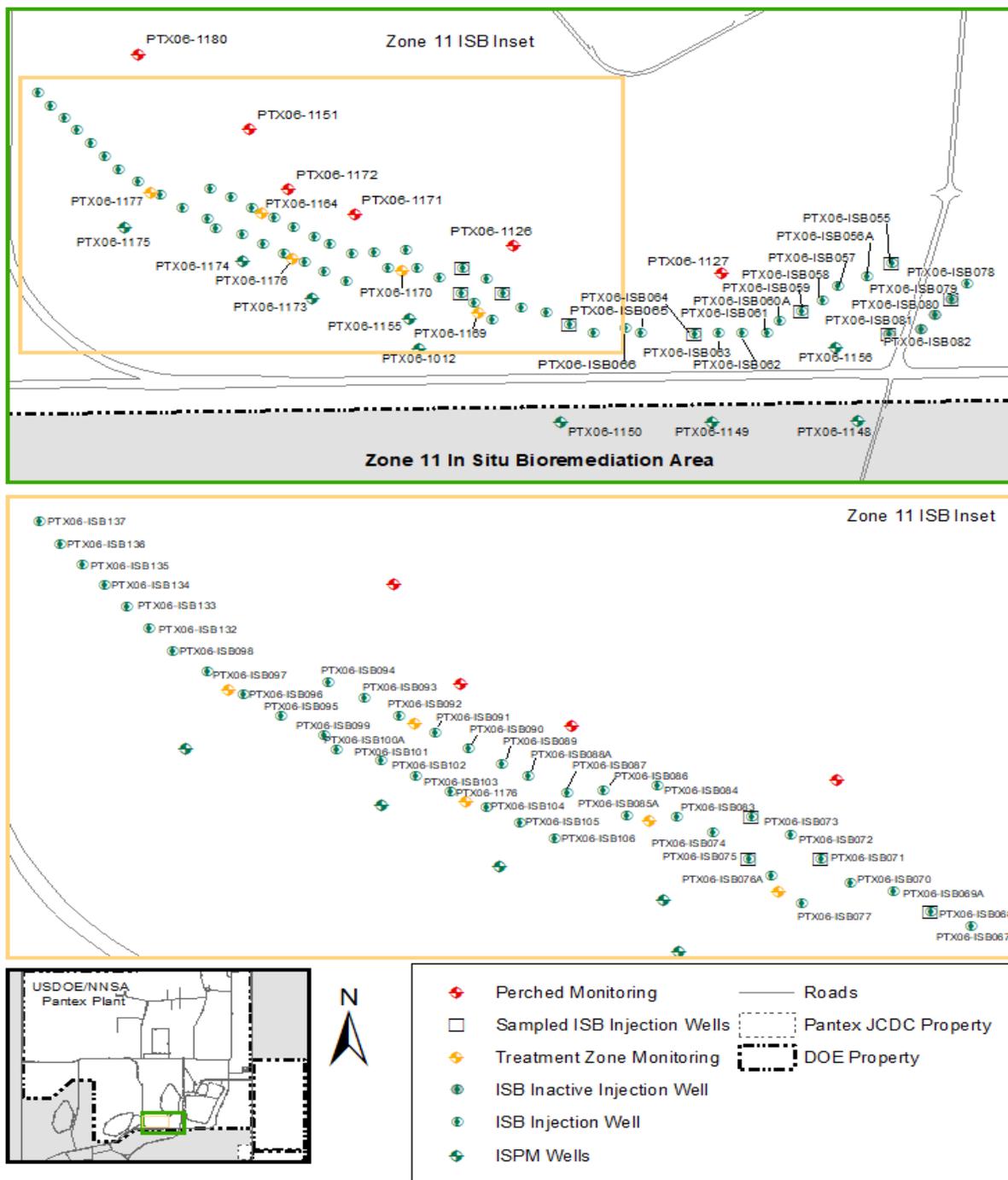
 Roads  DOE Property

0 1,000 2,000 Feet

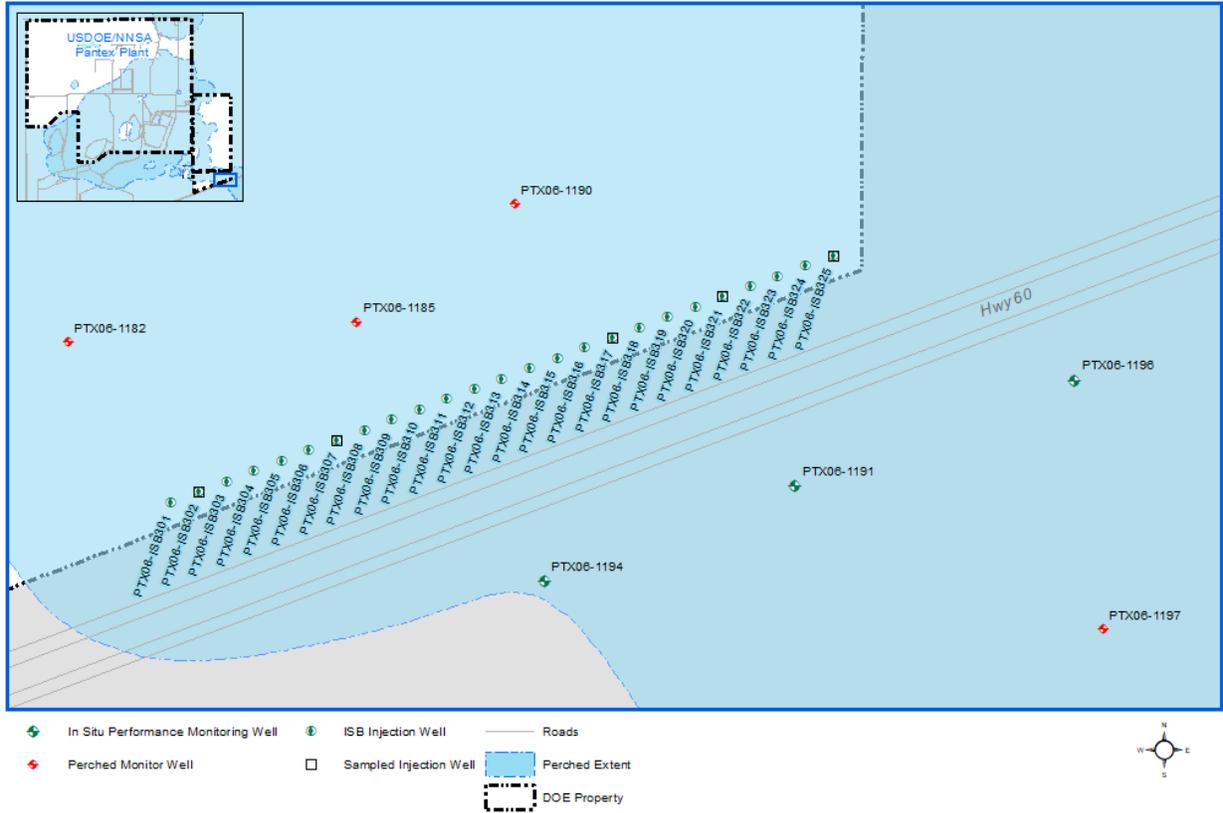
Southeast Pump and Treat System Wells



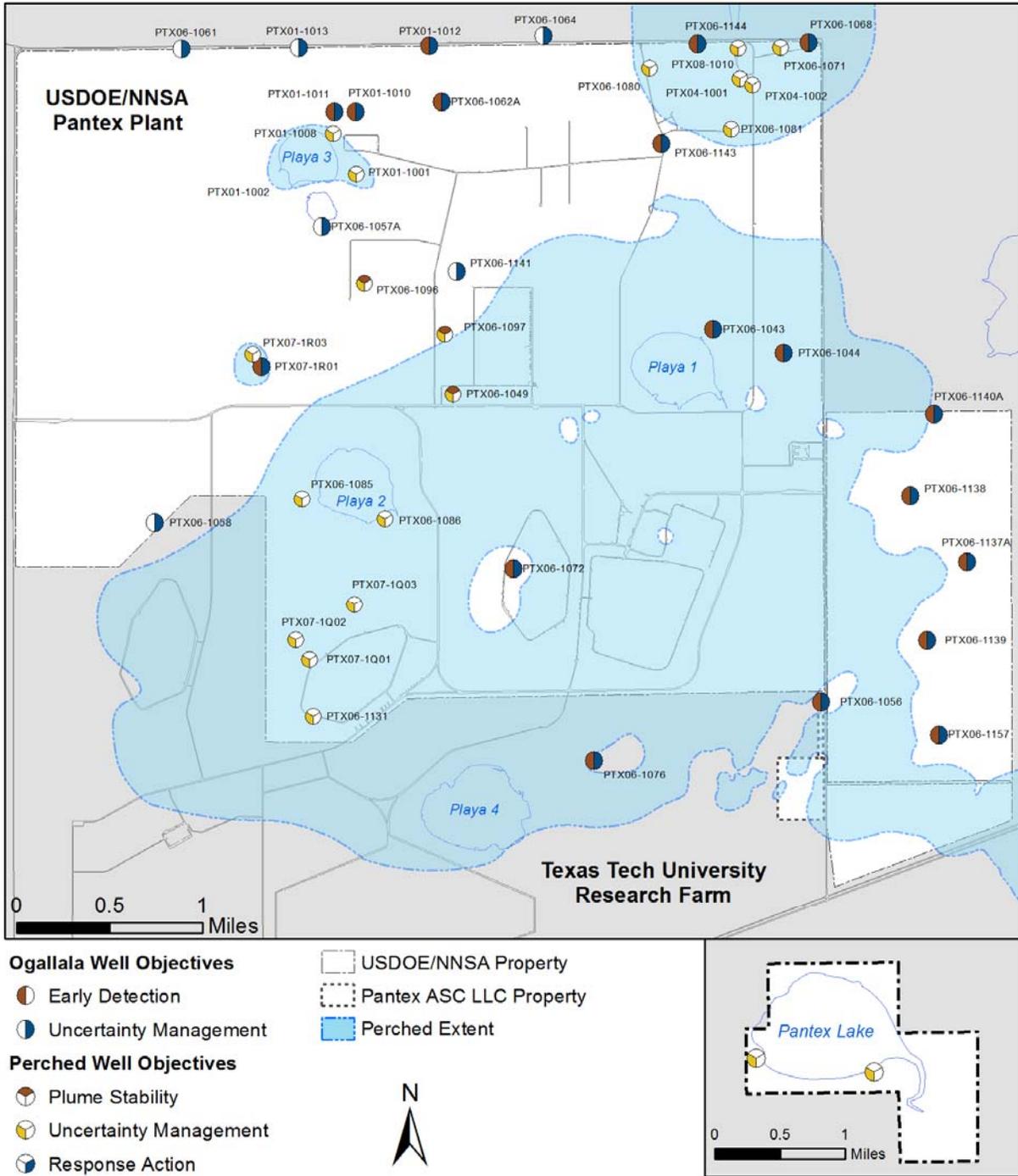
Southeast ISB Wells and Sampling Locations



Zone 11 ISB Wells and Sampling Locations



Southeast ISB Extension Wells and Sampling Locations



Uncertainty Management and Early Detection Wells  
Evaluated in the Quarterly Progress Report

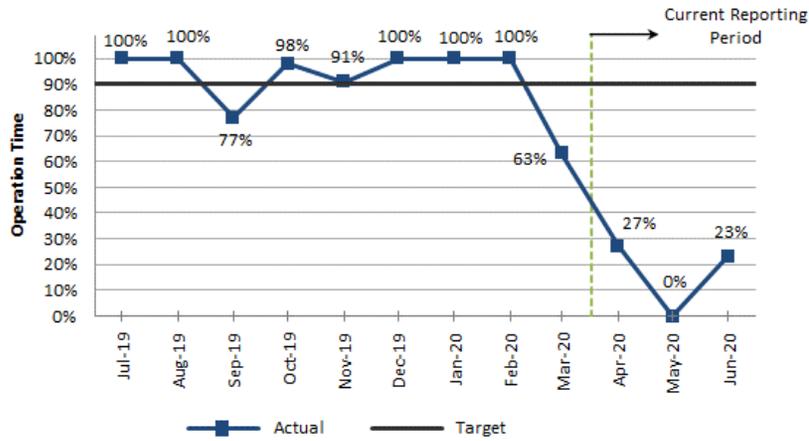


**Appendix B**  
**Pump and Treat System Graphs**

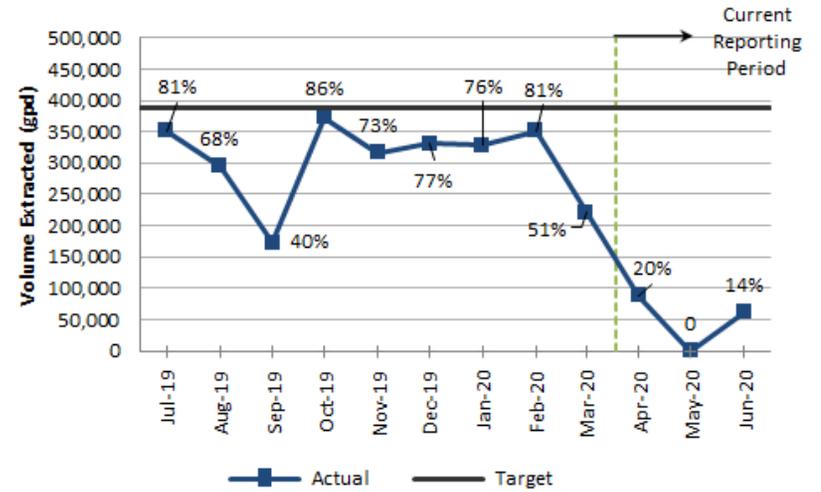


## **Southeast Pump and Treat System Graphs**

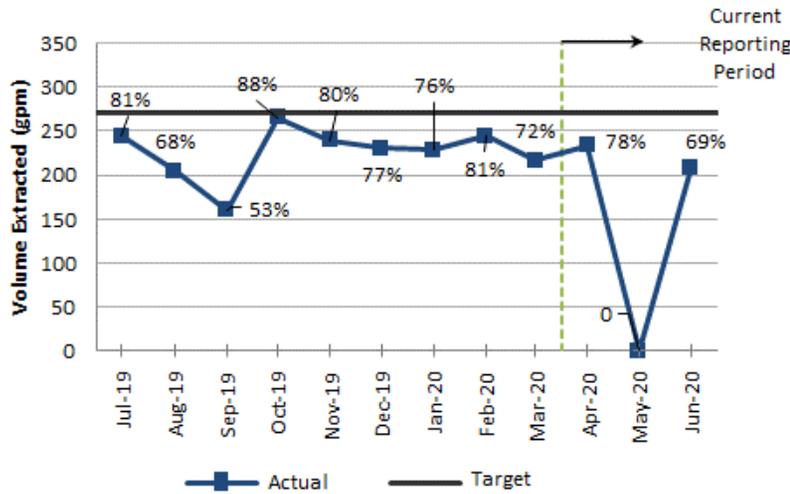




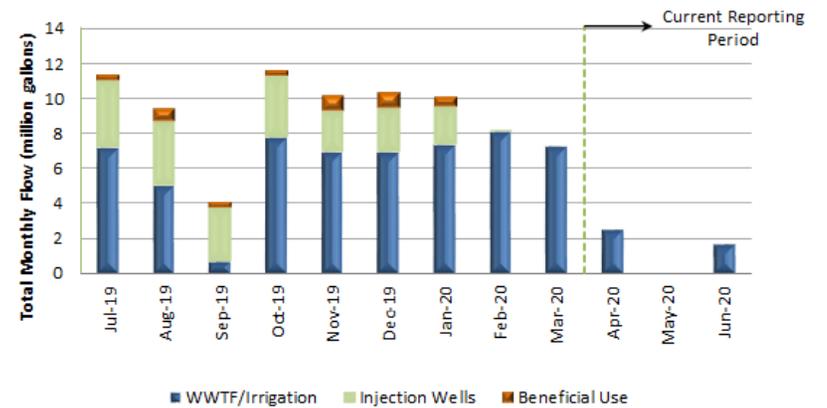
SEPTS Operation Time vs Target



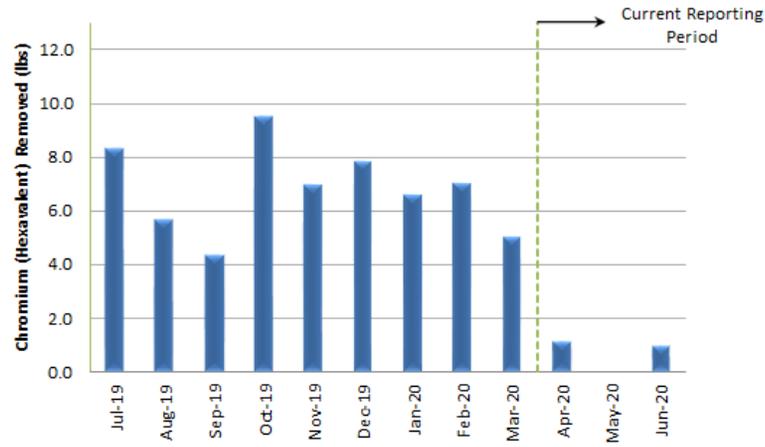
SEPTS GPD and % Capacity



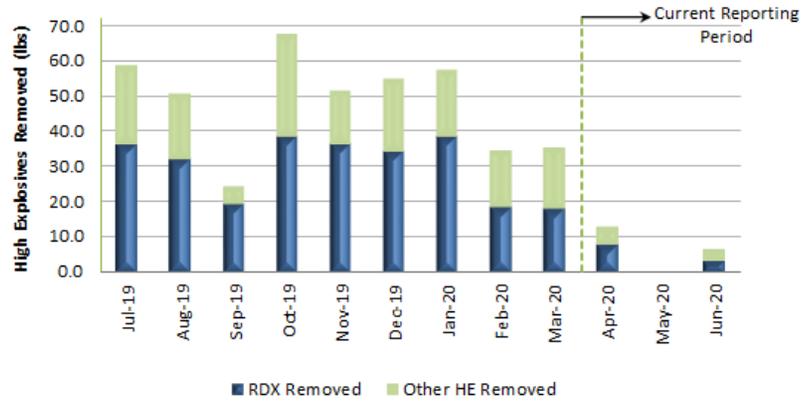
SEPTS Average GPM and % Capacity



SEPTS Monthly Total Flow



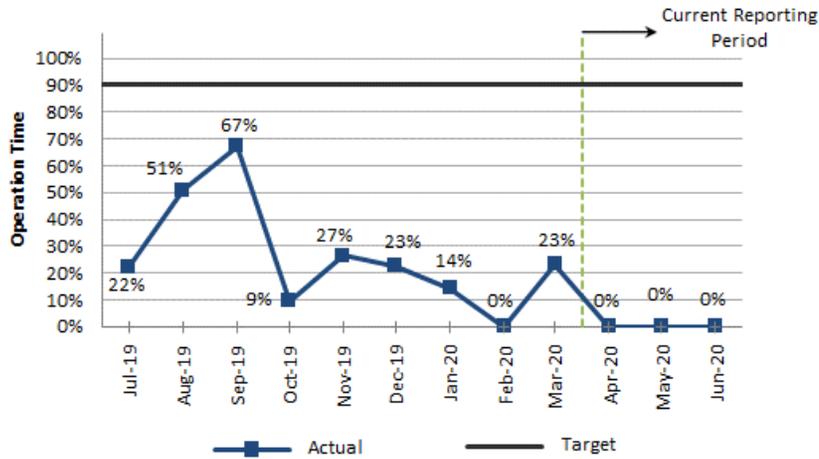
SEPTS Chromium Mass Removal by Month



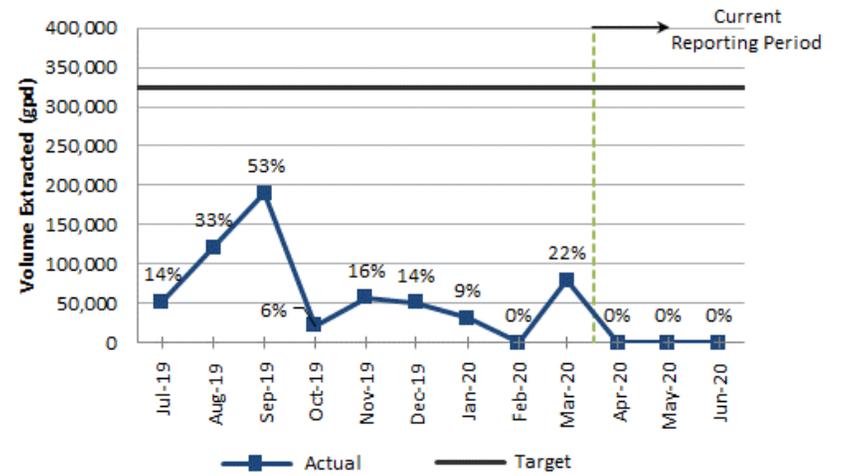
SEPTS HE Mass Removal by Month

## **Playa 1 Pump and Treat System Graphs**

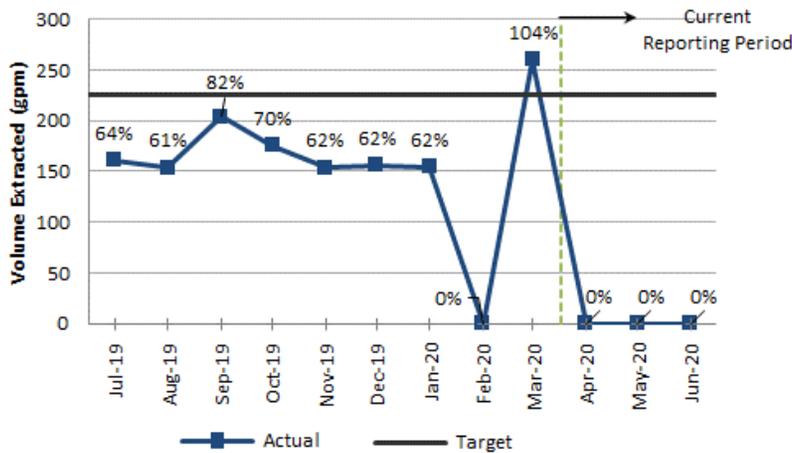




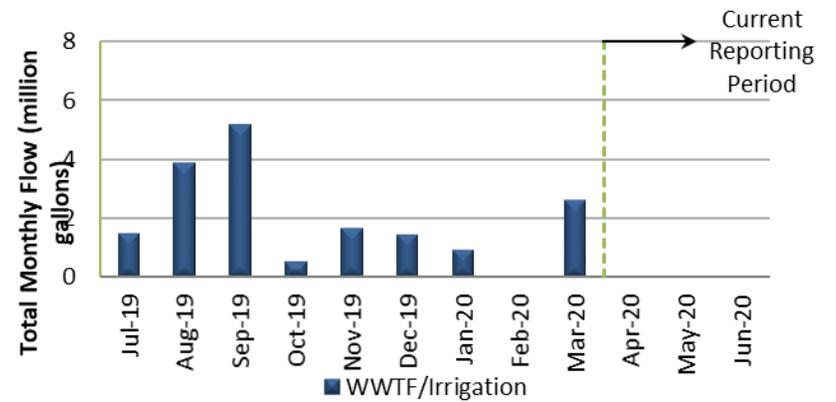
P1PTS Operational Time Vs Target



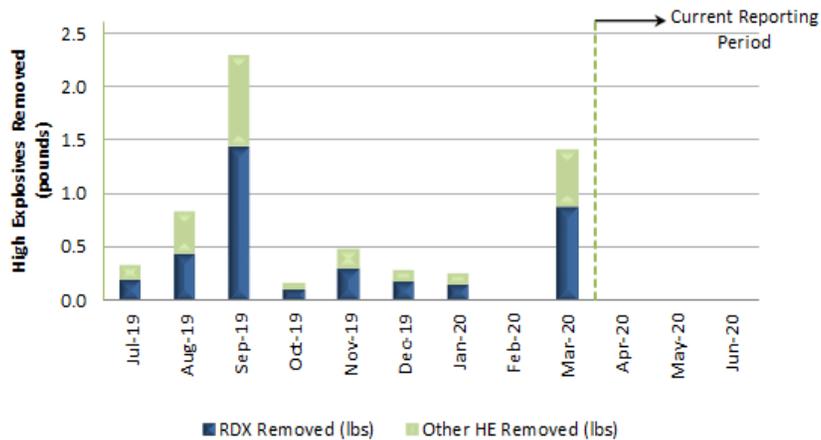
P1PTS Average GPD and % Capacity



P1PTS Average GPM and % Capacity



P1PTS Monthly System Total Flow



P1PTS HE Mass Removal by Month

### Appendix B Glossary

Operation Time	Operation time represents the percentage of the total number of hours the system was actually operated vs. the total possible hours the system could have operated on a monthly basis.
GPM Extraction	The gallons per minute (GPM) extraction rate represents the extraction rate from the well field while the system was operating. This is a measurement of the well field's capability to support the overall system throughput goals. Low well field rates can occur due to inoperable wells or decline in saturated thickness that makes extraction difficult.
GPD Extraction	The gallons per day (GPD) extraction rate represents the system's ability to meet overall throughput goals, considering the well field extraction rate and the system's operational rate. This rate is affected by the ability to extract water from the well field and the system downtime.
Total Monthly Flow	Total monthly flow is the total volume of extracted water measured at the influent point of the pump and treat system. Individual well measurements and flow rates are provided in the annual progress report.



## **Appendix C**

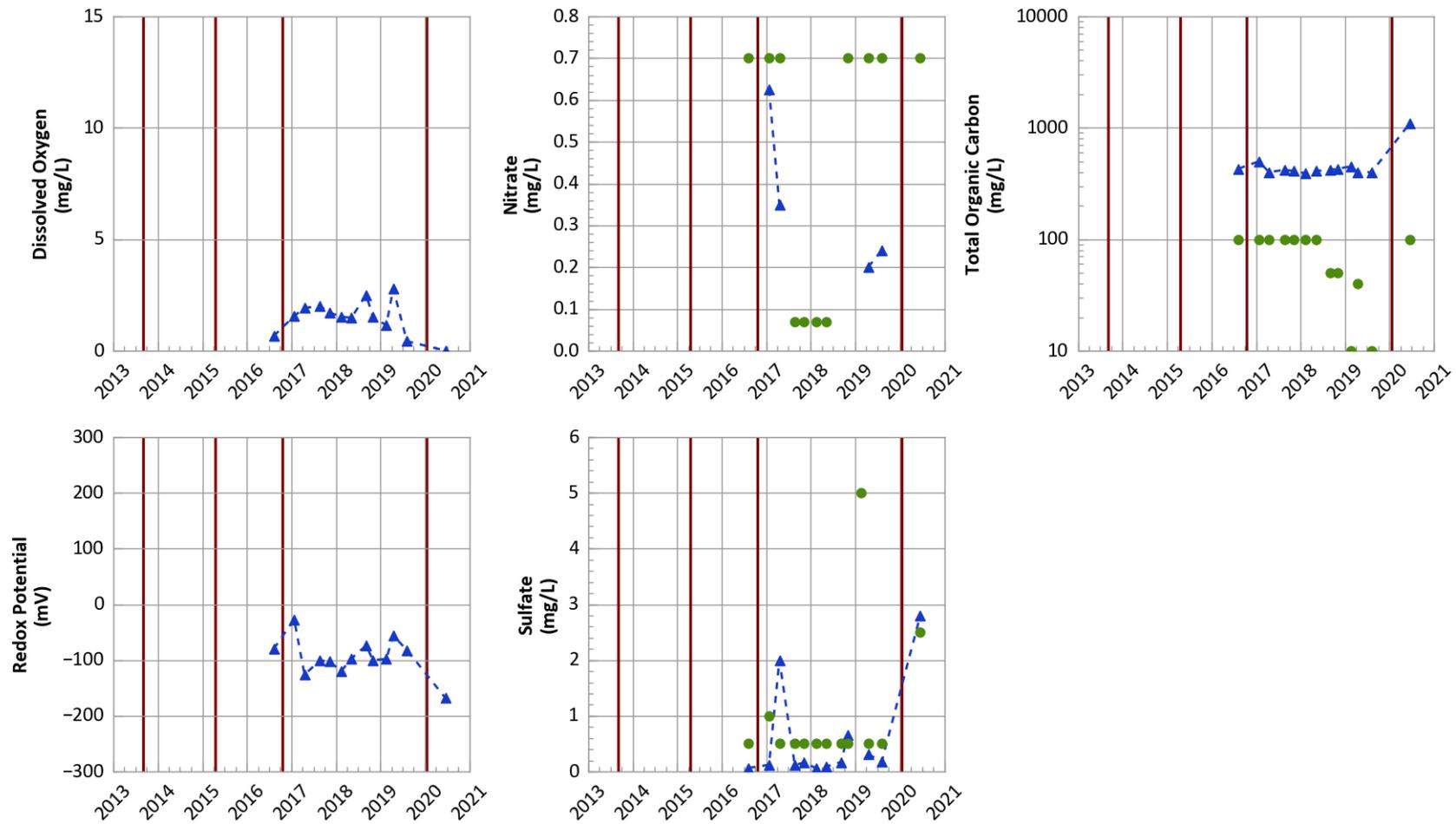
### **ISB Graphs**



## **Southeast ISB Graphs**



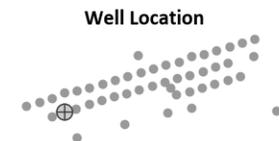
PTX06-ISB030B Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



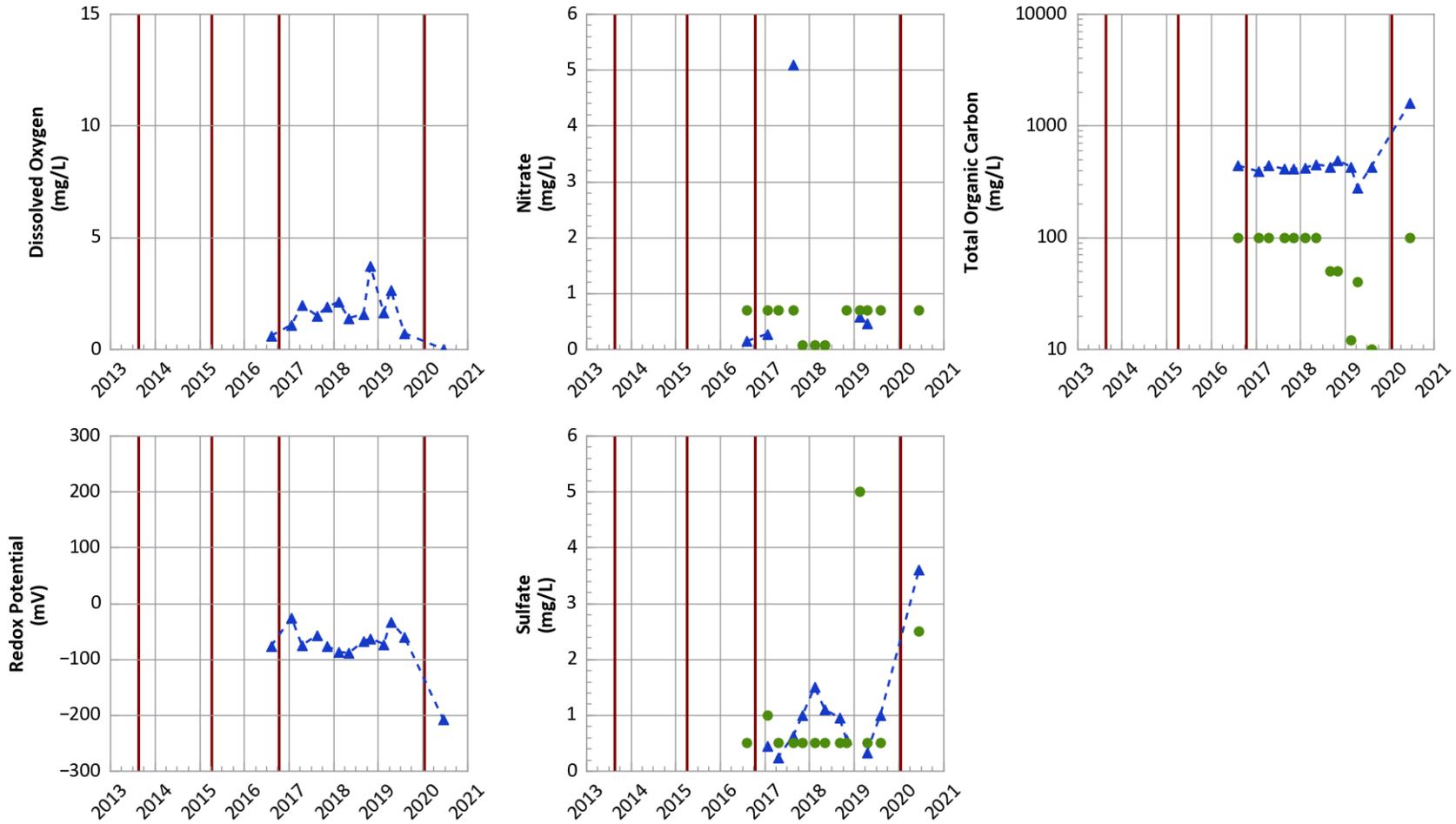
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



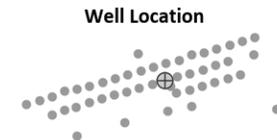
**PTX06-ISB038 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



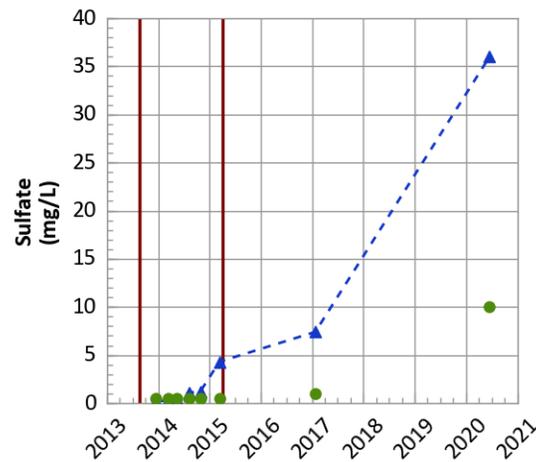
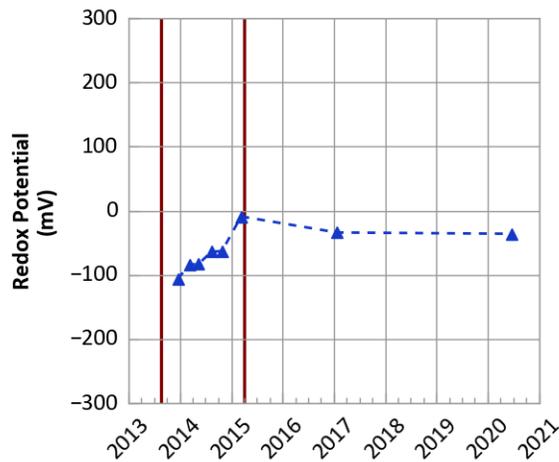
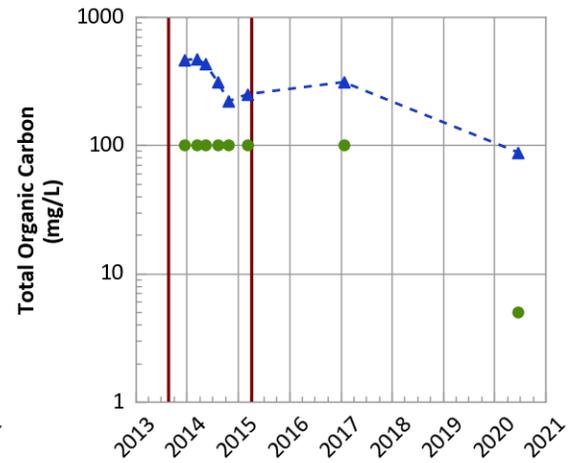
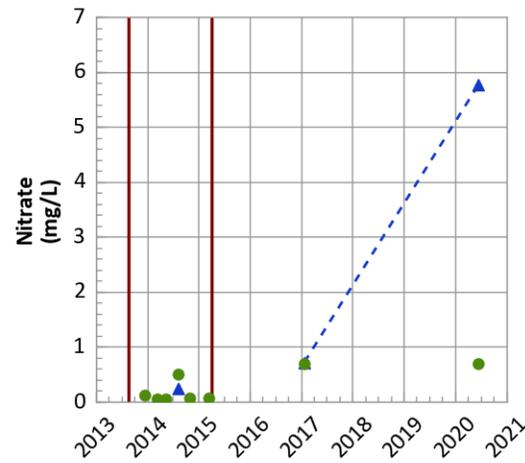
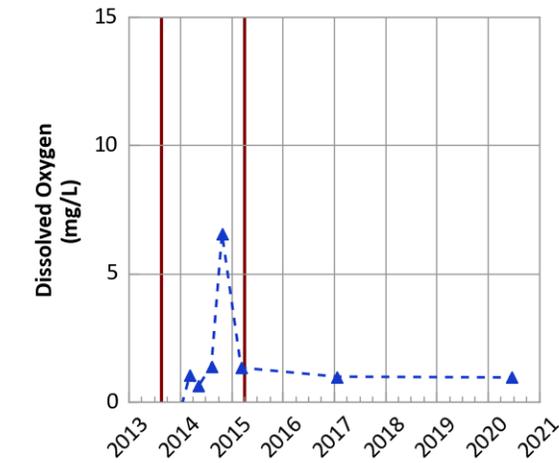
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- Concentration Trend
- Injection Dates



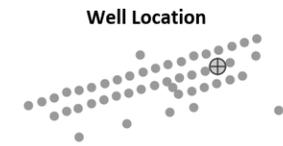
PTX06-ISB042 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



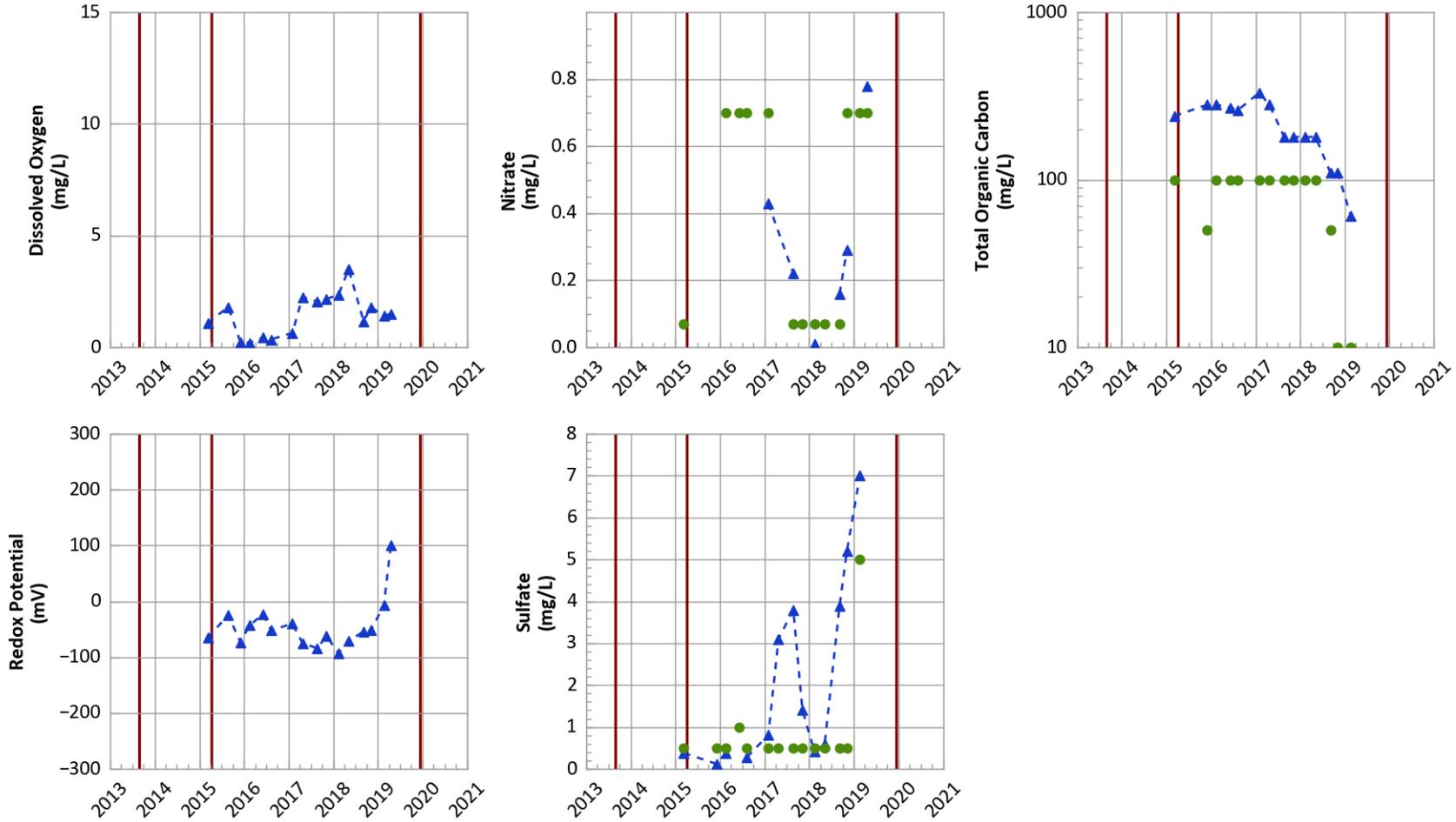
Typical Baseline Concentrations in Perched Groundwater

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



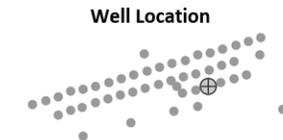
**PTX06-ISB048 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



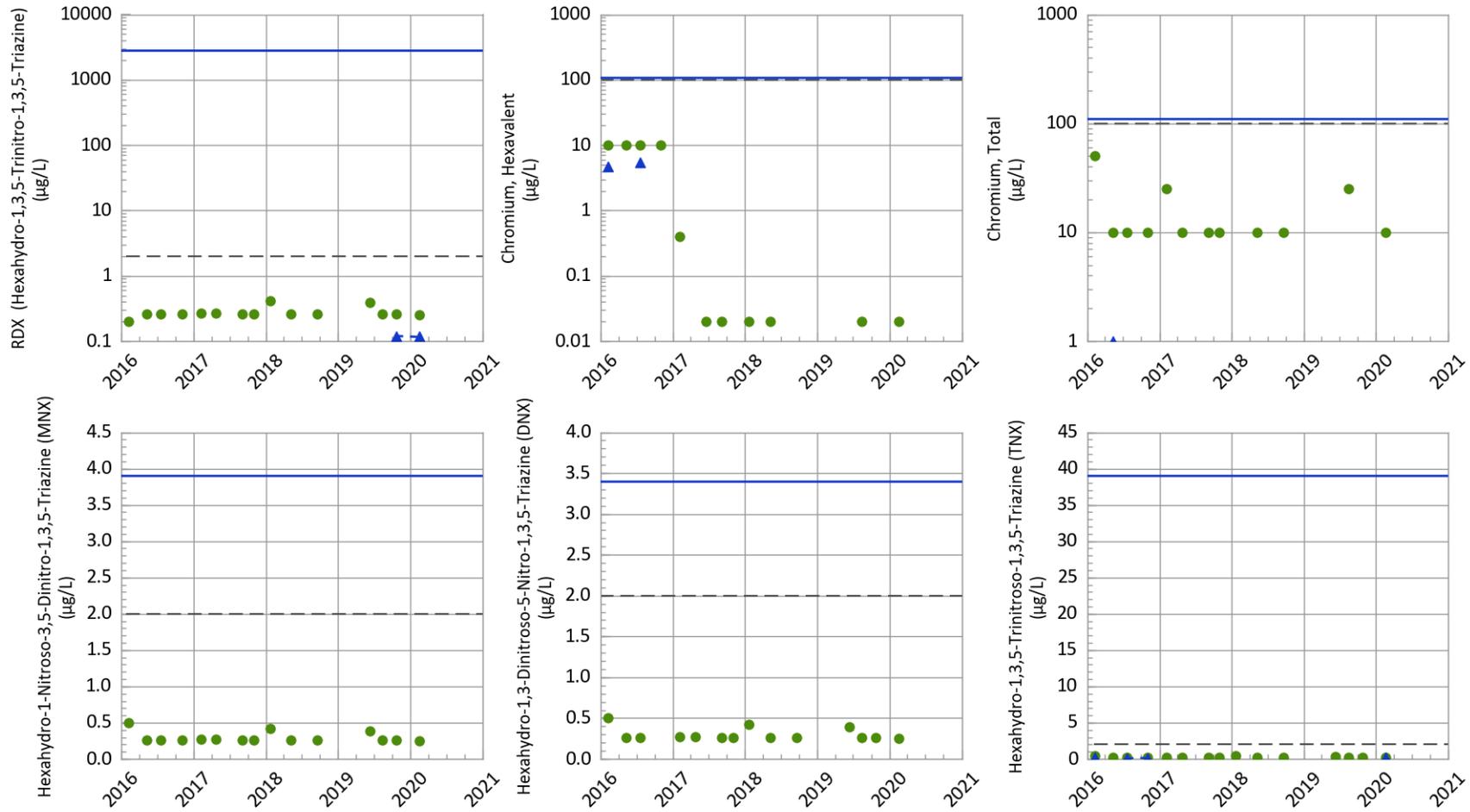
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- Concentration Trend
- Injection Dates



**PTX06-1037 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



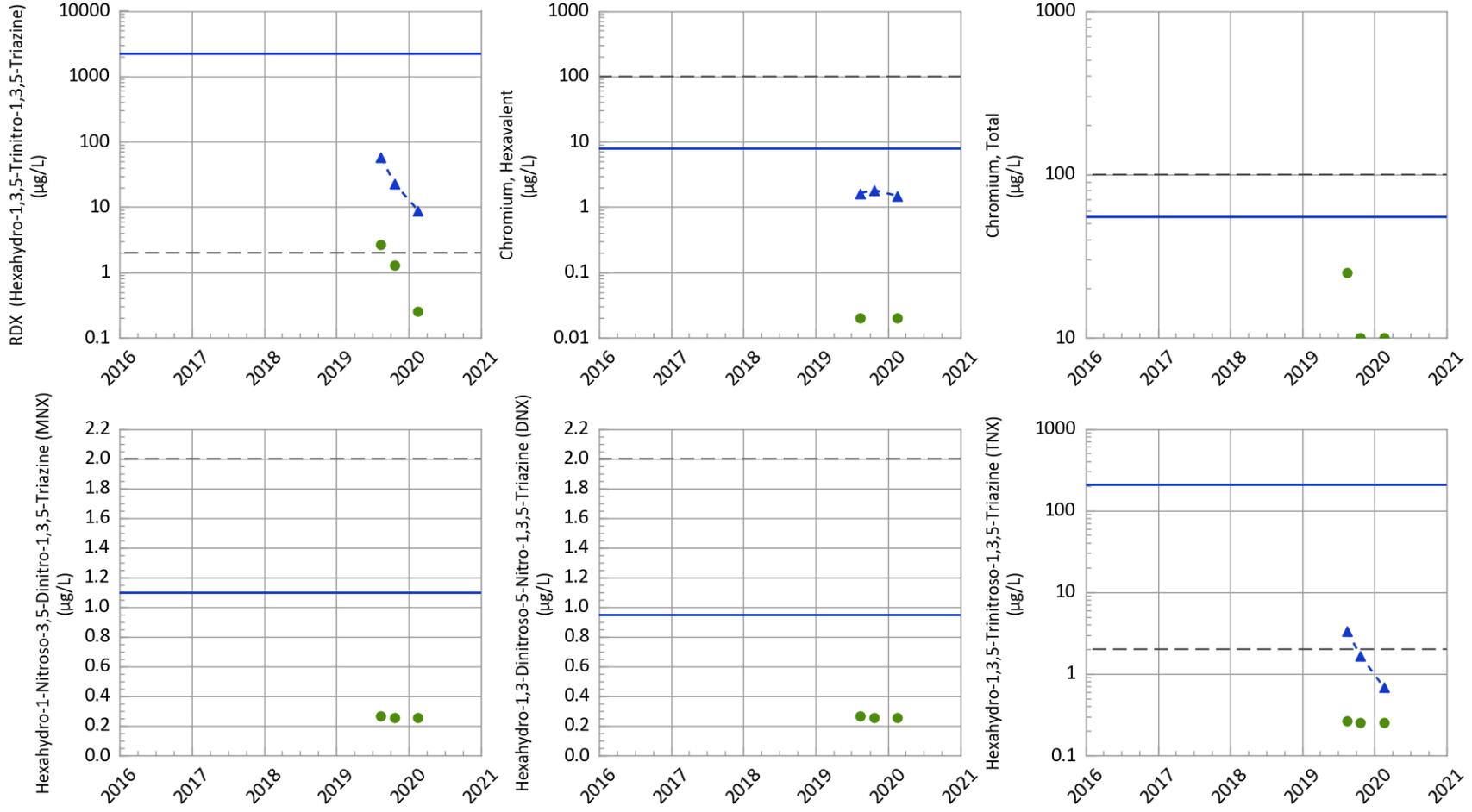
**Most Recent Measured COC Concentrations (Feb 18, 2020)**

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	0.12	2.0
MNX	Non-Detect	2.0
CR-6	Non-Detect	100.0
DNX	Non-Detect	2.0
CR	Non-Detect	100.0
TNX	0.19	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



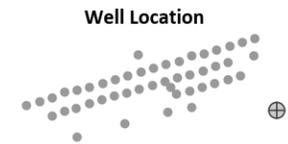
**PTX06-1045 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



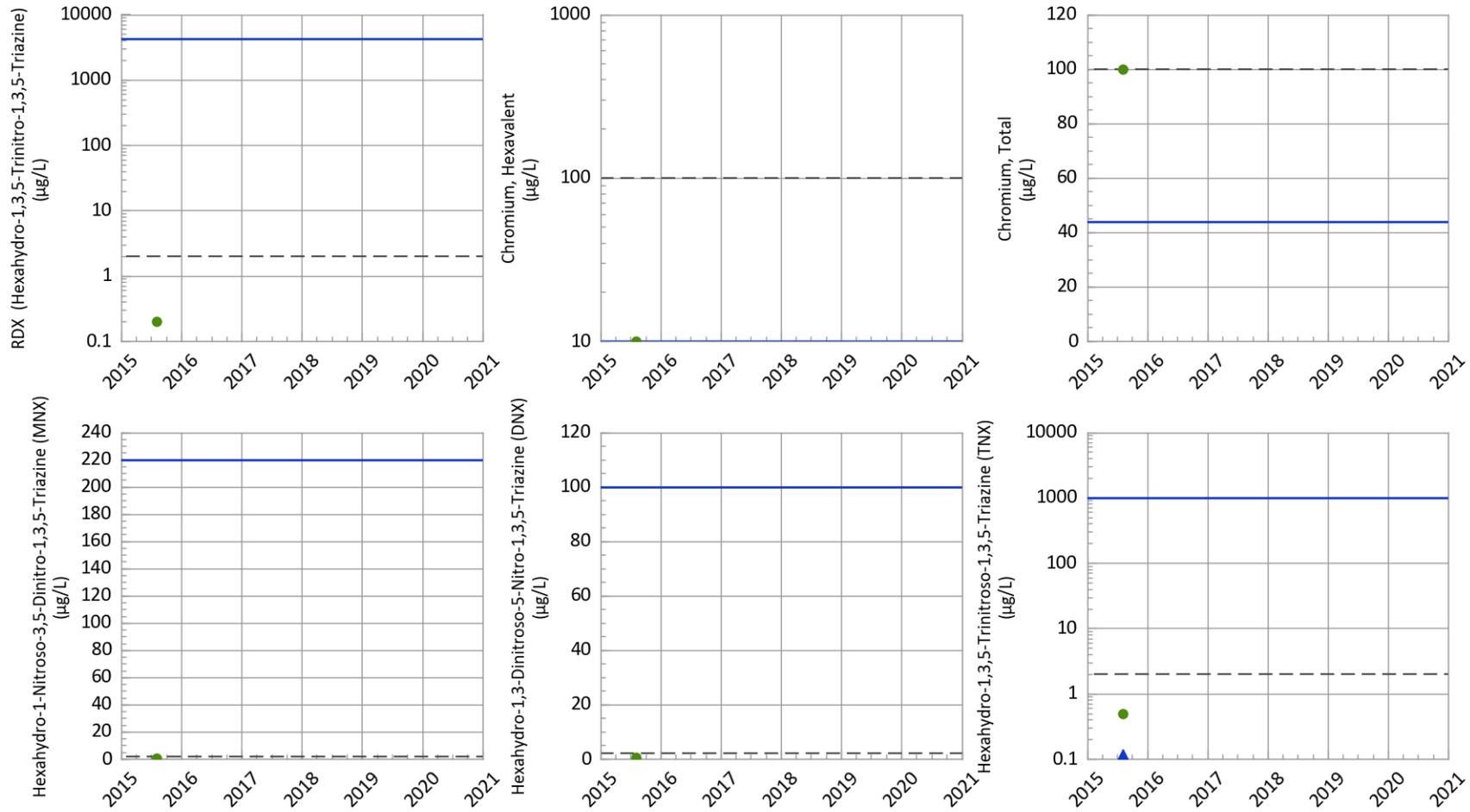
Most Recent Measured COC Concentrations (Feb 18, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	8.86	2.0
MNX	Non-Detect	2.0
CR-6	1.48	100.0
DNX	Non-Detect	2.0
CR	Non-Detect	100.0
TNX	0.68	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



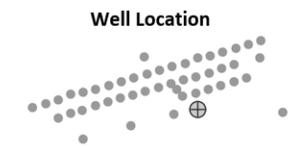
**PTX06-1123 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



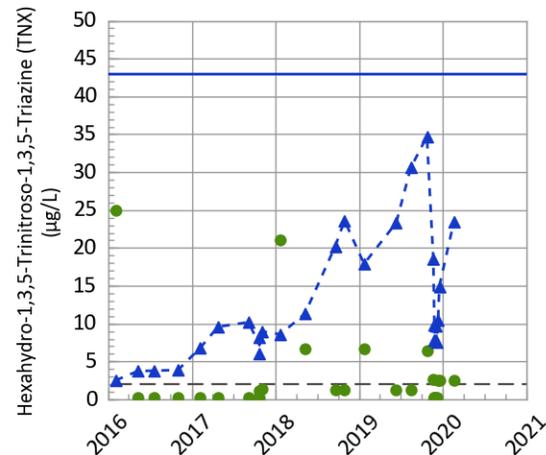
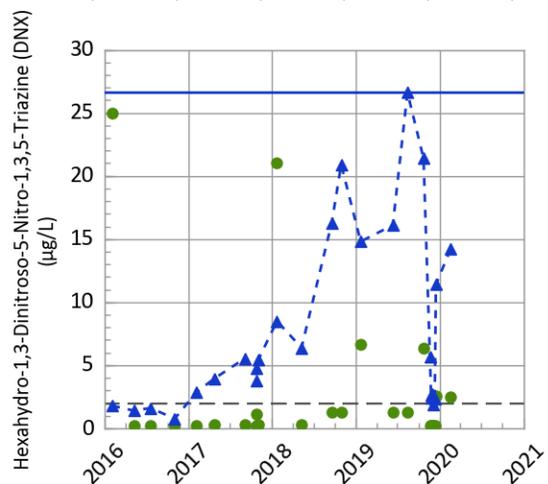
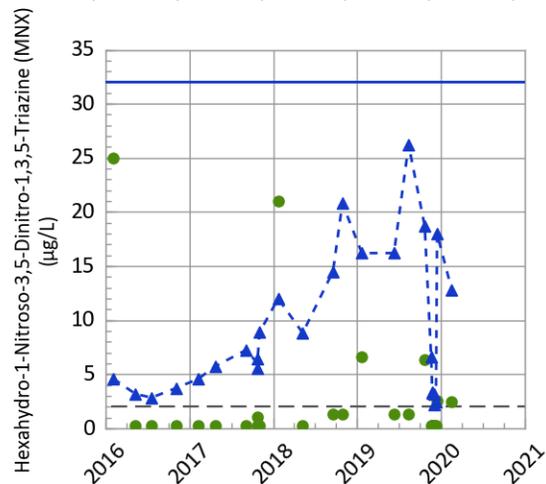
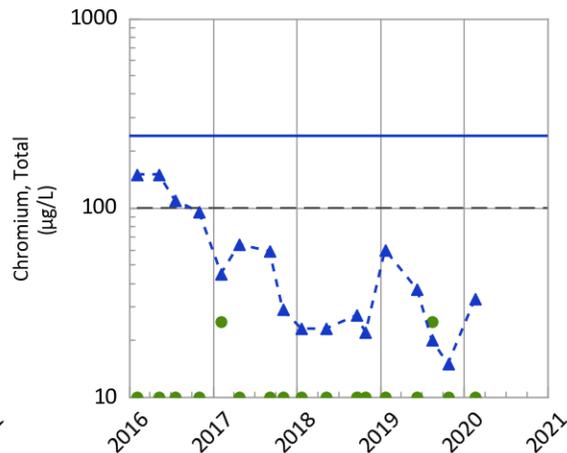
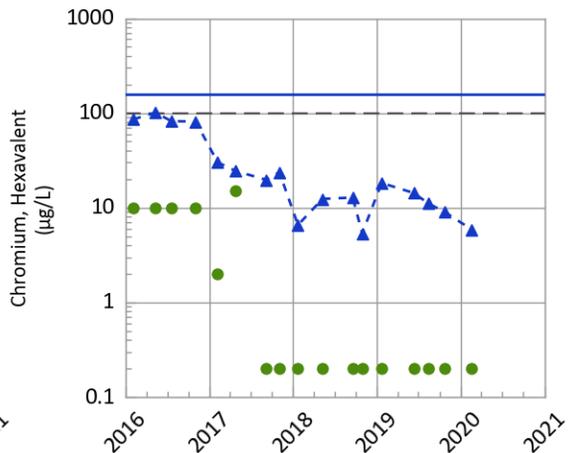
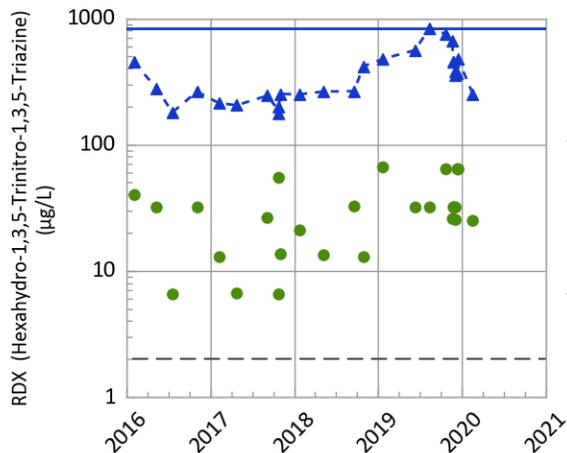
Most Recent Measured COC Concentrations (Aug 05, 2015)

COC	Concentration ( $\mu\text{g/L}$ )	GWPS ( $\mu\text{g/L}$ )
RDX	Non-Detect	2.0
MNX	Non-Detect	2.0
CR-6	Non-Detect	100.0
DNX	Non-Detect	2.0
CR	Non-Detect	100.0
TNX	0.12	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



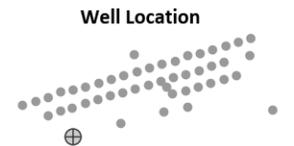
**PTX06-1153 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



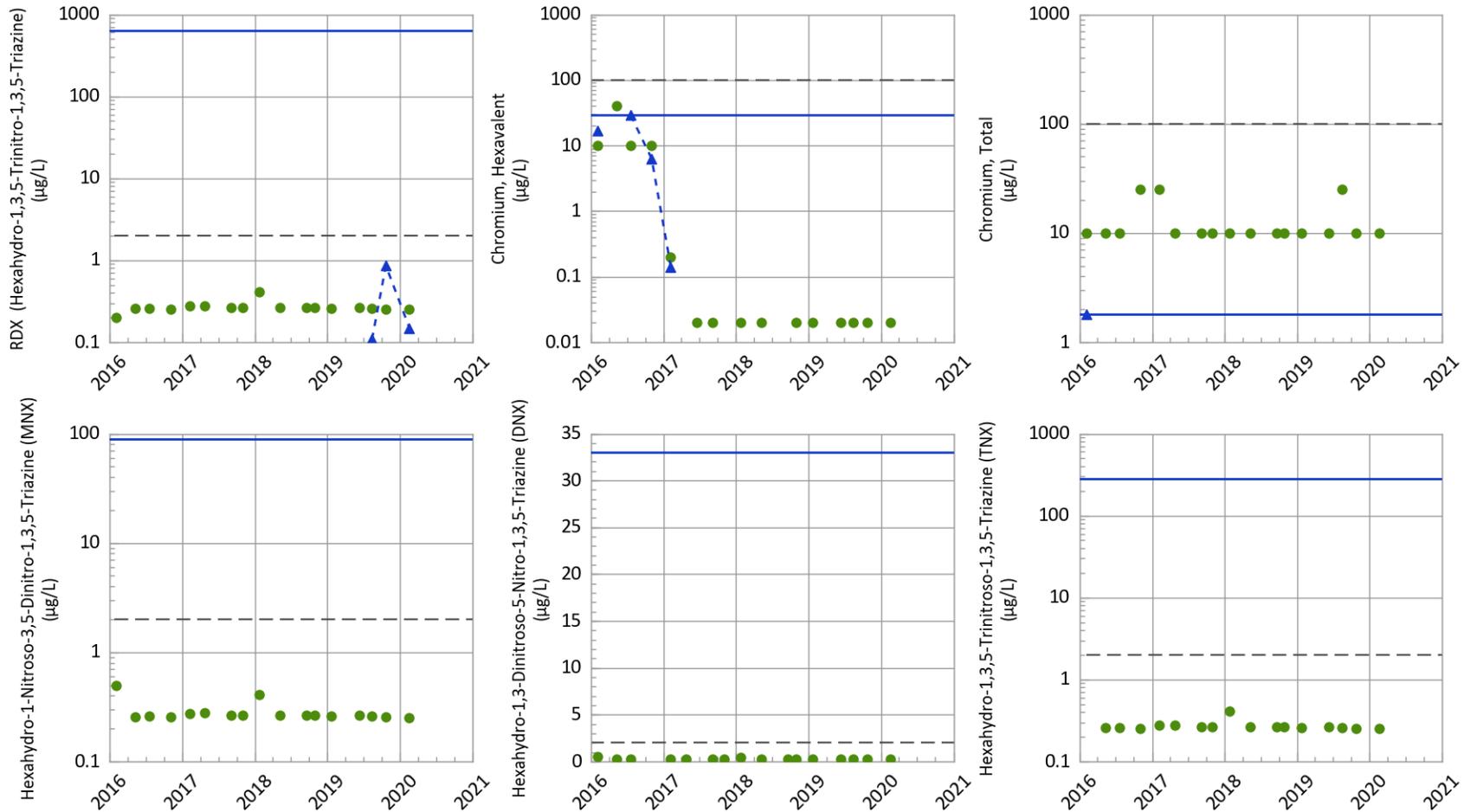
Most Recent Measured COC Concentrations (Feb 18, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	252.0	2.0
MNX	12.8	2.0
CR-6	5.89	100.0
DNX	14.2	2.0
CR	33.0	100.0
TNX	23.5	2.0

- ▲ Measured Value
- Sample Detection Limit
- Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



**PTX06-1154 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Feb 18, 2020)

COC	Concentration ( $\mu\text{g/L}$ )	GWPS ( $\mu\text{g/L}$ )
RDX	0.15	2.0
MNX	Non-Detect	2.0
CR-6	Non-Detect	100.0
DNX	Non-Detect	2.0
CR	Non-Detect	100.0
TNX	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard

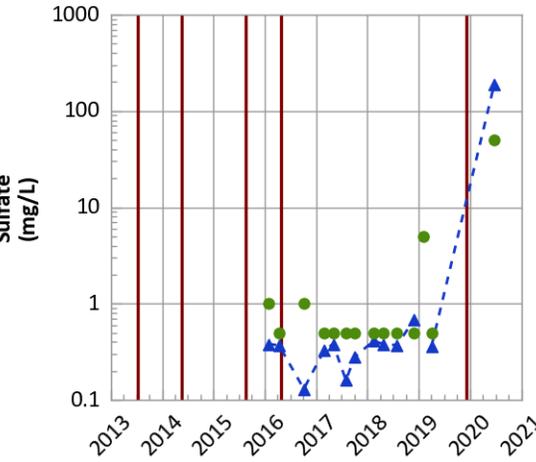
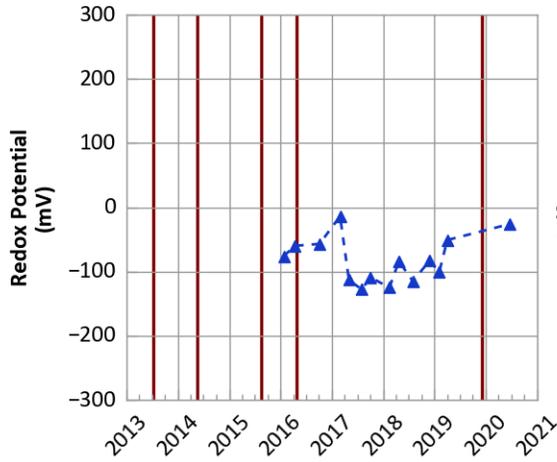
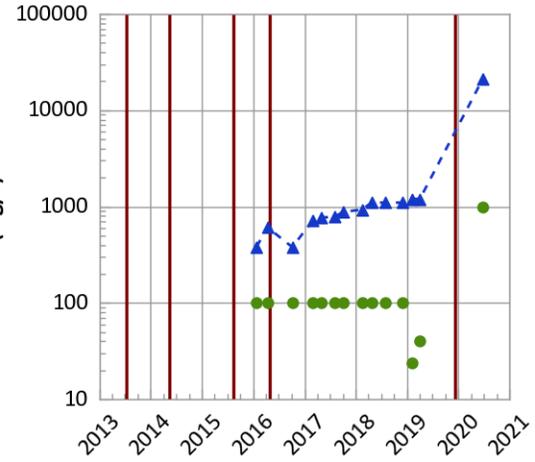
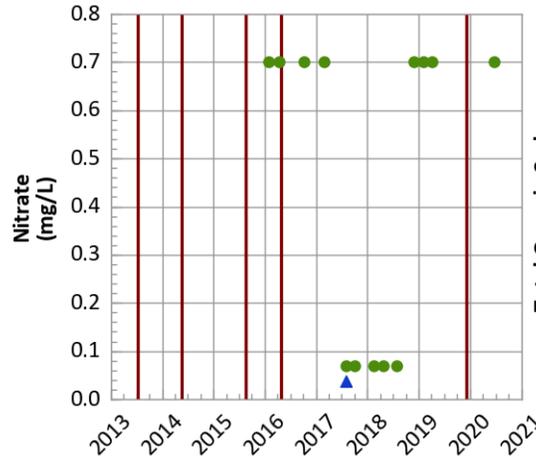
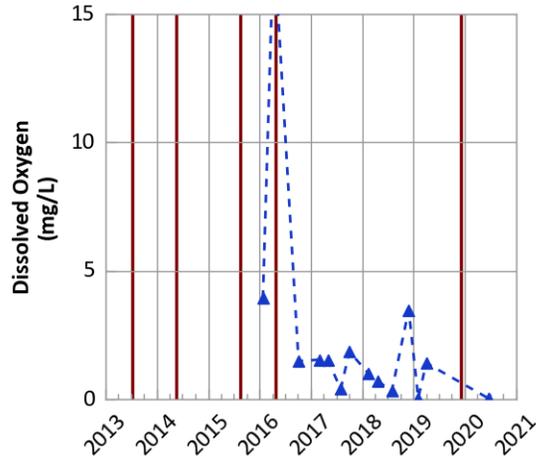


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## Zone 11 ISB Graphs



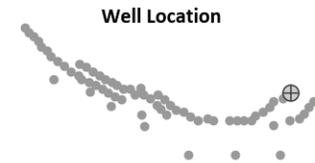
PTX06-ISB055 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



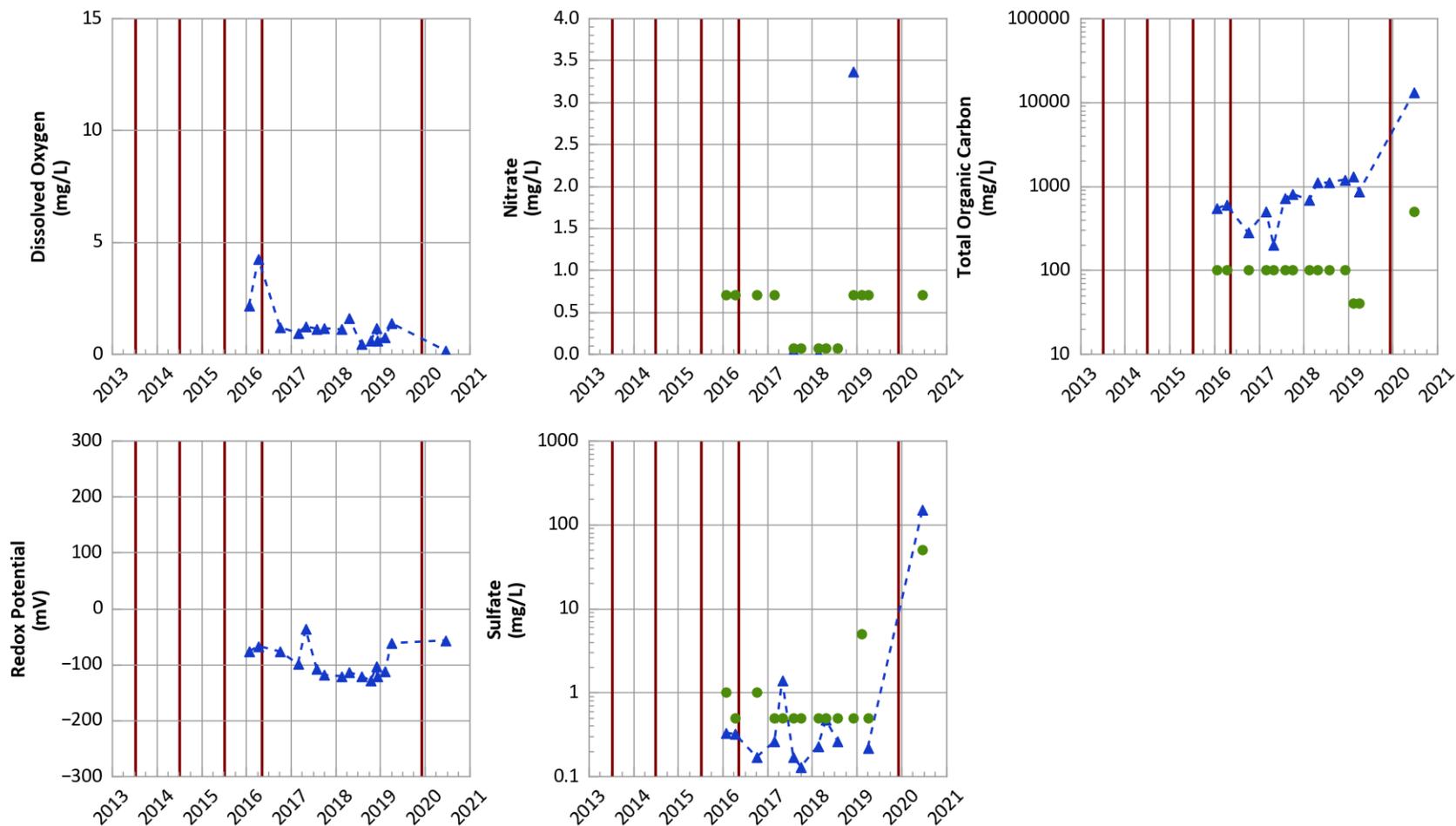
Typical Baseline Concentrations in Perched Groundwater

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



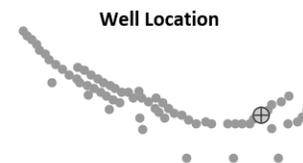
PTX06-ISB059 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



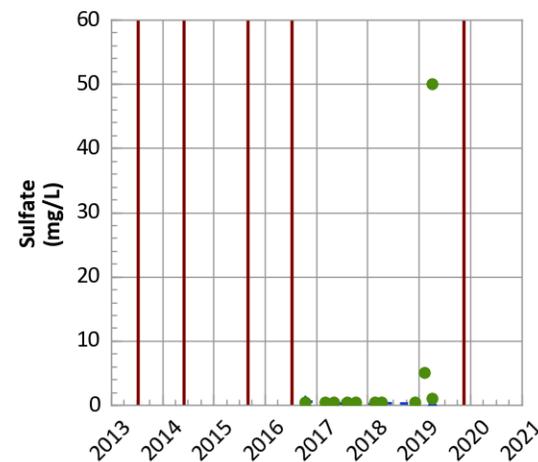
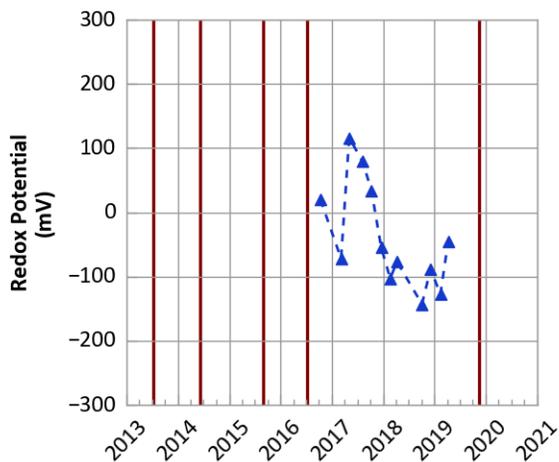
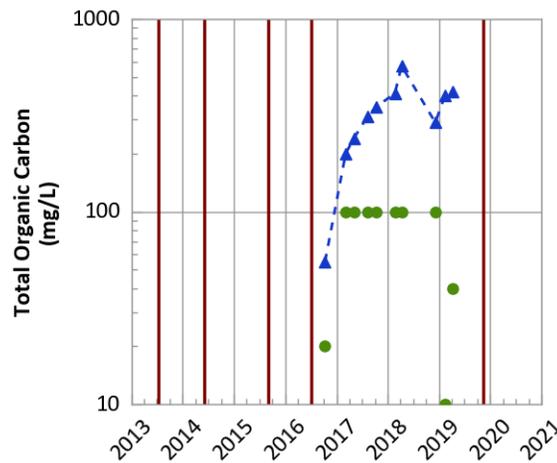
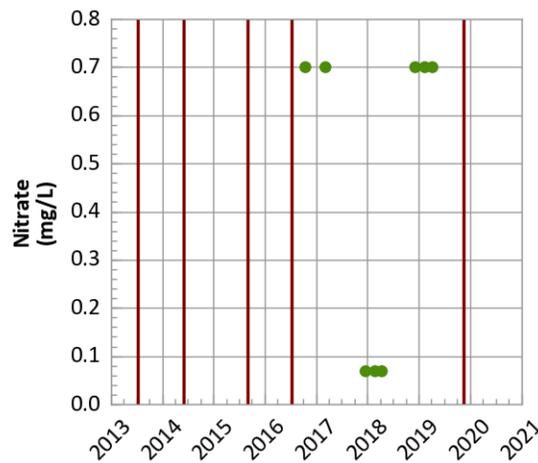
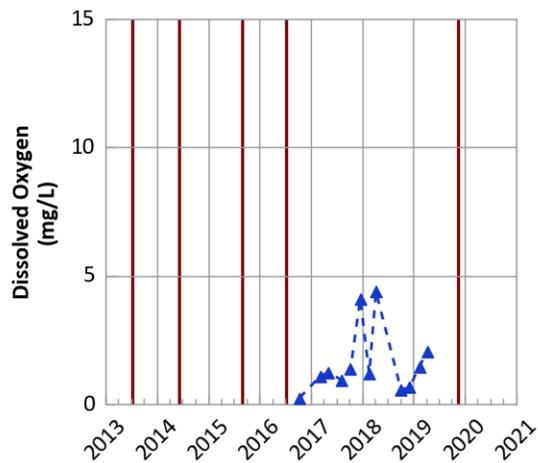
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



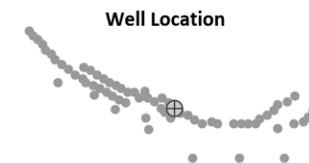
PTX06-ISB071 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



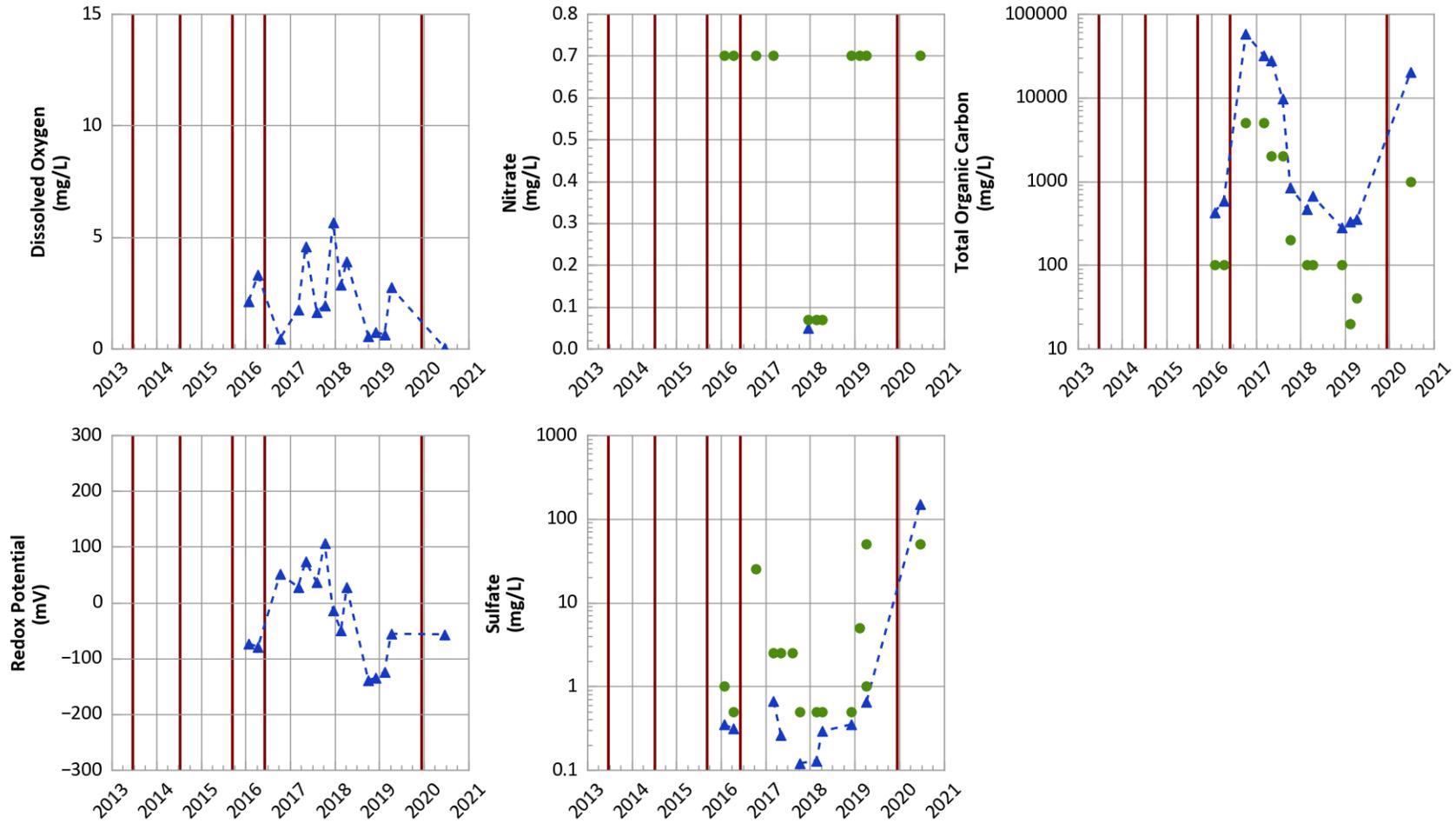
Typical Baseline Concentrations in Perched Groundwater

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



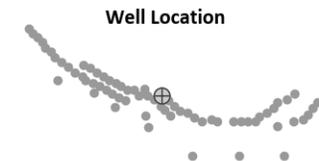
PTX06-ISB073 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



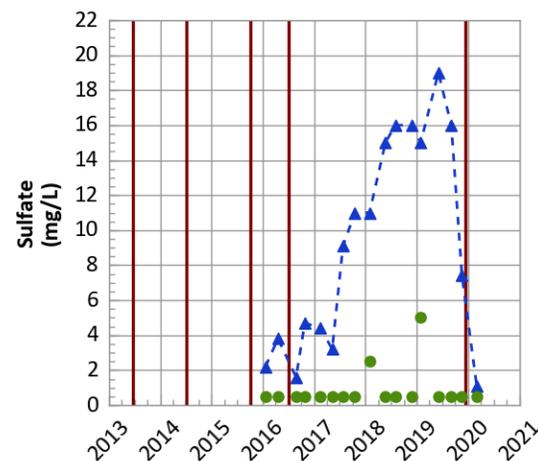
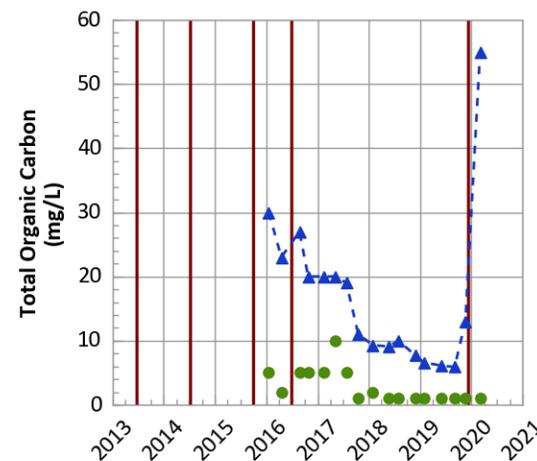
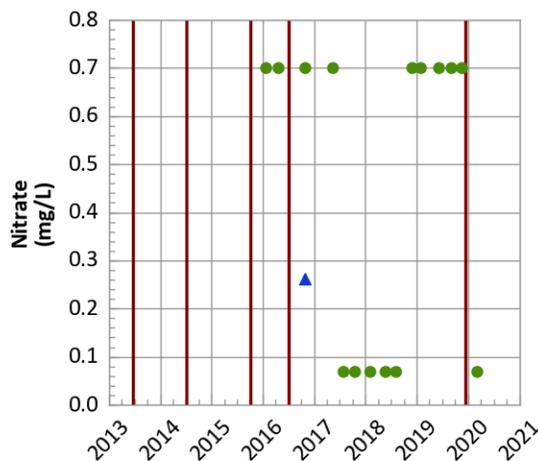
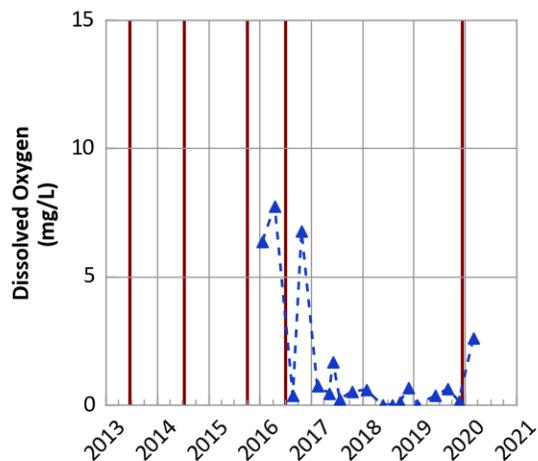
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



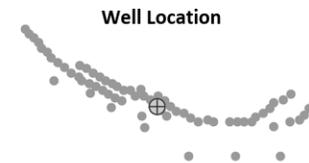
PTX06-ISB075 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



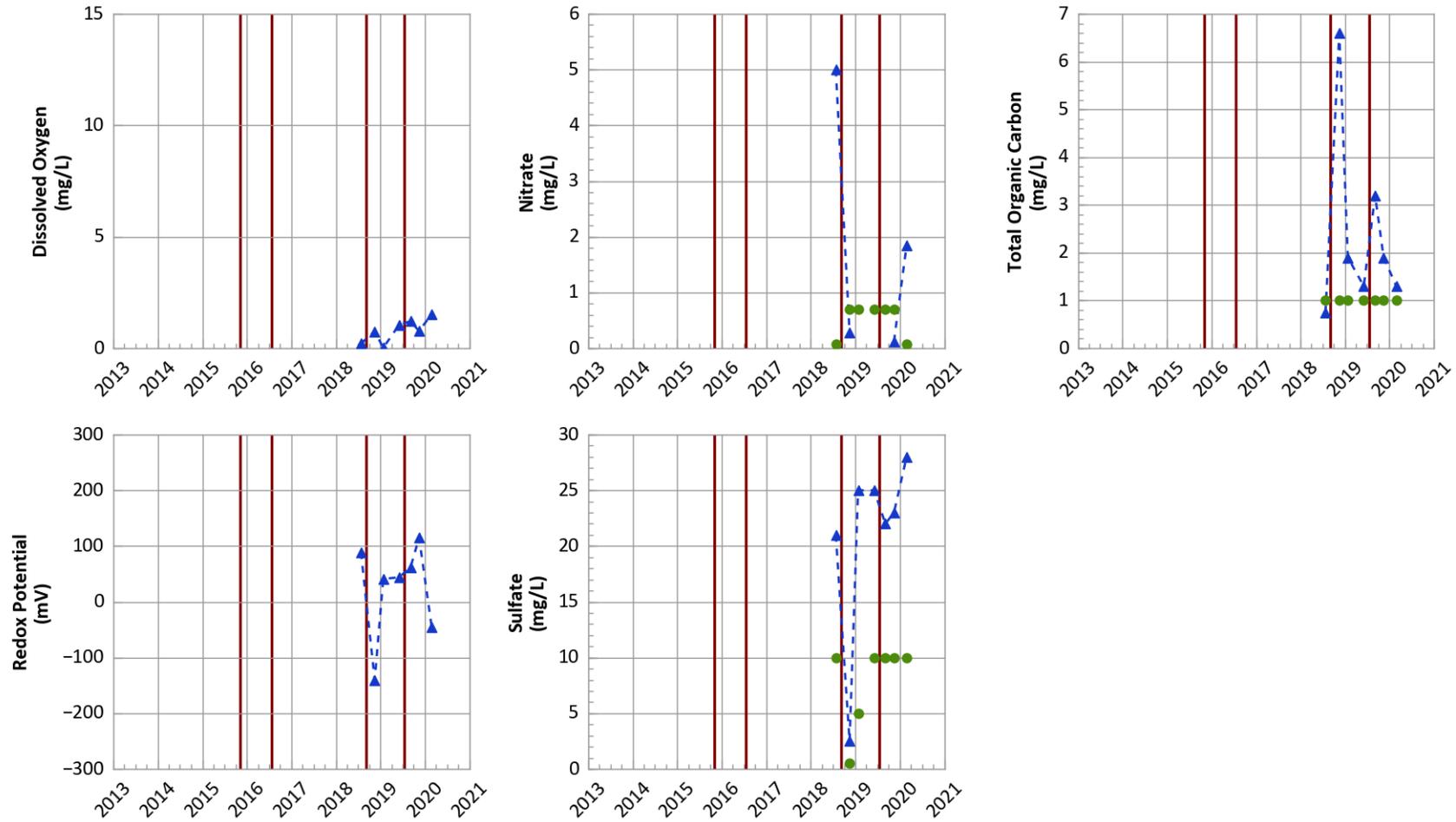
Typical Baseline Concentrations in Perched Groundwater

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



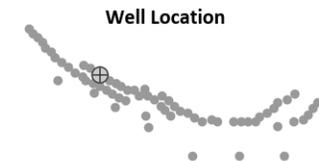
**PTX06-1164 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



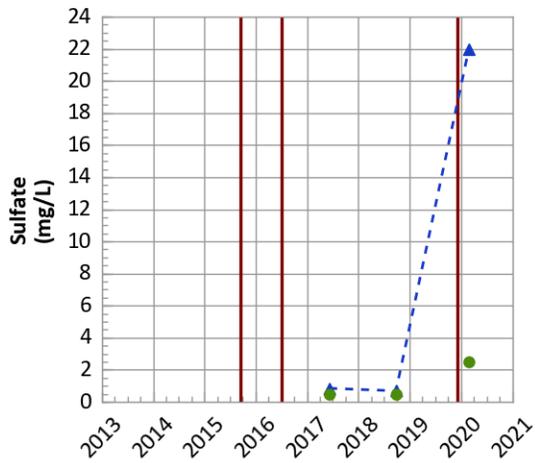
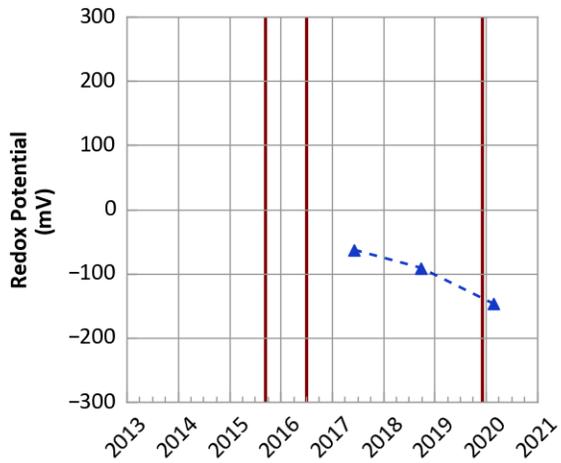
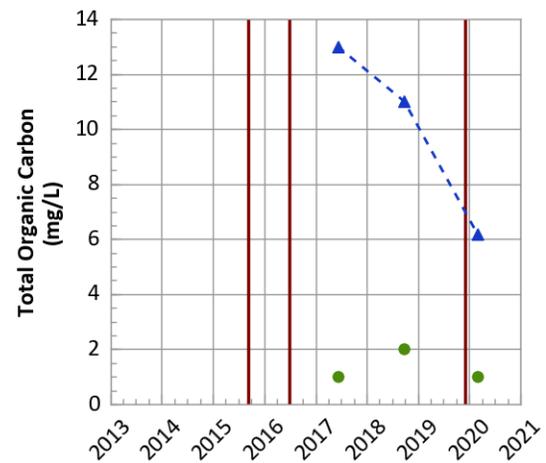
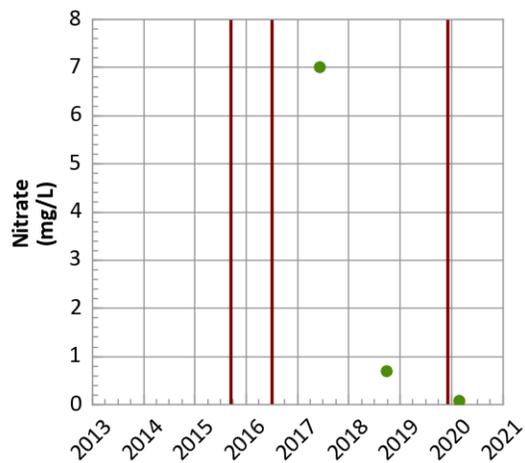
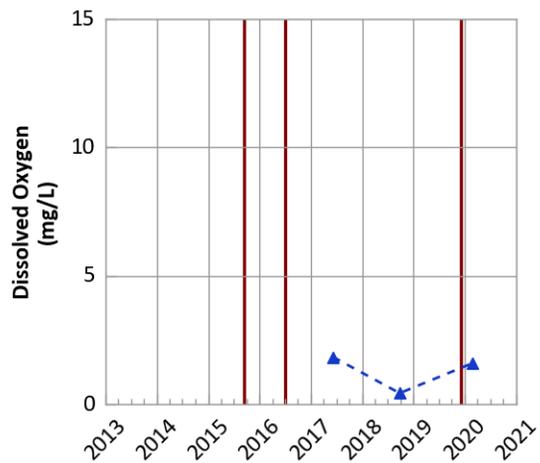
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates

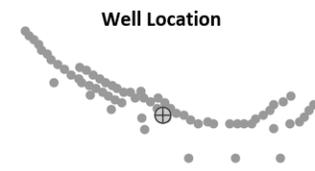


PTX06-1169 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant

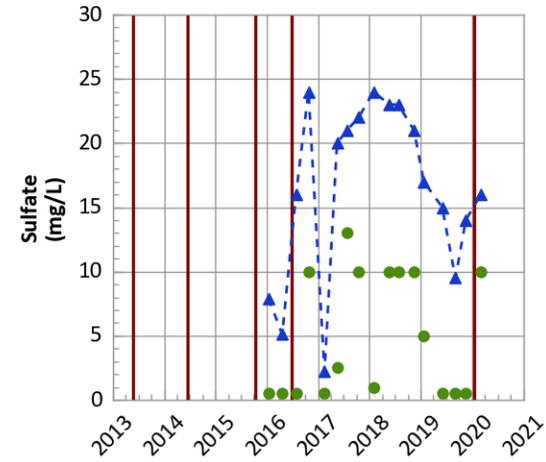
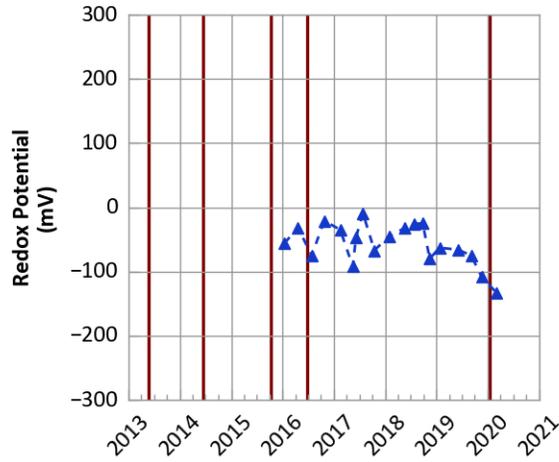
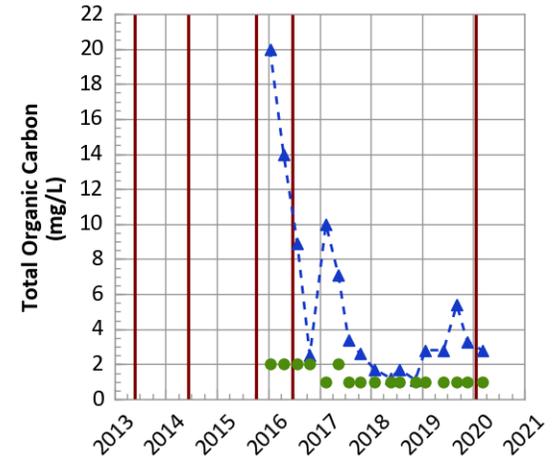
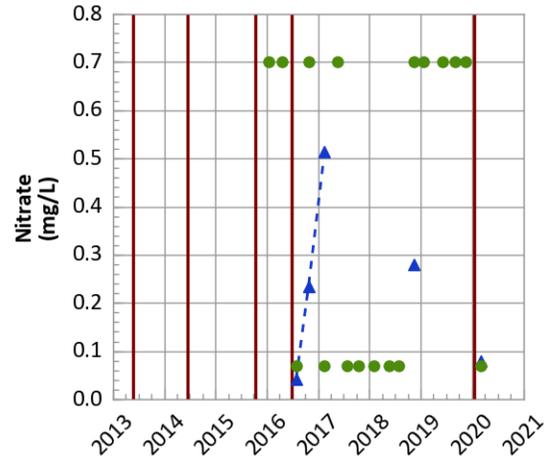
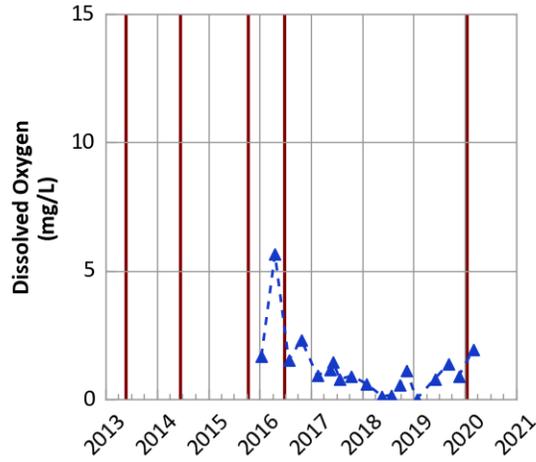


**Typical Baseline Concentrations in Perched Groundwater**  
 Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



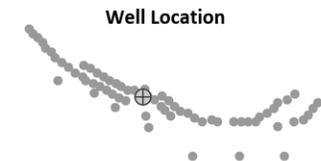
PTX06-1170 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



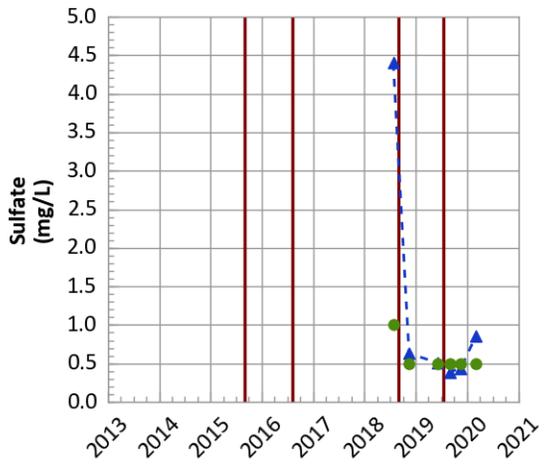
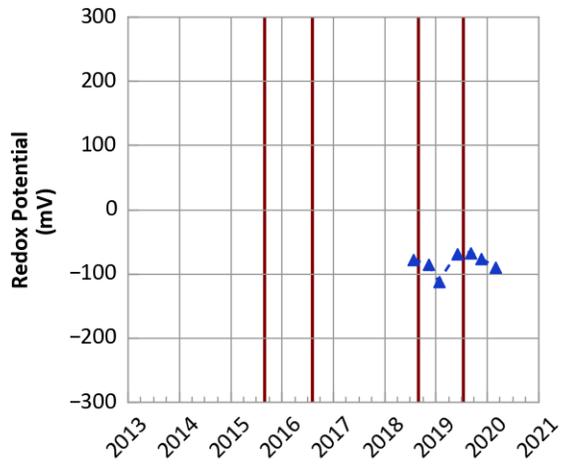
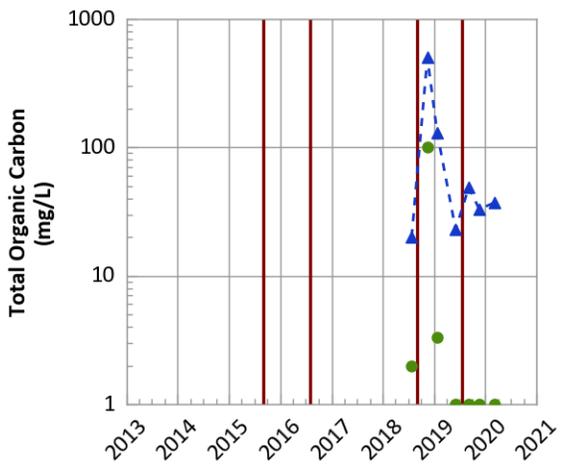
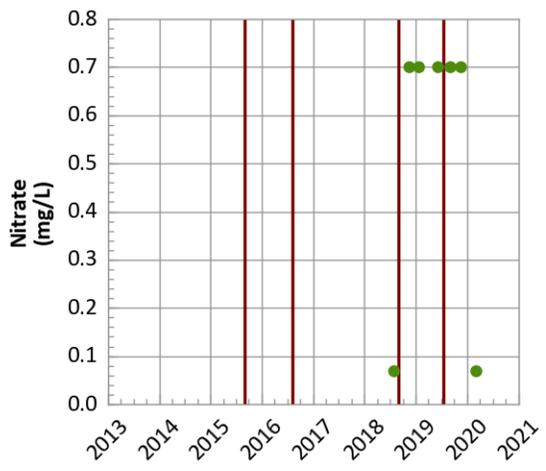
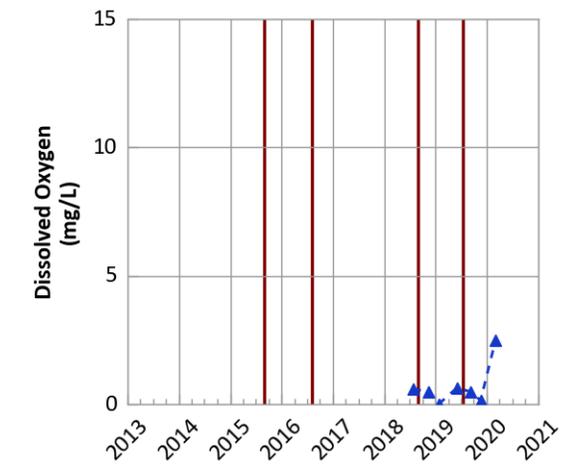
Typical Baseline Concentrations in Perched Groundwater

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



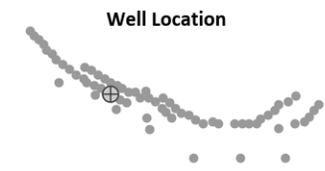
**PTX06-1176 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



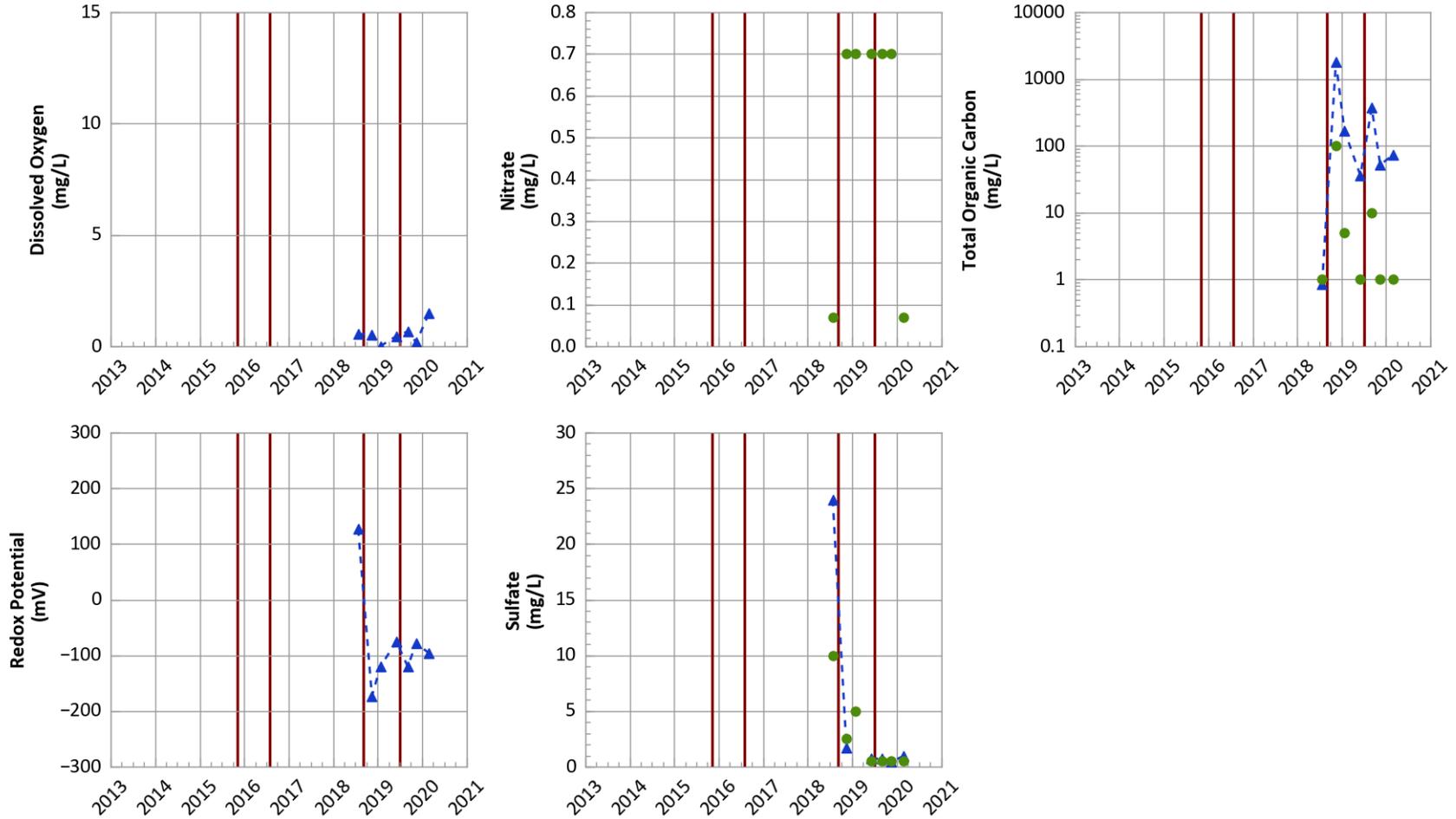
**Typical Baseline Concentrations in Perched Groundwater**

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



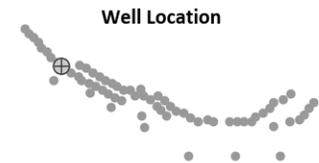
**PTX06-1177 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



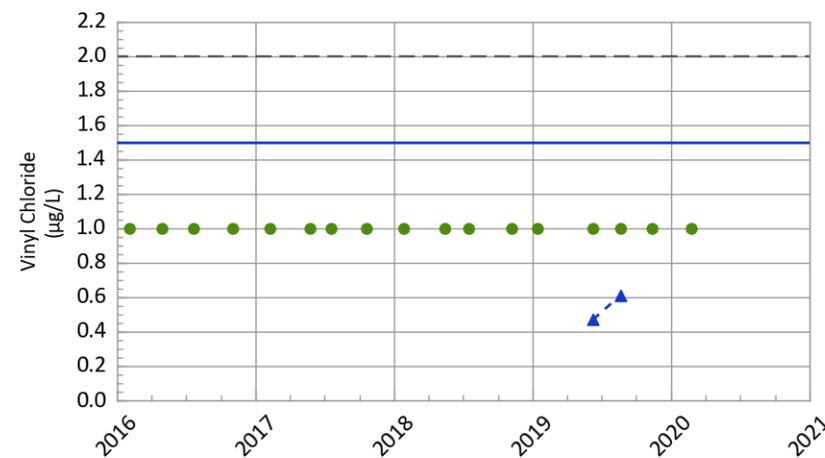
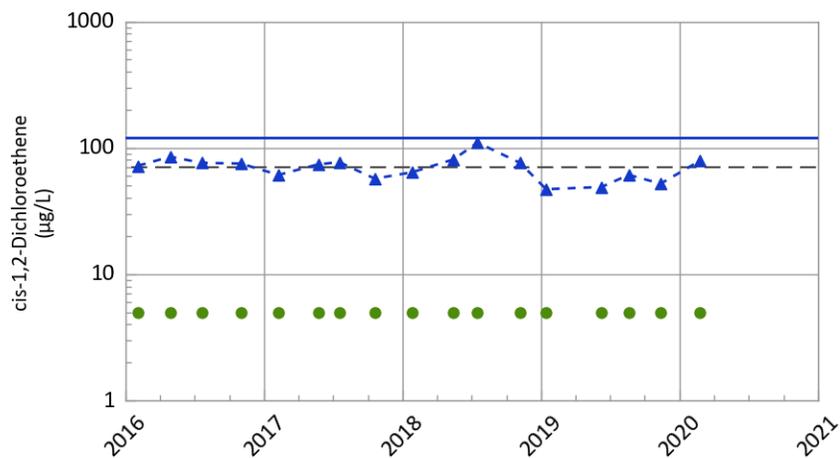
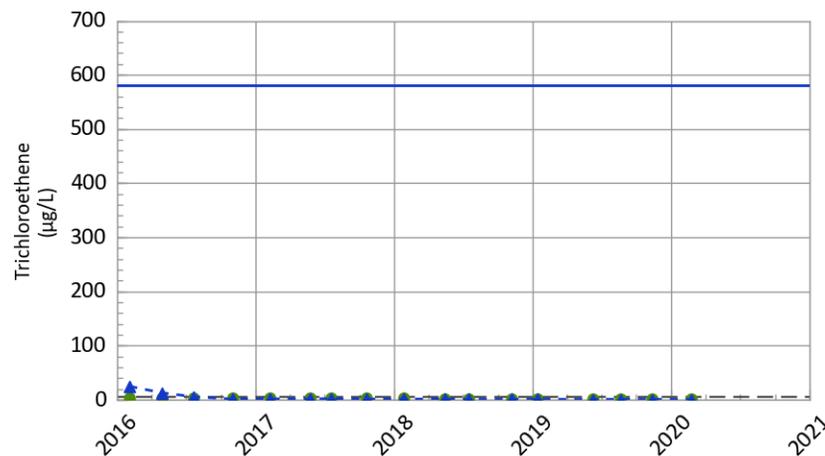
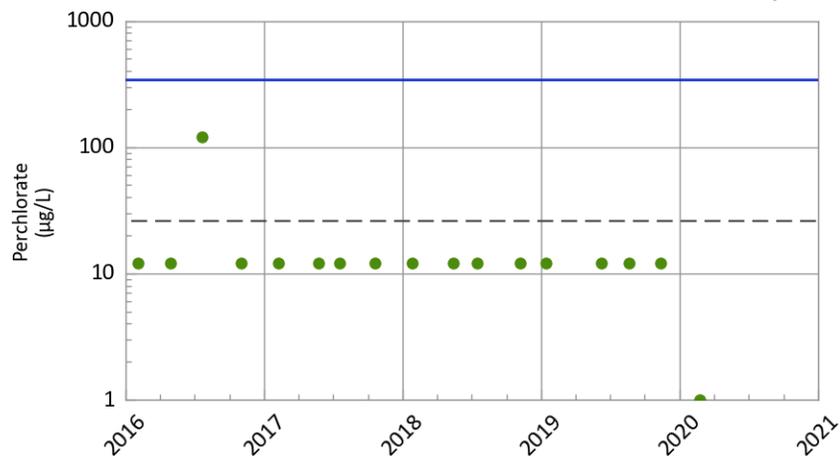
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



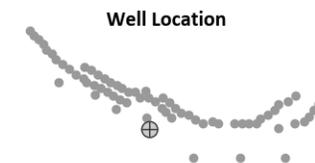
**PTX06-1012 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



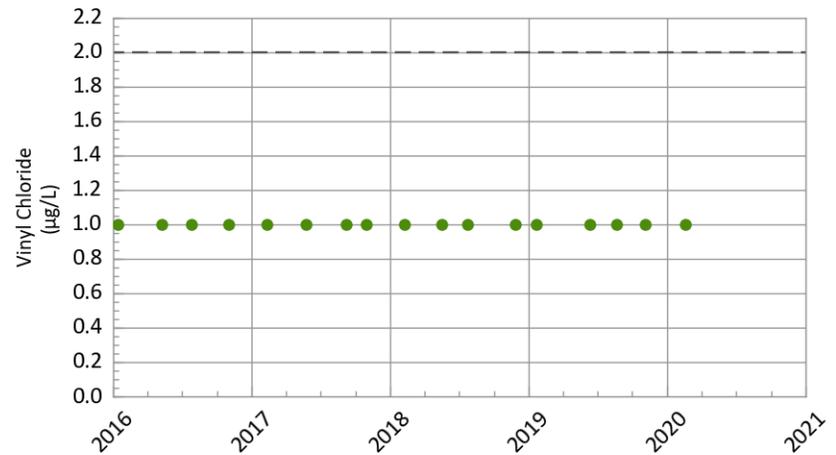
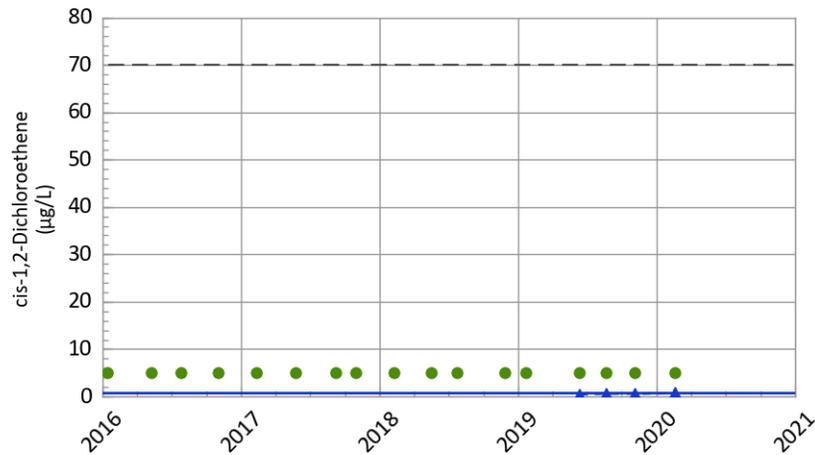
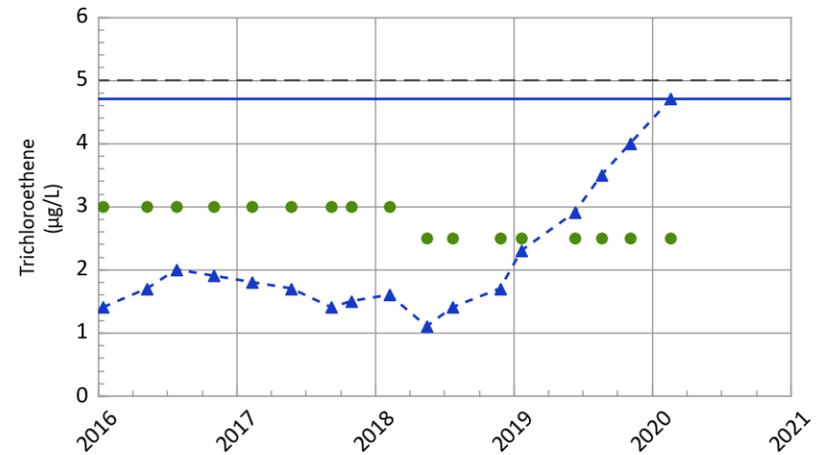
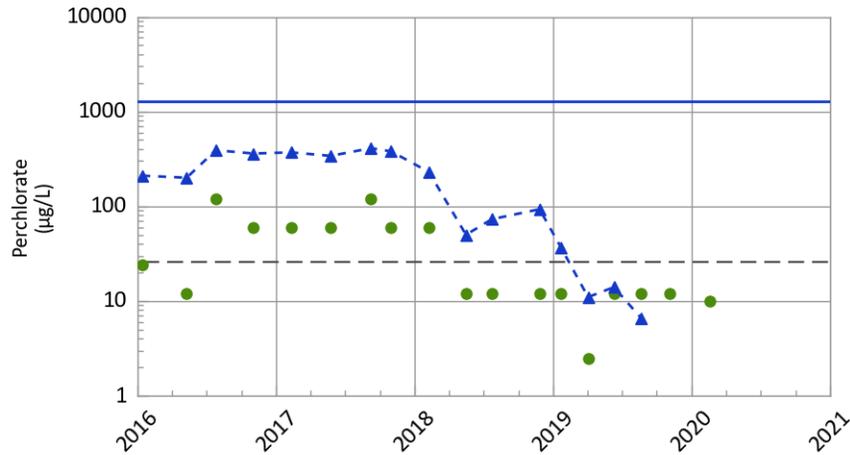
**Most Recent Measured COC Concentrations (Aug 20, 2019)**

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	79.0	70.0
TCE	0.86	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



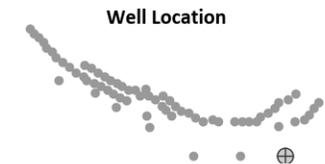
**PTX06-1148 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



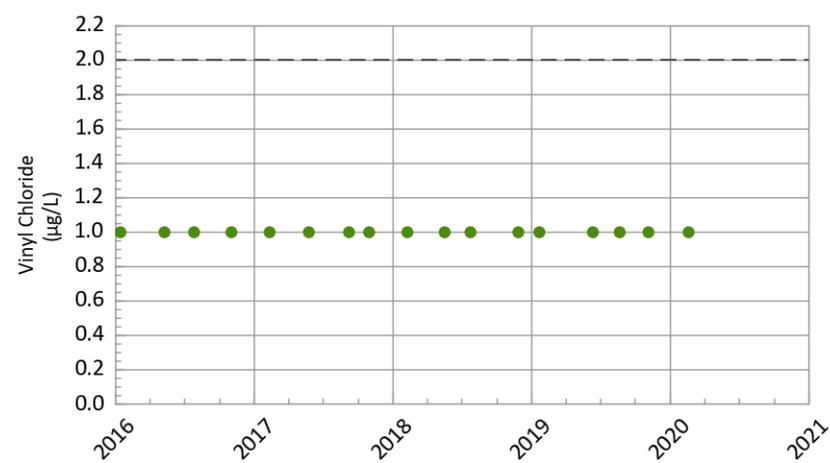
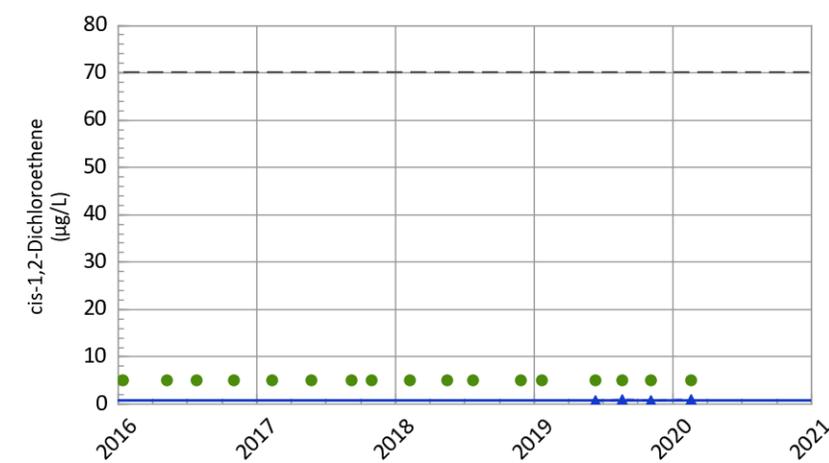
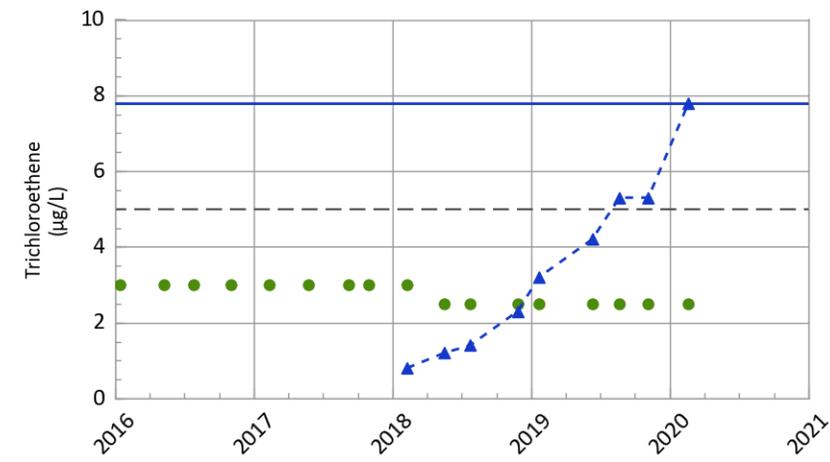
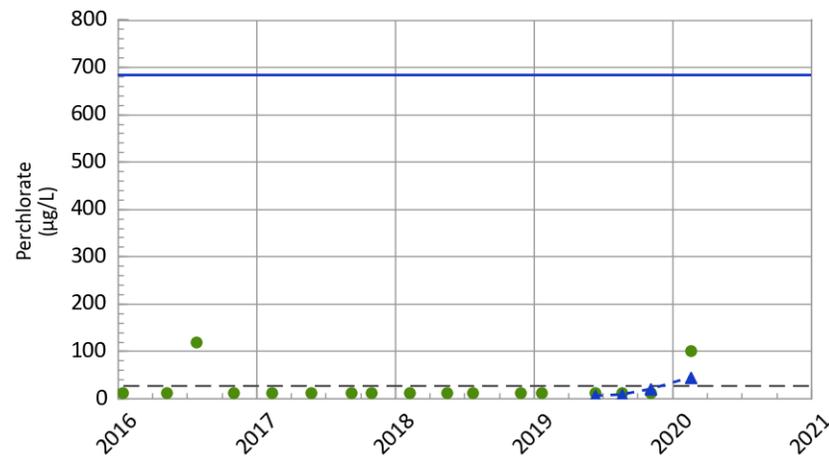
Most Recent Measured COC Concentrations (Feb 19, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	0.72	70.0
TCE	4.7	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



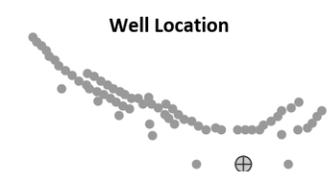
**PTX06-1149 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



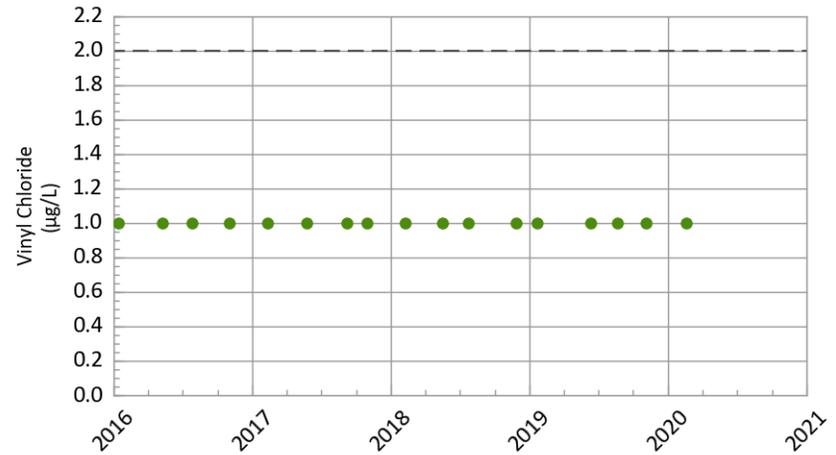
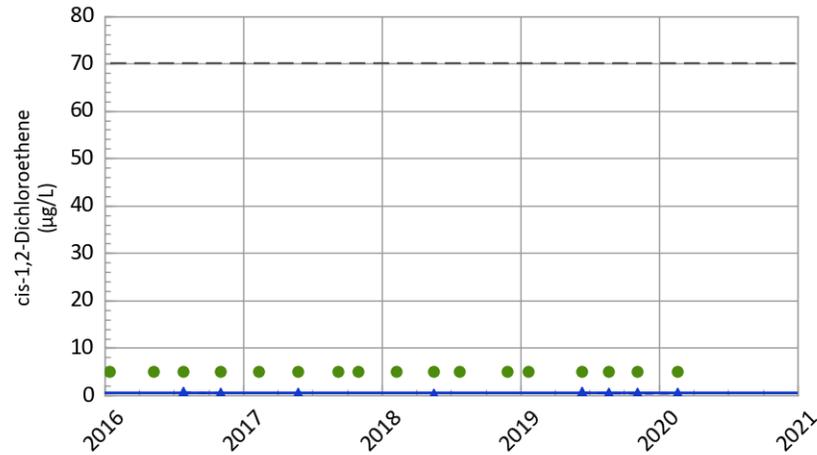
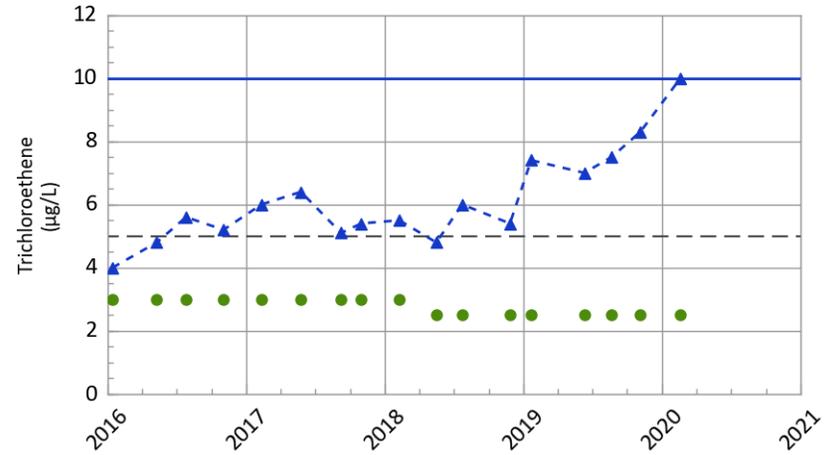
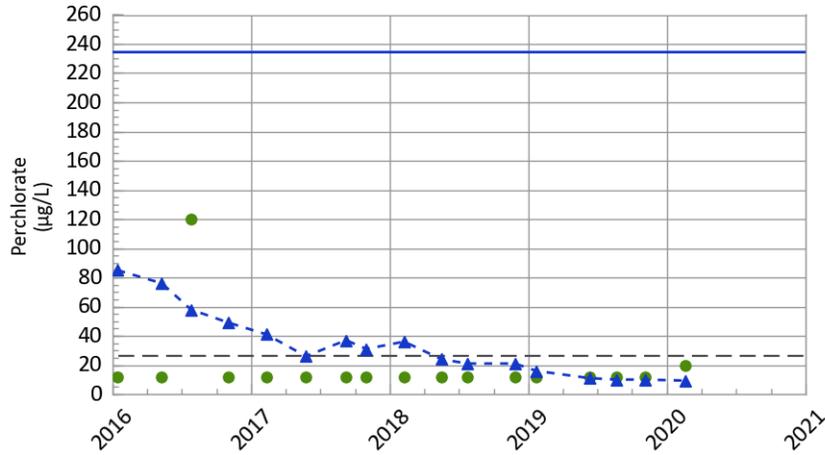
Most Recent Measured COC Concentrations (Feb 19, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	45.0	26.0
DCE12C	0.82	70.0
TCE	7.8	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



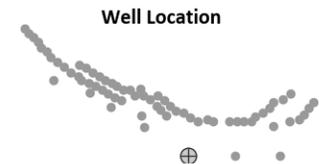
**PTX06-1150 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Feb 19, 2020)

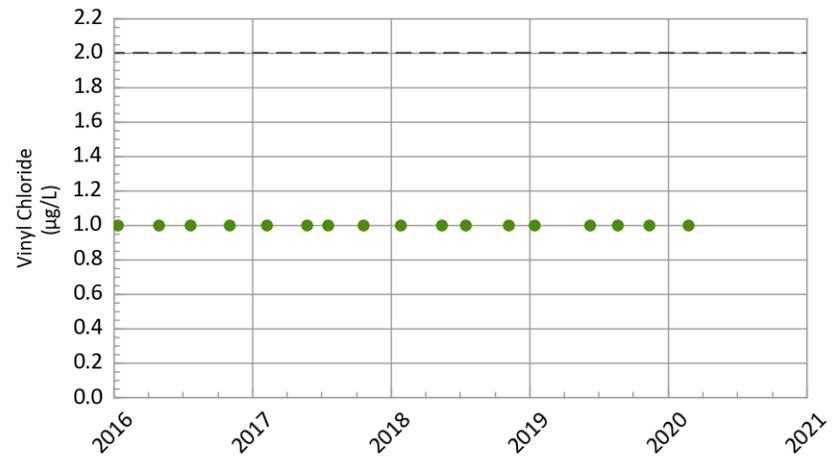
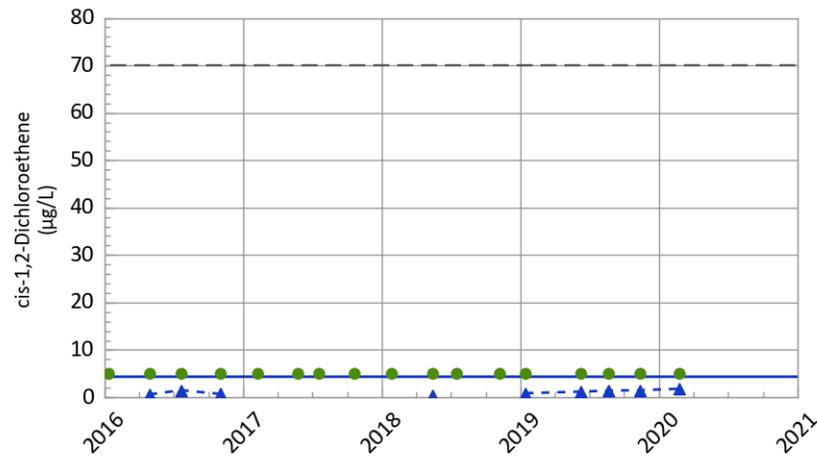
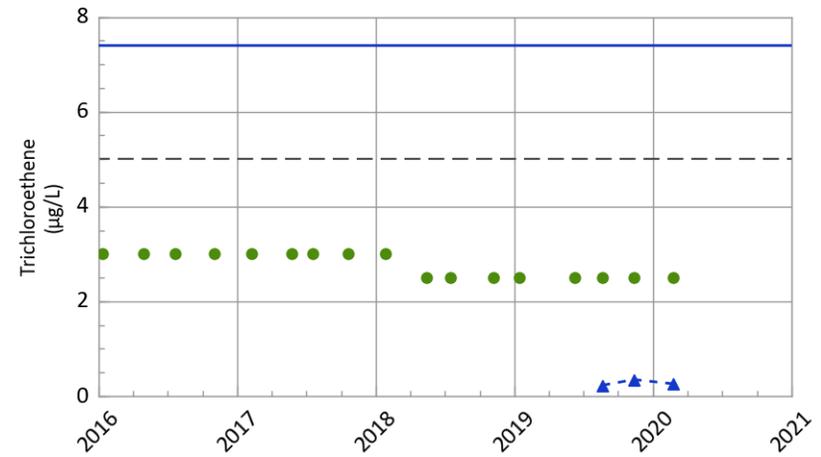
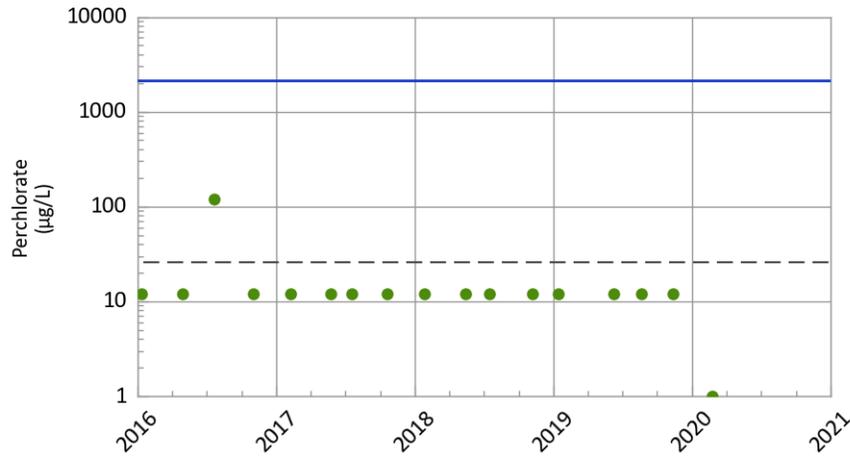
COC	Concentration (µg/L)	GWPS (µg/L)
PERC	9.3	26.0
DCE12C	0.42	70.0
TCE	10.0	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard





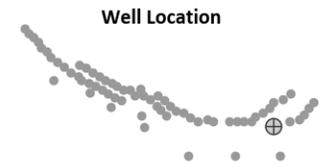
**PTX06-1156 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



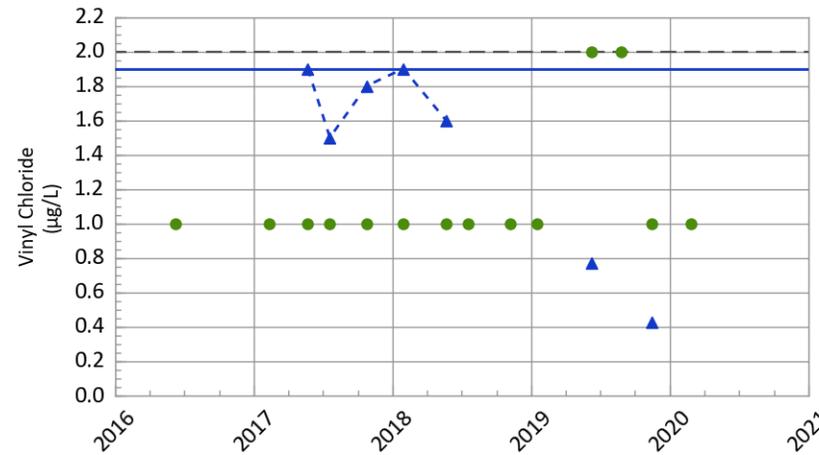
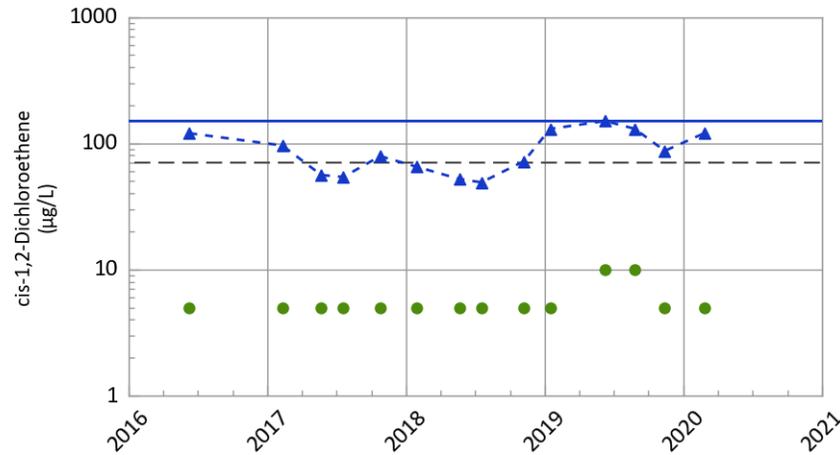
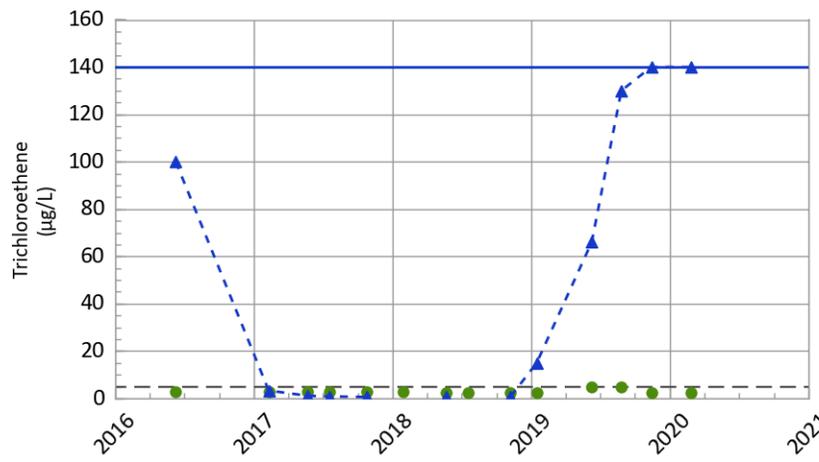
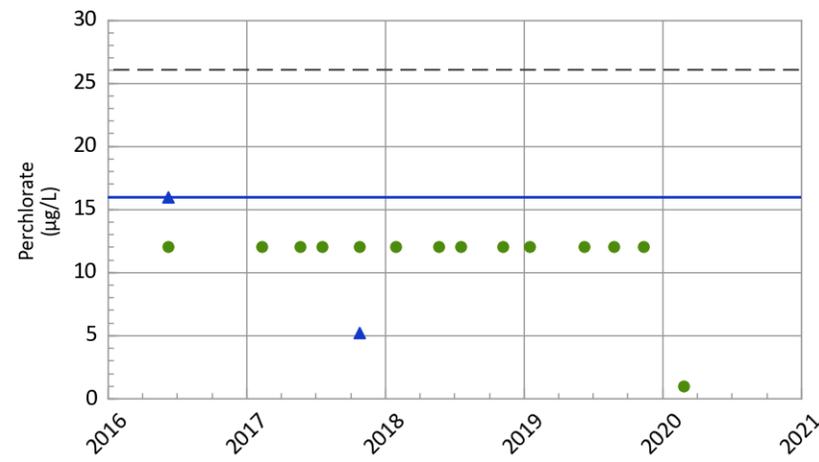
Most Recent Measured COC Concentrations (Feb 24, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	1.8	70.0
TCE	0.26	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



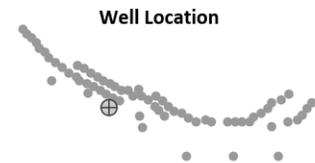
**PTX06-1173 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



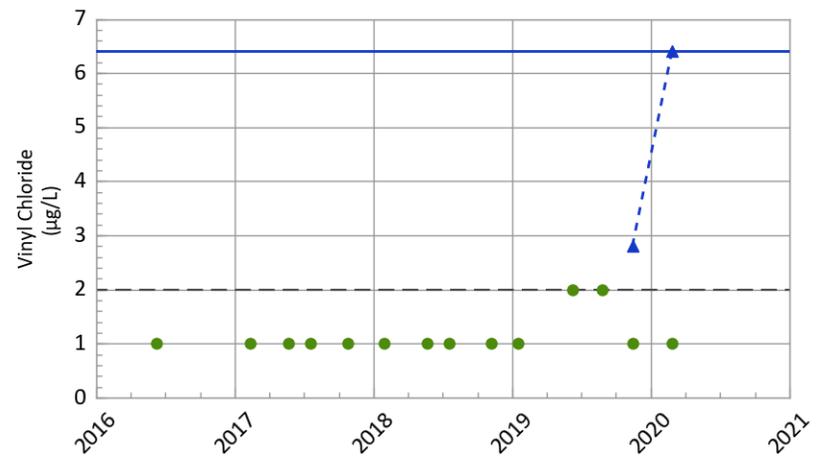
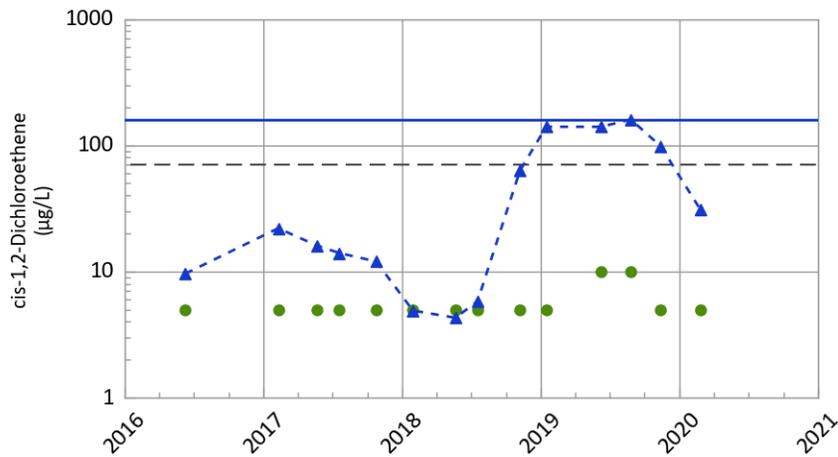
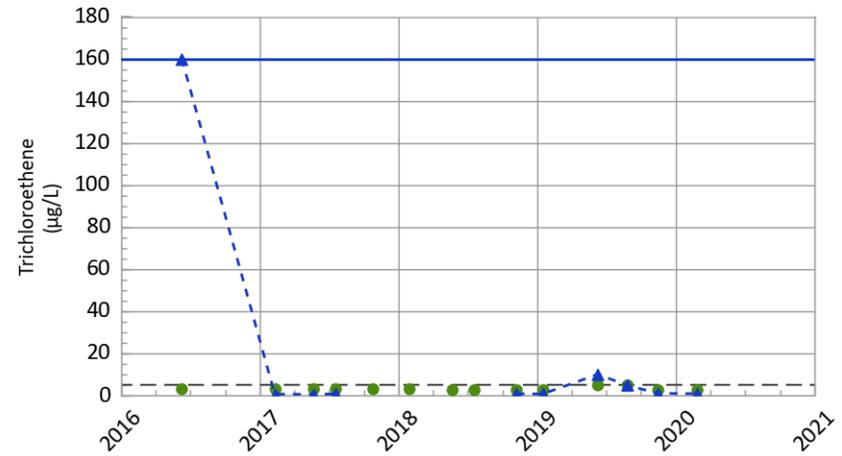
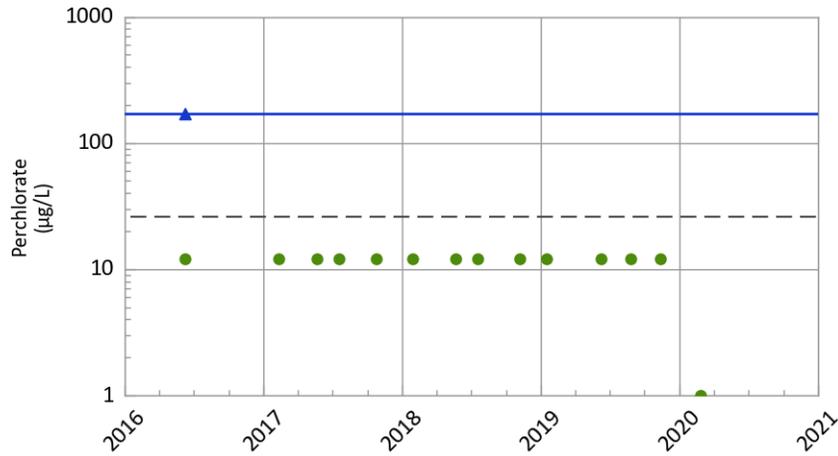
**Most Recent Measured COC Concentrations (Nov 13, 2019)**

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	120.0	70.0
TCE	140.0	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



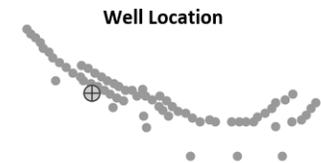
**PTX06-1174 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



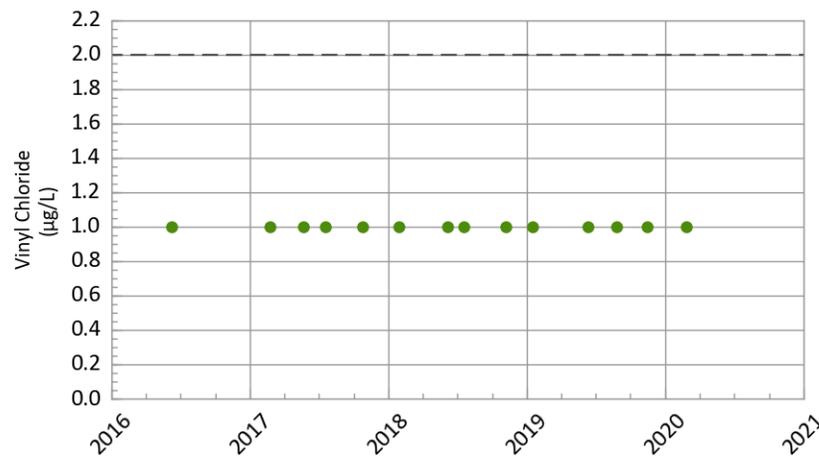
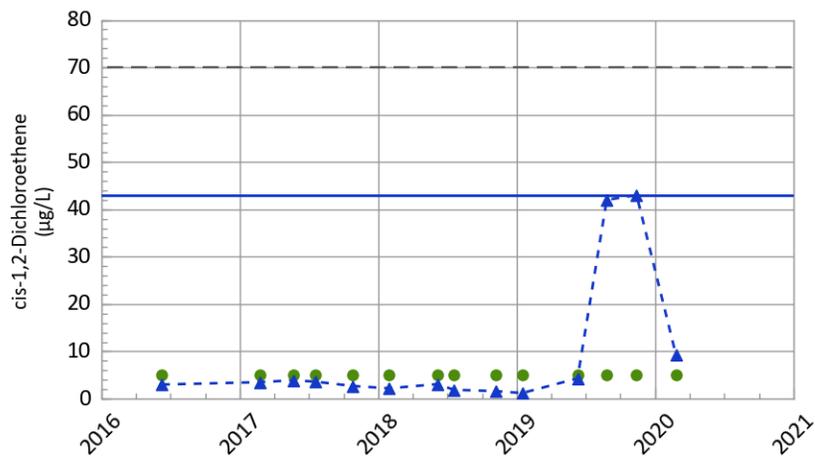
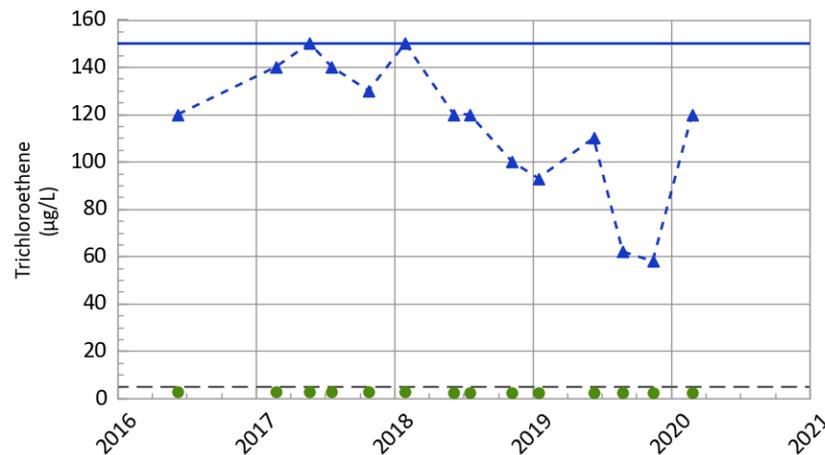
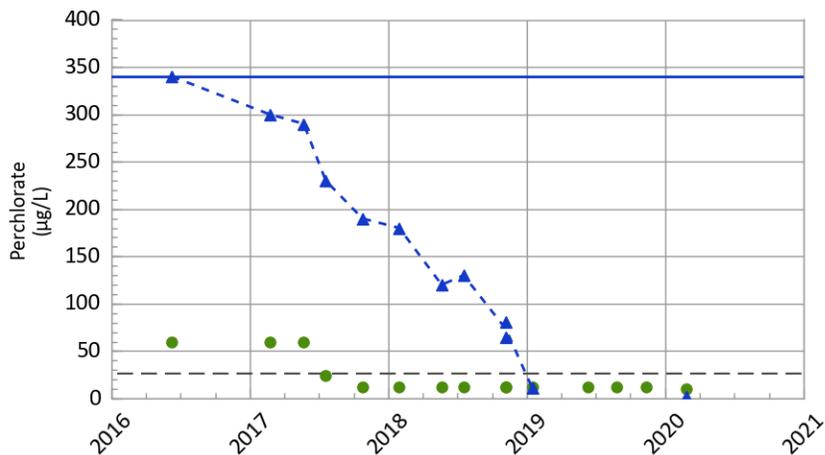
Most Recent Measured COC Concentrations (Feb 25, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	31.0	70.0
TCE	0.83	5.0
VC	6.4	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



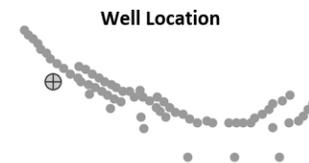
**PTX06-1175 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



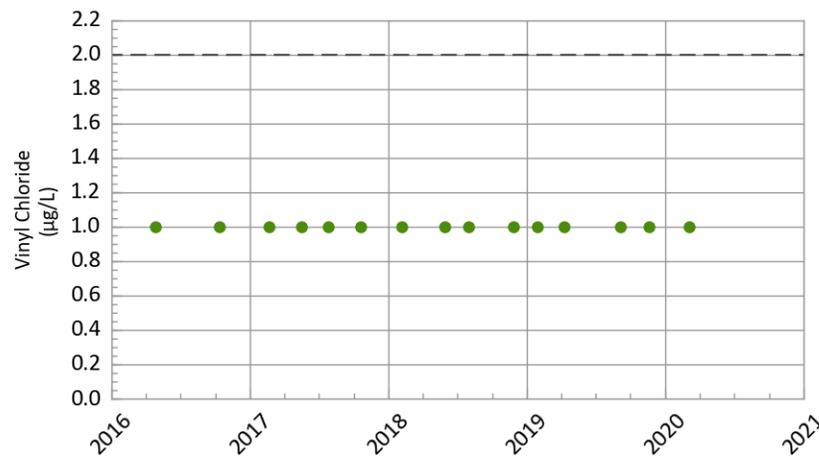
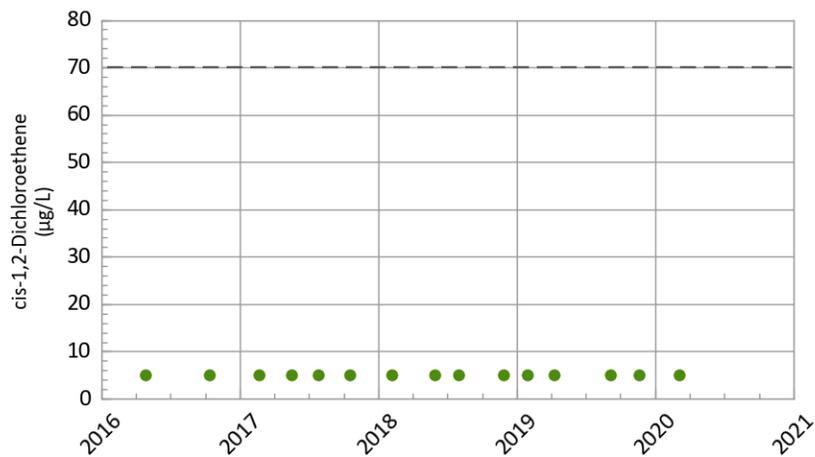
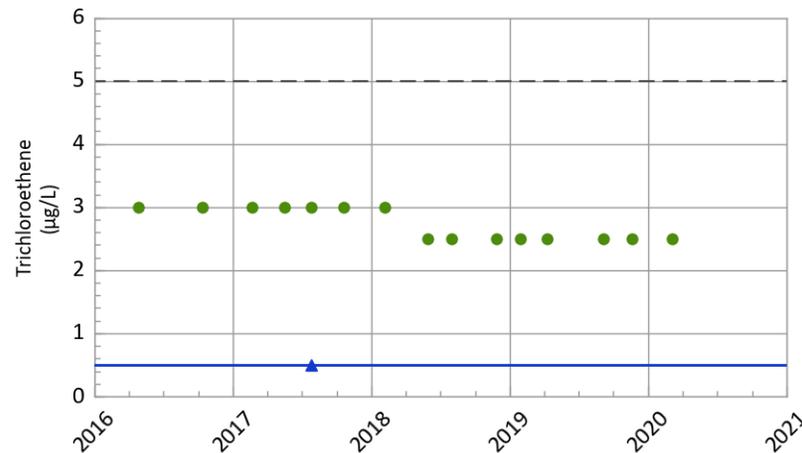
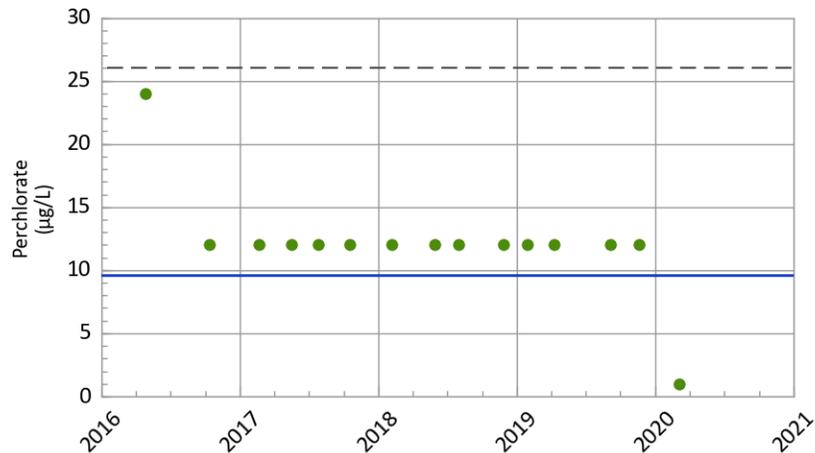
Most Recent Measured COC Concentrations (Feb 25, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	2.4	26.0
DCE12C	9.2	70.0
TCE	120.0	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



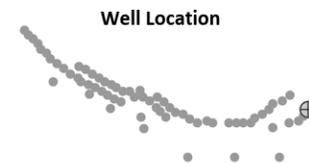
**PTX06-ISB079 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



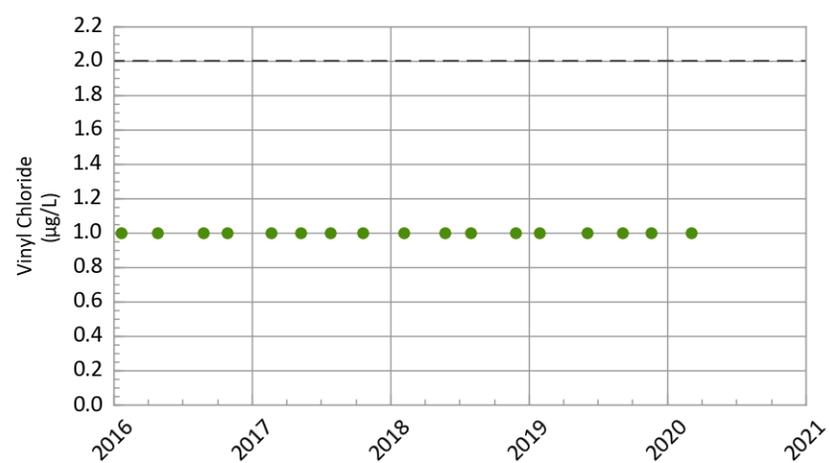
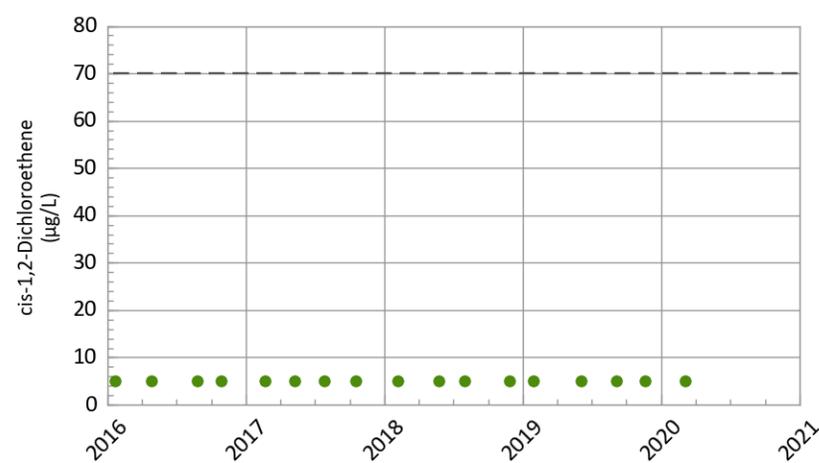
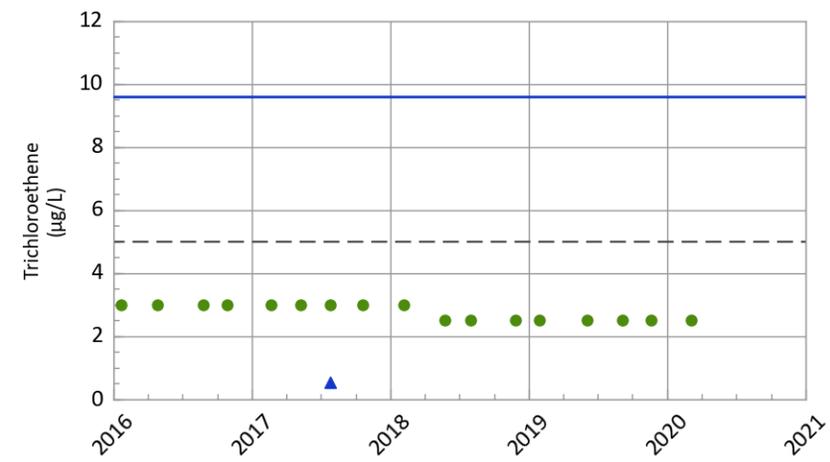
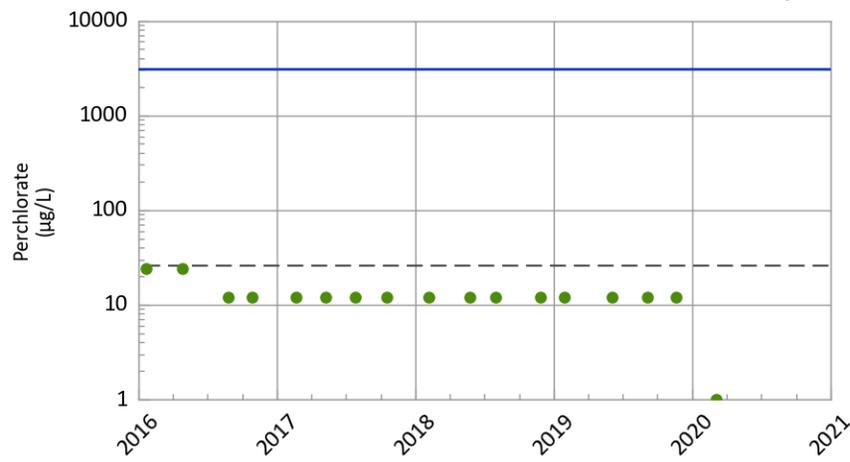
Most Recent Measured COC Concentrations (Mar 04, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	Non-Detect	70.0
TCE	Non-Detect	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



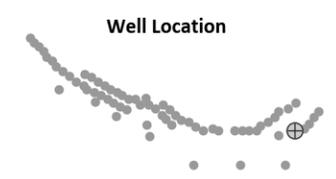
**PTX06-ISB082 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Mar 04, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	Non-Detect	70.0
TCE	Non-Detect	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard

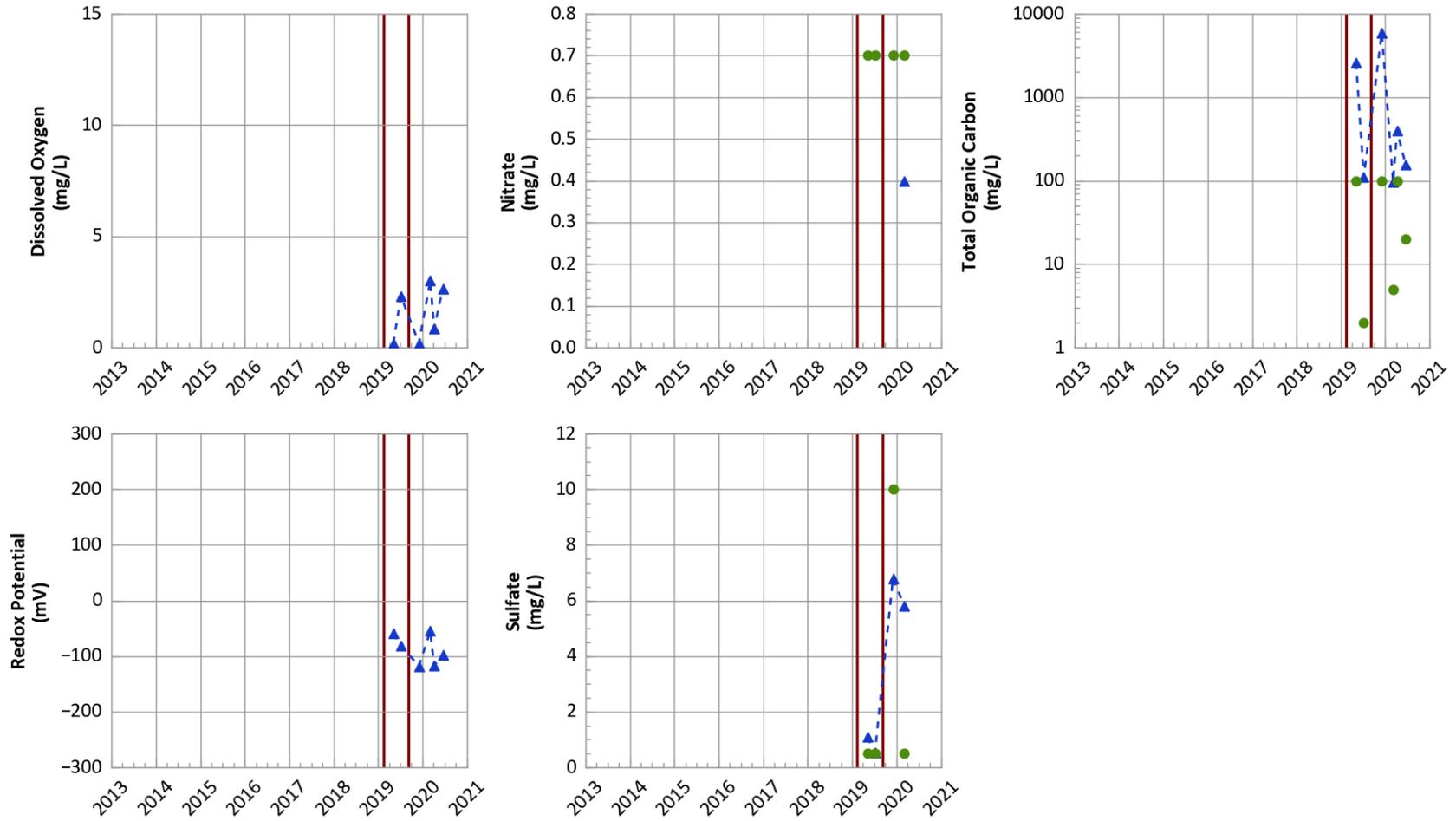


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## **Southeast ISB Extension**



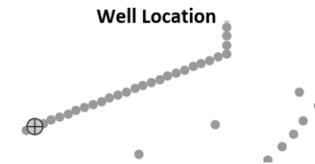
PTX06-ISB302 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



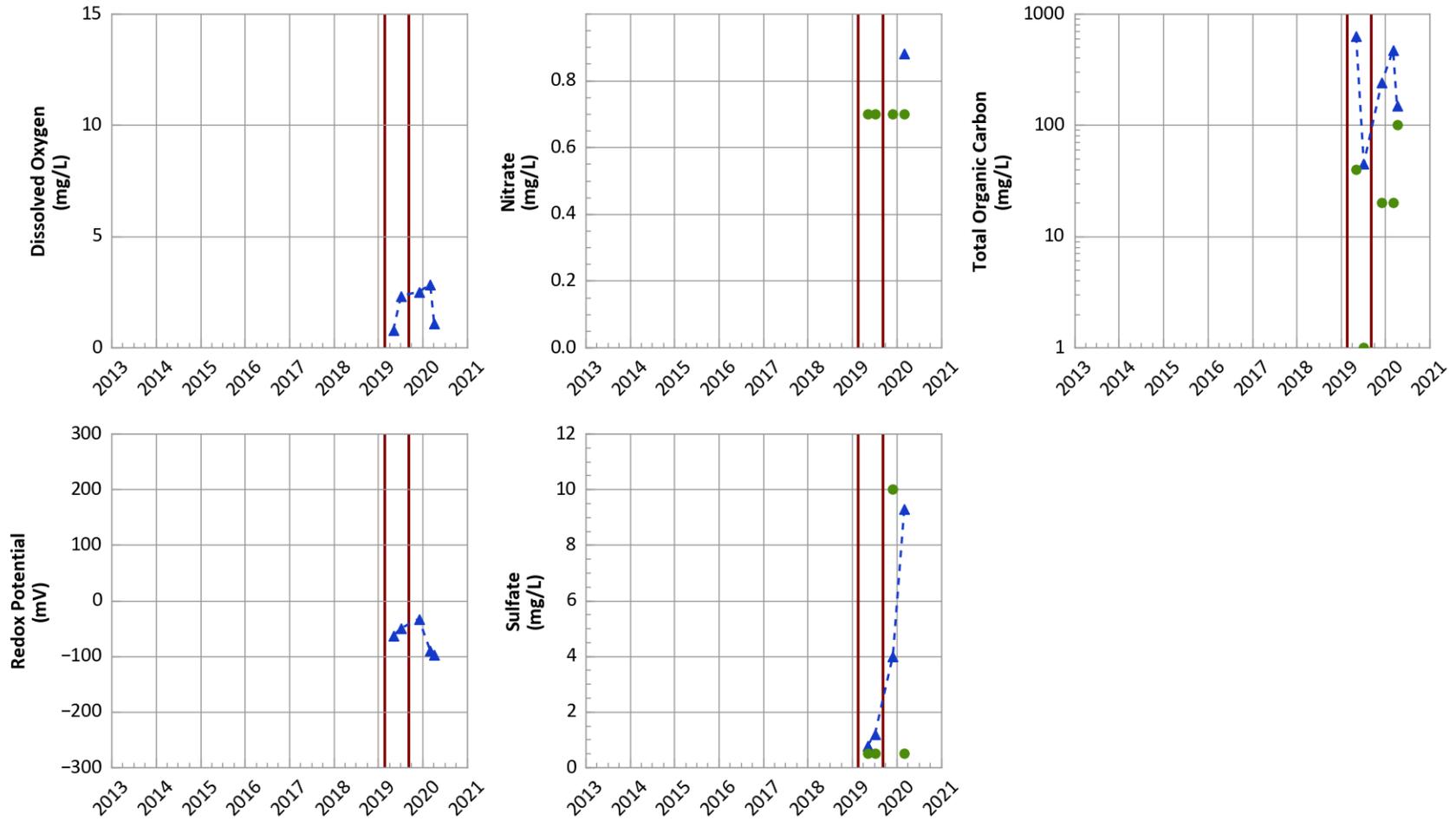
Typical Baseline Concentrations in Perched Groundwater

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



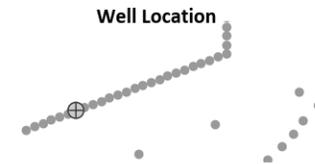
PTX06-ISB307 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



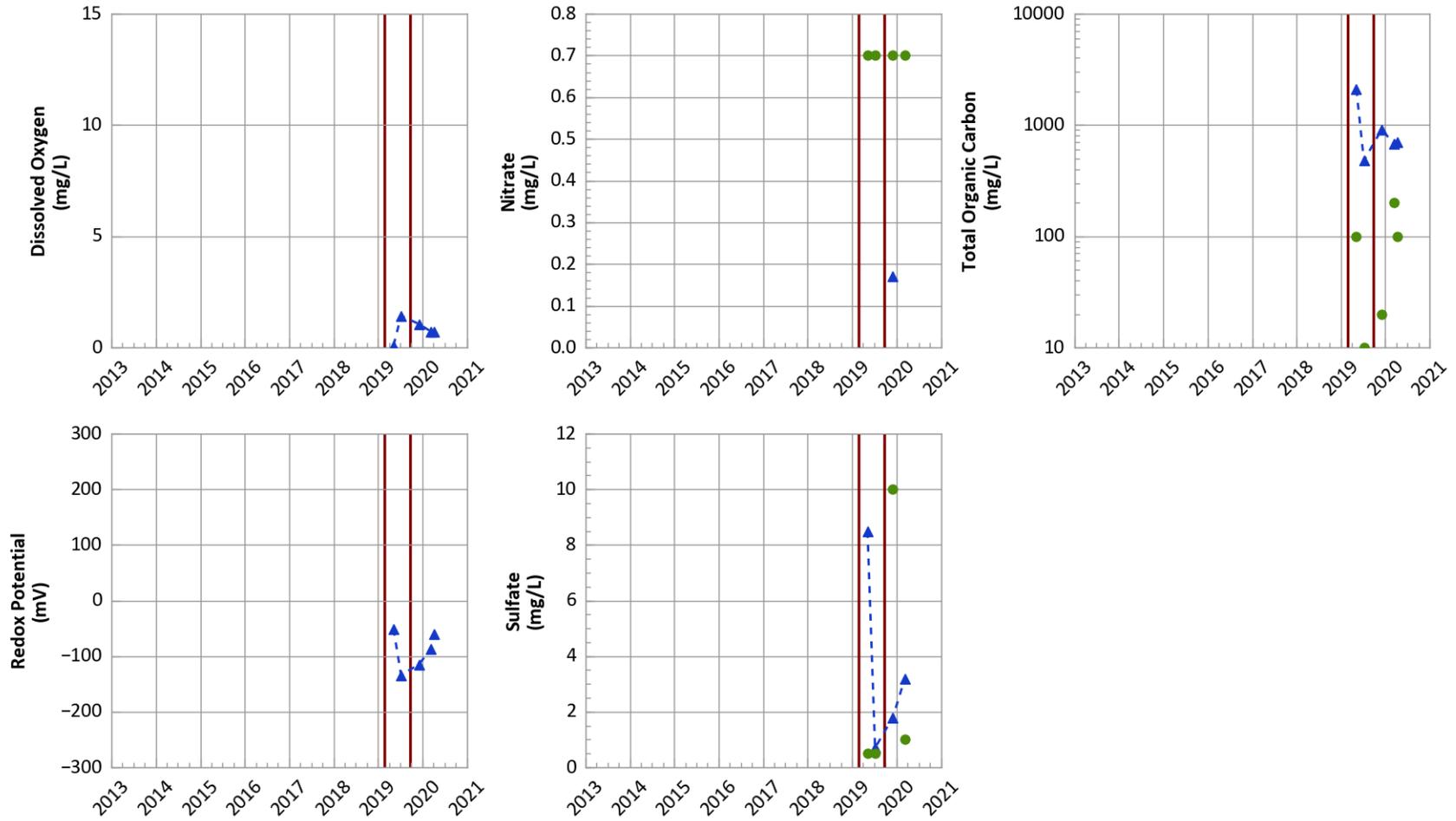
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



PTX06-ISB317 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



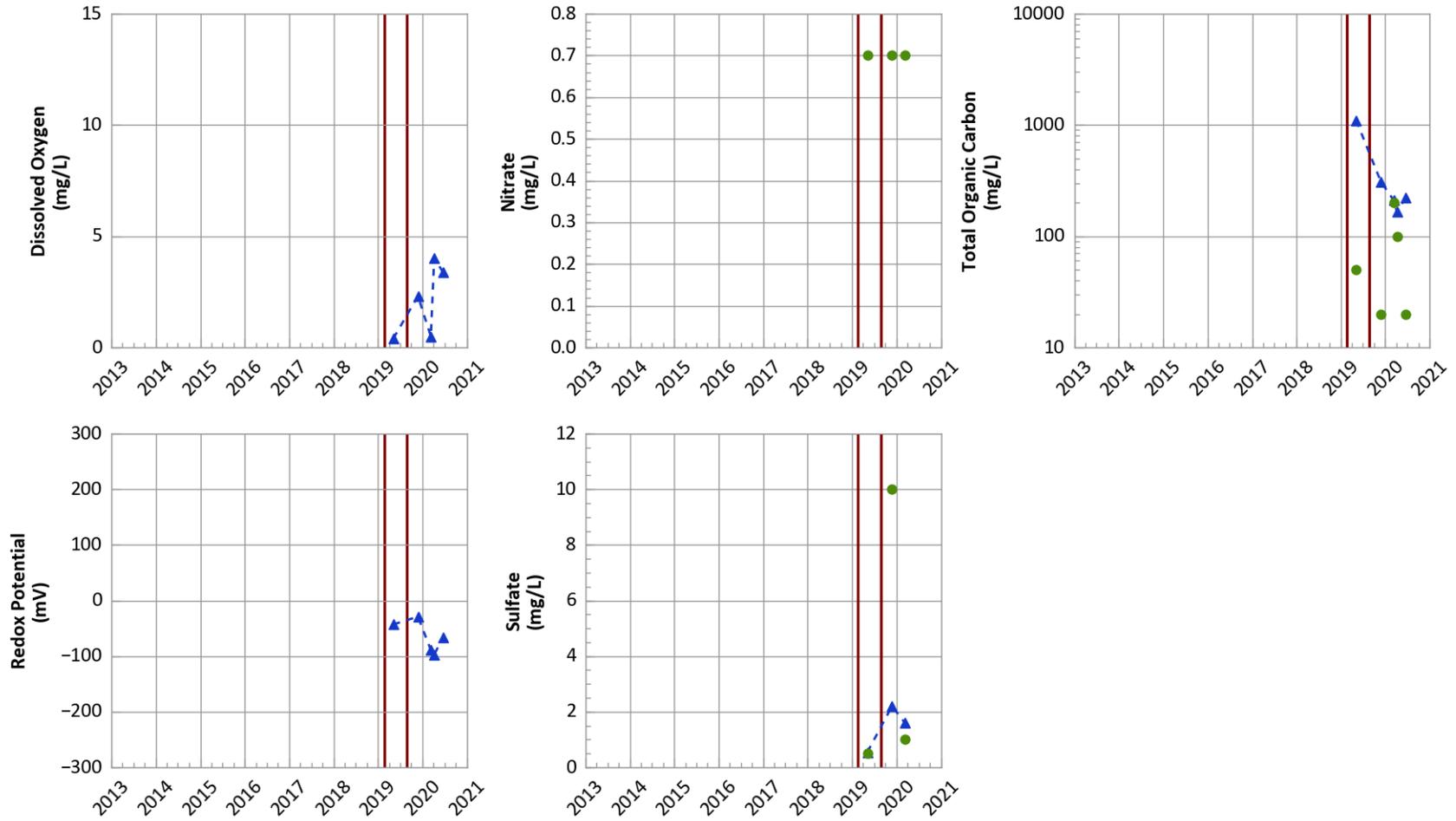
Typical Baseline Concentrations in Perched Groundwater

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



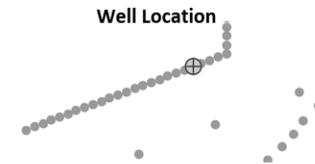
**PTX06-ISB321 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



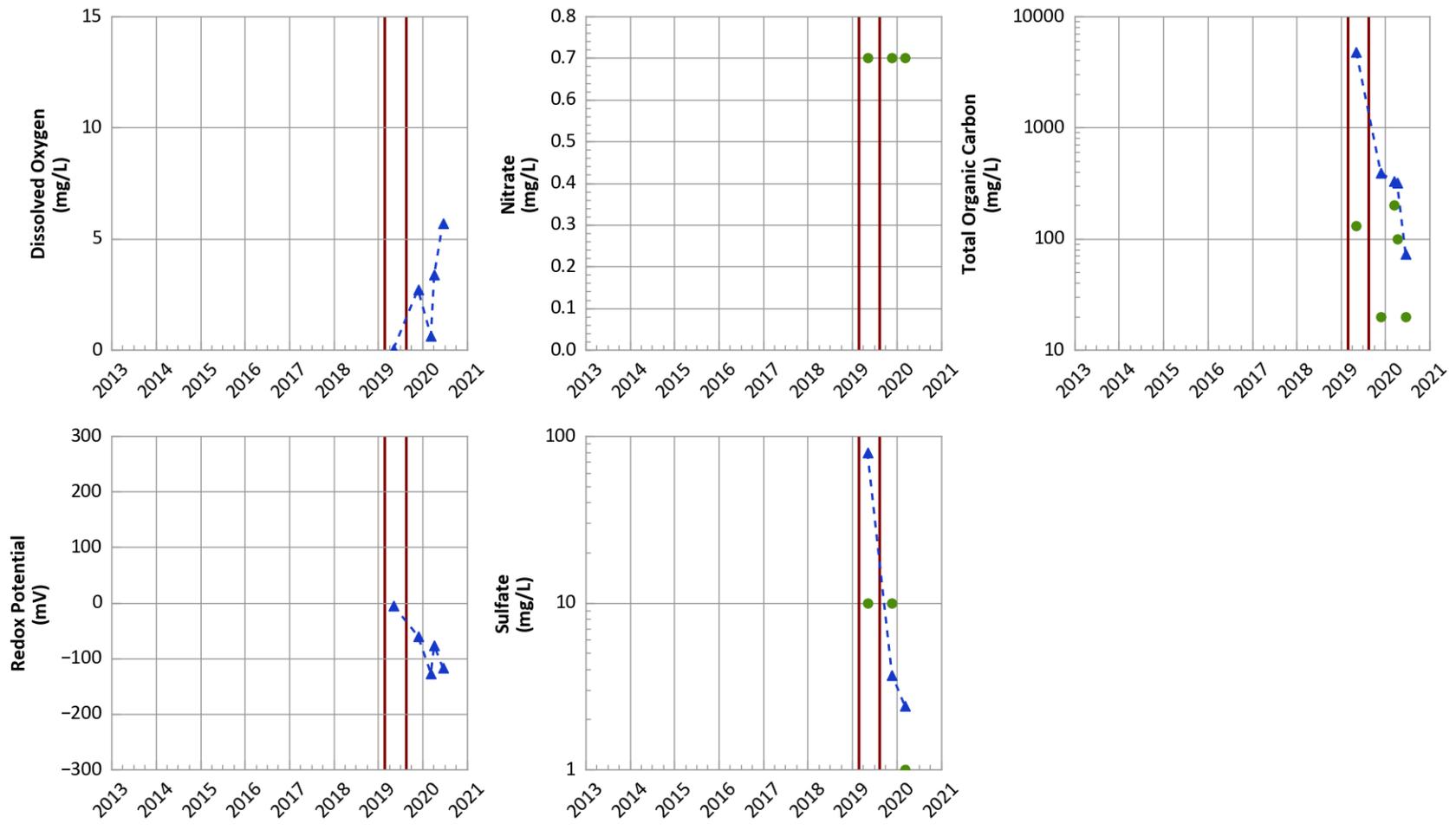
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



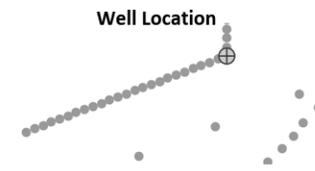
PTX06-ISB325 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



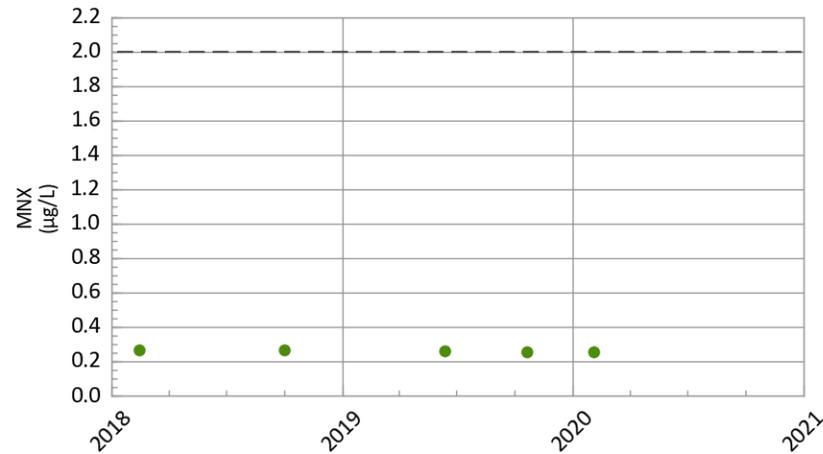
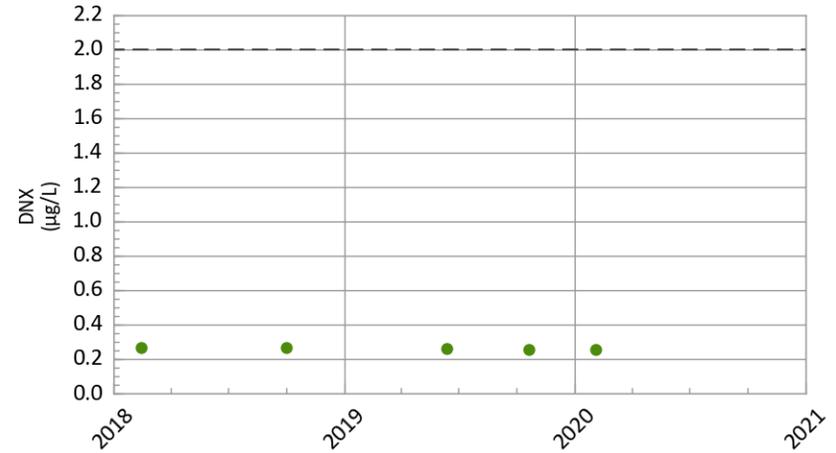
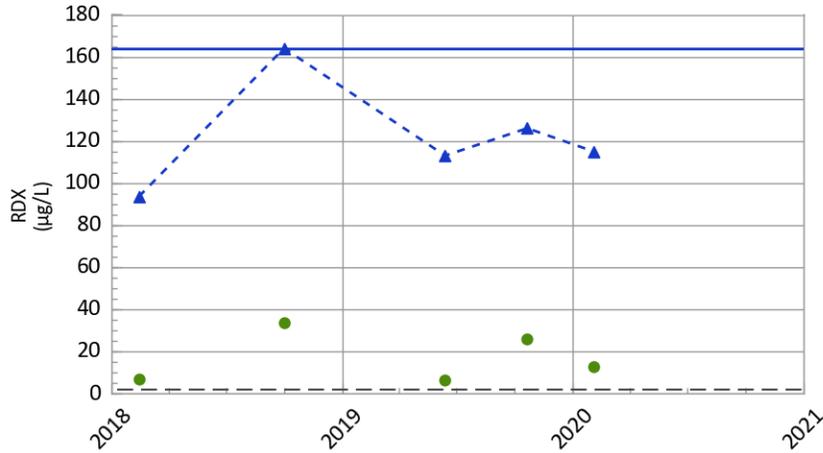
Typical Baseline Concentrations in Perched Groundwater

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



**PTX06-1191 Downgradient Performance Indicators  
Southeast Ext In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



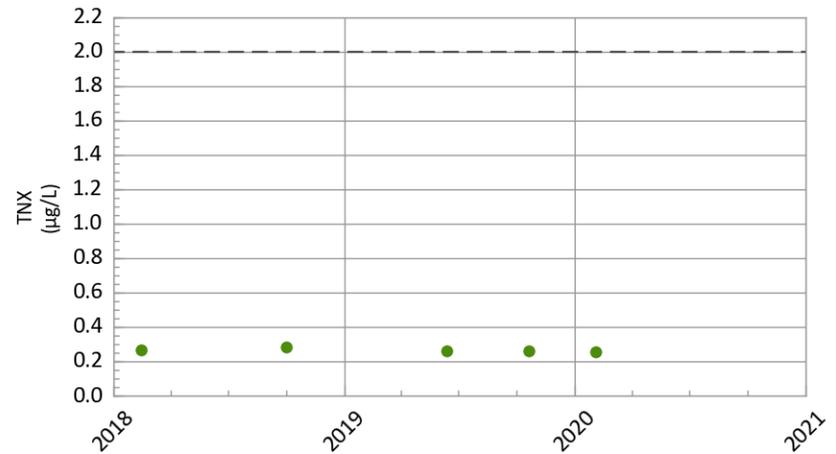
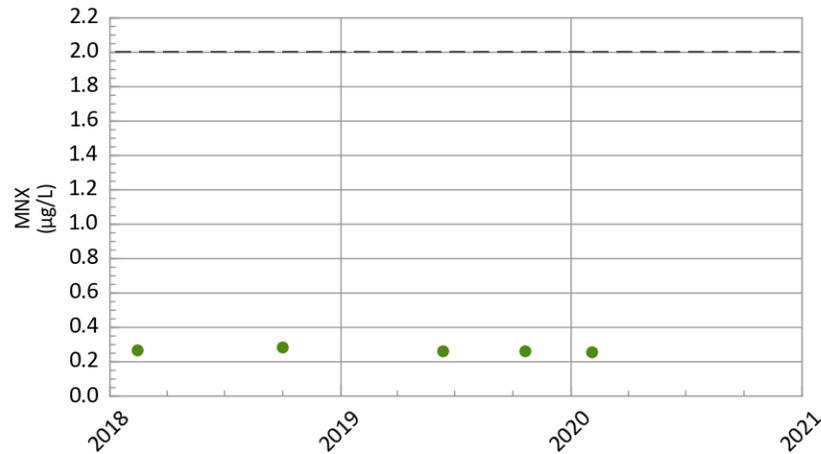
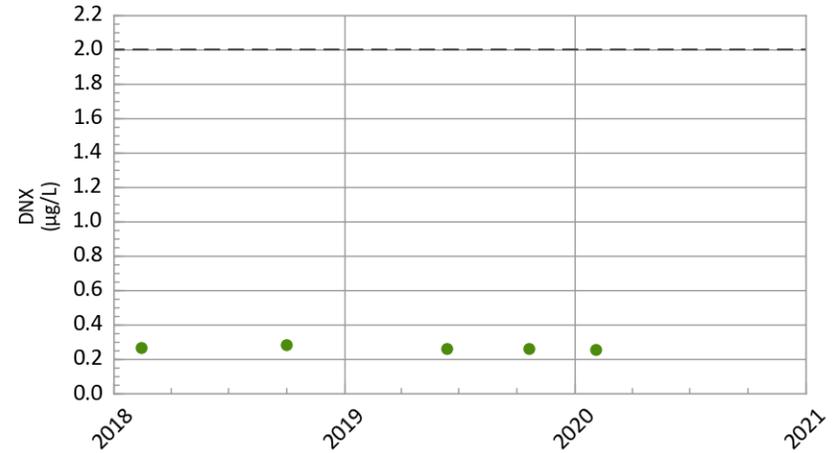
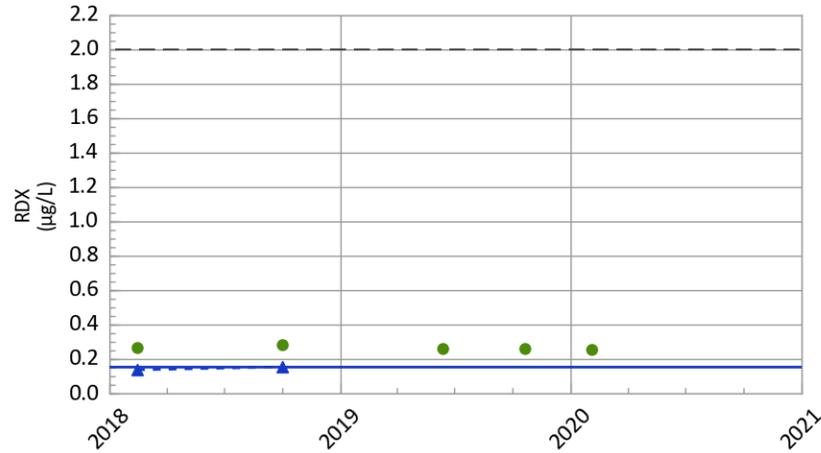
Most Recent Measured COC Concentrations (Feb 03, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	115.0	2.0
MNX	Non-Detect	2.0
DNX	Non-Detect	2.0
TNX	0.261	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



**PTX06-1194 Downgradient Performance Indicators  
Southeast Ext In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



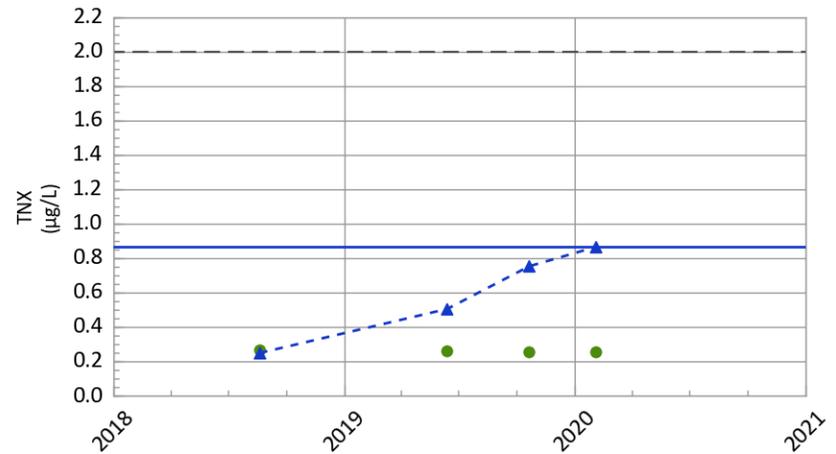
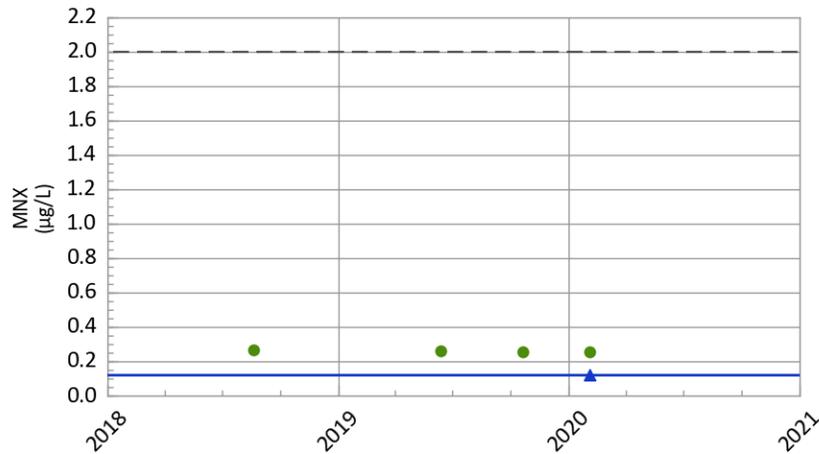
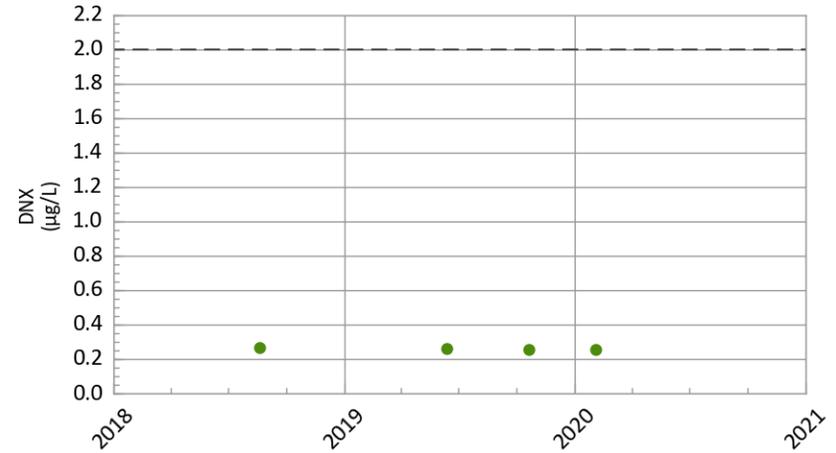
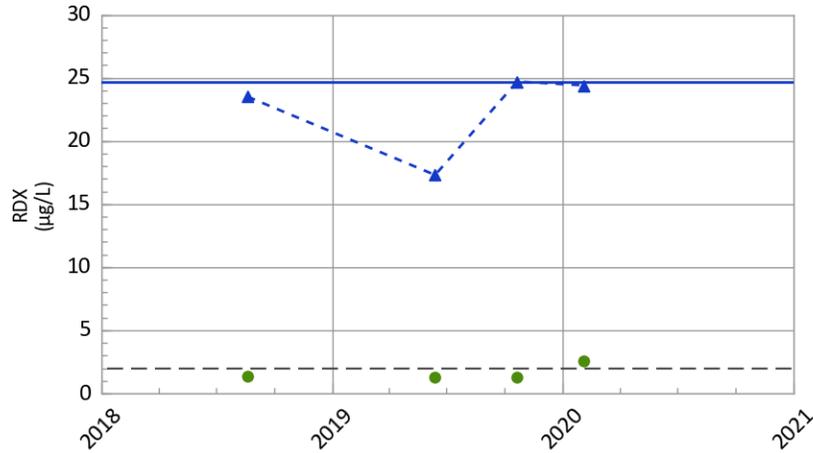
Most Recent Measured COC Concentrations (Feb 03, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	Non-Detect	2.0
MNX	Non-Detect	2.0
DNX	Non-Detect	2.0
TNX	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



**PTX06-1196 Downgradient Performance Indicators  
Southeast Ext In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Feb 03, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	24.4	2.0
MNX	0.121	2.0
DNX	Non-Detect	2.0
TNX	0.864	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard

