



PANTEX QUARTERLY PROGRESS REPORT

Remedial Action Progress

Fourth Quarter 2022

In support of Hazardous Waste Permit #50284 and
Pantex Plant Interagency Agreement
March 2023

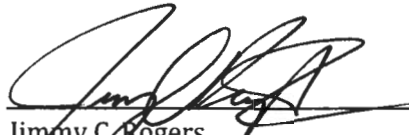
Pantex Plant
FM 2373 and U.S. Highway 60
P.O. Box 30030
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CERTIFICATION STATEMENT

Fourth Quarter 2022 Remedial Action Progress Report
Pantex Plant, March 2023

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.



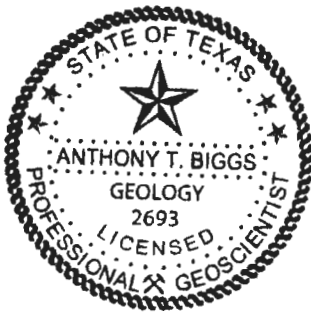
Jimmy C. Rogers
Senior Director, Environment, Safety and Health
Consolidated Nuclear Security, LLC


3/22/23
Date

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Fourth Quarter 2022
in Support of Hazardous Waste Permit #50284
and Pantex Plant Interagency Agreement
for the Pantex Plant, Amarillo, Texas
March 2023**

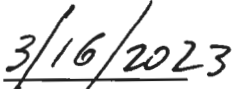
Prepared by
Consolidated Nuclear Security, LLC
Management and Operating Contractor
for the
Pantex Plant and Y-12 National Security Complex
under Contract No. DE-NA0001942
with the
U.S. Department of Energy
National Nuclear Security Administration

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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Date

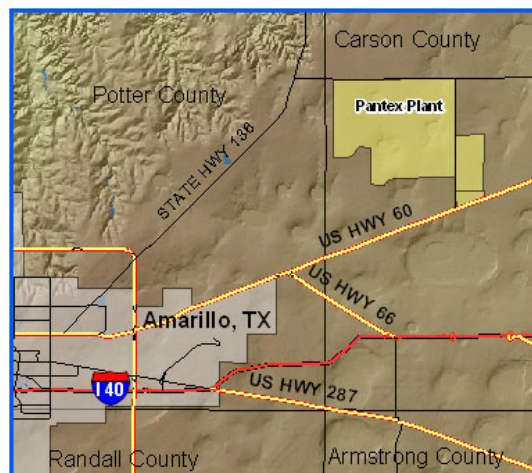
Project Team: Tony Biggs
Dr. Maeghan Brundrett
Michelle Jarrett

LIST OF ACRONYMS

| | |
|--------|---|
| µg/L | micrograms per liter |
| CatOX | catalytic oxidation |
| COC | contaminant of concern |
| CP | Compliance Plan |
| Cr(VI) | hexavalent chromium |
| DCE | dichloroethene |
| DNT4A | 4-amino-2,6-dinitrotoluene |
| EVO | emulsified vegetable oil |
| FGZ | fine-grained zone |
| GWPS | groundwater protection standard |
| HE | high explosive |
| ISB | <i>In Situ</i> bioremediation |
| ISPM | <i>In Situ</i> performance monitoring |
| lbs | Pounds |
| Mgal | million gallons |
| mV | millivolts |
| NAPL | non-aqueous phase liquid |
| ORP | oxidation-reduction potential |
| P1PTS | Playa 1 Pump and Treat System |
| PID | photoionization detector |
| ppmv | parts per million by volume |
| PQL | practical quantitation limit |
| RDX | hexahydro-1,3,5-trinitro-1,3,5-triazine |
| SAP | Sampling and Analysis Plan |
| Scfm | standard cubic feet per minute |
| SEPTS | Southeast Pump and Treat System |
| SVE | soil vapor extraction |
| TAC | Texas Administrative Code |
| TCE | trichloroethene |
| TZM | treatment zone monitoring |
| 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 four 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 Fourth Quarter 2022.



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 CP Table VII and the Pantex Interagency Agreement.

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 potentially 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.

Pump and Treat System Fourth Quarter 2022 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 | 91 |
| % Operation Time | 97 % |
| Volume Water Treated (Mgal) | 24.8 |
| HE Mass Removal (lbs) | 76.7 |
| Chromium Mass Removal (lbs) | 11.5 |
| Beneficial Use of Water | 0 % |

*Value below operational goals

The subsurface drip irrigation system filter bank break that occurred in late June 2017 continued to impact operations of SEPTS and P1PTS during the fourth quarter of 2022. Due to the severity of the break, an engineering evaluation, contracting, and major repairs were required to restore the irrigation system. Repairs to the filter bank were completed in May 2019 and after completion of startup testing and repairs on the communication systems, a portion of the system became operational in March 2022. However, in April 2022, the communication interface on the system failed. System repairs were completed and the system became operationally available in late September 2022. However, a mishap with a bird caused an electrical failure of the system in early December 2022. The system is currently under repair. Operation of the subsurface system is also currently hindered by lowered lagoon storage capacity due to ongoing construction of repairs to the Plant's WWTF storage lagoons. During periods the drip irrigation system is unavailable, Pantex continues to release WWTF water to Playa 1 as approved in the Texas Commission on Environmental Quality wastewater permit (WQ0002296000). However, the permit restricts the amount of water that can be released to the playa, so pump and treat throughput is reduced.

Current and future operations of both pump and treat systems will be impaired by the permit-restricted flow to Playa 1 until the subsurface drip and new center pivot irrigation systems are fully

operational. The SEPTS system has operated at a higher capacity using injection, release to Playa 1, and scheduled shutdowns of P1PTS. Pantex planned to run P1PTS one week per quarter in the 2022 calendar year based on technical evaluations of the current system requirements. Reduction of operational time at P1PTS allows SEPTS to operate at a greater capacity and support capture of water along the FM 2373 fence line, at wells east of FM 2373, and at the highest plume concentrations to the south on Texas Tech property. When P1PTS is operational, SEPTS is operated at a lower capacity to meet permit requirements. However, the system was shut down at the end of April 2022 to connect P1PTS to the new center pivot irrigation system east of FM 2373 and was not operated during the fourth quarter. The work is expected to complete in 2023.

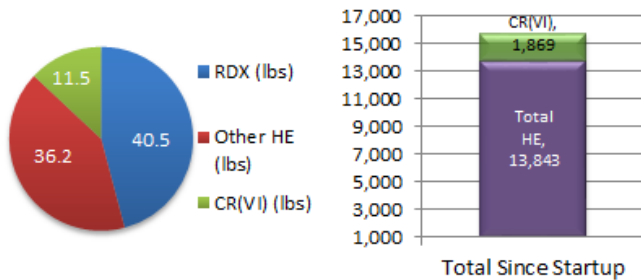


Figure 1. SEPTS Mass Removal

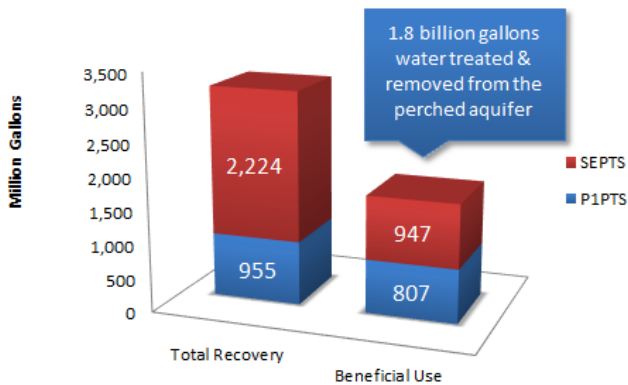


Figure 2. System Recovery and Use

Graphs of monthly operation and throughput are included in Appendix B. The SEPTS wellfield had more than nine wells that required repair during the fourth quarter due to electrical and equipment issues. Pantex has issued a contract to address the problems, and most wells will be operational by the beginning of 2023. Almost 79% of the treated water was released to Playa 1. SEPTS treated about 25 million gallons (Mgal) during the fourth quarter. P1PTS primarily treats RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine), and SEPTS primarily treats RDX and hexavalent chromium [Cr(VI)]. Figure 1 provides SEPTS mass removal information for RDX and other high explosives (HEs) and Cr(VI) for the fourth quarter, as well as totals since system startup.

P1PTS was not operated during the fourth quarter, but had previously removed over

770 pounds (lbs) of high explosives (HEs). Overall, the systems have removed over 16,500 lbs of HEs and chromium contaminants from perched groundwater since operations began.

The total recovery and treatment from both systems since startup has been calculated at about 3.2 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 1.8 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 a 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 installing an irrigation alternative on the property east of FM 2373 to provide additional long-term use of the treatment system water. Funding was requested in fiscal year 2021 to design and construct infrastructure for irrigation of land east of FM 2373 using five center pivot sprinklers. The design of the new irrigation system was completed in May 2021 and a new construction contract was awarded in August 2021. Construction on the system began in November 2021 and is expected to be operational in the summer of 2023. The first irrigated crops are expected to be planted for the late summer/fall 2023 growing season.

Pantex also identified funding to design and construct three new perched injection wells to the east of Playa 2; northwest of the Zone 11 ISB System. Construction of the injection wells and infrastructure was completed in February 2022. Due to issues with the communication system, operation of the system will not begin until early 2023. The Playa 2 injection wells will provide a consistent outlet for a portion of the treated water from SEPTS 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.

Perchlorate was detected in two SEPTS extraction wells starting in 2017, with concentrations increasing since the first detection. Perchlorate has been identified in two additional extraction wells in 2021. Pantex contracted to expand the SEPTS with a perchlorate pre-treatment for wells in the southwestern part of the system. The design portion of the contract started in August 2021 and was completed in February 2022. Construction was finished in August 2022. Mass removal for the system will be included in future 2023 reports.

ISB SYSTEMS

Four ISB systems (Zone 11 ISB, Southeast ISB, Southeast ISB Extension, and Offsite ISB) were operating at Pantex during the fourth quarter of 2022. 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 are 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 and the Offsite ISB is RDX.

The following section provides an understanding of the expected conditions at the ISB systems and downgradient concentrations of COCs. For the treatment zone wells, this report evaluates whether the conditions are present, including oxidation-reduction (i.e. redox) potential (ORP) and the reduction of electron acceptors (i.e. dissolved oxygen and nitrate), to degrade the COCs in each area. The presence of gases, such as methane, can also be an indication of deeper reducing conditions. The presence of a continued food source (total organic carbon) for the microbial reduction of COCs

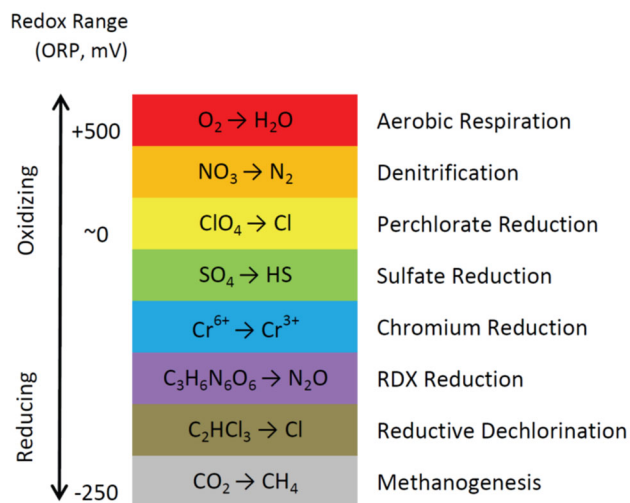


Figure 3. Redox Range for COCs

is also evaluated. Strong reducing conditions (ORP below -50 millivolts (mV) to reduce RDX and TCE and near 0 mV to reduce hexavalent chromium and perchlorate) are required to adequately reduce COCs. Figure 3 presents the redox ranges for the reduction of various COCs. Dissolved gases, redox potential, nitrate, and TOC are evaluated in the ISB treatment zone performance wells to determine if the treatment zone is rebounding to baseline conditions, thus requiring amendment injection. At this time, sulfate is not used as an indicator of reducing conditions, due to potential addition of high level of sulfates in the treatment zone from molasses used during injections.

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 with the exception of the Offsite ISB wells, which were excluded due to limits in data.

ISB INJECTION ACTIVITIES

Sampling of the ISB systems has been reduced to a semi-annual frequency. As a system's data is not always available for quarterly evaluation, only new and complete data sets for each system will be assessed during the current quarter. In the fourth quarter, all systems were sampled. Table 1 summarizes the injection activities for 2022. Injections were completed at the Offsite ISB in the fourth quarter.

Table 1. ISB Systems Activities

| Month (2022) | SE ISB EXT | SE ISB | Z11 ISB | Offsite ISB ¹ |
|--------------|-------------|-----------|-------------|---------------------------------|
| January | | Sample | | |
| February | Sample | | | Sample (Interrupted) /Injection |
| March | | Injection | | Injection |
| April | | Injection | Sample | Injection |
| May | Maintenance | | Maintenance | Injection |
| June | Maintenance | | Injection | Sample (Finished)/Injection |
| July | | | Injection | |
| August | Injection | | Injection | Maintenance |
| September | Injection | Sample | Injection | Maintenance |
| October | | Sample | | Sample/Injection |
| November | Sample | | Sample | Injection |
| December | | | | |

¹All sampled wells in the Offsite ISB are extraction (REC) wells and not injected; therefore, injection will not affect the sampling of the REC wells. Scheduled first quarter sampling for the Offsite ISB system was interrupted due to an electrical outage that caused the shutdown of two of the extraction wells required to be sampled. The wells were repaired in June 2022 and sampling was completed.

SE ISB EXT = Southeast ISB Extension

SE ISB = Southeast ISB

Z11 ISB = Zone 11 ISB

ZONE 11 REMEDIAL EFFECTIVENESS

Installation of the Zone 11 ISB remedial action was completed in 2009, and an expansion to the northwest of PTX06-ISB083 was completed in early 2015 and 2019 (see Appendix A maps). Another expansion was completed in late 2021 to address the southeast moving plume. Fourteen injection events have been completed at the current system, with the first injection event occurring in the expansion zone in 2015. The 14th injection event for the Zone 11 ISB system was completed in October 2022. Pantex has moved 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 emulsified vegetable oil (EVO). More frequent injections are required 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.

The Zone 11 ISB has a well-established treatment zone in the original portion of the system, where injection has occurred since 2009. Portions of the northwest expansion area have received more than five injections, so deeper reducing conditions are likely established at the injection wells. Seven injected wells, seven treatment zone monitoring (TZM) wells, nine downgradient ISPM, and two inactive injection wells were sampled in the Zone 11 ISB system in the fourth quarter.

Reduction of nitrate and the measured ORP indicate whether conditions across the treatment zone are present for reductive dechlorination. Evaluation of data in the treatment zone indicates very mild to strong reducing conditions, with ORP ranging from -132 to 66 mV across the Zone 11 ISB. Monitored conditions inside the treatment zone indicate nitrate was reduced at all fourteen wells

and negative ORP was measured in twelve of the treatment zone wells, indicating deeper reducing conditions in most areas. Soluble metals (arsenic and manganese) increased, indicating that reducing conditions are being established. Methane was also measured in all treatment zone wells indicating deeper reducing conditions across the treatment zone. Conditions improved at most of the non-injected wells in the northwest expansion area, following the molasses injections that began in 2018. TCE continues to be reduced to cis-1,2-dichloroethene (DCE), with TCE concentrations below GWPS in twelve monitored wells inside of the treatment zone and cis-1,2-DCE present at concentrations below the GWPS in twelve of the fourteen monitored wells. When greater amounts of TCE and cis-1,2-DCE are being degraded, ethene and vinyl chloride are expected to be detected. Vinyl chloride was detected in six sampled wells inside the treatment zone, but ethene was not detected in any wells. These results could indicate that a portion of the TCE is being completely degraded in some areas of the treatment zone, while other areas have milder reducing conditions. Perchlorate was reduced in all wells across the treatment zone.

Pantex evaluates performance at nine downgradient ISPM wells for the Zone 11 ISB and two former ISB injection wells (PTX06-ISB079 and PTX06-ISB082). Seven of nine ISPM wells exhibit perchlorate concentrations below the GWPS in the fourth quarter. TCE concentrations are at or below the GWPS in three of nine ISPM wells. The first breakdown product of TCE, cis-1,2-DCE, was below the GWPS in eight of nine downgradient wells. Data indicate that due to treatment, concentrations of TCE and its breakdown products are very close to meeting the GWPS. Two downgradient wells, PTX06-1149 and PTX06-1150, historically did not demonstrate strong treatment. These wells were downgradient of a single row of injection wells. In lieu of installing a recirculation system in 2021, Pantex drilled a second row of closely spaced 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 were infilled with new wells, rather than replacing the old wells, so that injections can be more closely spaced. Current data at downgradient wells demonstrates that stronger treatment is beginning to occur.

PTX06-ISB079 and PTX06-ISB082 are now monitored to evaluate perchlorate conditions on the eastern side of the ISB, in the second row of injection wells. Pantex no longer injects into these second row wells, and evaluates these wells to ensure that treatment continues on the perchlorate side of the ISB. Perchlorate, TCE, and TCE degradation products were not detected in PTX06-ISB079 and PTX06-ISB082. These wells are being evaluated for resumption of injection in the 2023 calendar year.

SOUTHEAST ISB REMEDIAL EFFECTIVENESS

The Southeast ISB was installed in 2007. Eight injection events have been completed at this system at the time of this report. The Southeast ISB continues to demonstrate declining water levels at the system; as a result, only 60% of the system was injected during the 2022 injection event. The inability to sample or inject into these wells is expected to persist with continued upgradient removal of water by the SEPTS. Pantex injected the system in early 2022 with molasses, as recommended in the *Fourth Quarter 2018 Progress Report*, but further injections may be limited or unnecessary.

Five injection wells and three downgradient ISPM wells were sampled at Southeast ISB in the fourth quarter. Two ISPM wells (PTX06-1118 and PTX06-1123) have gone dry or did not have sufficient water to be sampled. Analytical data indicate that reducing conditions continue at the treatment zone in four of five wells. Very mild reducing conditions were observed at PTX06-ISB042, a second row well, indicating that treatment may not be effective at that location. All five wells have total organic carbon to allow continued treatment. Downgradient wells indicate that complete treatment is occurring at all but one well, PTX06-1153. PTX06-1153 indicates partial treatment, as the breakdown products of RDX are present; RDX continues to slowly decline at this location.

SOUTHEAST ISB EXTENSION REMEDIAL EFFECTIVENESS

The Southeast ISB Extension was installed in 2017 as an extension of the chosen remedy for the southeast perched groundwater. Four additional wells were installed in late 2020 and an additional two in 2021 along the eastern property line in a north-south alignment to further encompass the plume (Appendix A). These new wells were injected for the first time in April 2021, with the exception of PTX06-ISB331, which was injected in August 2022 for the first time. Two treatment zone monitoring (TZM) wells were also installed in late 2021. Overall, six injection events have been completed at this system, with the latest injection completed in September 2022. Due to the success with distribution of a more soluble carbon (molasses), Pantex began injection at the Southeast ISB Extension using only soluble carbon (molasses), as recommended in the *Fourth 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 every nine months.

Seven ISB wells, two TZM wells and three downgradient ISPM wells were sampled during the fourth quarter of 2022. Treatment zone data indicates strong to mild reducing conditions are present for treatment of HEs. ORP was between -129.4 mV and 24 mV and nitrate was reduced in all wells. Soluble metals (arsenic and manganese) increased, indicating that reducing conditions are established. Total organic carbon results indicate that a sufficient food source is available to support establishment of reducing conditions at the wells.

Downgradient wells in the slower moving areas of the plume did not demonstrate treatment during this quarter and are not expected to until 2023. One Southeast Extension ISPM well (PTX06-1191) was converted to an Offsite ISB System injection well to better treat a neighboring property, where a small portion of the plume occurs. The well was injected for the first time in October 2022, after the most recent sampling event. Prior to injection, the well had not demonstrated treatment of HEs. Modeling results showed the area would benefit from one or two injections due to the stagnant nature of the plume under this property. The well will no longer be sampled as an ISPM well starting in 2023 and has been renamed PTX06-ISB462.

OFFSITE REMEDIAL EFFECTIVENESS

The installation of the first phase of wells for the Offsite ISB system was completed in 2020. The first phase of the installation focused on treatment at the leading edge of the plume. Infrastructure

to support an injection event was completed in June 2021, with first injection of molasses completed in October 2021. Based on the use of molasses, injections are planned every six months at differing parts of the system. Injection plans will follow the schedule that was designed using fate and transport and optimization modeling.

All water used in the injection process must be withdrawn from beneath the offsite property, so downgradient ISB extraction wells were installed. These wells were installed at the very edge of the plume and assist in pulling the amendment towards the removal wells, providing an expanded zone for COC treatment. Four ISB extraction wells (labeled REC wells due to the recirculation they provide) were sampled in the fourth quarter 2022. Evaluation of the baseline data from 2021 at these wells indicated very mild reducing conditions with ORP ranging from 19 to 281 mV. As of the fourth quarter 2022, reducing conditions improved and ORP ranged from -77 mV to 57.8. Concentrations of HEs remain low in the REC wells at the leading edge of the plume. Total organic carbon was also present at a higher concentration in all four wells, demonstrating arrival of treated water.

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 focused on treating residual non-aqueous phase liquid (NAPL) and soil gas at a single extraction well (SVE-S-20) near the source area.

Overall, the system operated 33% of the quarter (~ 736 hours of operation). The SVE was shut down in October 2021 as part of the pulsing plan for path to closure of the system. The system was restarted in January 2022, but shutdown in March, when an unexpected failure of the catalytic oxidizer occurred. The system was restarted on August 22 and ran until the end of October when another failure of the catalytic oxidizer shutdown the system. Figure 4 shows mass removal calculated for the fourth quarter and since startup for VOCs that historically contribute to the total VOC concentration.

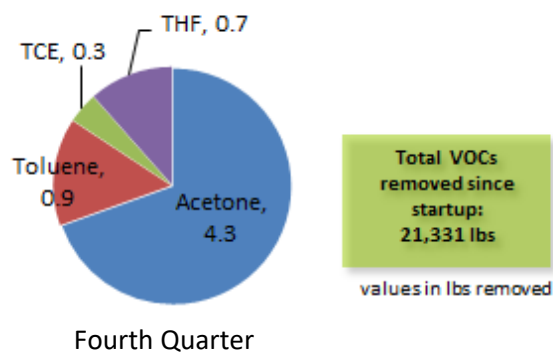


Figure 4. SVE Mass Removal

The system removed ~ 6 lbs of total VOCs during the fourth quarter, but has removed about 21,330 lbs of VOCs since startup. Based on PID data collected at the system effluent port, system destruction efficiency was at least 99%. Analytical data collected at startup indicate that the NAPL source is almost depleted, as reflected in the current mass removal values. Pantex will request closure of the system with the renewal of the Hazardous Waste Permit.

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 Fourth Quarter 2018. The removal rate declined during 2018, but began to improve over the first two quarters of 2019. In the third and fourth quarter of 2019, removal rates decreased and continued to remain low in the fourth quarter of 2022. As total VOC concentrations continue to remain below 100 ppmv, Pantex has been pulsing the system to determine current recovery efforts and feasibility of system closure. A more detailed discussion will be included in the upcoming *2022 Annual Progress Report*.

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 practical quantitation limit (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 fourth quarter indicates unexpected conditions at one Ogallala Aquifer well, PTX06-1064. RDX was detected below the PQL (0.26 µg/L) (see result below). Resample of the well did not confirm the detection (results were non-detect). At this time, no further action will be taken and sampling will continue as approved in the *2019 Sampling and Analysis Plan* and in accordance with the *Pantex Plant Ogallala Aquifer and Perched Groundwater Contingency Plan*.

Summary of Unexpected Ogallala Detections, Fourth Quarter 2022

| Well ID | Sample Date | Analyte | Measured Value (µg/L) | PQL (µg/L) | GWPS (µg/L) |
|------------|-------------|---------|-----------------------|------------|-------------|
| PTX06-1064 | 11/2/2022 | RDX | 0.114 | 0.26 | 2 |
| | 1/10/2023 | RDX | ND | 0.26 | 2 |

ND = Non-detect

One perched well, PTX01-1008 located at the Burning Ground, had a detect of RDX of 0.325 µg/L, above the PQL. RDX has only been detected at this well once previously in 2012 with no other RDX

detections occurring since the start of sampling in 2001. At this time, no further action will be taken and sampling will continue as approved in the *2019 Sampling and Analysis Plan*.

OTHER UNEXPECTED CONDITIONS

Pantex routinely evaluates data as received from the laboratory to determine if it presents off-trend, all-time high, or new detection conclusions 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 fourth quarter.

SCHEDULE UPDATE

Pantex provided a detailed schedule of upcoming work in the *2021 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 accomplished the following:

- The Explanation of Signification Difference was signed by both the NNSA Production Office Manager and the Acting Director of the EPA Region 6 Superfund and Emergency Management Division. A Notice of Availability was submitted and posted to local newspapers, the Amarillo Globe News and the Panhandle Herald.

Pantex continues progress toward completion of the following items:

- Pantex submitted a Request for Proposal for the design of the upgrade to the SCADA system for SEPTS and P1PTS. The contract was awarded in September 2022 and the conceptual design was submitted and approved in December. The final design is expected to be completed by May 2023.
- Pantex awarded a contract to build two mobile pump and treat systems that will be used at the Offsite Remediation System and in other areas where plume control may be required. Design was completed in April 2022. Construction of the systems has begun and the delivery of the trailers is expected during April 2023.
- The design of the new center pivot irrigation system planned to be installed east of FM 2373 was completed in May 2021. The new construction contract was awarded in August 2021 and construction began in November 2021. Operation of the system is expected by summer 2023.
- Construction of Phase 3 and 4 infrastructure for the Offsite System commenced in August 2022. Work is anticipated to be completed in summer 2023.
- Work began to evaluate the Pantex perched groundwater network, acquire LiDAR Survey information for assessing landfill cover deficiencies and acquisition of new toxicity data for Pantex COCs for use in evaluating its effect on risk in Five-Year Review. The Five-Year Review activities were initiated on August 1, 2022. A draft report was submitted to Pantex in February.
- Pantex awarded a contract for construction of two new ISB injection trailers to be used for future injection events. These trailers are anticipated to be completed by April 2023.

The following items are upcoming work to be completed by Pantex:

- Pantex is preparing a contract for upgrading the SCADA system for SEPTS and P1PTS. The contract is anticipated to be awarded in August 2023.
- Pantex is performing well maintenance at the Offsite ISB in February 2023 and will start the spring injection event in March.
- Pantex is preparing to maintain the Zone 11 ISB wells in April 2023, with injection commencing afterward.
- Pantex is planning to inject the Southeast ISB Extension in August 2023.
- Pantex awarded a new well drilling contract in January 2023. The new contract includes scope to install two new Ogallala wells (in response to HE detects at PTX06-1056) and all Phase 4 wells for the Offsite ISB. Mobilization for the well drilling contract is anticipated in March 2023.

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 an existing remediation system. 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 Southeast Pump and Treat System continued 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. 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 subsurface irrigation system is fully operational or construction of other options finishes.

System repairs were completed at the subsurface irrigation system, with limited operation starting in March 2022. The system ran during the month of March, but an issue with the communication system caused the system to be shutdown. System repairs were completed and the system became available in late September 2022. Full operation of the subsurface system is currently hindered by lowered lagoon storage capacity due to ongoing repair of the WWTF's storage lagoons. Pantex has installed 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 the system is brought online in 2023. Pantex completed the design and started the construction of a center pivot irrigation system east of FM 2373, with an anticipated completion date of summer 2023. Pantex also completed construction of a perchlorate pre-treatment system to address the perchlorate moving southeast through the SEPTS extraction wellfield.

Monitoring results for areas downgradient of the established ISB systems continue to demonstrate that treatment has been generally effective. Downgradient wells at the Zone 11 ISB are

demonstrating treatment. Most downgradient wells meet or are near the GWPS for the primary contaminants and breakdown products. Pantex has changed the injection strategy at the Z11 ISB to attempt better distribution of amendment between wells and provide better treatment of TCE and perchlorate. 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. In lieu of installing a recirculation system in 2021, Pantex drilled a second row of closely spaced wells across the southern portion of the ISB to address higher concentrations of TCE moving into those areas. Pantex will continue to evaluate the data and make appropriate recommendations for treatment in the upcoming progress reports.

COC concentrations meet the GWPS at the Southeast ISB at two downgradient wells, with a third dry well having previously met GWPS. One downgradient well (PTX06-1153) for the Southeast ISB is not responding to treatment as well as the others. Pantex injected molasses during the 2019 and 2022 injection event to attempt better distribution of the amendment and will continue to monitor the results over time to determine if the injection will affect 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.

The Southeast ISB Extension was installed at the Pantex fence line to arrest the continued movement of COCs to offsite properties. That system has been operating and is being evaluated for its effectiveness at the offsite property. The Southeast ISB Extension is demonstrating treatment in the zone where injection has occurred, but downgradient monitoring wells are not expected to exhibit the effects of that treatment effort until 2023. One Southeast Extension ISPM well (PTX06-1191) was converted to an Offsite ISB System injection well to better treat a neighboring property, where a small portion of the plume occurs. The well was injected for the first time in October 2022, and as such, will no longer be sampled as an ISPM well starting in 2023. Pantex continues progress toward cleanup of the southeast lobe of perched groundwater. A new ISB system (Offsite ISB) was designed to address HE contamination found on neighboring properties. Installation of infrastructure for Phase 1 and 2 of the Offsite ISB is complete and the first injection into the system was completed in October 2021. Phase 3 well construction is complete and construction of Phase 3 and 4 infrastructure commenced in August 2022 and is anticipated to be completed in summer 2023.

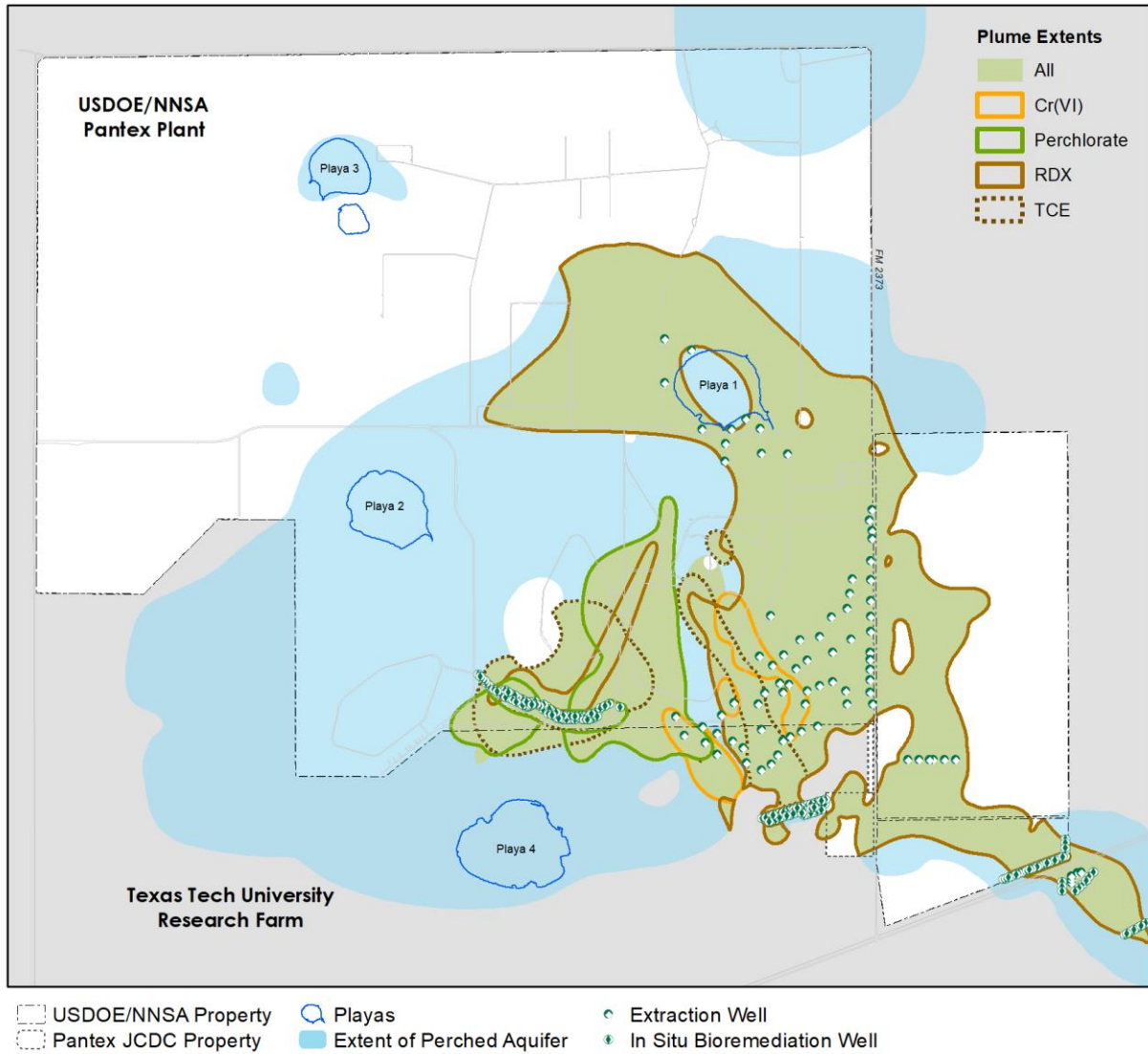
The SVE system continues to treat soil gas and residual NAPL in the solvent evaporation pit/chemical burn pit area of the Burning Ground, thereby mitigating vertical movement of VOCs to groundwater. Pantex was unable to complete rebound tests successfully, and was unable to prepare a path to closure as recommended in the first Five-Year Review. 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 airflow through the formation while the system is operating. The airflow 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 airflow; however, influent concentrations and mass removal have greatly decreased since the system was modified. Pantex is actively pulsing the system to evaluate final closure of the system

and will provide further recommendations based on review of influent SVE data in the annual report and the upcoming renewal of the Hazardous Waste Permit.

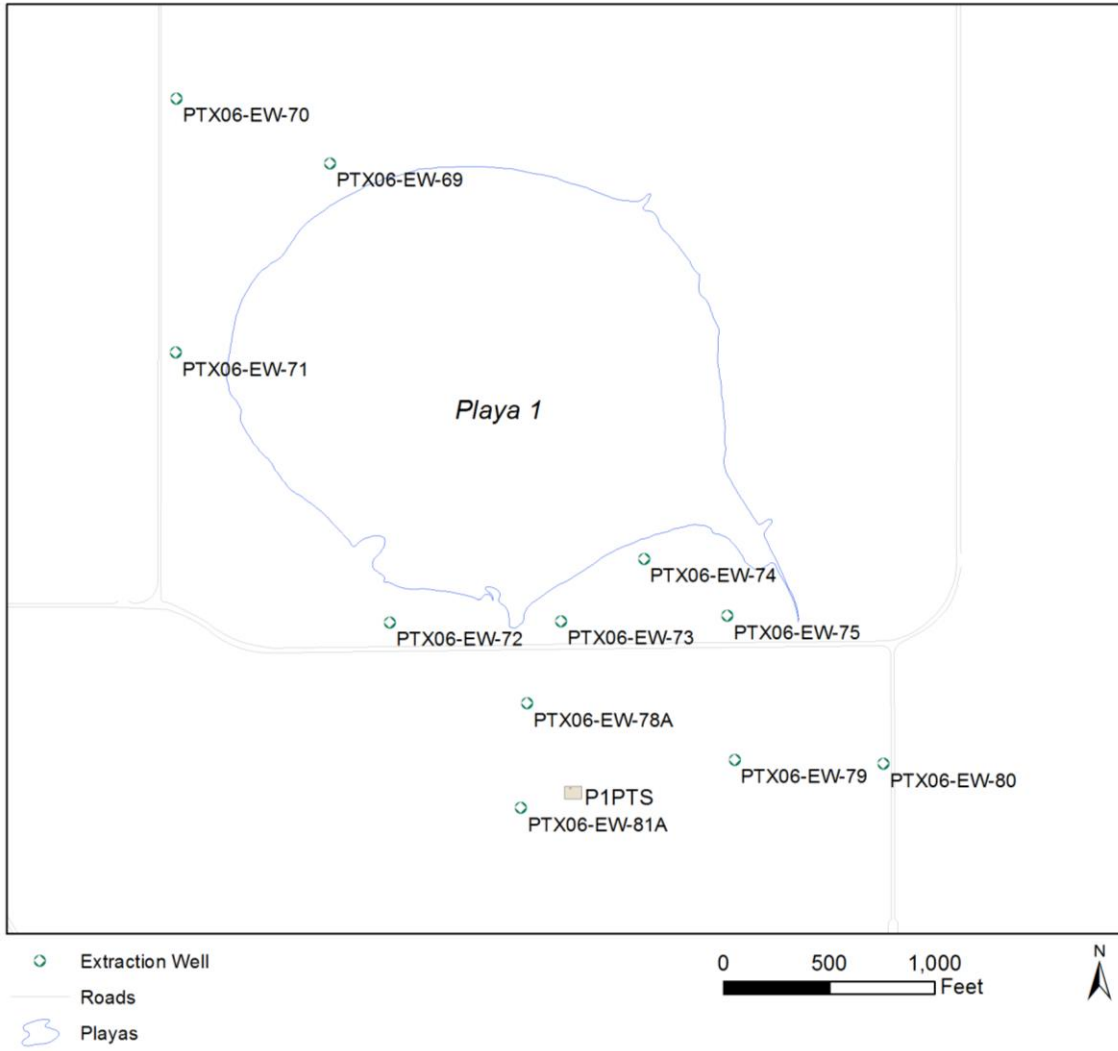
The groundwater remedies are considered protective for the short-term, as untreated perched groundwater usage is controlled to prevent human contact and monitoring data continue to indicate that the remedial actions remain generally protective of the Ogallala Aquifer. Additional investigation of the area of the Ogallala Aquifer near PTX06-1056 will begin in early 2023 with installation of two new monitoring wells.

Appendix A

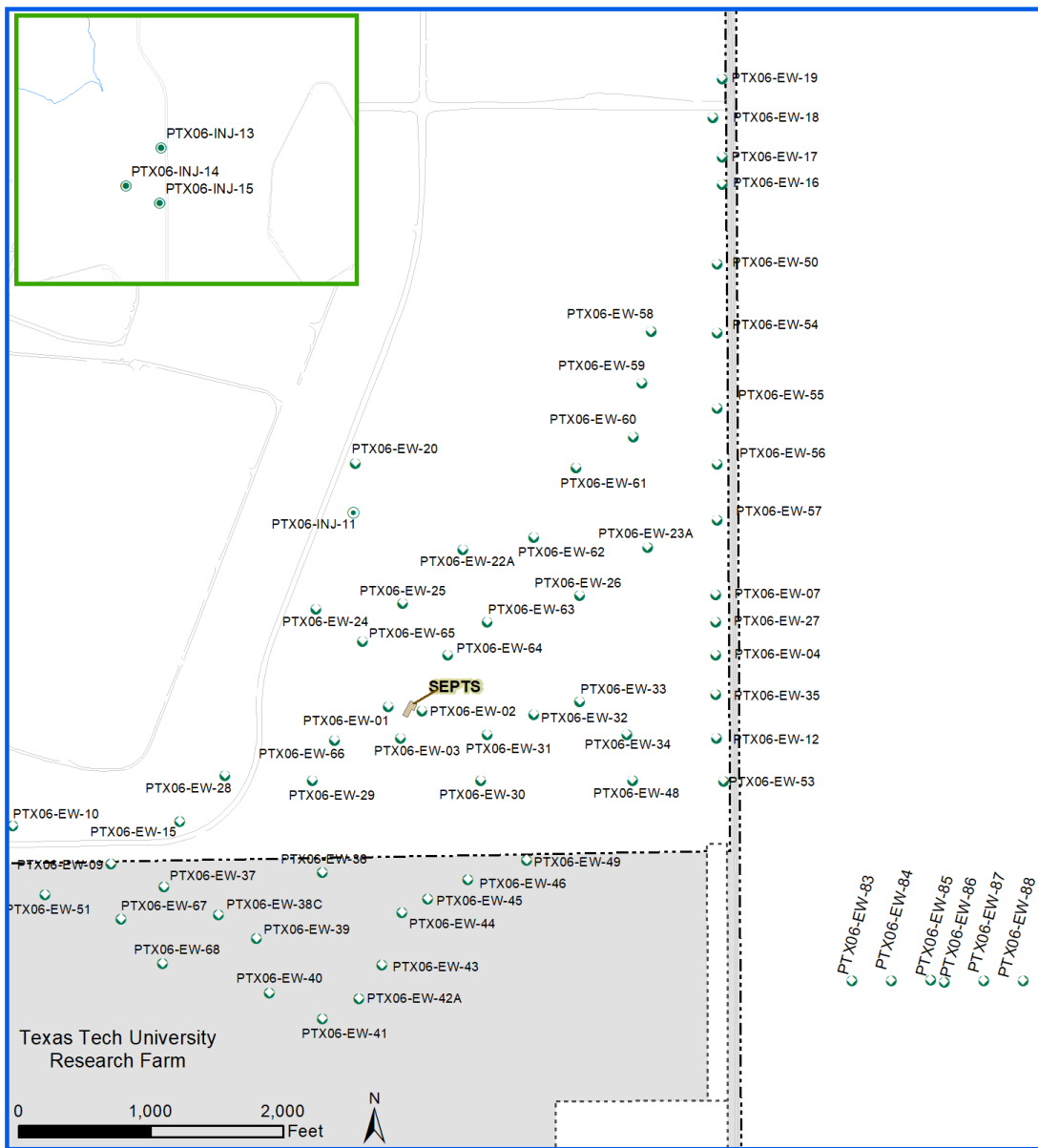
Maps



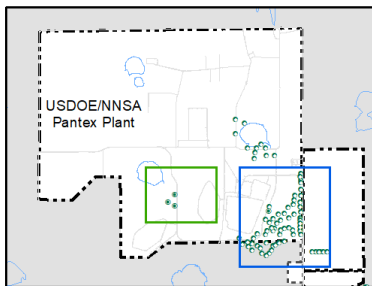
Extent of Perched Groundwater and Contaminant Plumes



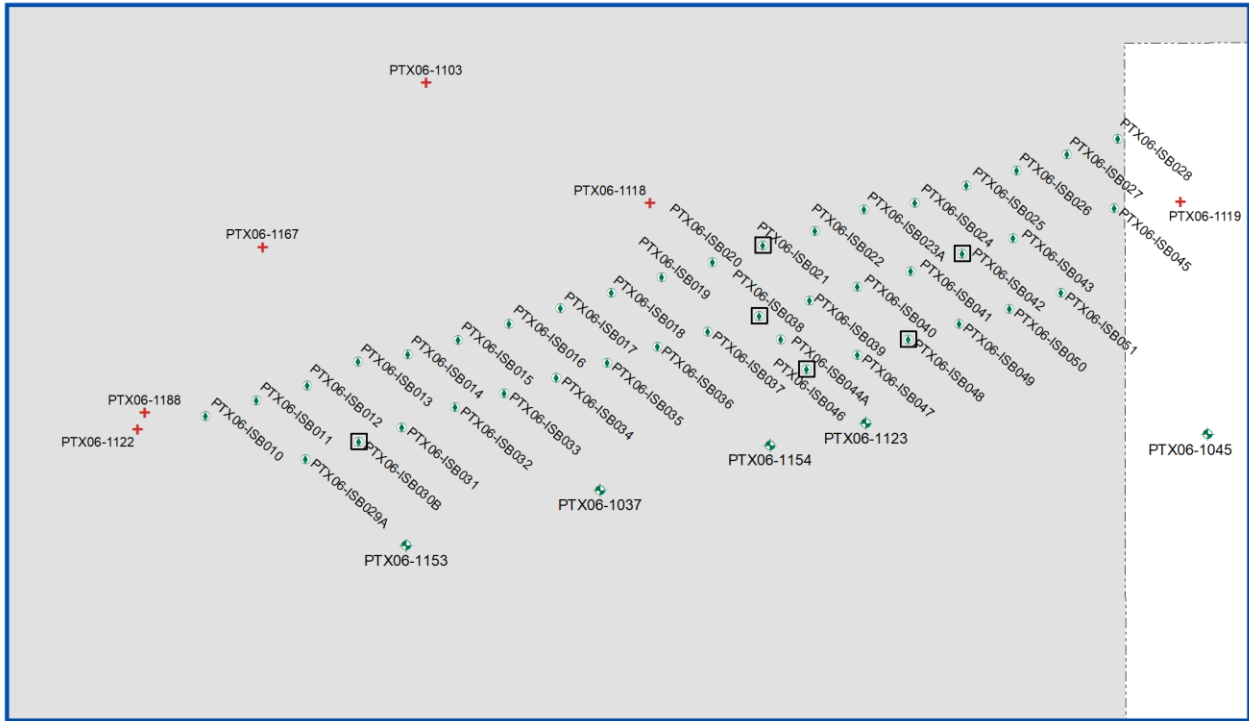
Playa 1 Pump and Treat System Wells



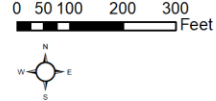
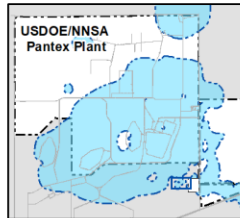
- Extraction Well
- Injection Well
- Roads
- - - DOE Property
- ▭ Pantex ASC LLC Property



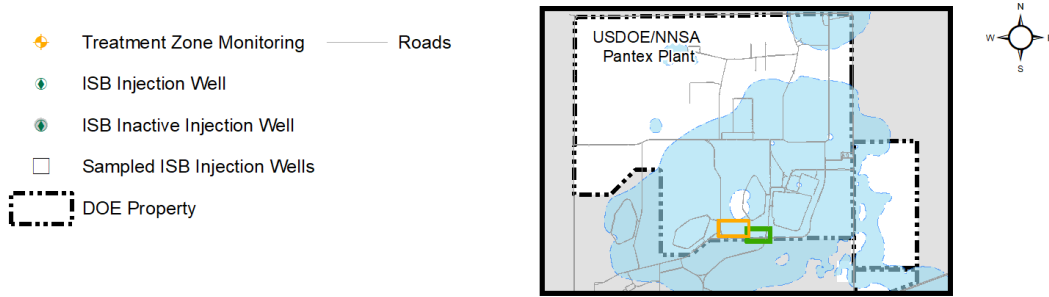
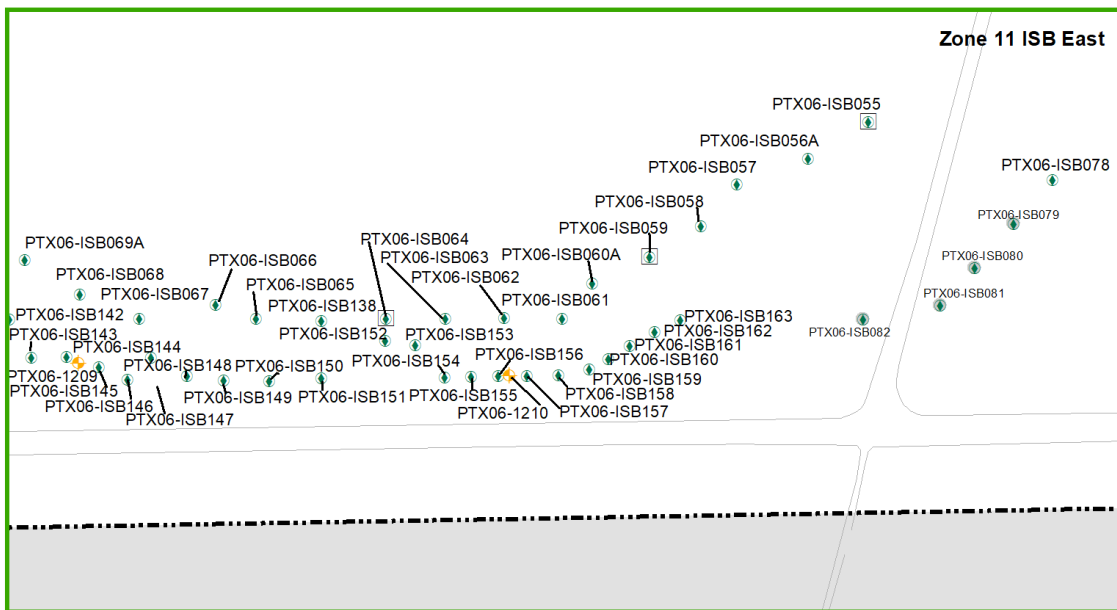
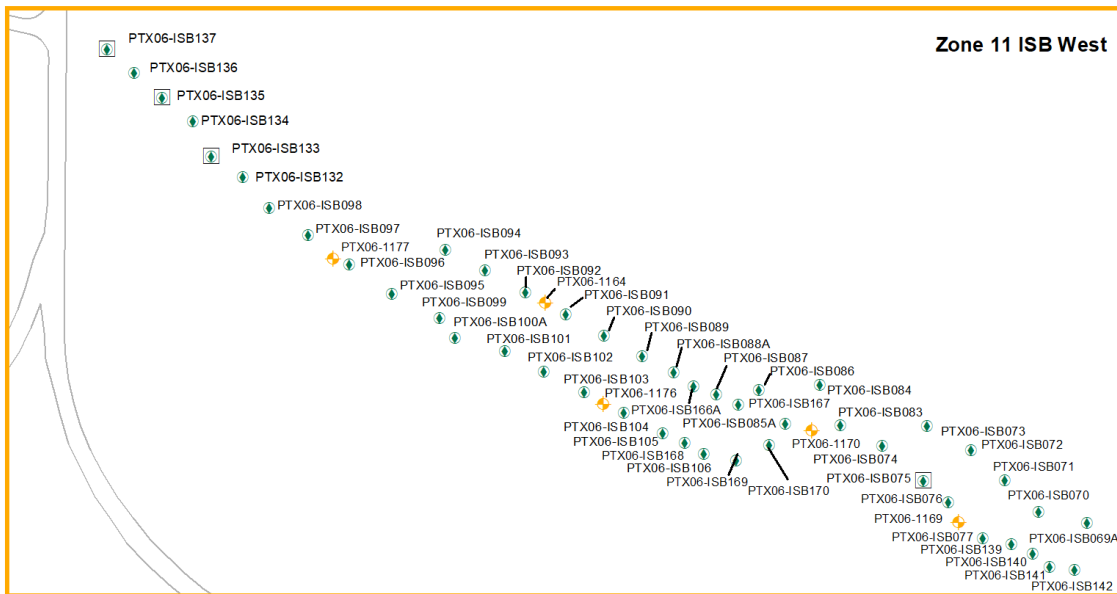
Southeast Pump and Treat System Wells



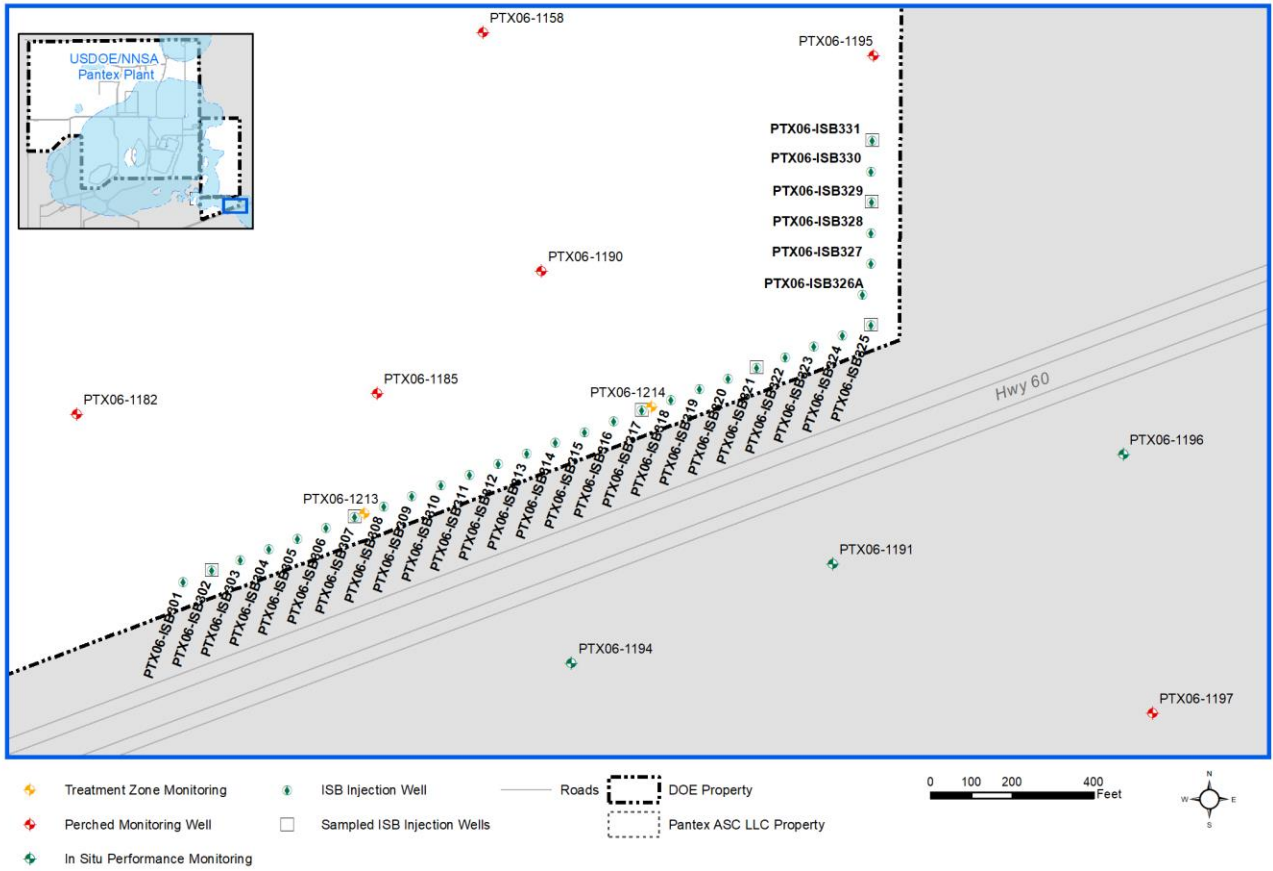
- + ISPM Well
- ISB Injection Well
- Sampled ISB Injection Well
- + Dry Monitoring Well
- Pantex ASC Property
- DOE Property



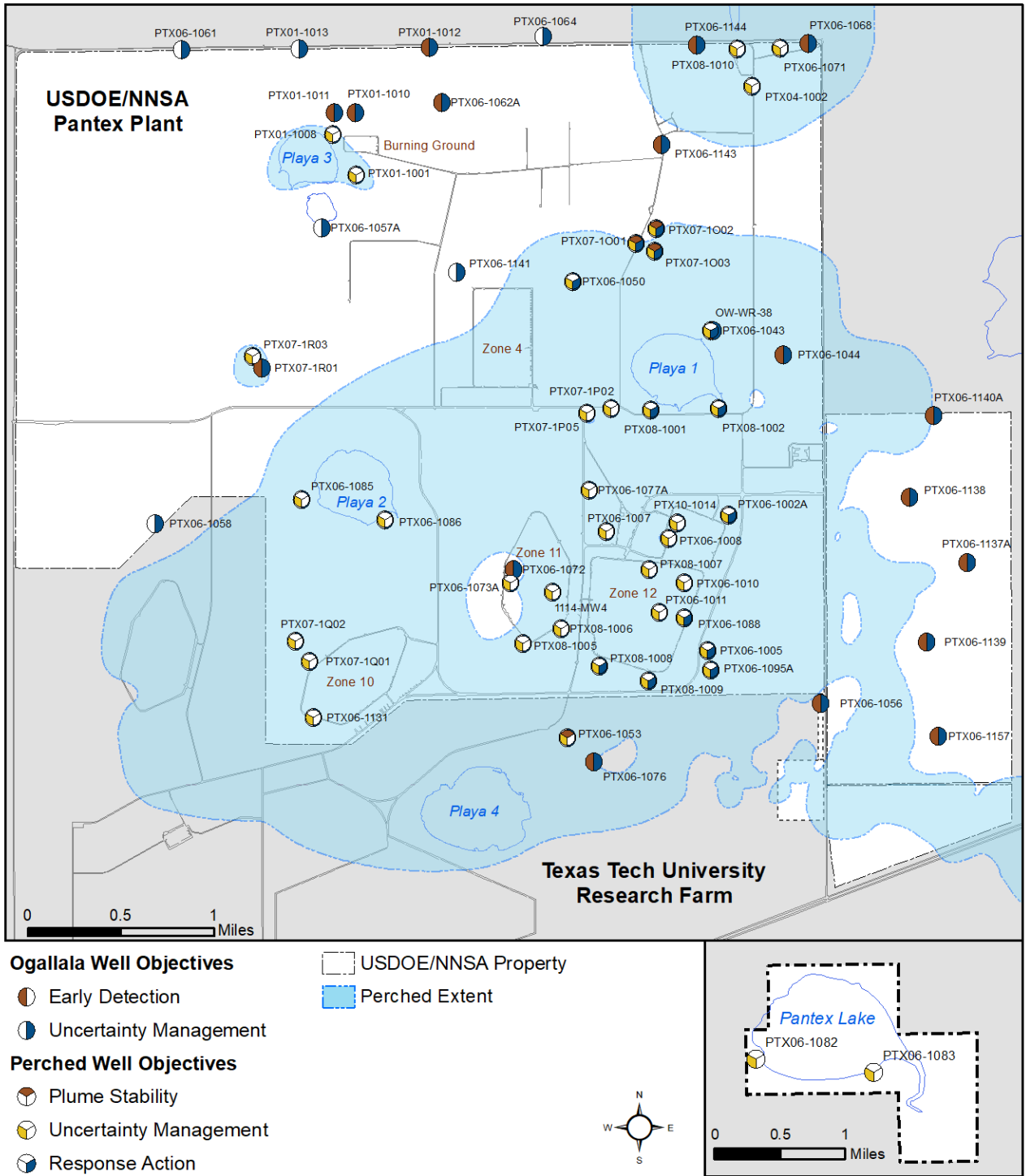
Southeast ISB Wells and Sampling Locations



Zone 11 ISB Wells and Sampling Locations



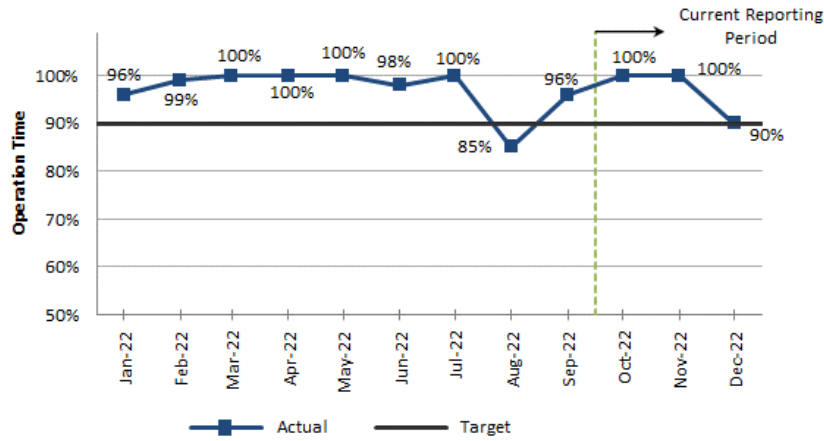
Southeast ISB Extension Wells and Sampling Locations



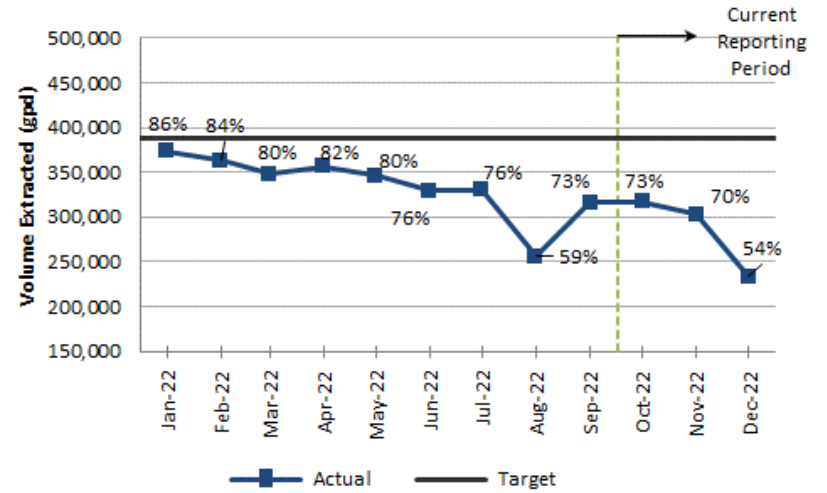
Uncertainty Management and Early Detection Wells Evaluated in the Quarterly Progress Report

Appendix B
Pump and Treat System Graphs

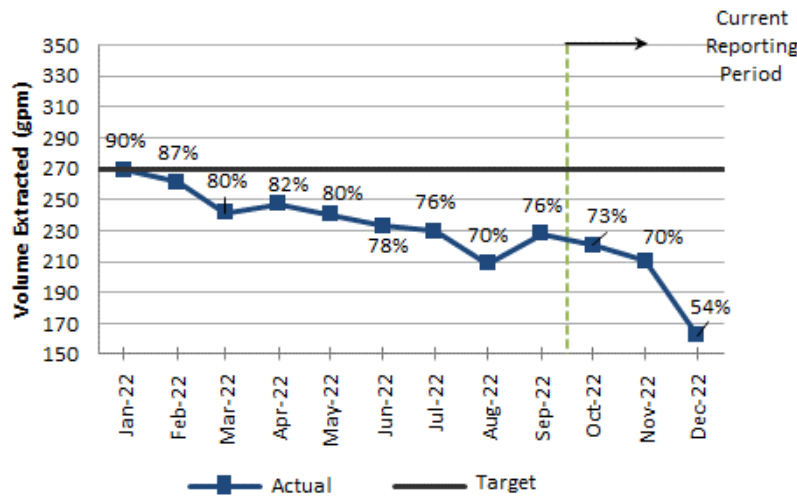
Southeast Pump and Treat System Graphs



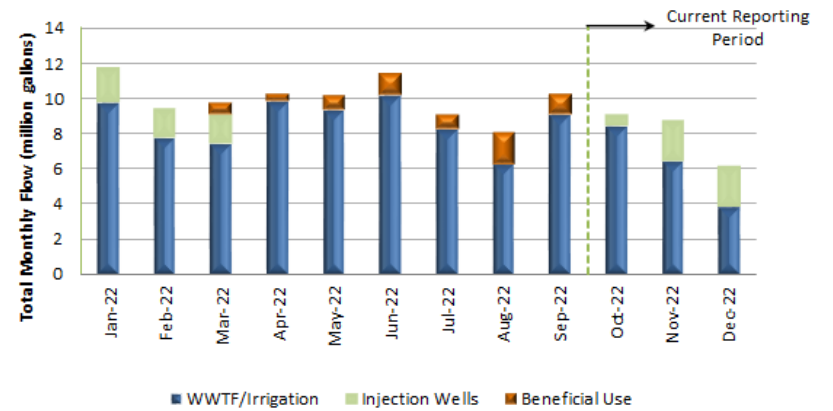
SEPTS Operation Time vs Target



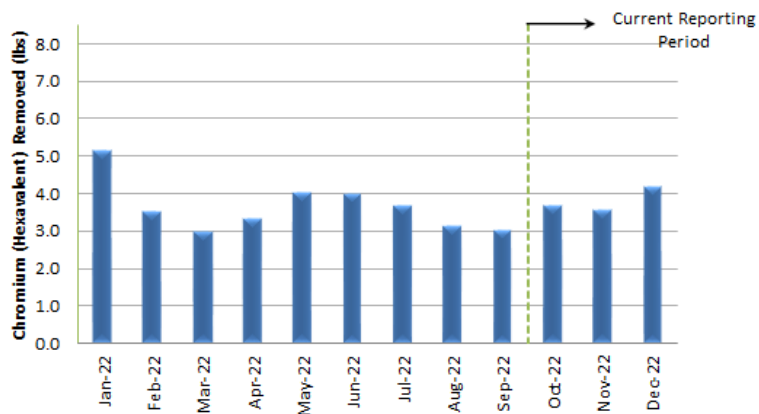
SEPTS GPD and % Capacity



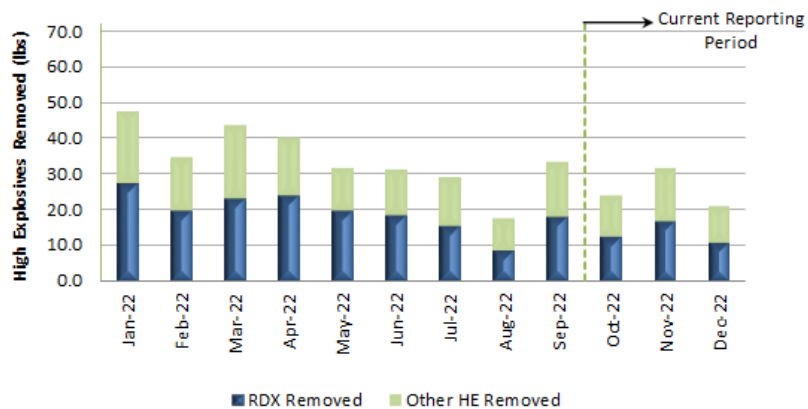
SEPTS Average GPM and % Capacity



SEPTS Monthly Total Flow

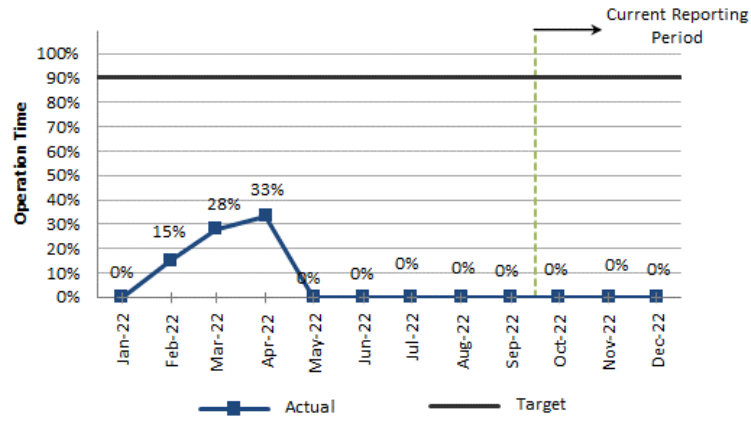


SEPTS Chromium Mass Removal by Month

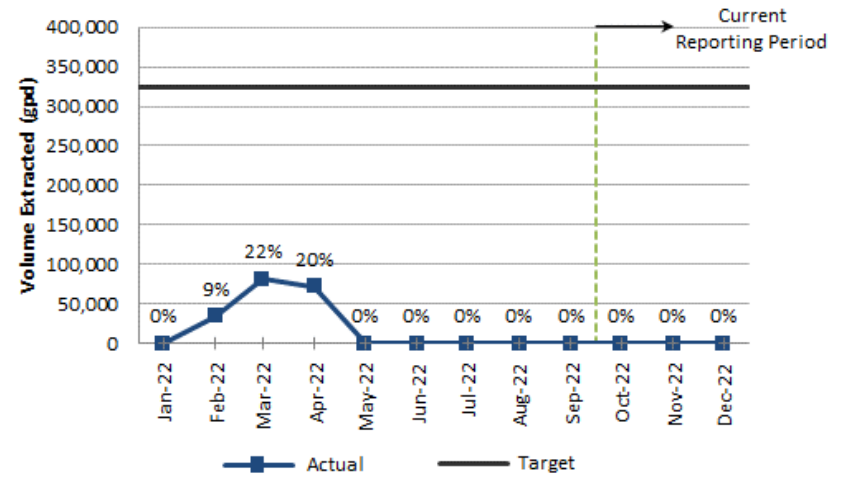


SEPTS HE Mass Removal by Month

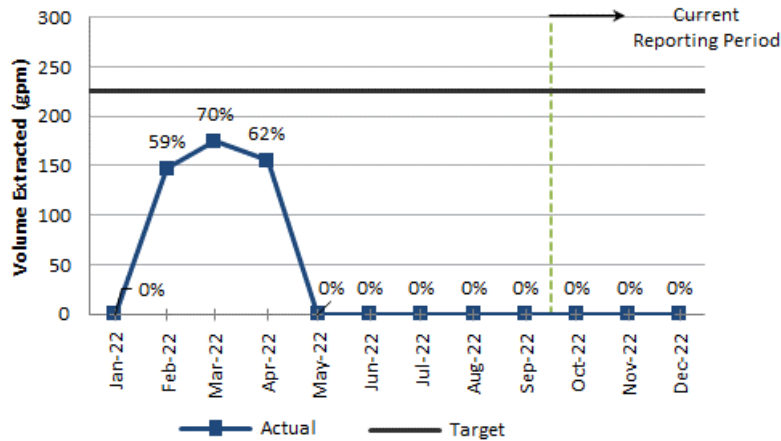
Playa 1 Pump and Treat System Graphs



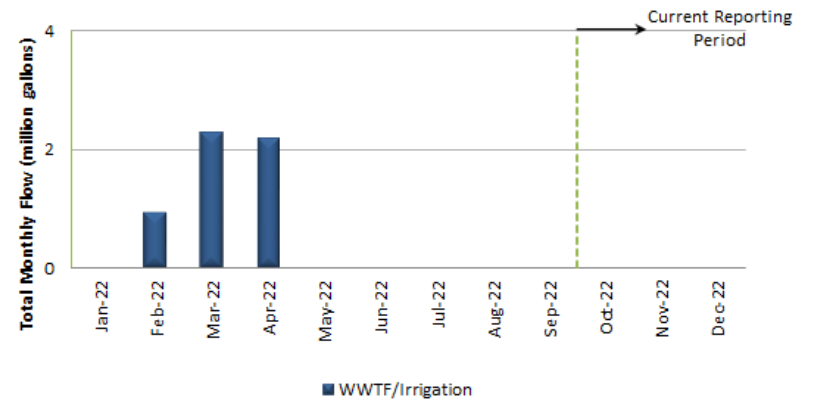
P1PTS Operational Time Vs Target



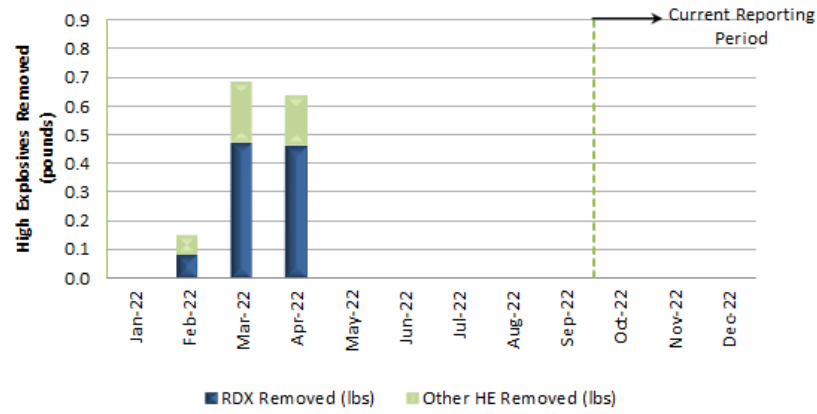
P1PTS Average GPD and % Capacity



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. |

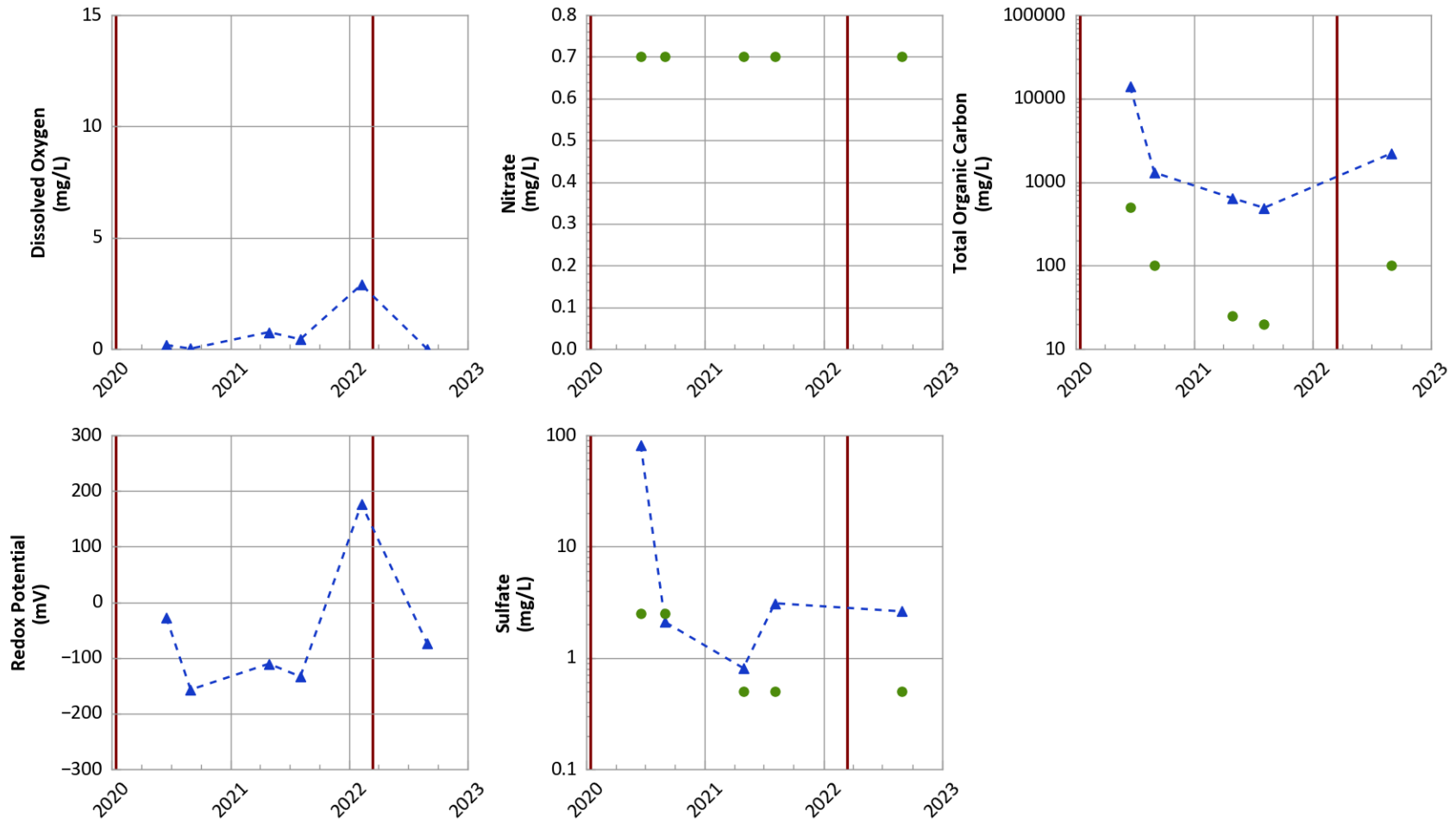
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Appendix C

ISB Graphs

Southeast ISB Graphs

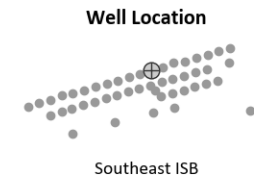
**PTX06-ISB021 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



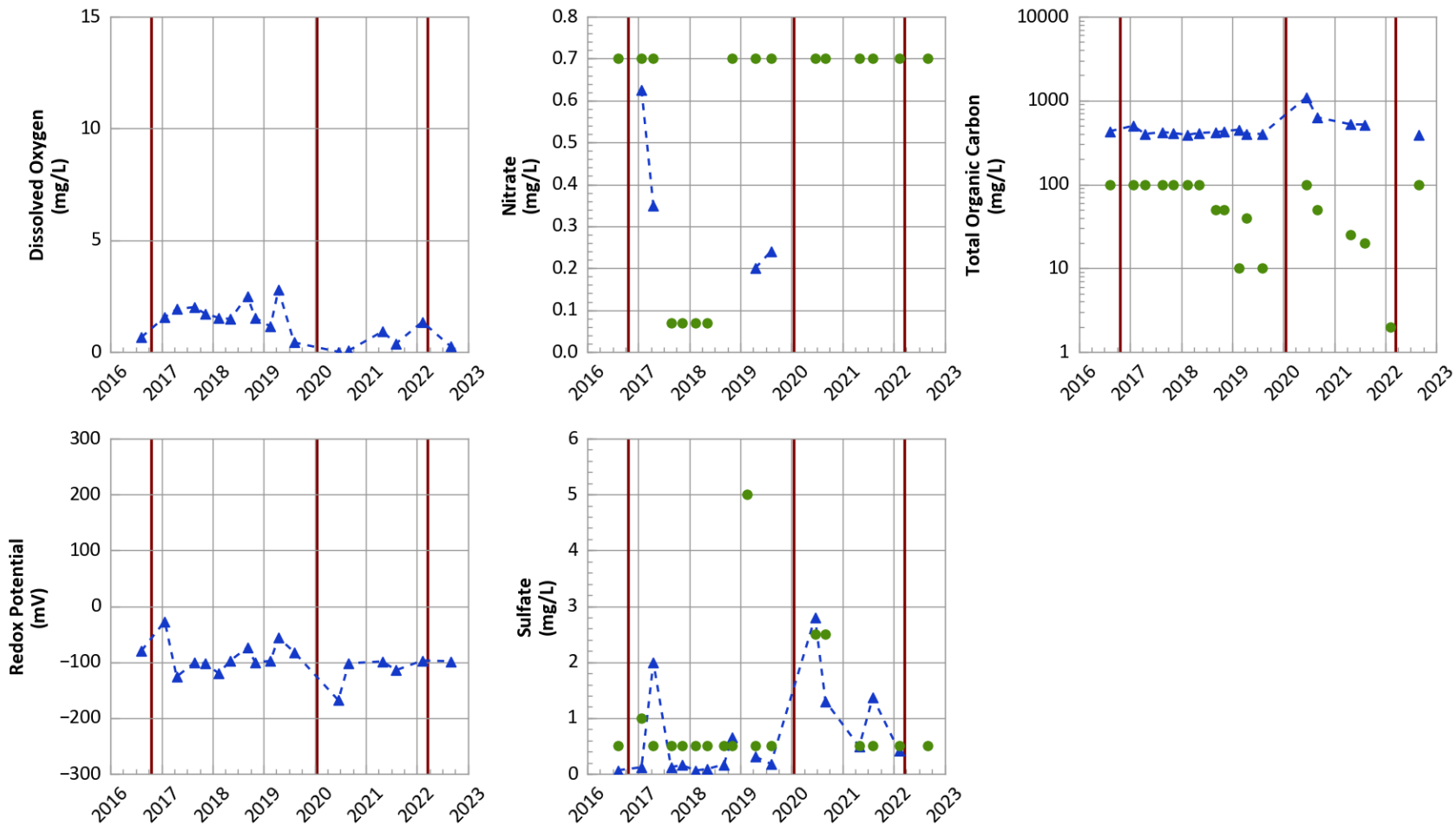
Typical Baseline Concentrations in Perched Groundwater

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



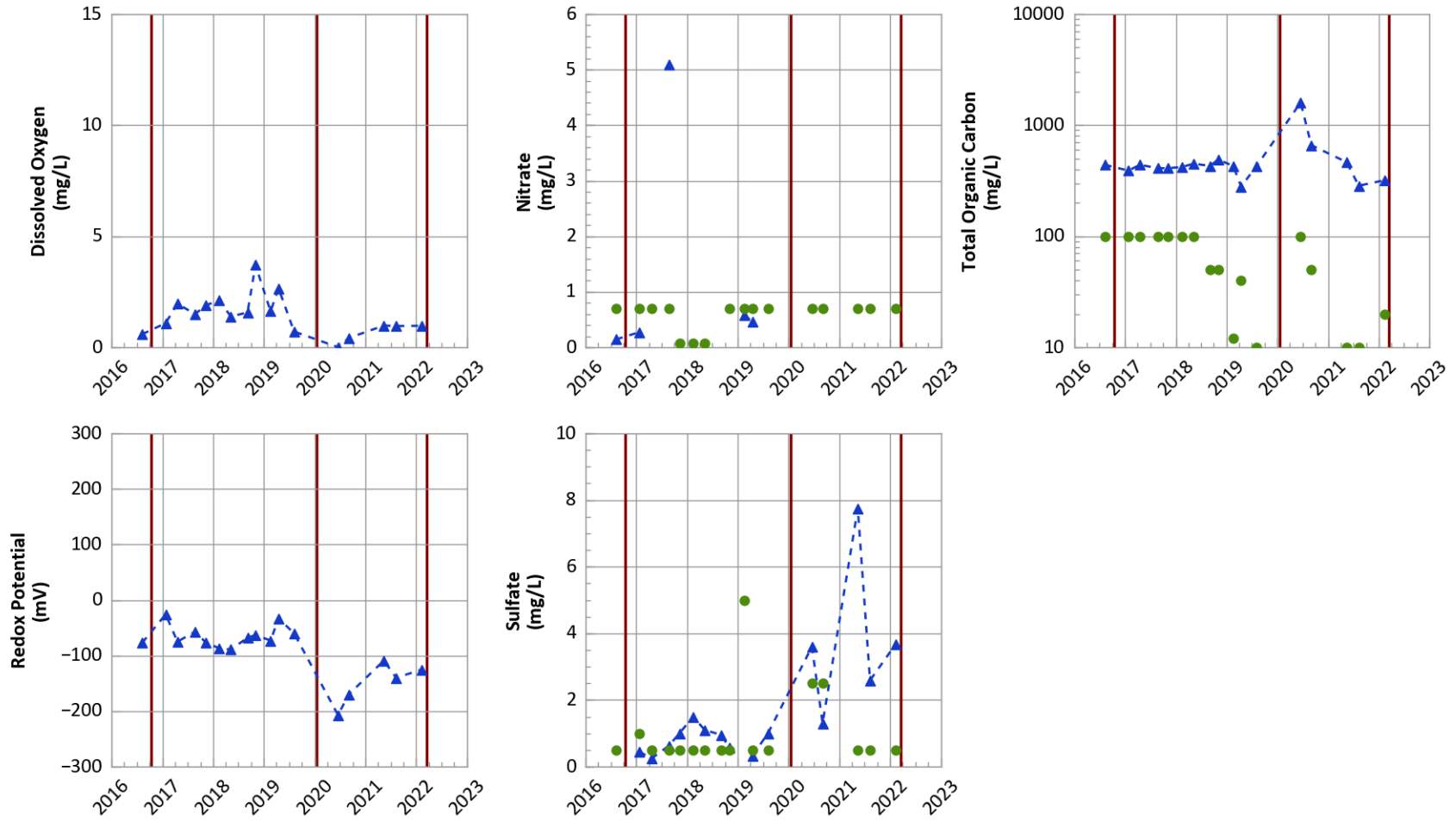
Typical Baseline Concentrations in Perched Groundwater

- 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



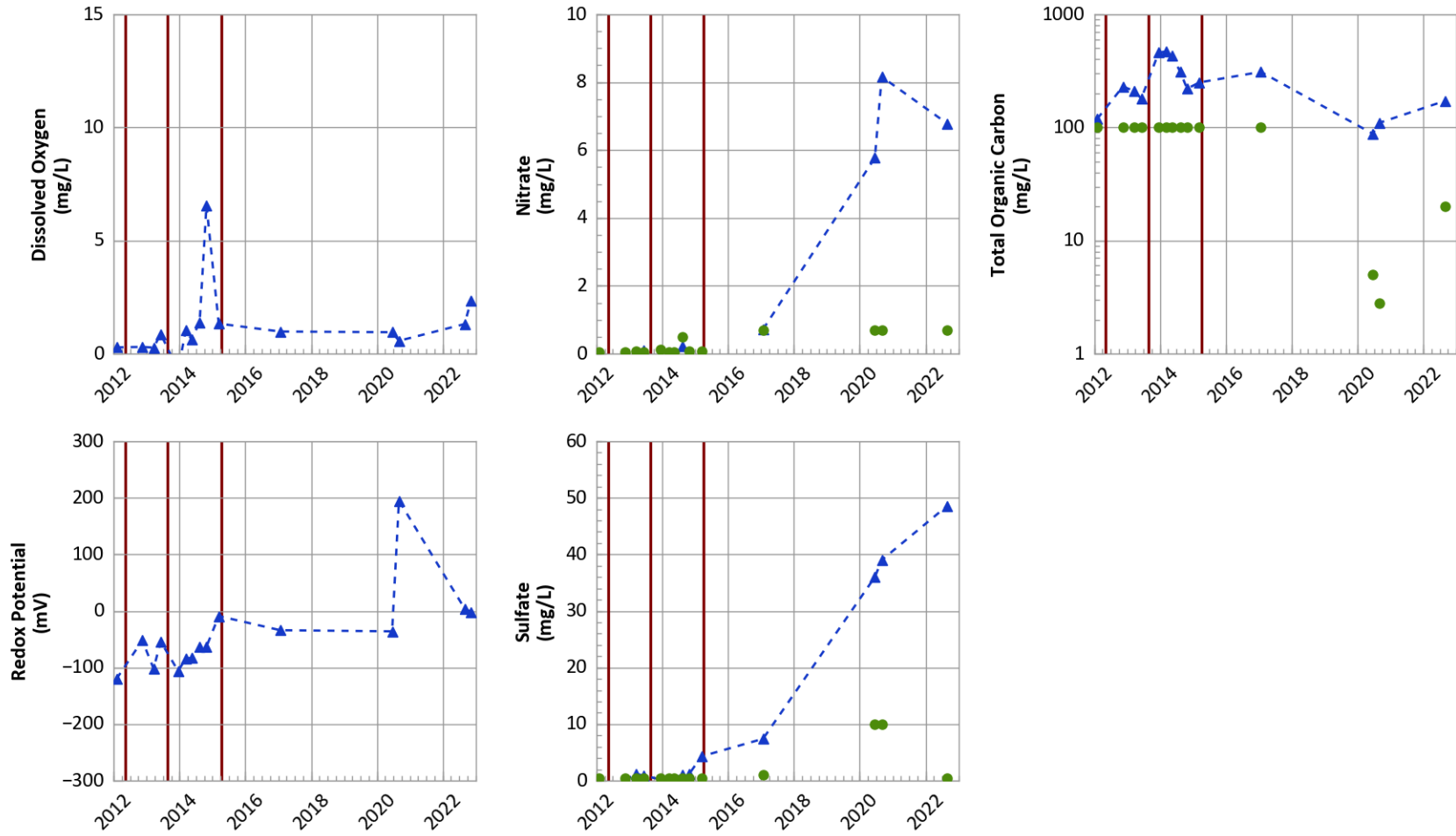
Typical Baseline Concentrations in Perched Groundwater

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

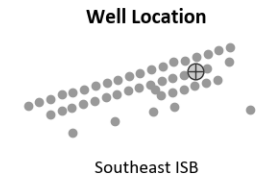


**PTX06-ISB042 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**

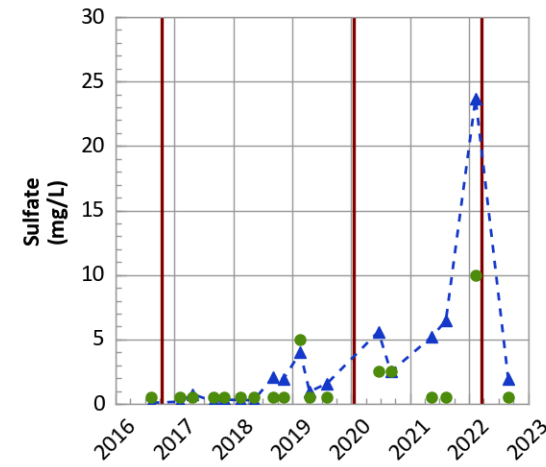
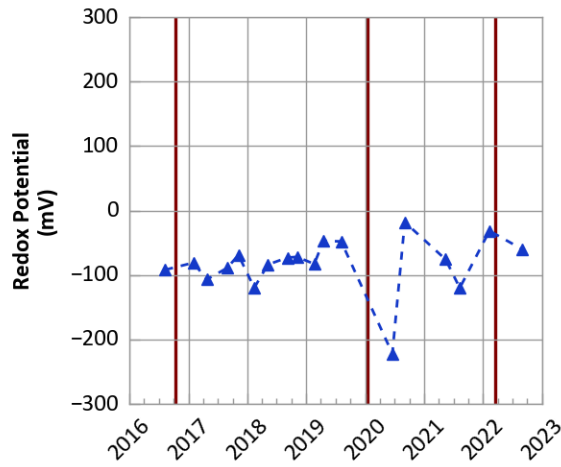
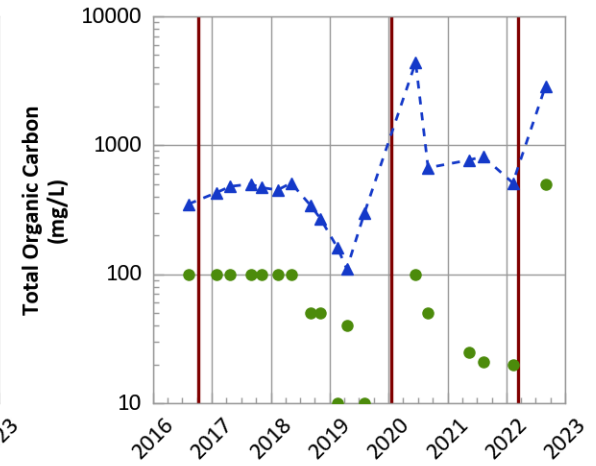
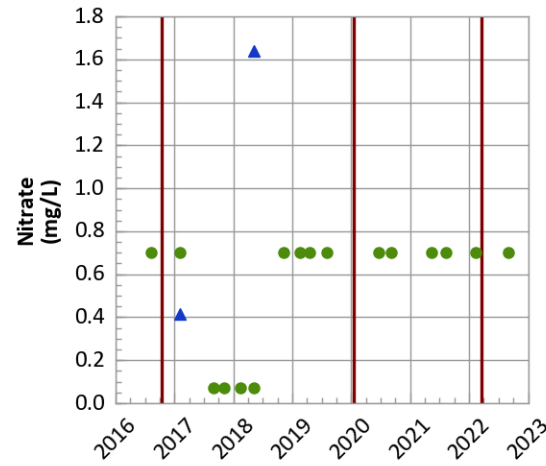
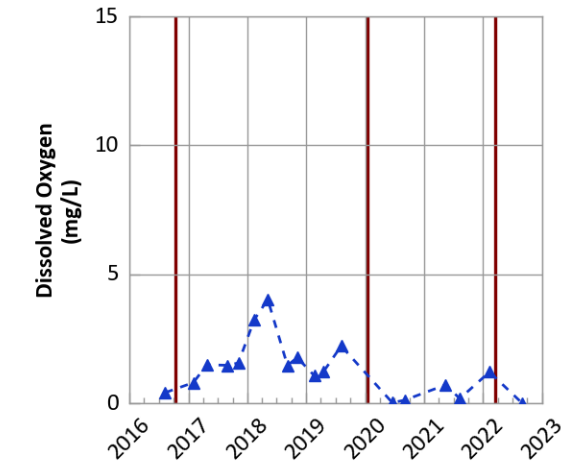


Typical Baseline Concentrations in Perched Groundwater
 Dissolved Oxygen: 5-10 mg/L
 Redox Potential: > 100 mV
 Nitrate: > 1 mg/L
 Sulfate: > 10 mg/L
 Total Organic Carbon: < 5 mg/L
 Total Volatile Fatty Acids: Not Detected

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



PTX06-ISB046 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant



Typical Baseline Concentrations in Perched Groundwater

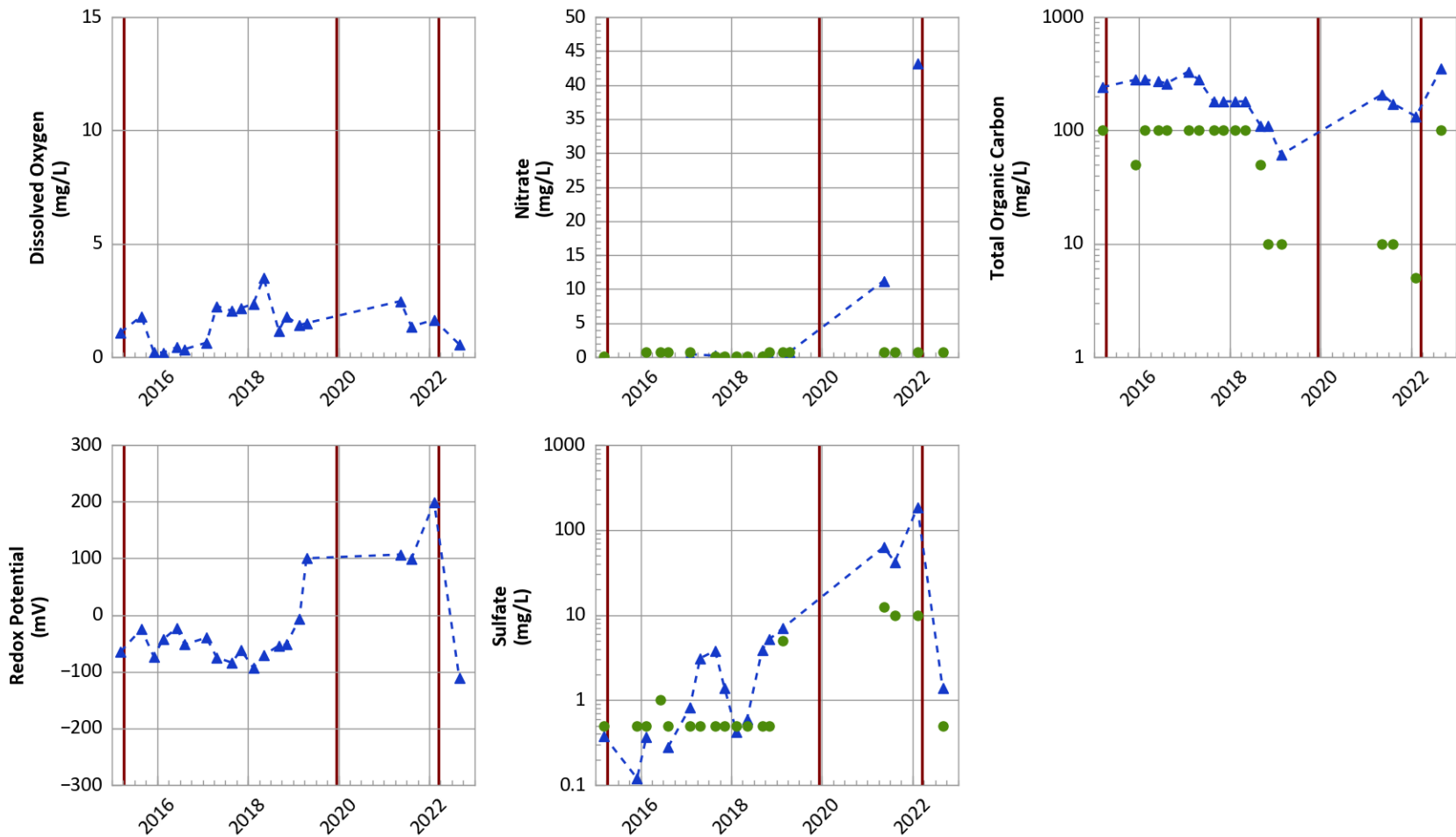
- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

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



Southeast ISB

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



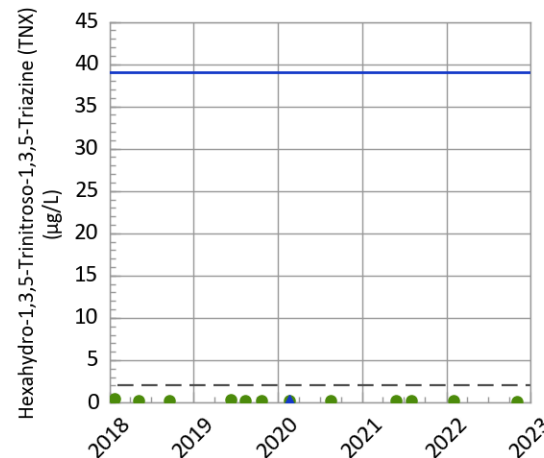
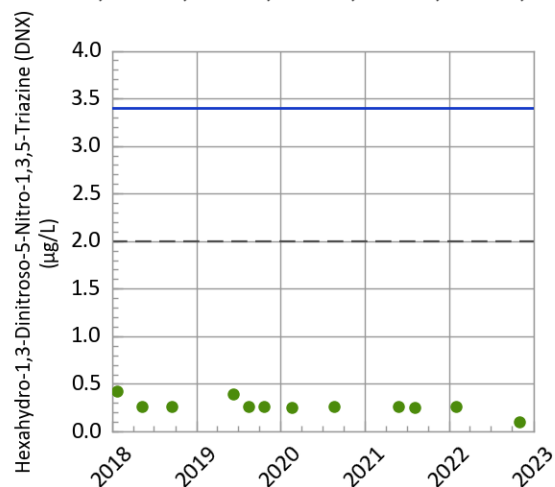
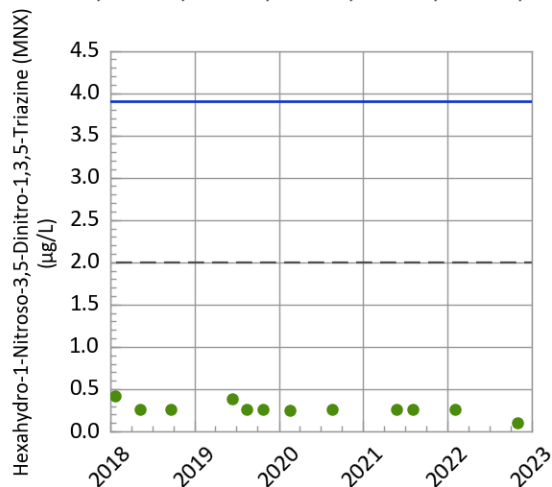
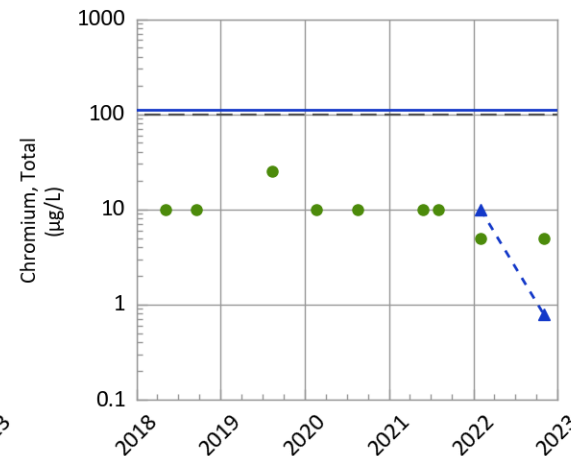
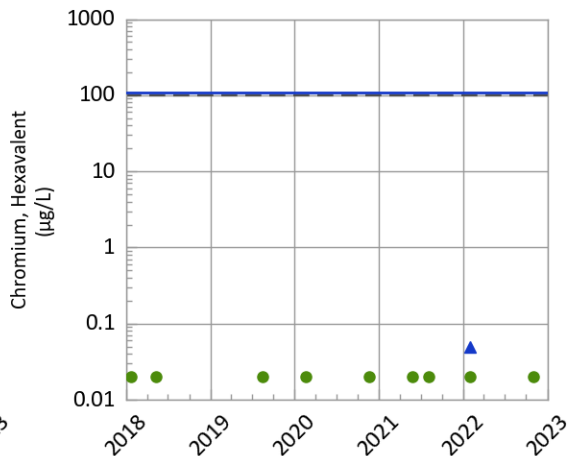
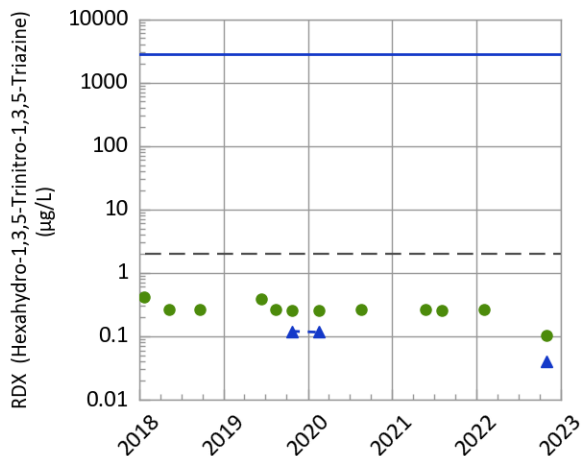
Typical Baseline Concentrations in Perched Groundwater

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**



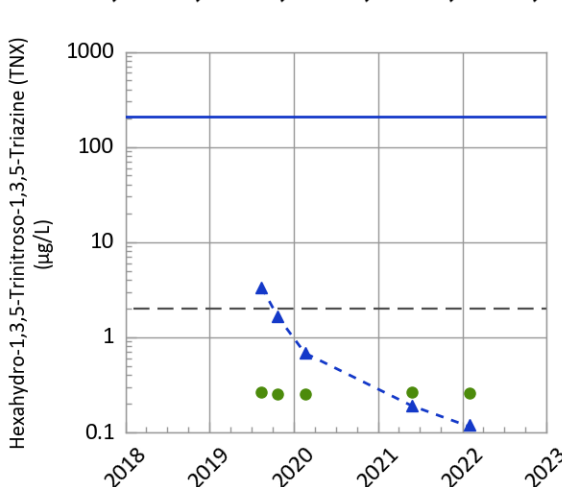
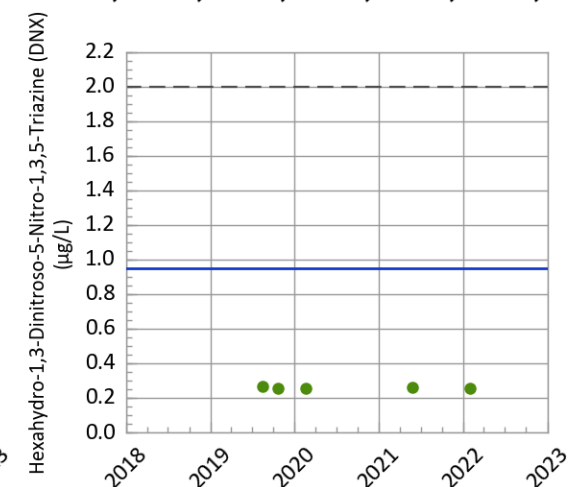
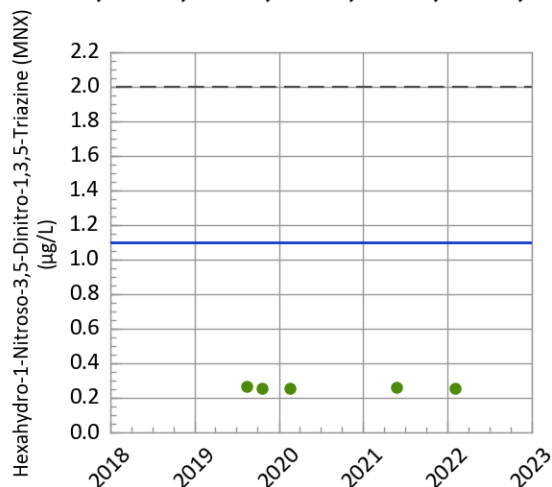
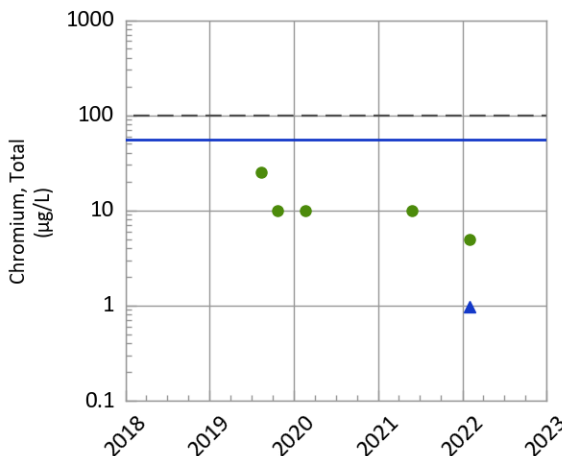
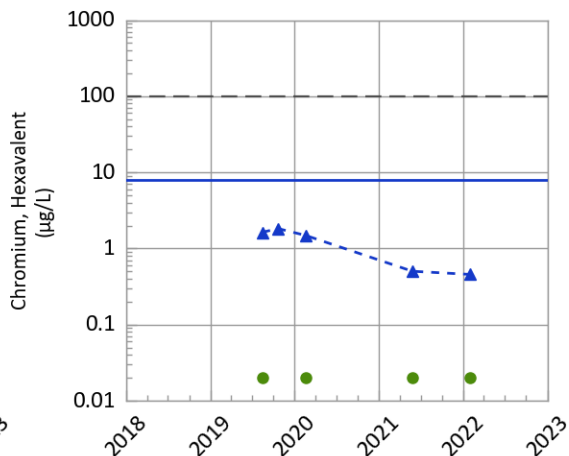
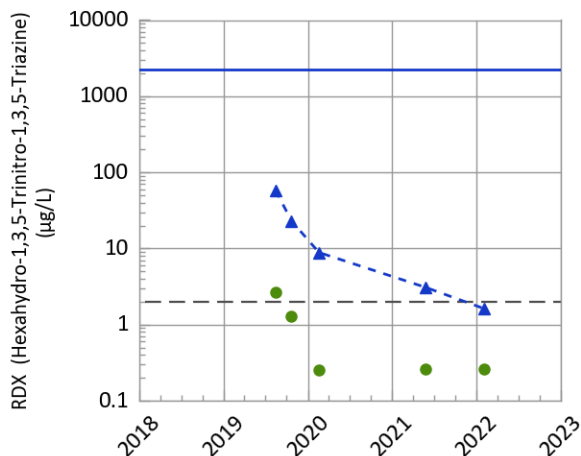
Most Recent Measured COC Concentrations (Feb 18, 2020)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|------|----------------------|-------------|
| RDX | 0.04 | 2.0 |
| MNX | Non-Detect | 2.0 |
| CR-6 | Non-Detect | 100.0 |
| DNX | Non-Detect | 2.0 |
| CR | 0.79 | 100.0 |
| TNX | Non-Detect | 2.0 |

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



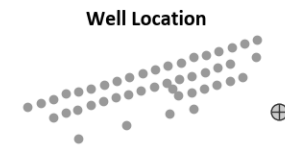
**PTX06-1045 Downgradient Performance Indicators
Southeast In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



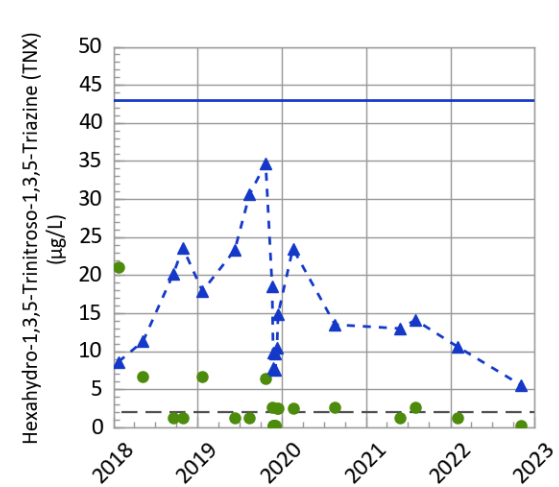
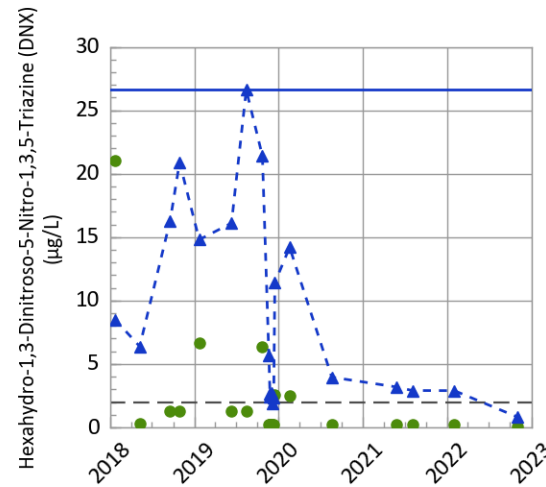
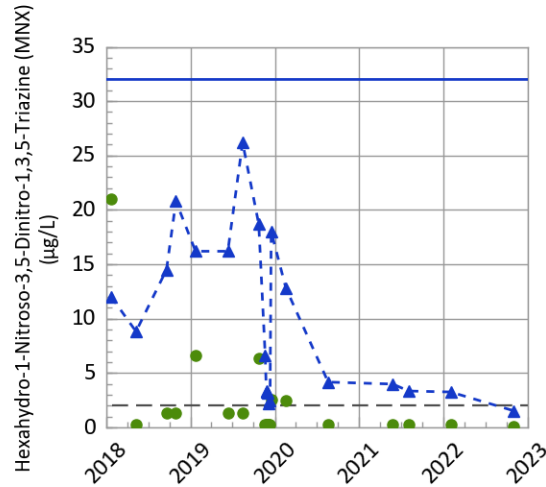
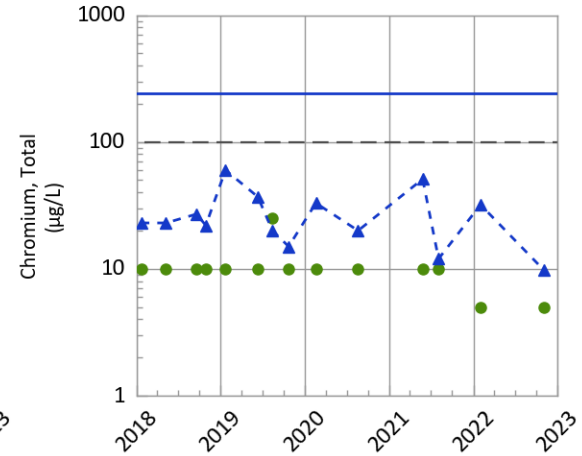
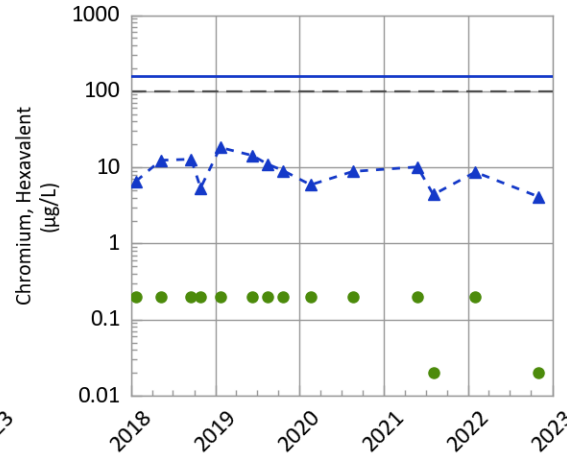
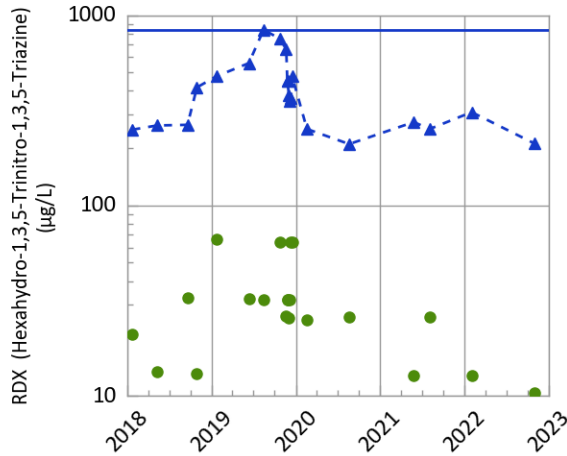
Most Recent Measured COC Concentrations (Feb 01, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|------|----------------------|-------------|
| RDX | 1.63 | 2.0 |
| MNX | Non-Detect | 2.0 |
| CR-6 | 0.46 | 100.0 |
| DNX | Non-Detect | 2.0 |
| CR | 0.97 | 100.0 |
| TNX | 0.12 | 2.0 |

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



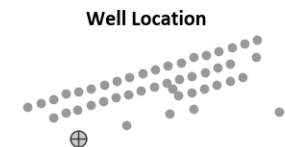
**PTX06-1153 Downgradient Performance Indicators
Southeast In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



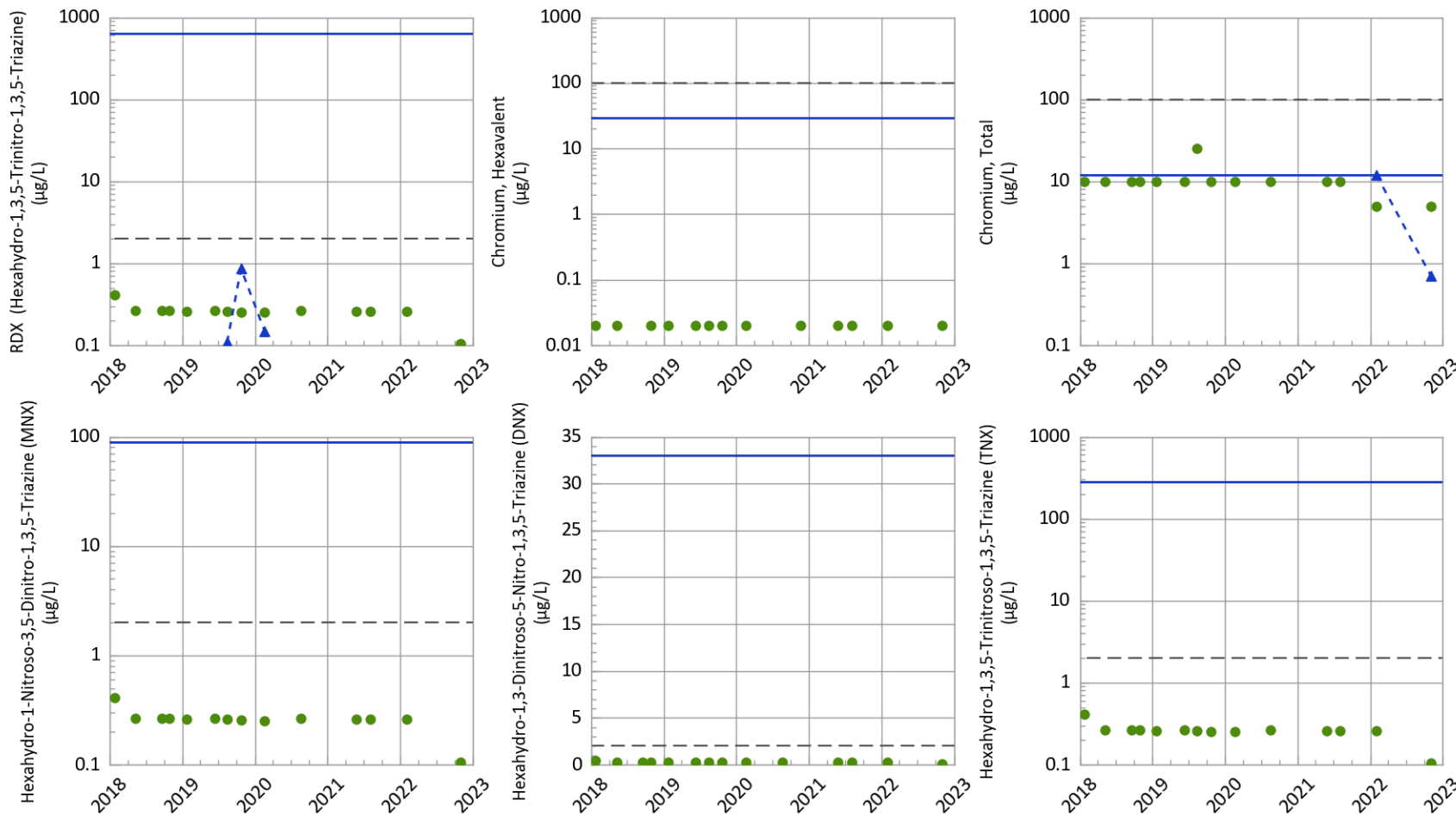
Most Recent Measured COC Concentrations (Nov 02, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|------|----------------------|-------------|
| RDX | 211.0 | 2.0 |
| MNX | 1.53 | 2.0 |
| CR-6 | 4.12 | 100.0 |
| DNX | 0.82 | 2.0 |
| CR | 9.8 | 100.0 |
| TNX | 5.58 | 2.0 |

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



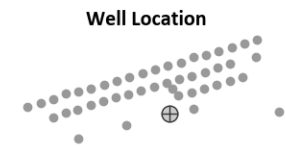
**PTX06-1154 Downgradient Performance Indicators
Southeast In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Nov 02, 2022)

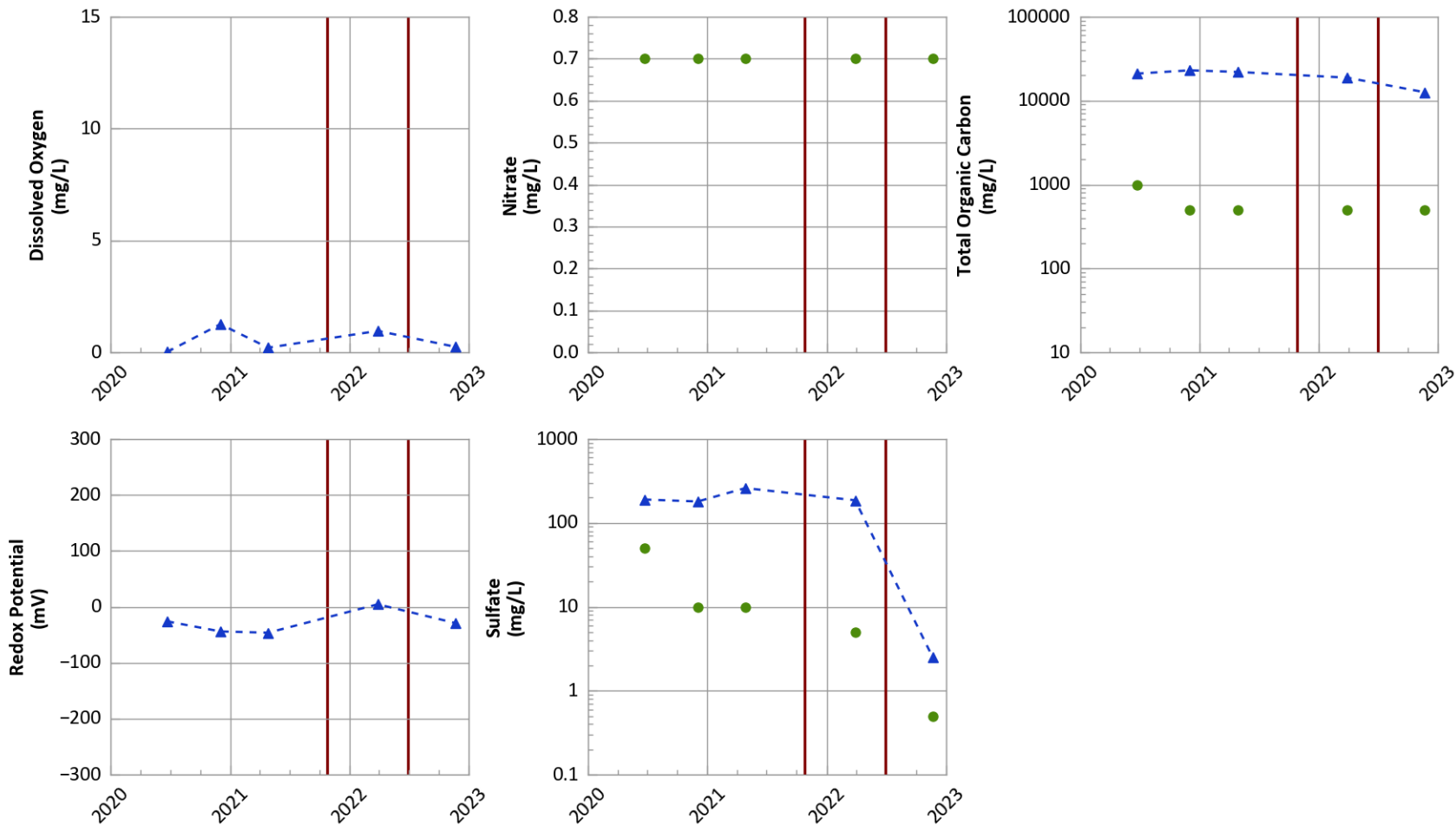
| COC | Concentration ($\mu\text{g/L}$) | GWPS ($\mu\text{g/L}$) |
|------|-----------------------------------|--------------------------|
| RDX | Non-Detect | 2.0 |
| MNX | Non-Detect | 2.0 |
| CR-6 | Non-Detect | 100.0 |
| DNX | Non-Detect | 2.0 |
| CR | 0.71 | 100.0 |
| TNX | Non-Detect | 2.0 |

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



Zone 11 ISB Graphs

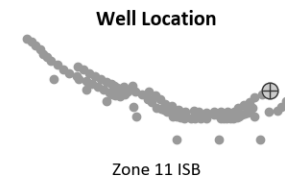
PTX06-ISB055 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant



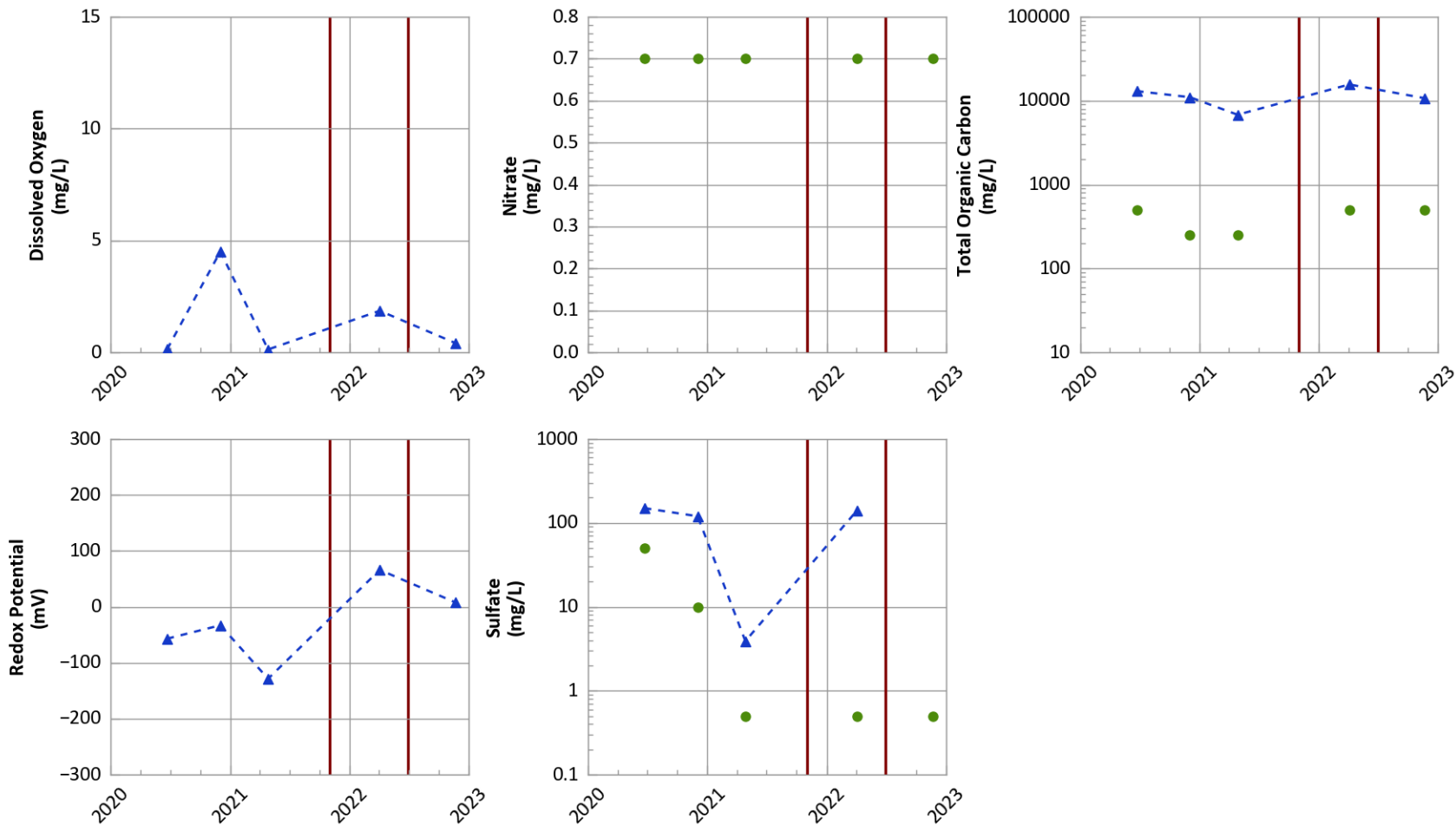
Typical Baseline Concentrations in Perched Groundwater

- 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



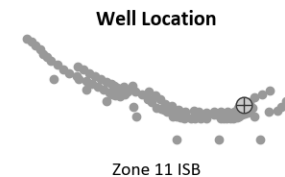
PTX06-ISB059 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant



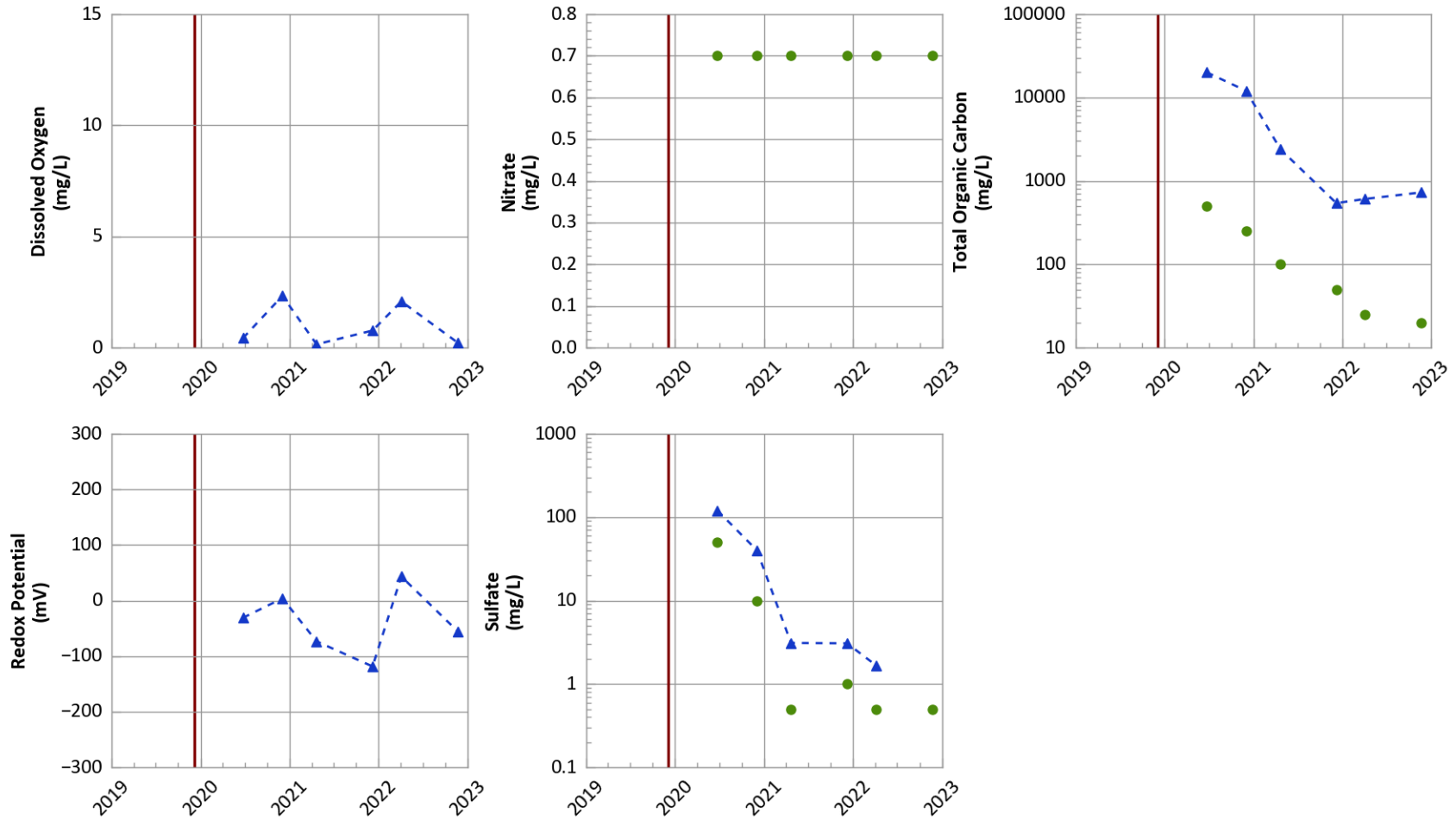
Typical Baseline Concentrations in Perched Groundwater

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



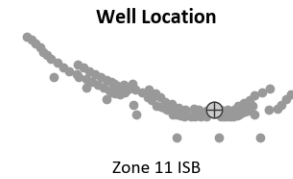
PTX06-ISB064 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant



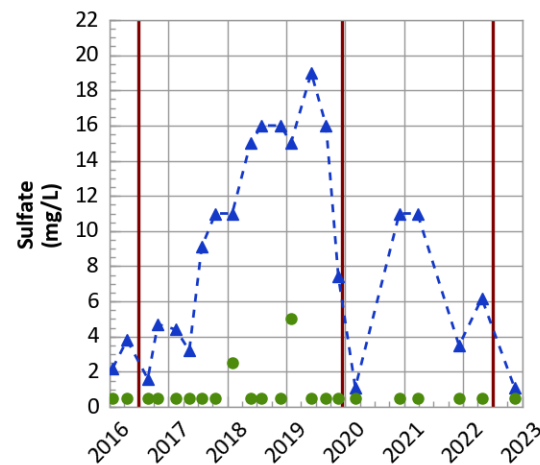
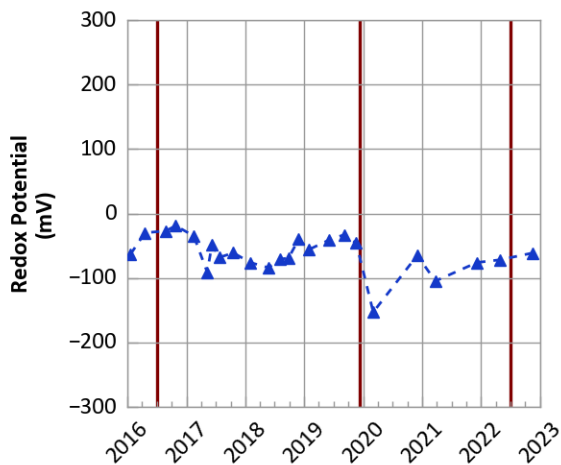
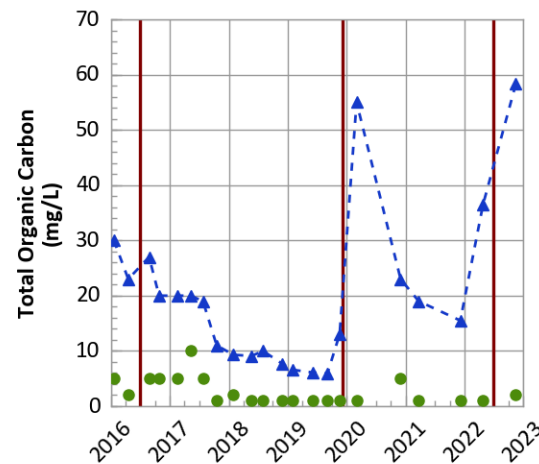
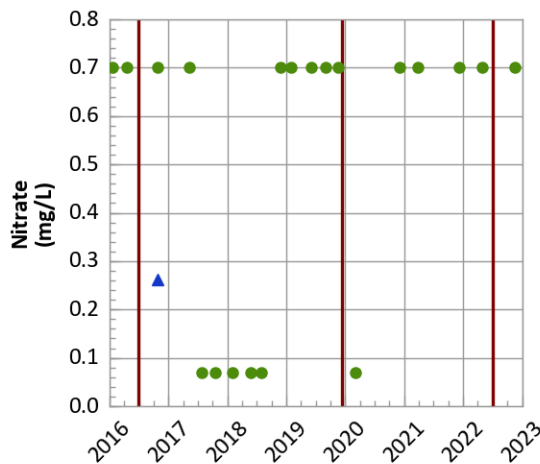
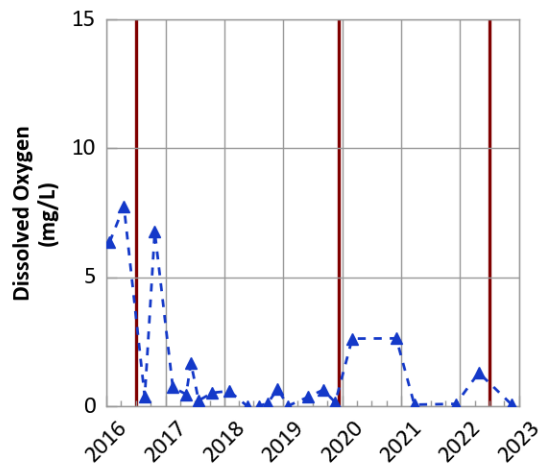
Typical Baseline Concentrations in Perched Groundwater

- 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



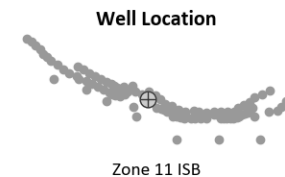
PTX06-ISB075 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant



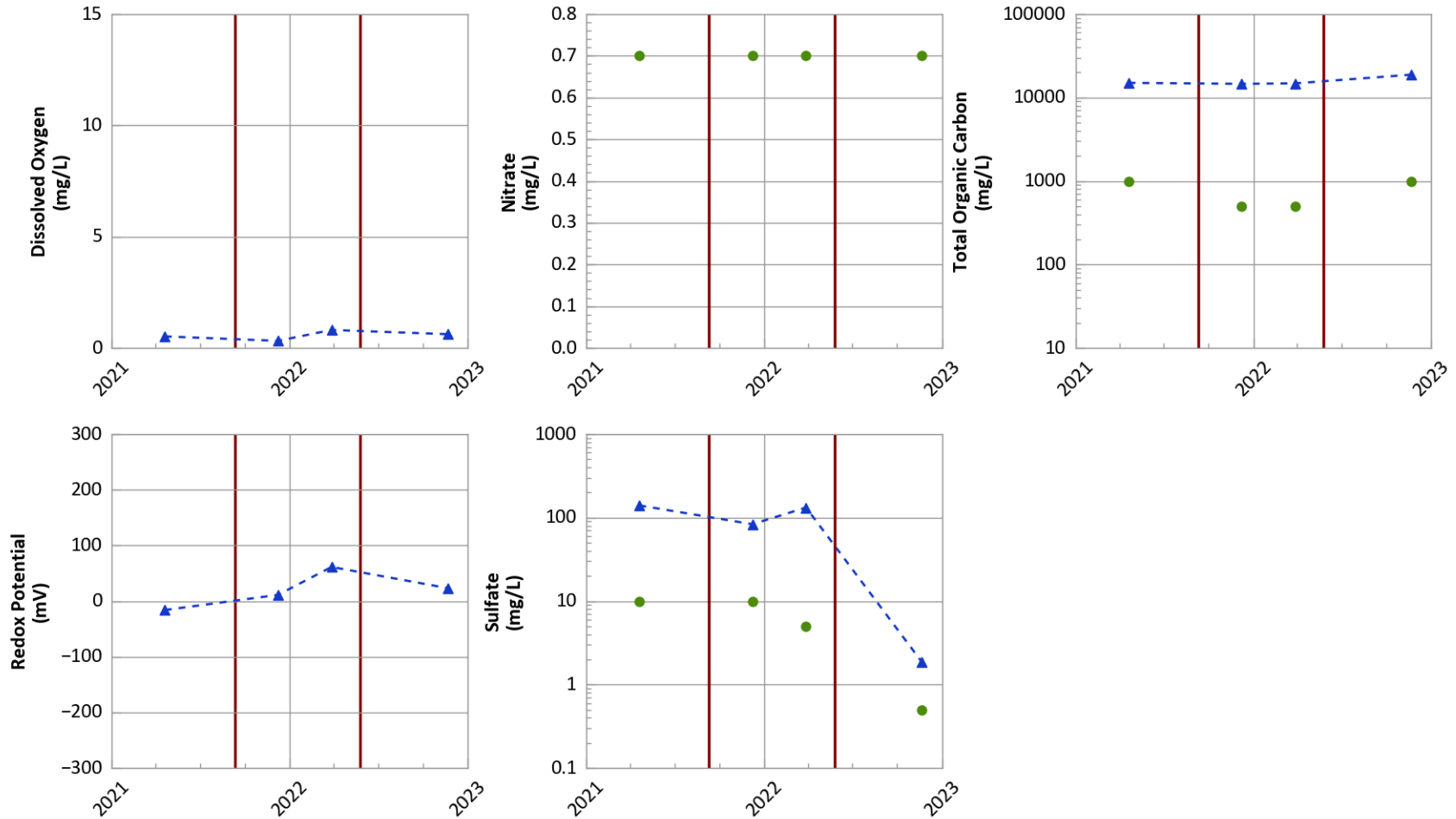
Typical Baseline Concentrations in Perched Groundwater

- 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



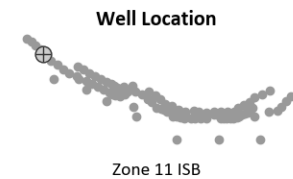
**PTX06-ISB133 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



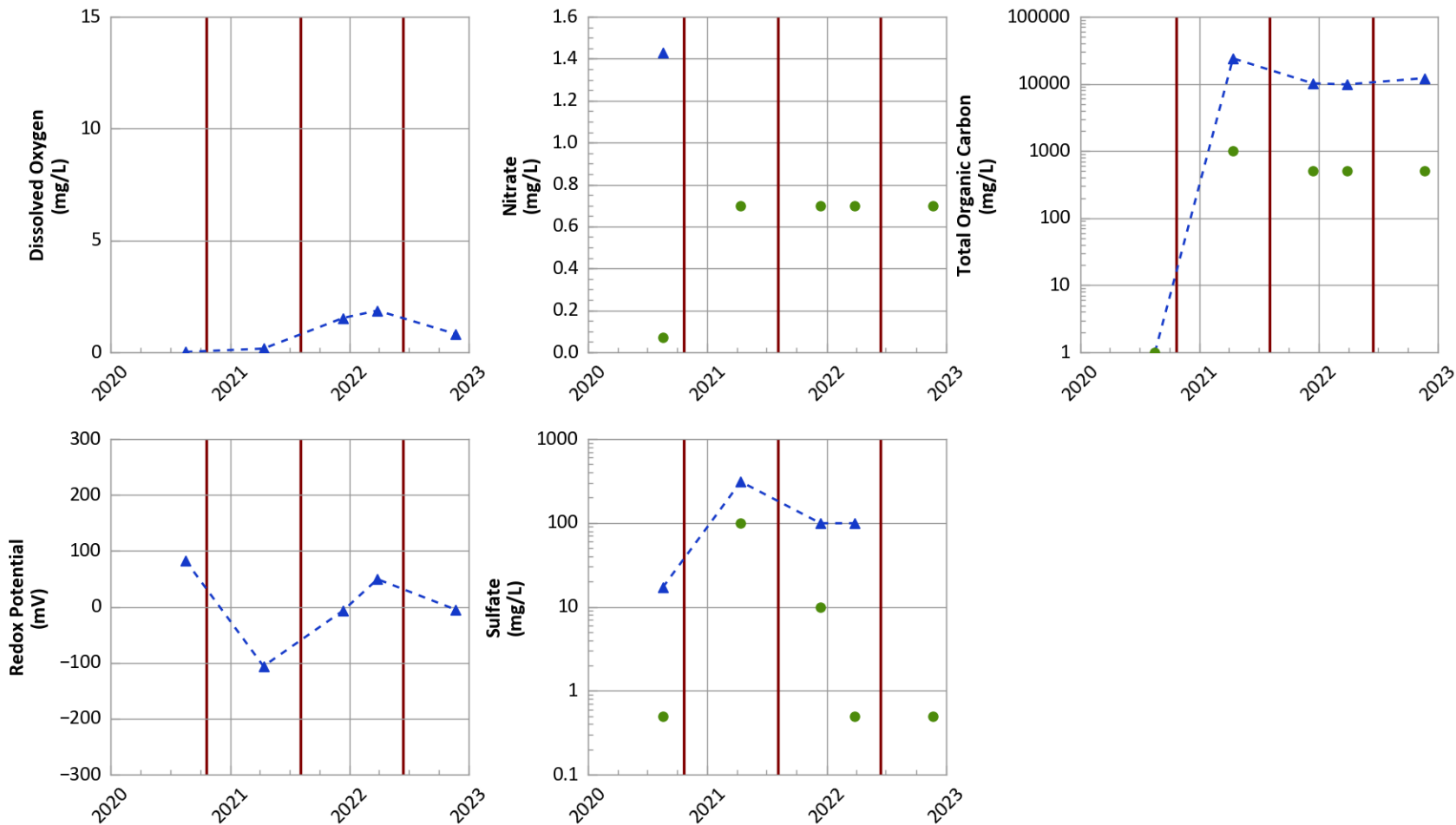
Typical Baseline Concentrations in Perched Groundwater

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



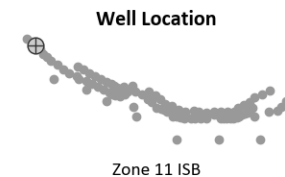
PTX06-ISB135 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant



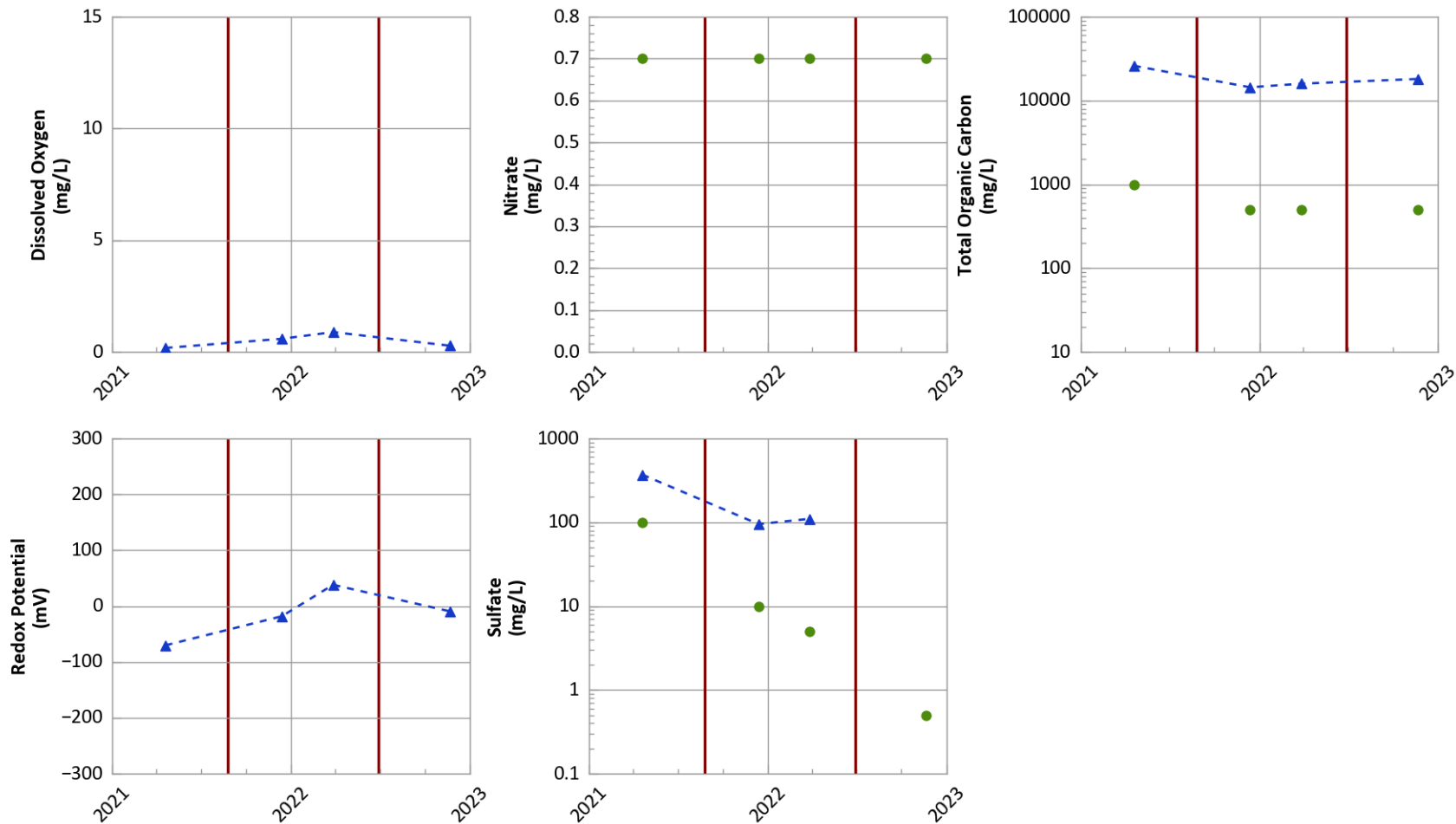
Typical Baseline Concentrations in Perched Groundwater

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



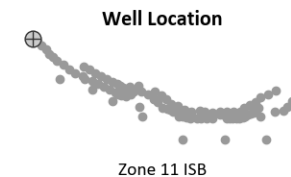
PTX06-ISB137 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant



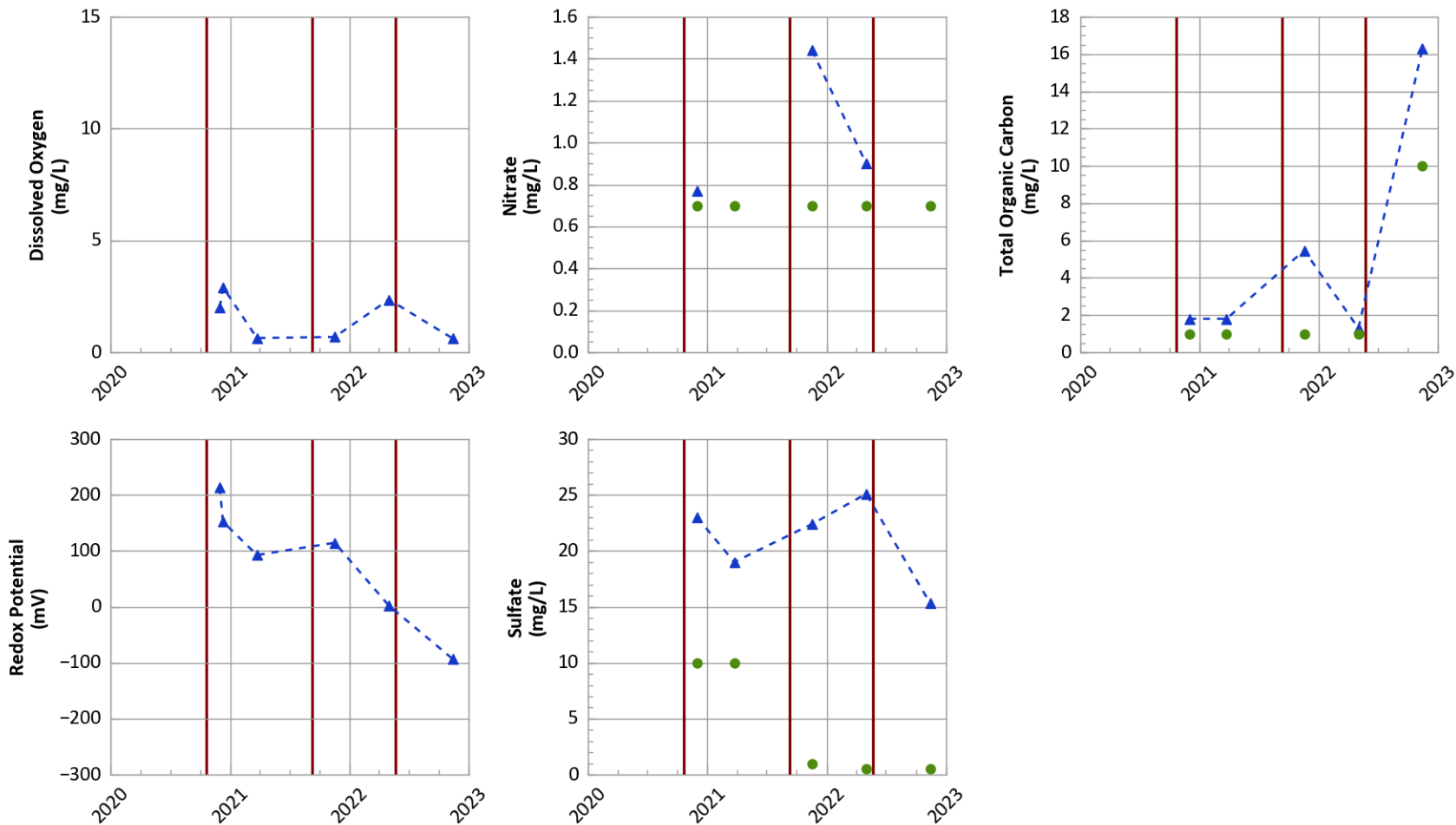
Typical Baseline Concentrations in Perched Groundwater

- 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



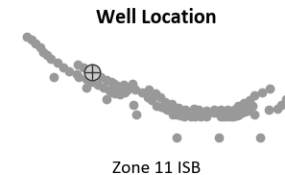
**PTX06-1164 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



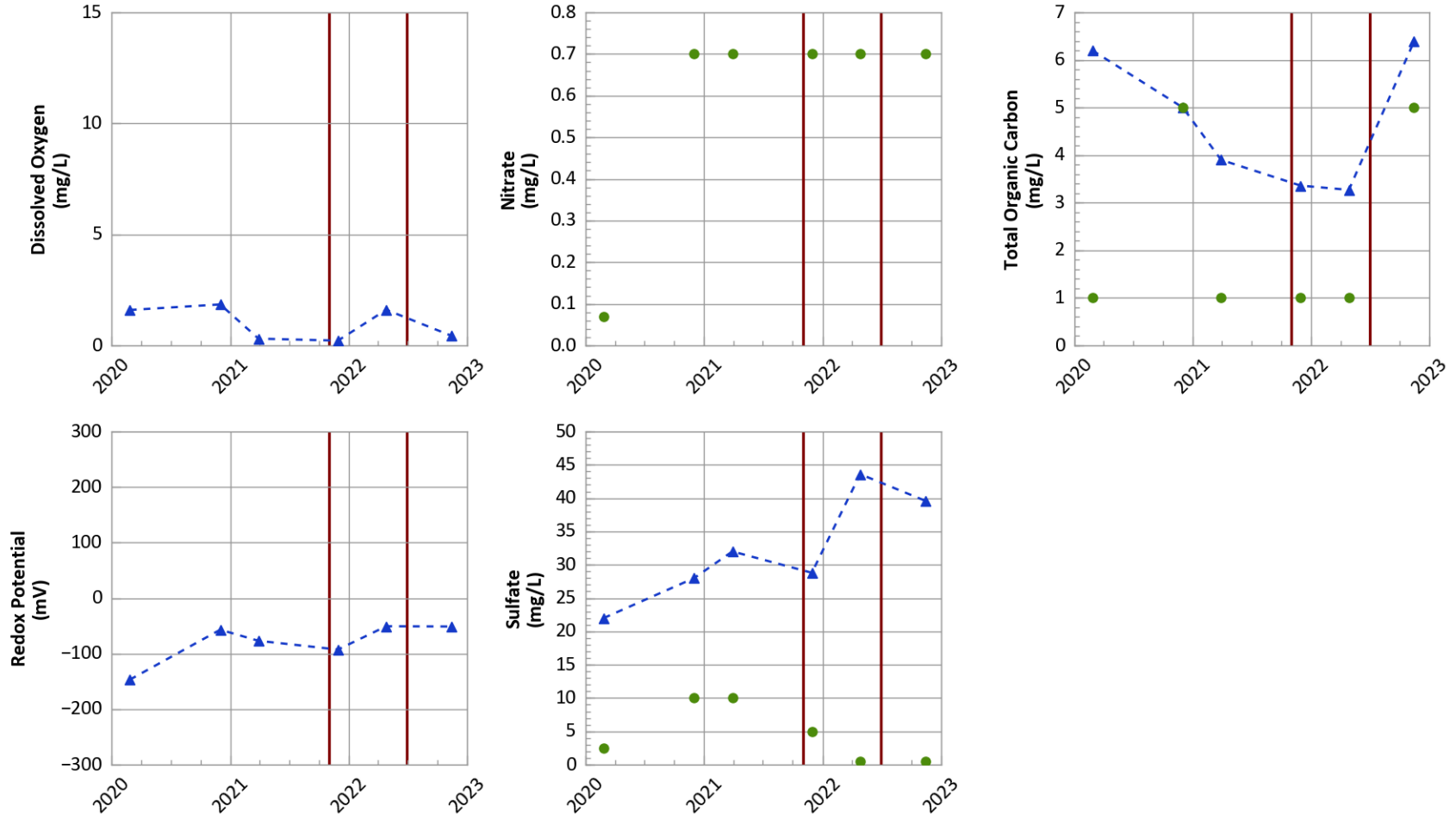
Typical Baseline Concentrations in Perched Groundwater

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



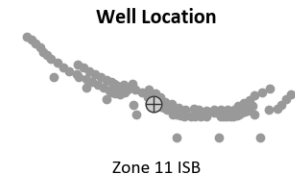
**PTX06-1169 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



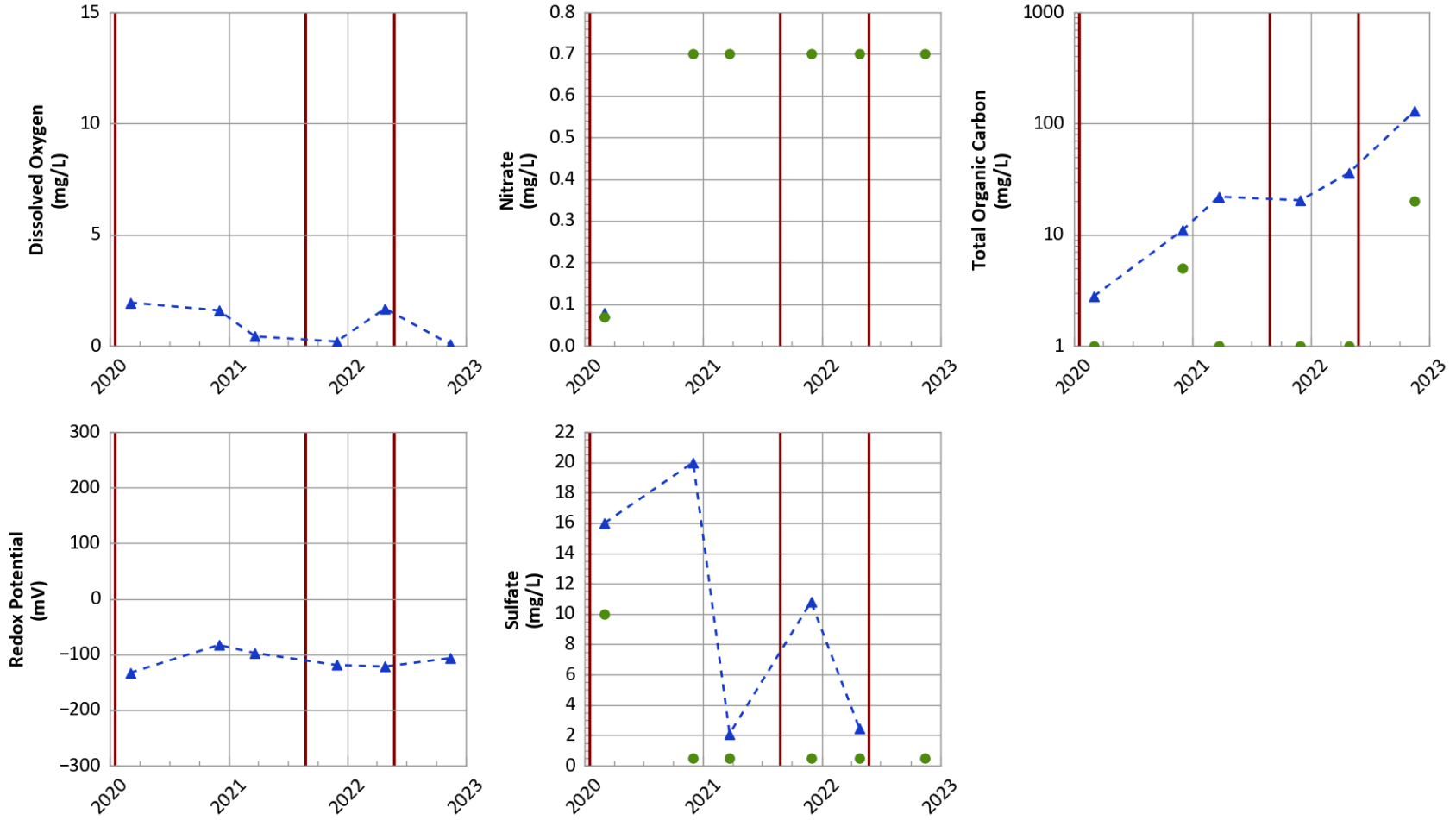
Typical Baseline Concentrations in Perched Groundwater

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



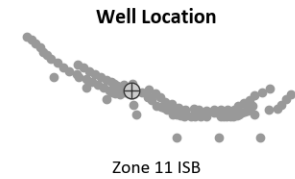
**PTX06-1170 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



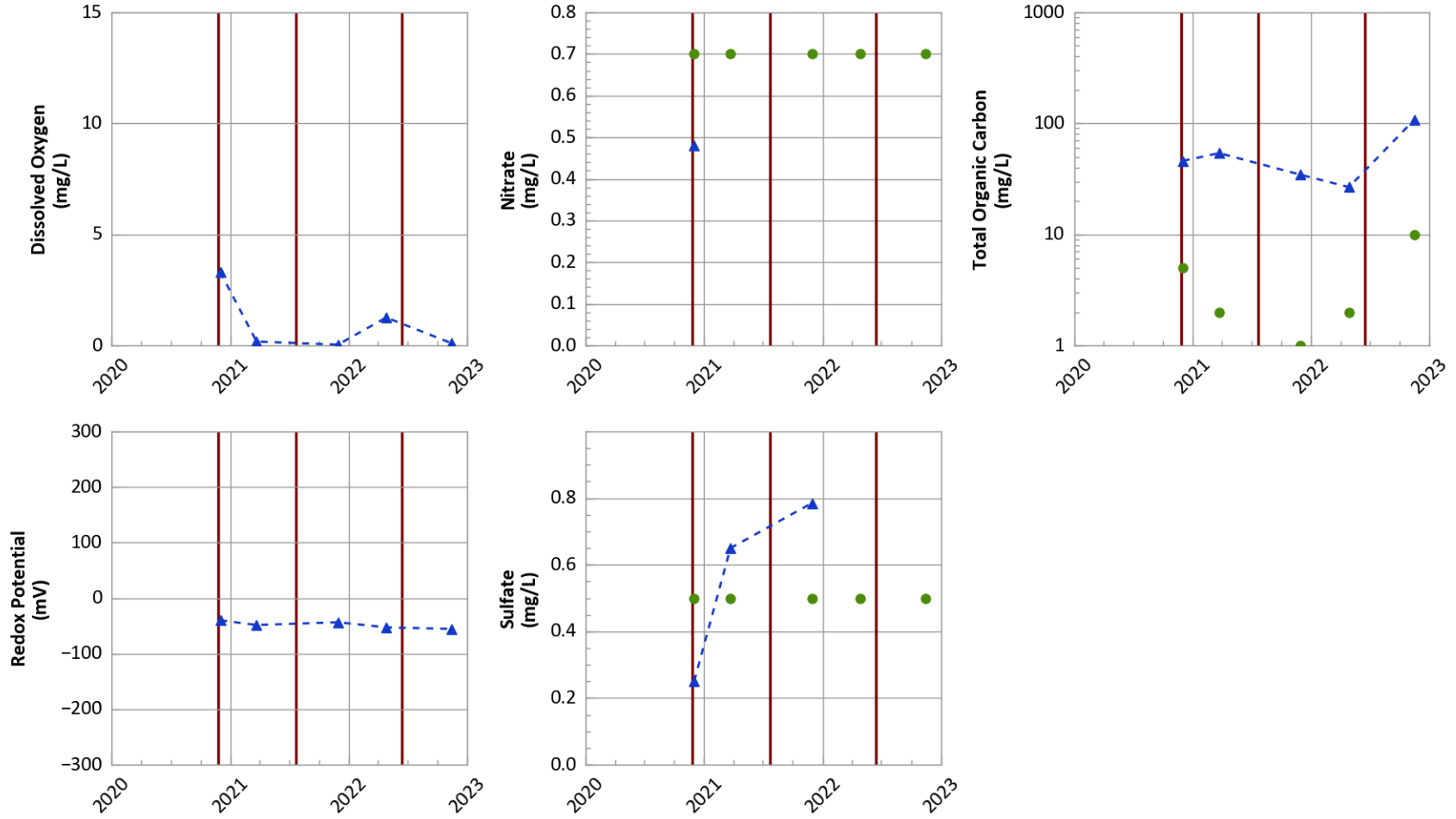
Typical Baseline Concentrations in Perched Groundwater

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



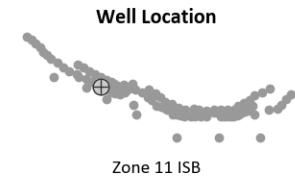
**PTX06-1176 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



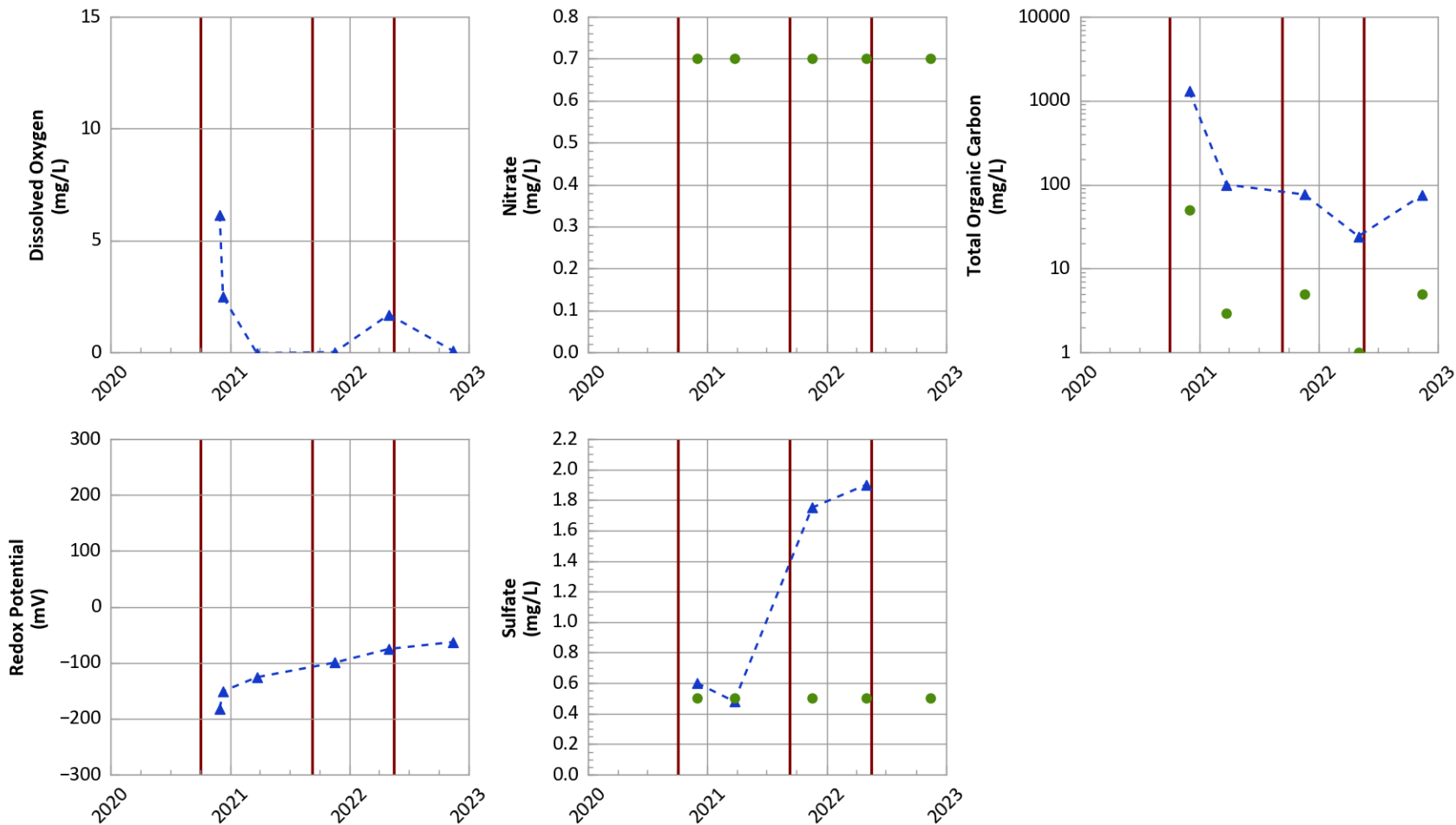
Typical Baseline Concentrations in Perched Groundwater

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



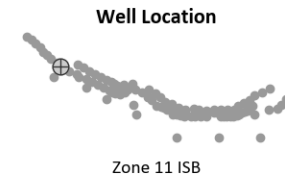
**PTX06-1177 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



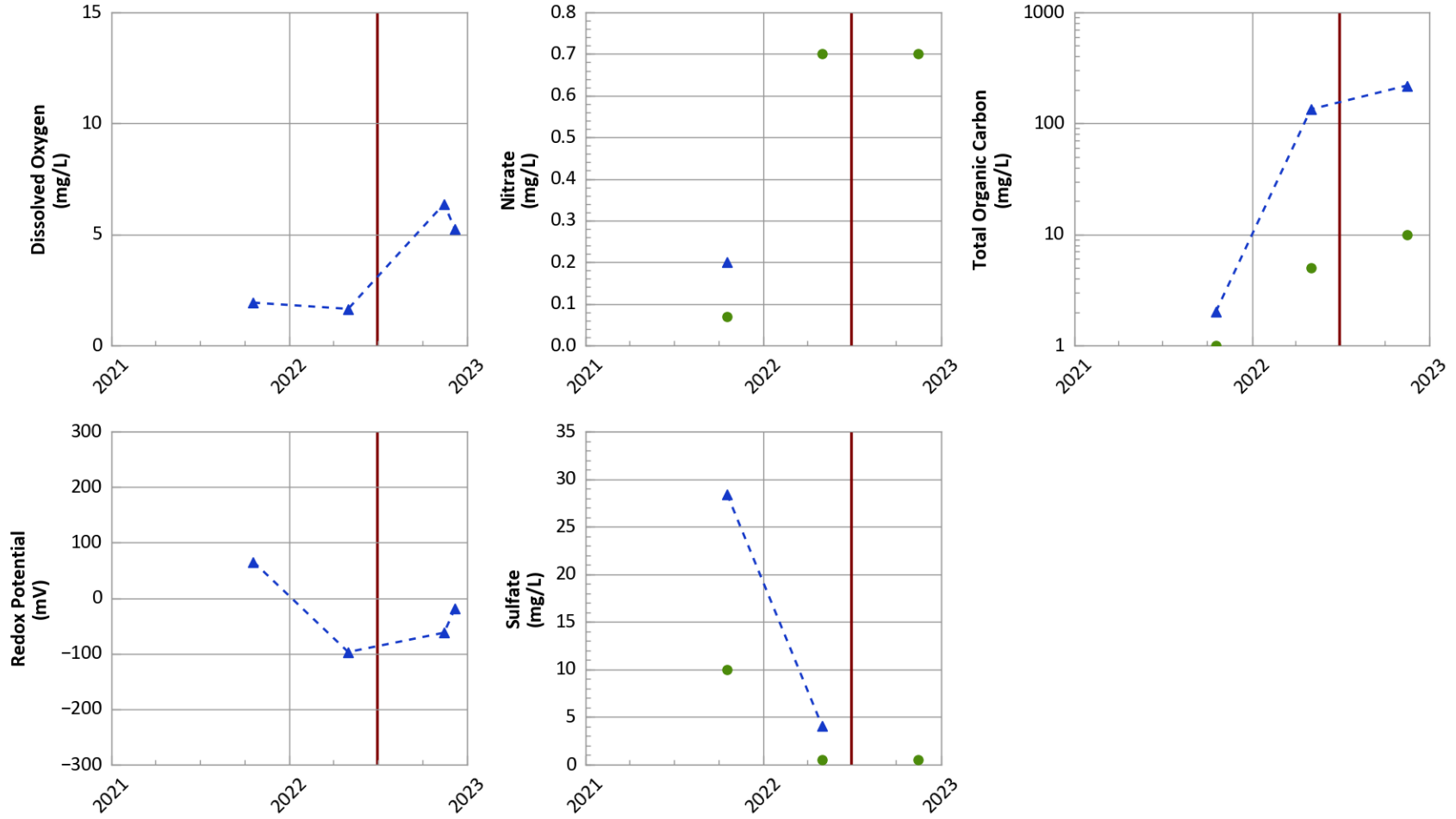
Typical Baseline Concentrations in Perched Groundwater

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



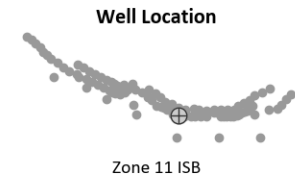
**PTX06-1209 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



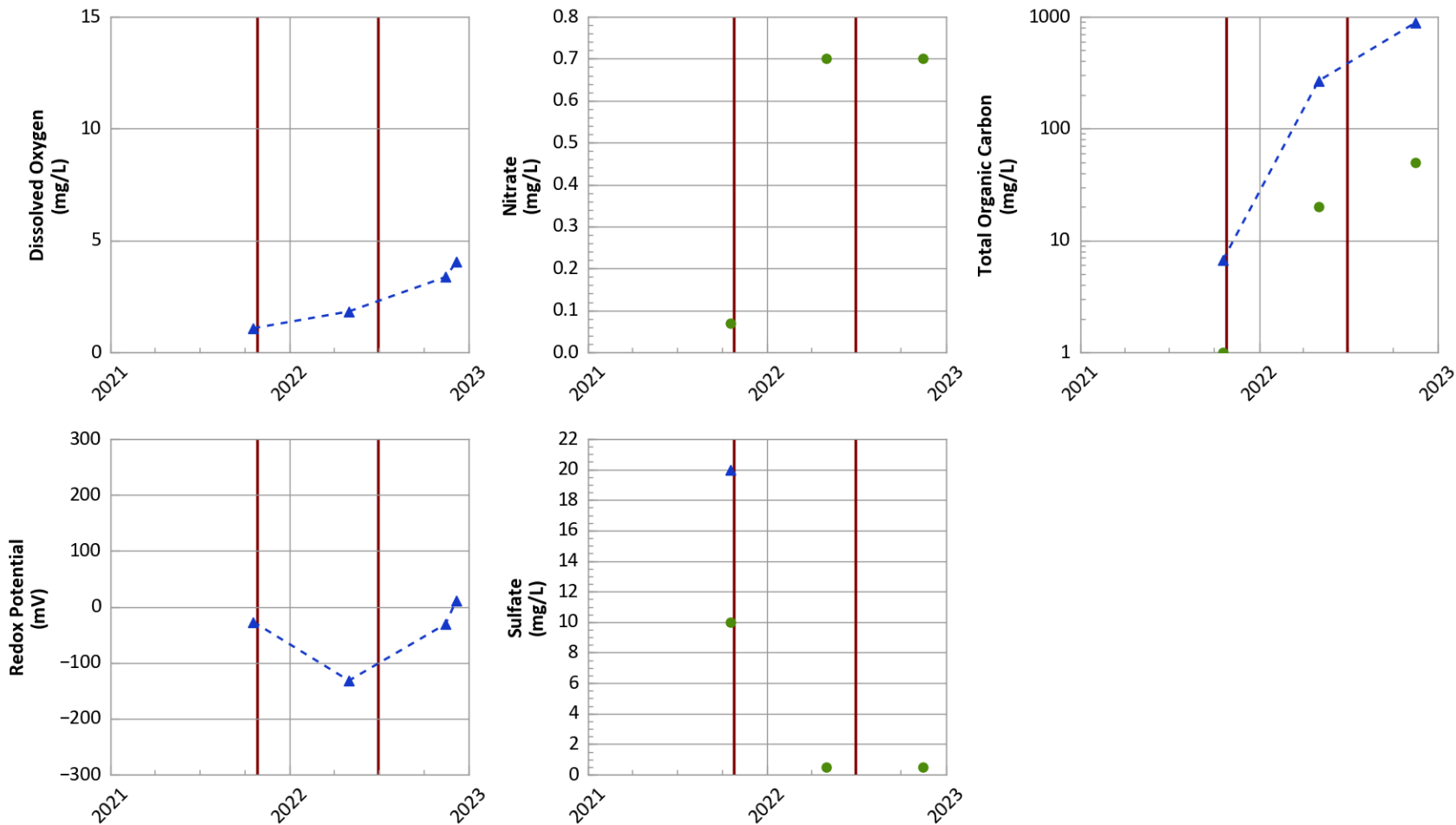
Typical Baseline Concentrations in Perched Groundwater

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



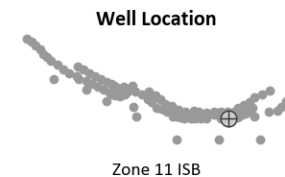
**PTX06-1210 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



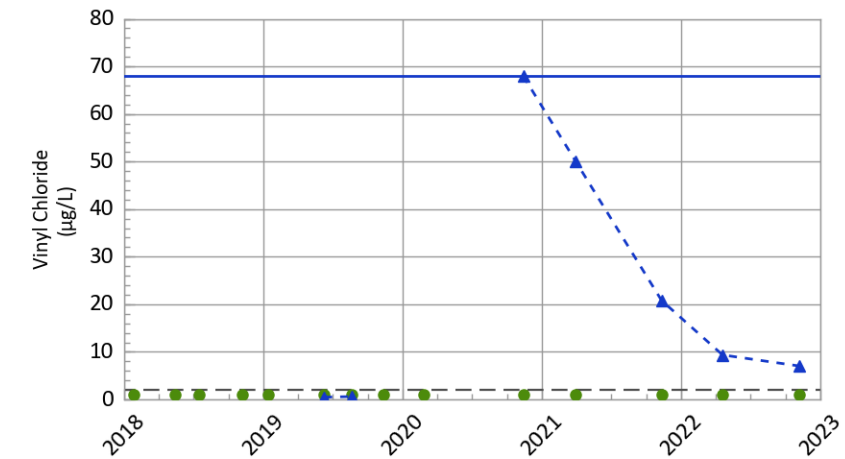
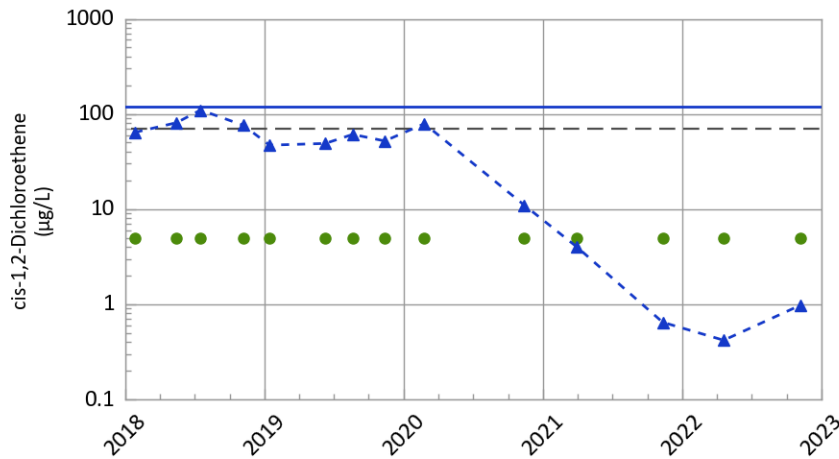
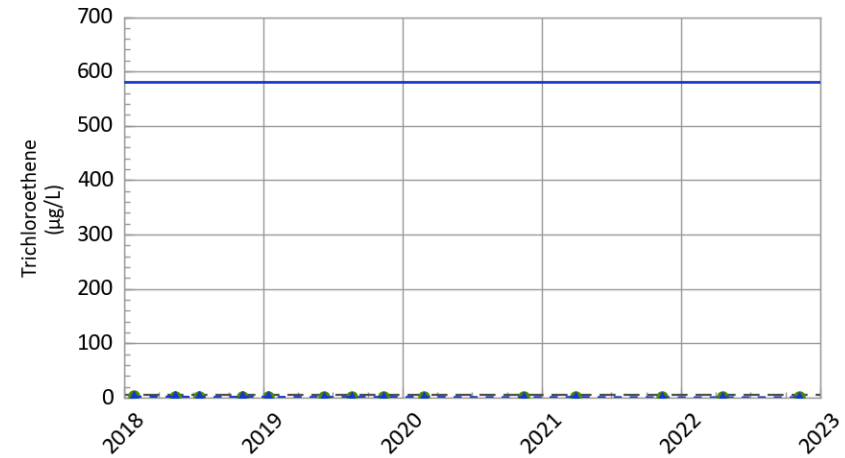
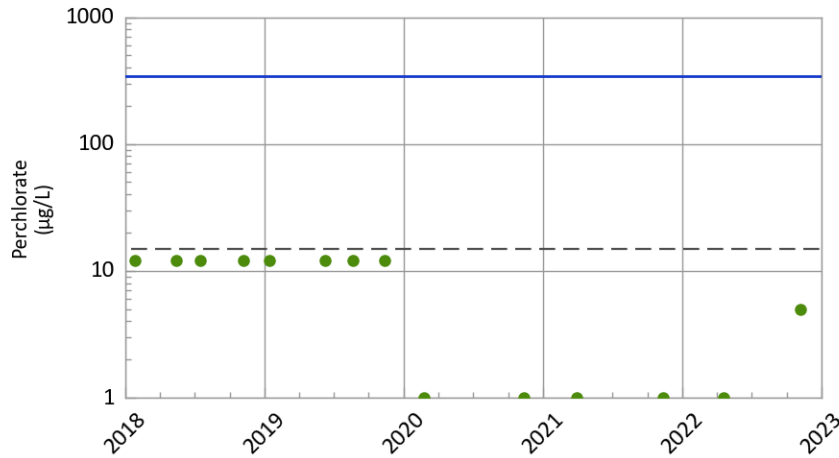
Typical Baseline Concentrations in Perched Groundwater

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



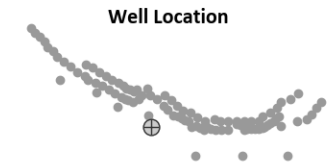
**PTX06-1012 Downgradient Performance Indicators
Zone 11 In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



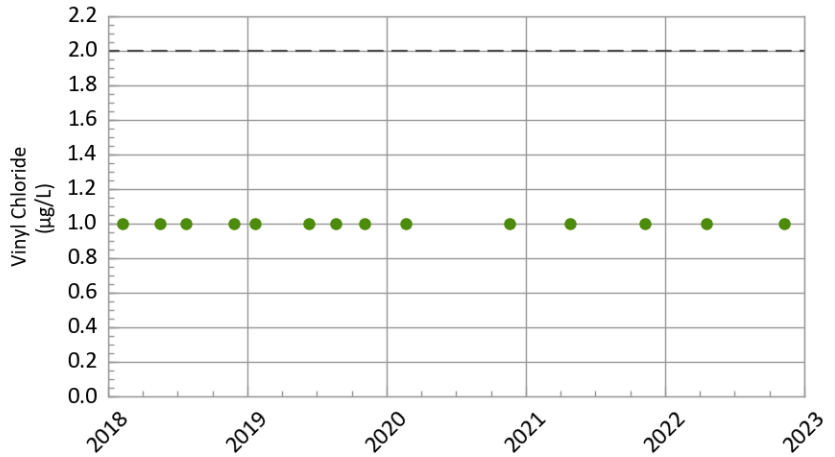
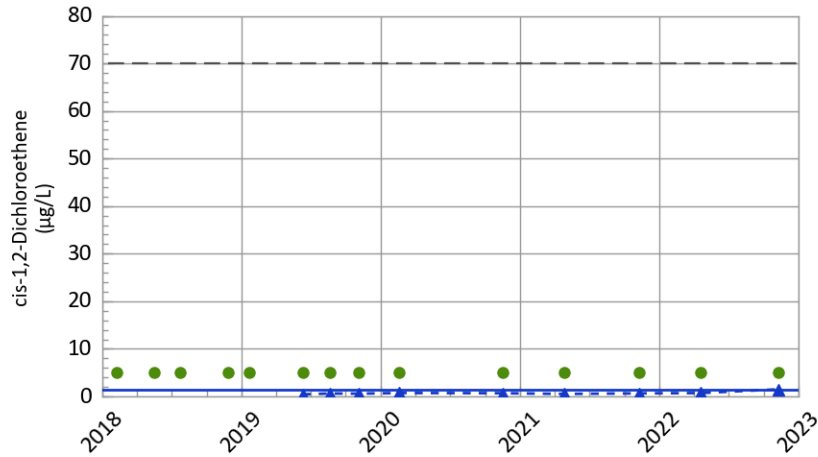
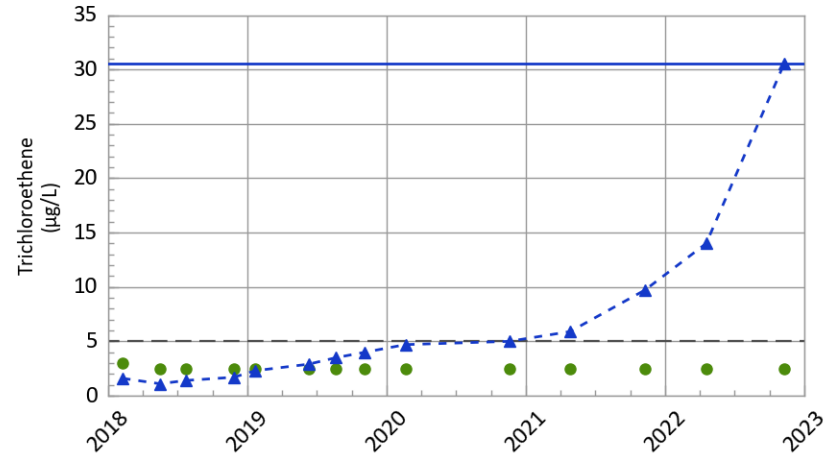
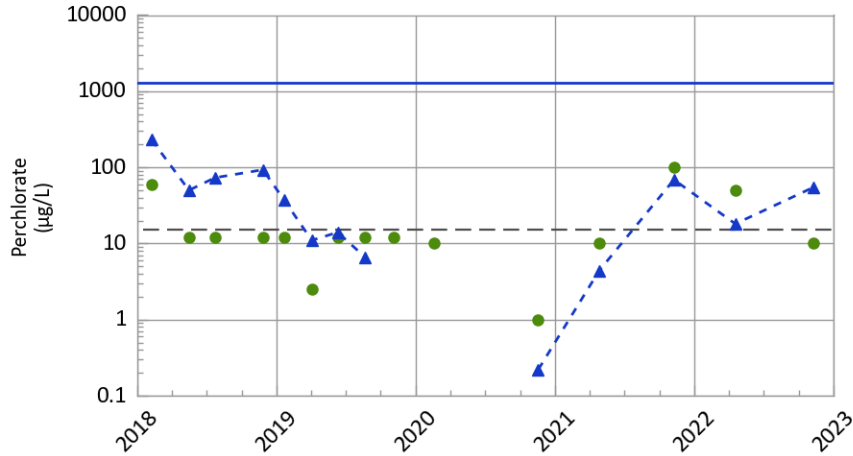
Most Recent Measured COC Concentrations (Nov 07, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|--------|----------------------|-------------|
| PERC | Non-Detect | 15.0 |
| DCE12C | 0.981 | 70.0 |
| TCE | 0.399 | 5.0 |
| VC | 7.02 | 2.0 |

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



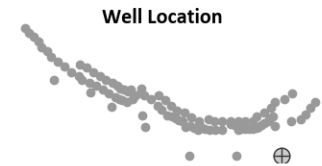
**PTX06-1148 Downgradient Performance Indicators
Zone 11 In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



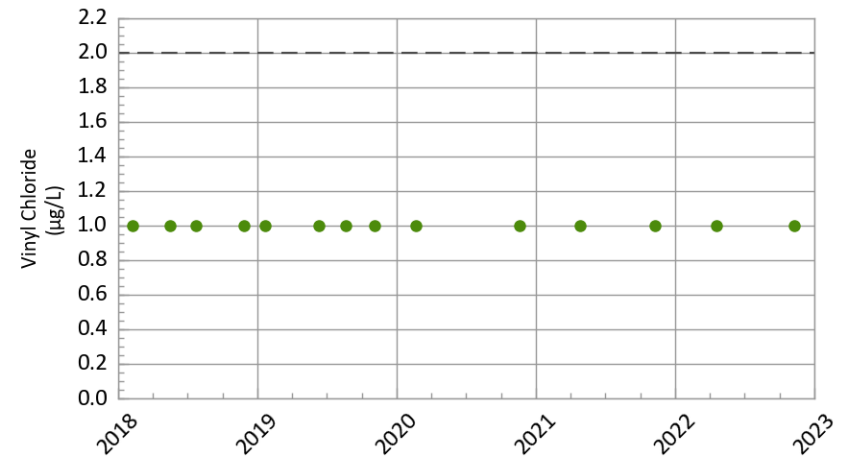
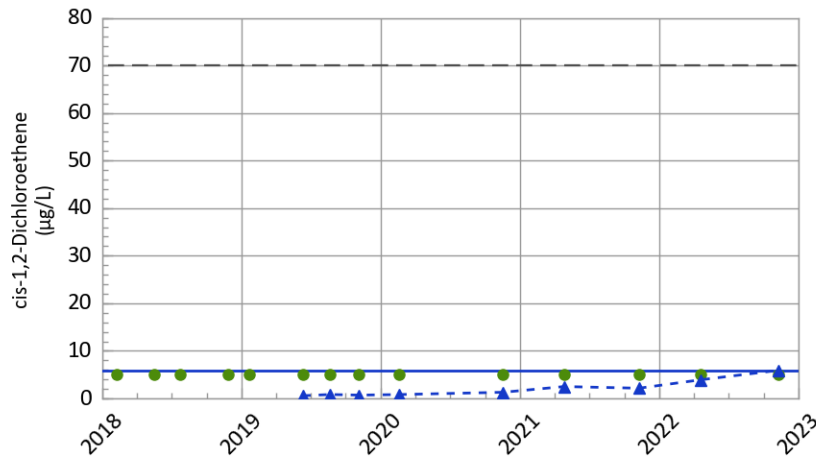
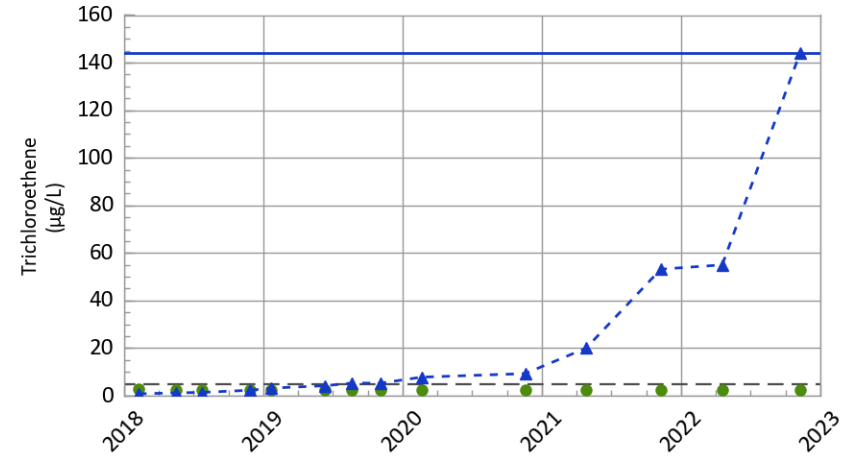
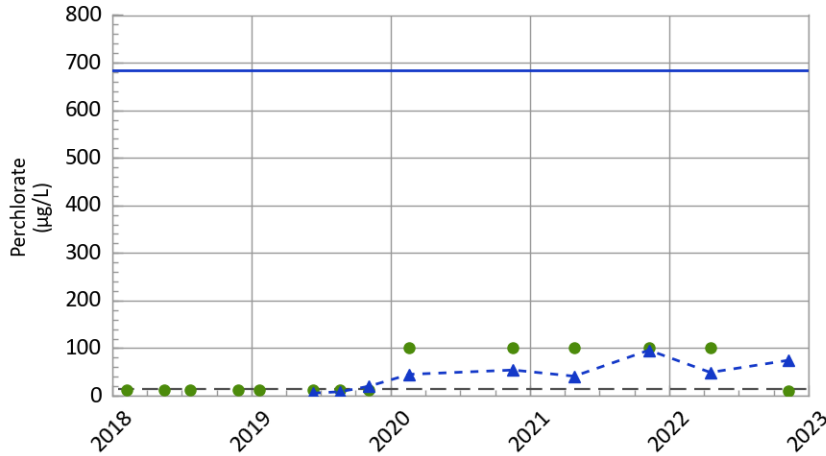
Most Recent Measured COC Concentrations (Nov 08, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|--------|----------------------|-------------|
| PERC | 54.4 | 15.0 |
| DCE12C | 1.5 | 70.0 |
| TCE | 30.5 | 5.0 |
| VC | Non-Detect | 2.0 |

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



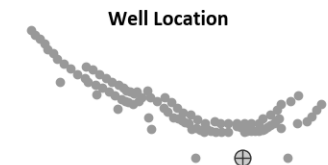
**PTX06-1149 Downgradient Performance Indicators
Zone 11 In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



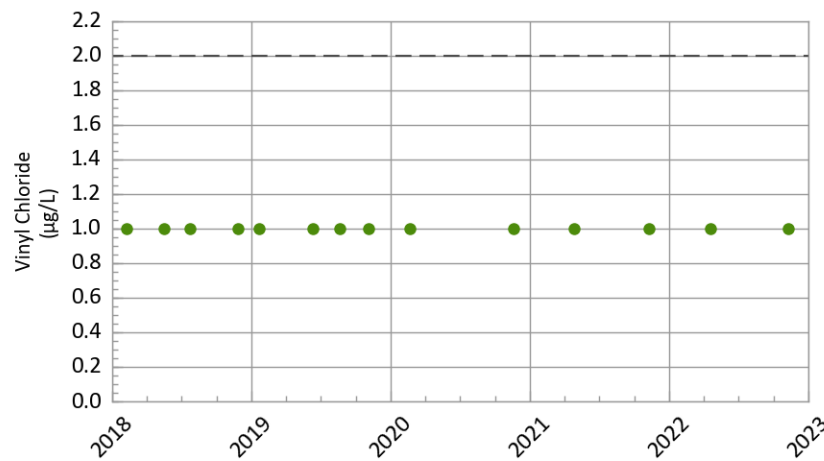
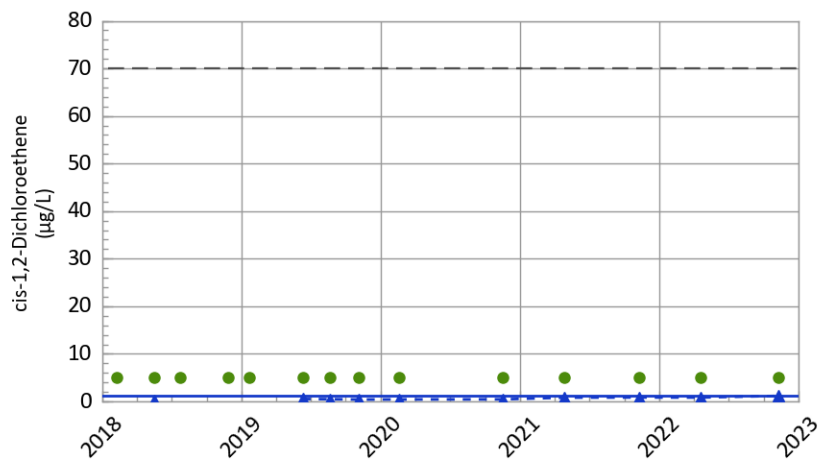
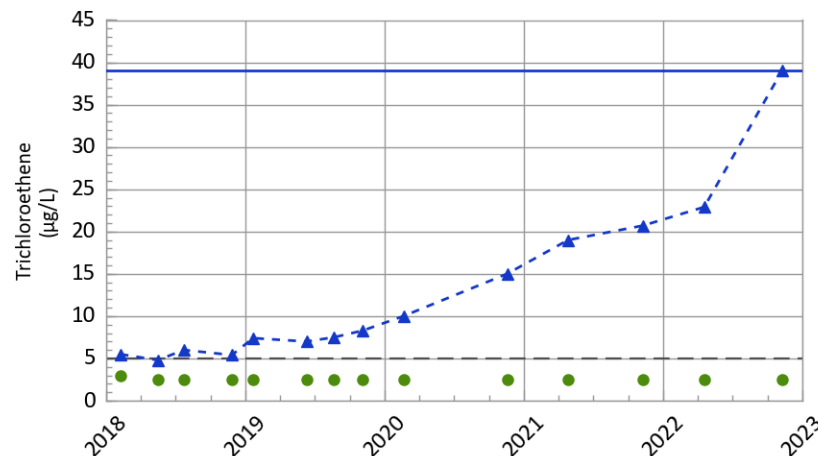
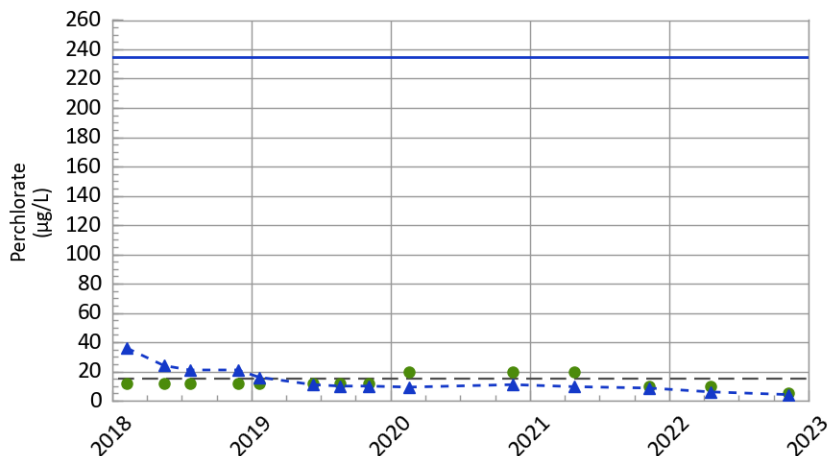
Most Recent Measured COC Concentrations (Nov 08, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|--------|----------------------|-------------|
| PERC | 74.4 | 15.0 |
| DCE12C | 5.9 | 70.0 |
| TCE | 144.0 | 5.0 |
| VC | Non-Detect | 2.0 |

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



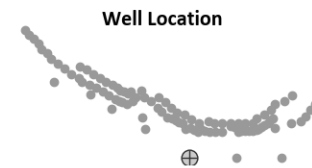
**PTX06-1150 Downgradient Performance Indicators
Zone 11 In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



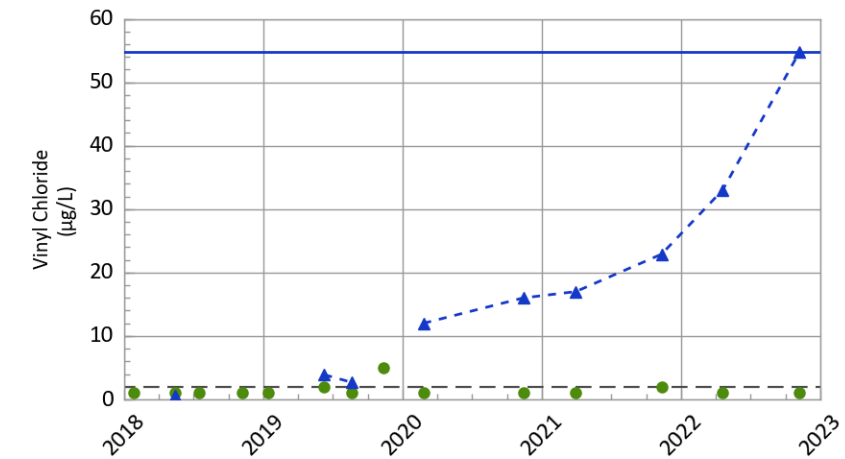
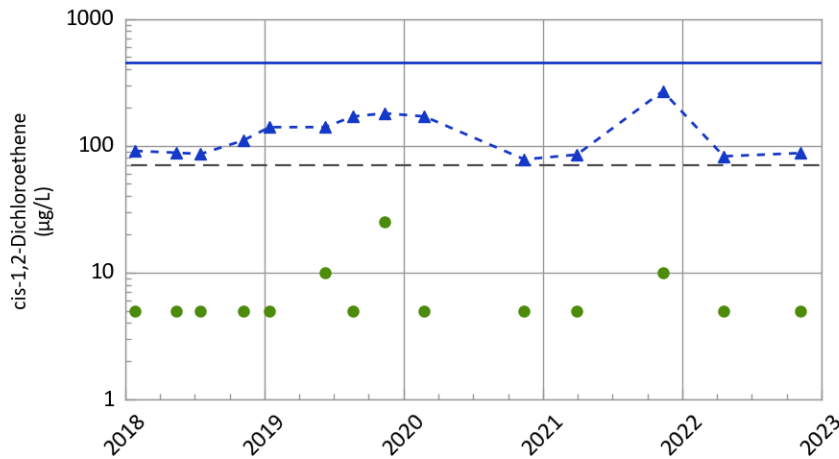
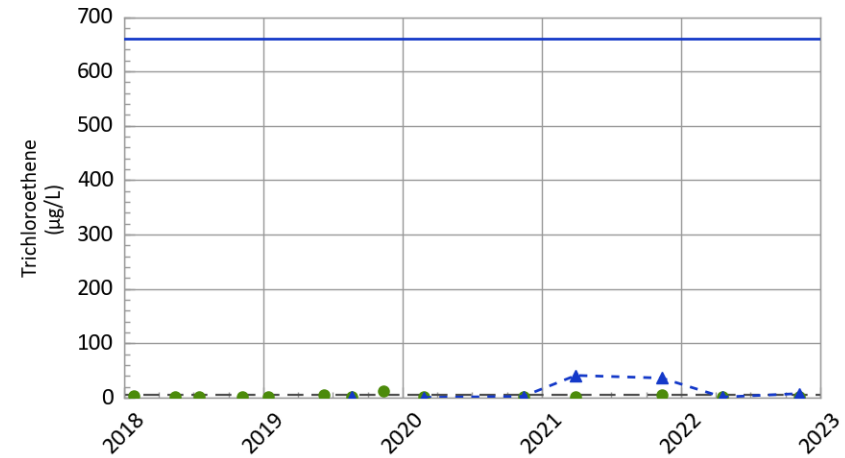
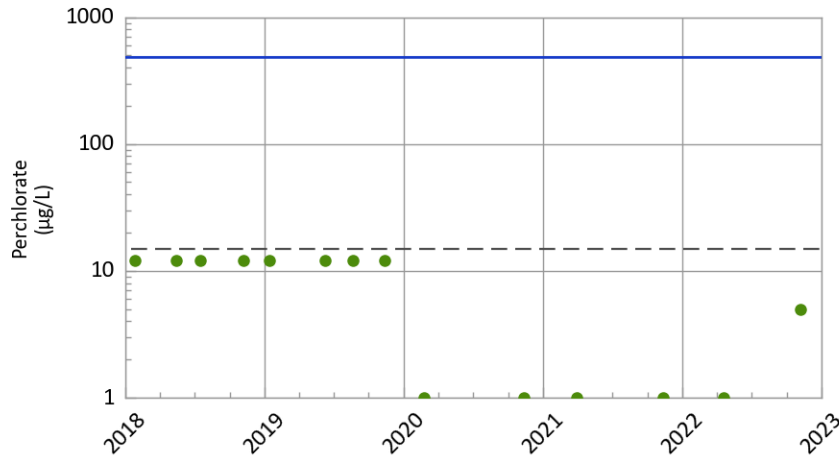
Most Recent Measured COC Concentrations (Nov 08, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|--------|----------------------|-------------|
| PERC | 4.2 | 15.0 |
| DCE12C | 1.17 | 70.0 |
| TCE | 39.0 | 5.0 |
| VC | Non-Detect | 2.0 |

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



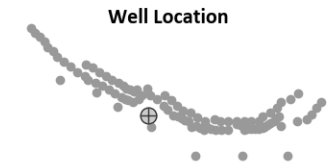
**PTX06-1155 Downgradient Performance Indicators
Zone 11 In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



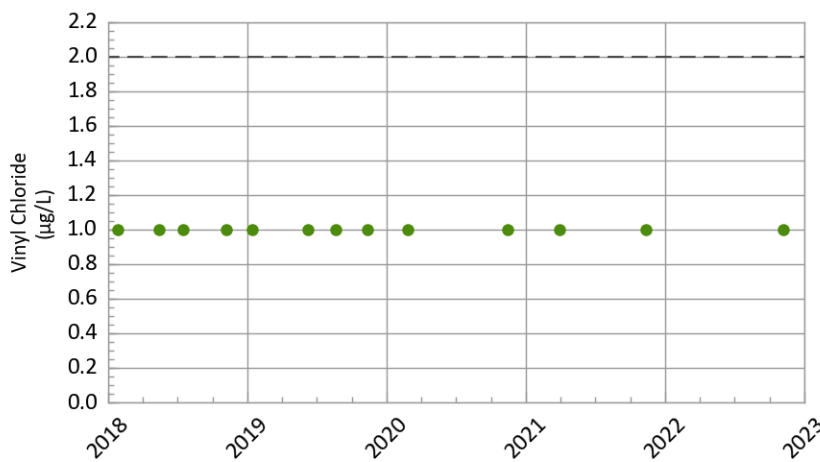
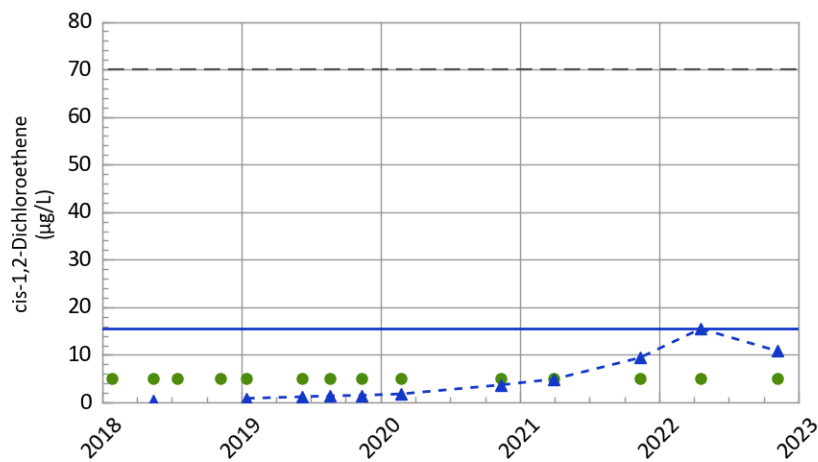
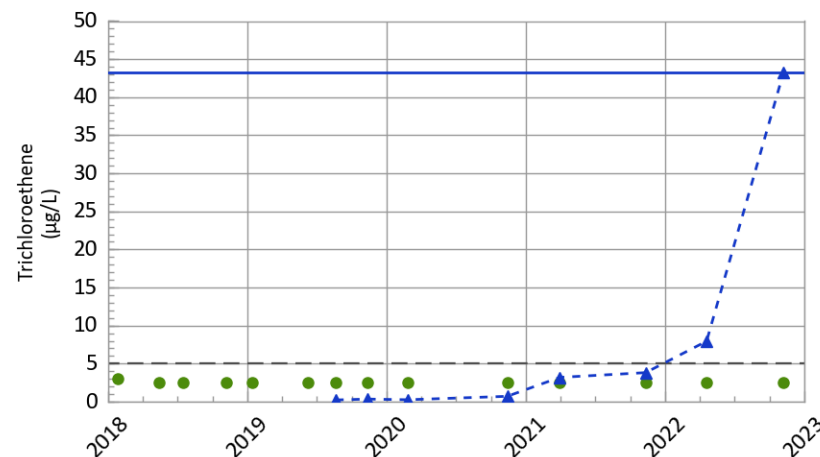
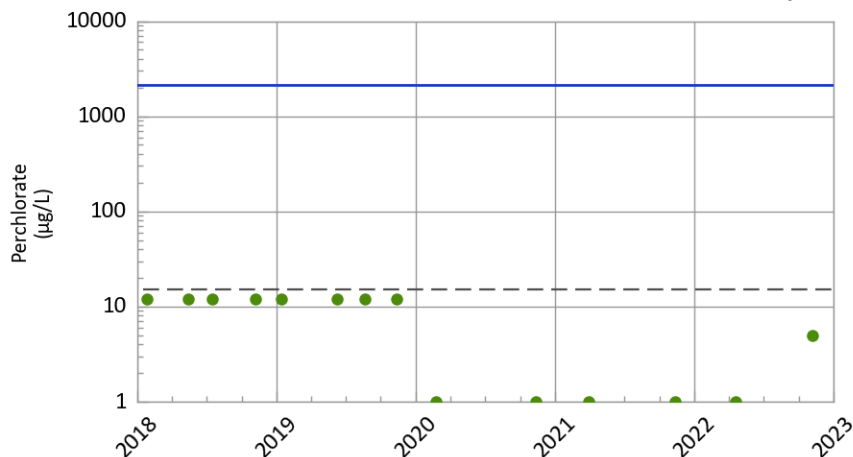
Most Recent Measured COC Concentrations (Nov 07, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|--------|----------------------|-------------|
| PERC | Non-Detect | 15.0 |
| DCE12C | 87.5 | 70.0 |
| TCE | 7.6 | 5.0 |
| VC | 54.8 | 2.0 |

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



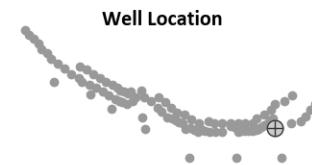
**PTX06-1156 Downgradient Performance Indicators
Zone 11 In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



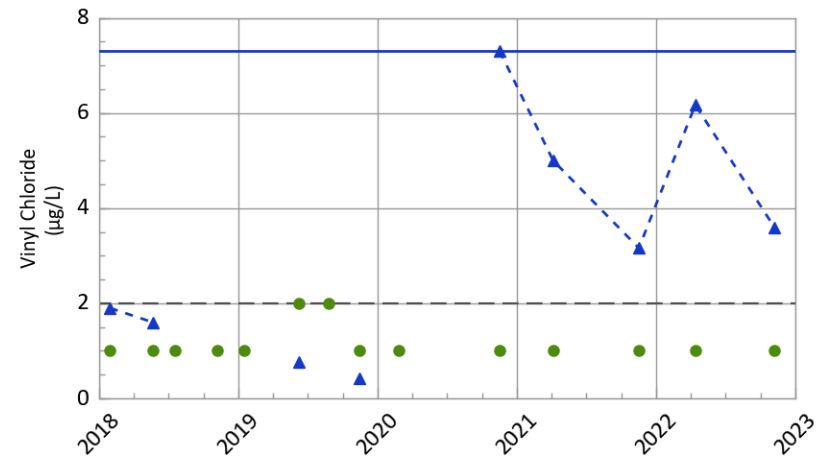
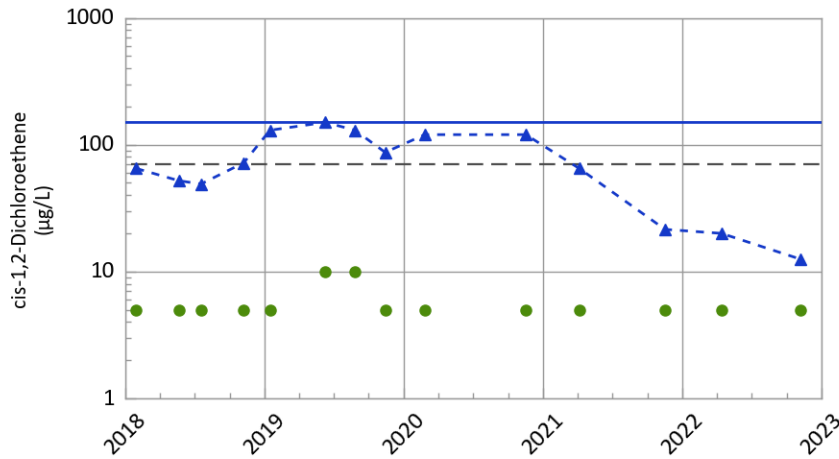
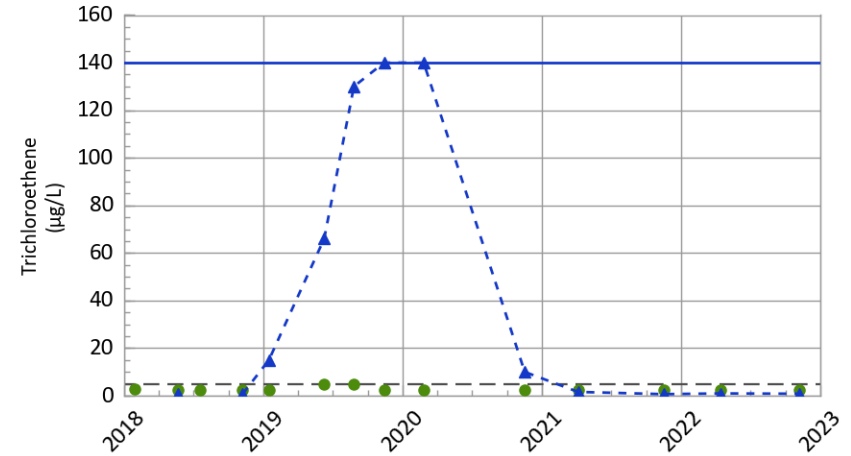
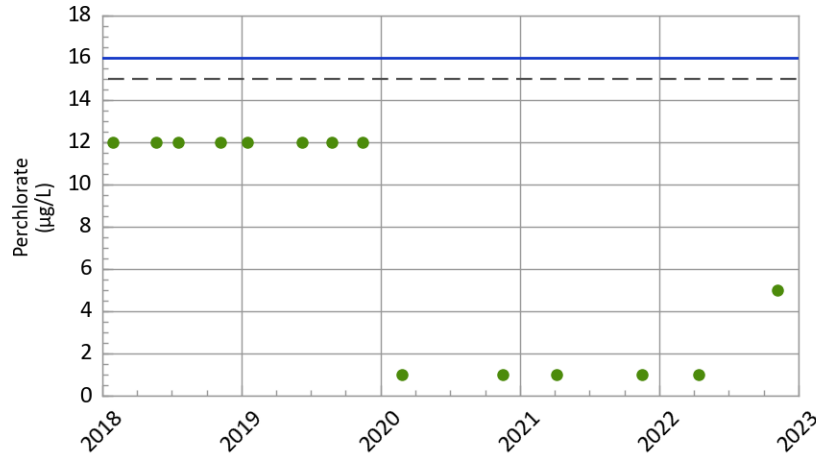
Most Recent Measured COC Concentrations (Nov 07, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|--------|----------------------|-------------|
| PERC | Non-Detect | 15.0 |
| DCE12C | 10.8 | 70.0 |
| TCE | 43.3 | 5.0 |
| VC | Non-Detect | 2.0 |

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



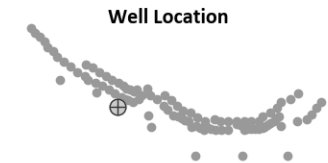
**PTX06-1173 Downgradient Performance Indicators
Zone 11 In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



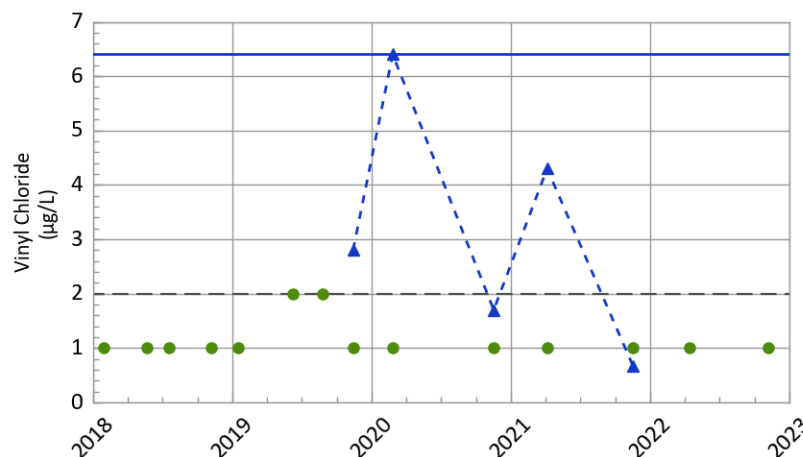
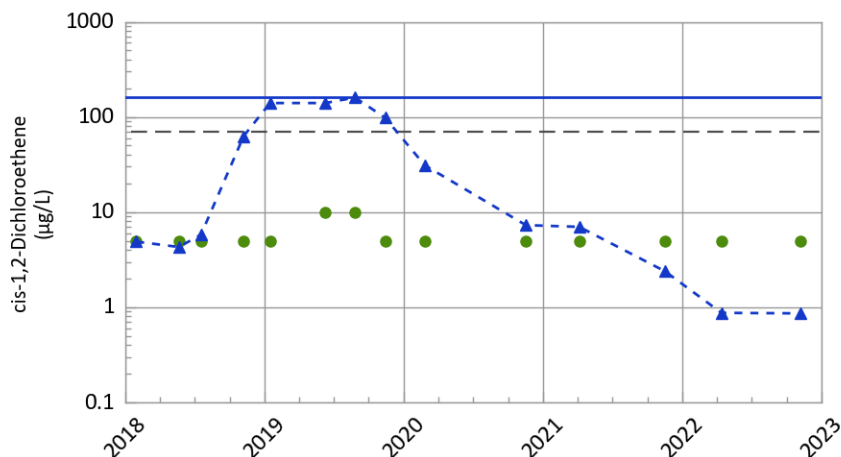
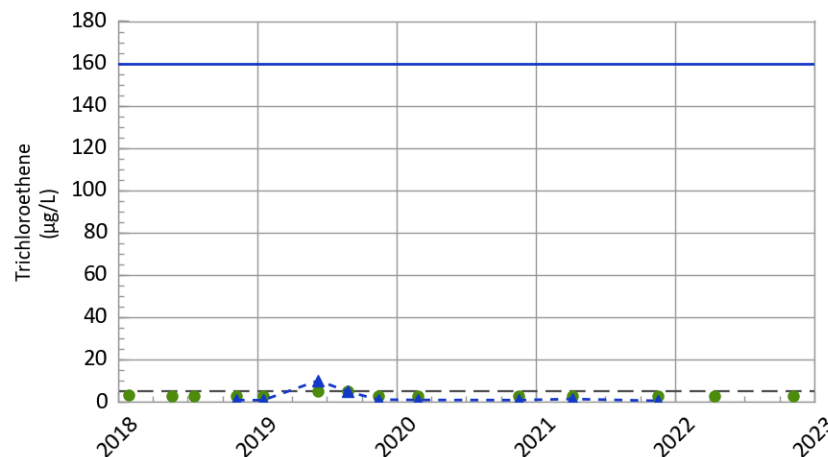
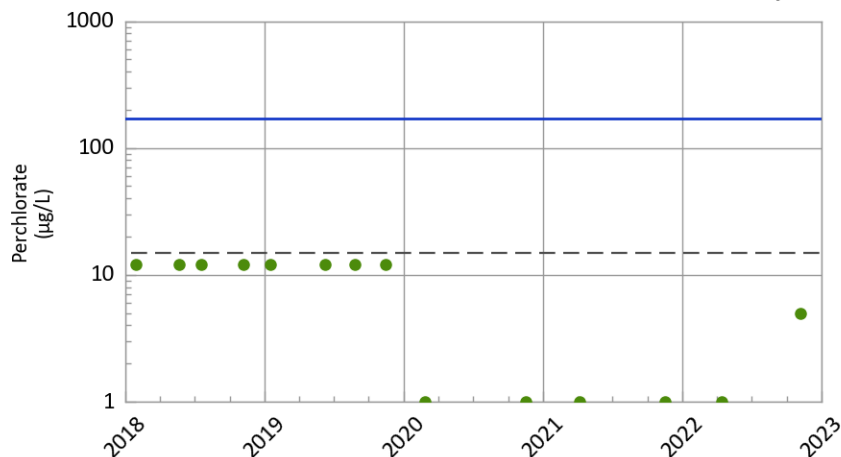
Most Recent Measured COC Concentrations (Nov 07, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|--------|----------------------|-------------|
| PERC | Non-Detect | 15.0 |
| DCE12C | 12.5 | 70.0 |
| TCE | 0.829 | 5.0 |
| VC | 3.59 | 2.0 |

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



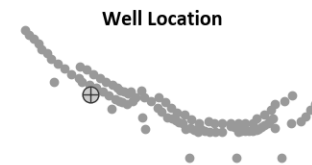
**PTX06-1174 Downgradient Performance Indicators
Zone 11 In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



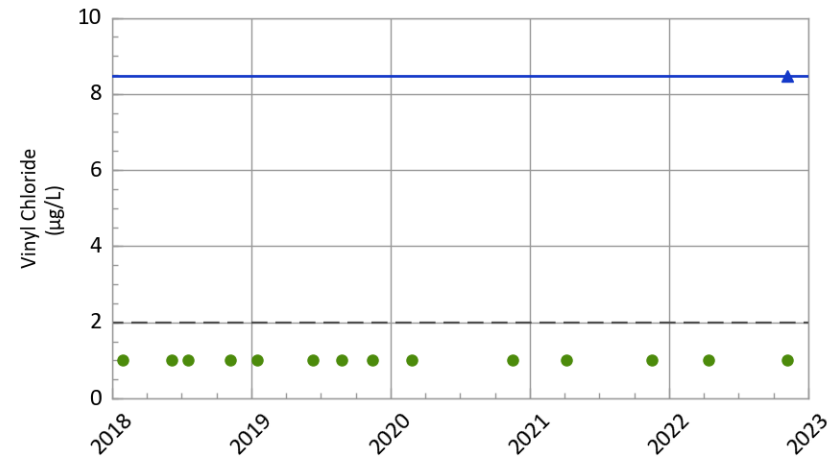
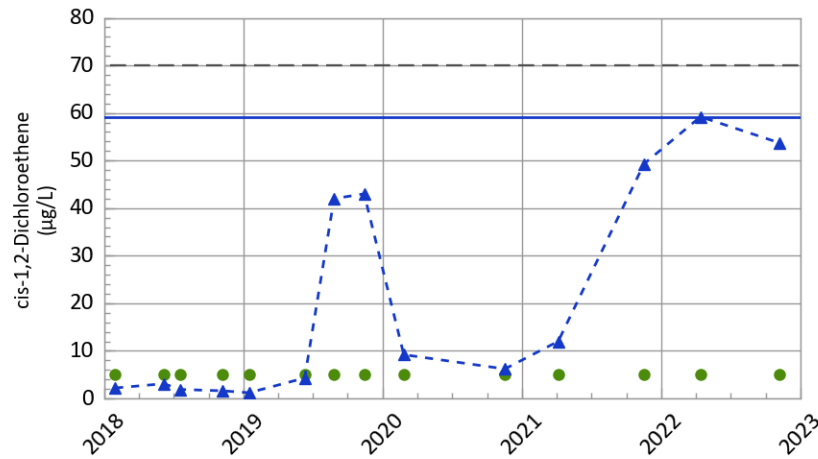
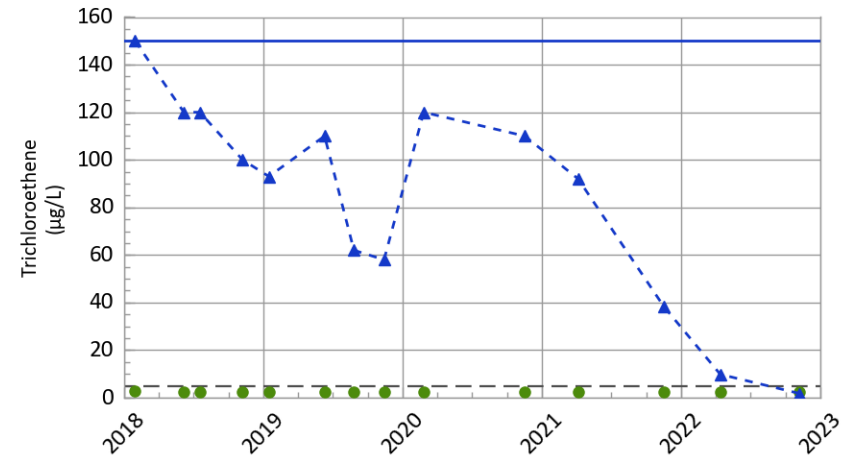
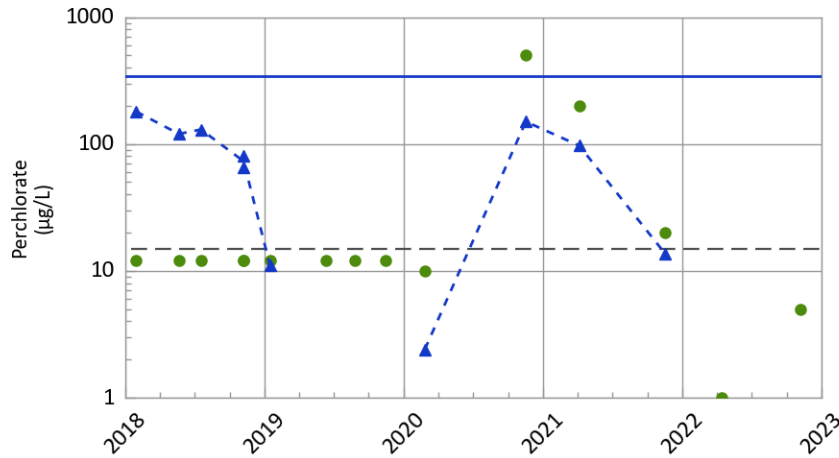
Most Recent Measured COC Concentrations (Nov 16, 2021)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|--------|----------------------|-------------|
| PERC | Non-Detect | 15.0 |
| DCE12C | 0.863 | 70.0 |
| TCE | Non-Detect | 5.0 |
| VC | Non-Detect | 2.0 |

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



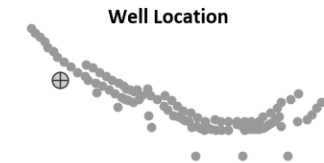
**PTX06-1175 Downgradient Performance Indicators
Zone 11 In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



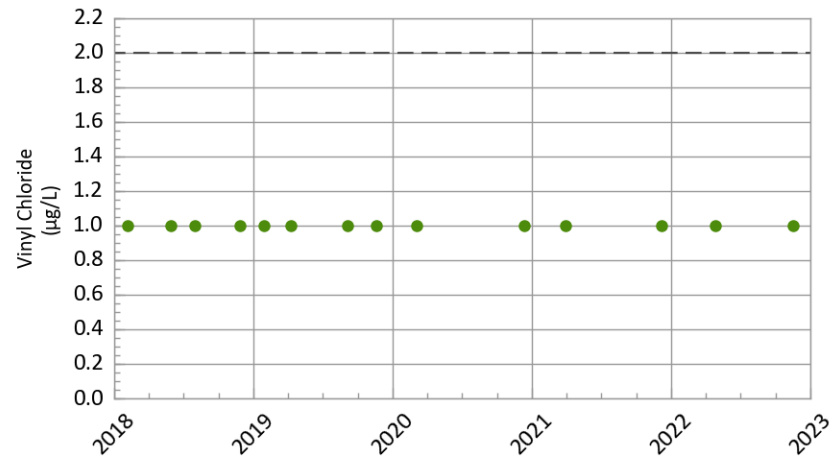
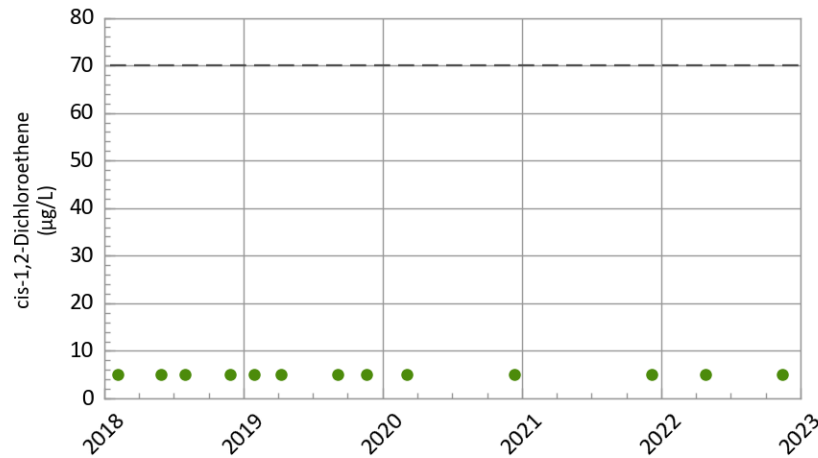
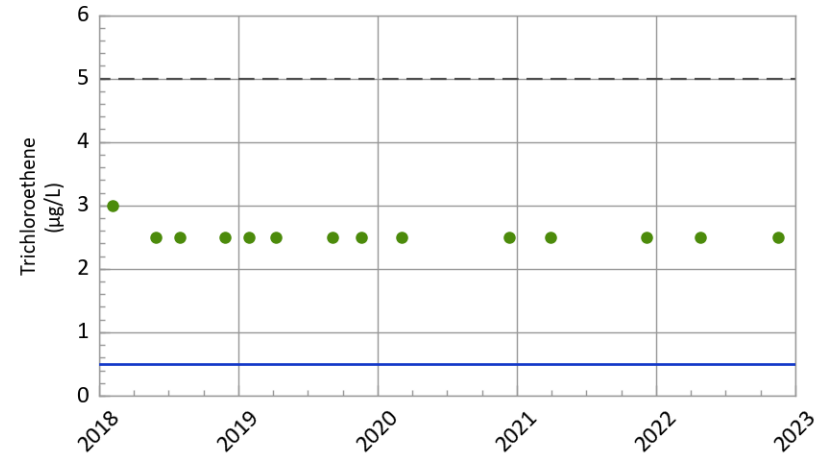
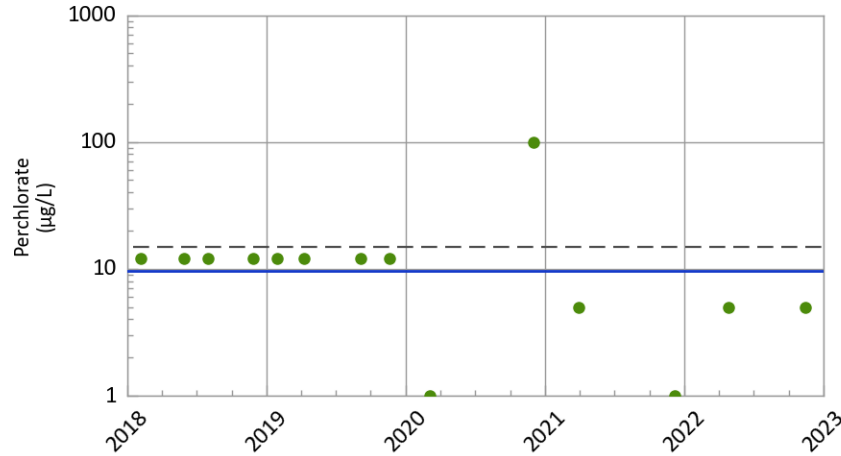
Most Recent Measured COC Concentrations (Nov 07, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|--------|----------------------|-------------|
| PERC | Non-Detect | 15.0 |
| DCE12C | 53.7 | 70.0 |
| TCE | 1.77 | 5.0 |
| VC | 8.47 | 2.0 |

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



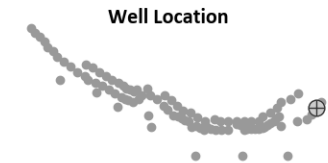
**PTX06-ISB079 Downgradient Performance Indicators
Zone 11 In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



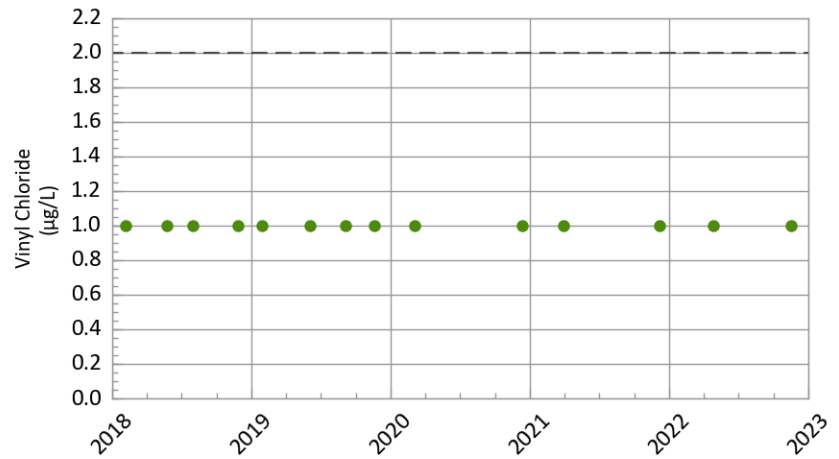
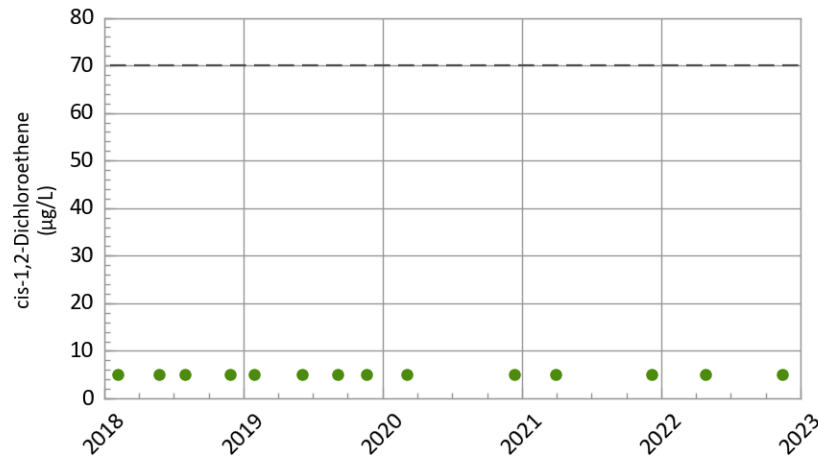
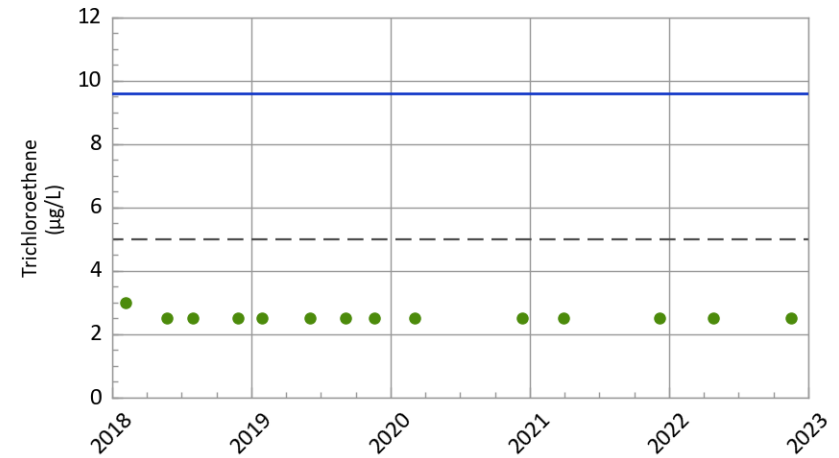
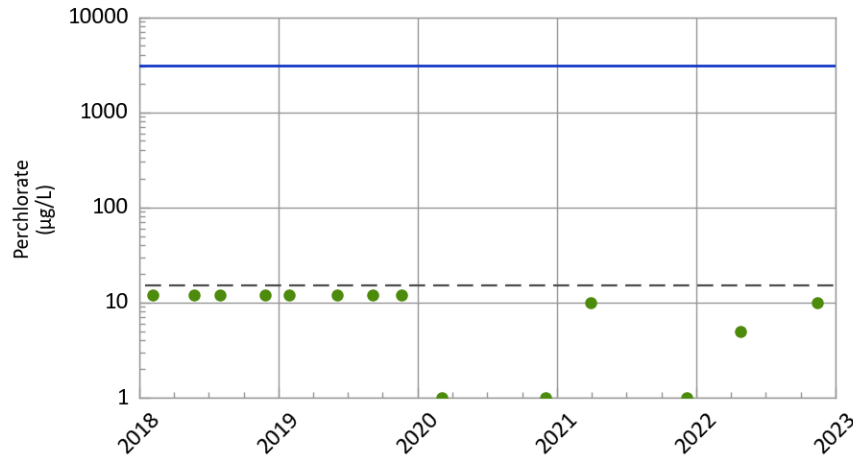
Most Recent Measured COC Concentrations (Nov 15, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|--------|----------------------|-------------|
| PERC | Non-Detect | 15.0 |
| 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



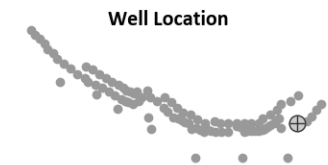
**PTX06-ISB082 Downgradient Performance Indicators
Zone 11 In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Nov 15, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|--------|----------------------|-------------|
| PERC | Non-Detect | 15.0 |
| DCE12C | Non-Detect | 70.0 |
| TCE | Non-Detect | 5.0 |
| VC | Non-Detect | 2.0 |

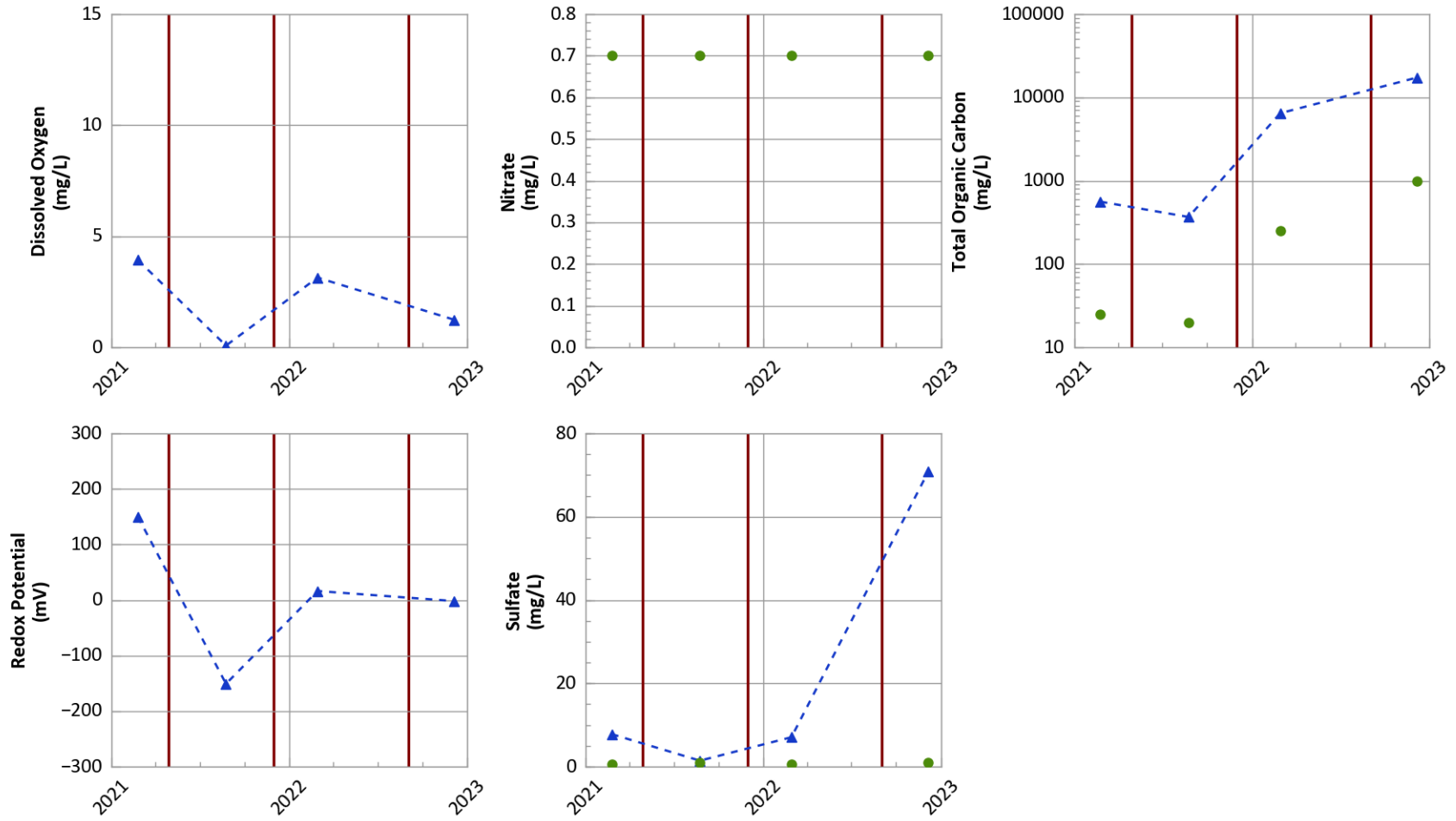
- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



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Southeast ISB Extension

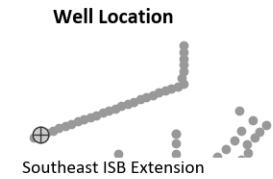
PTX06-ISB302 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant



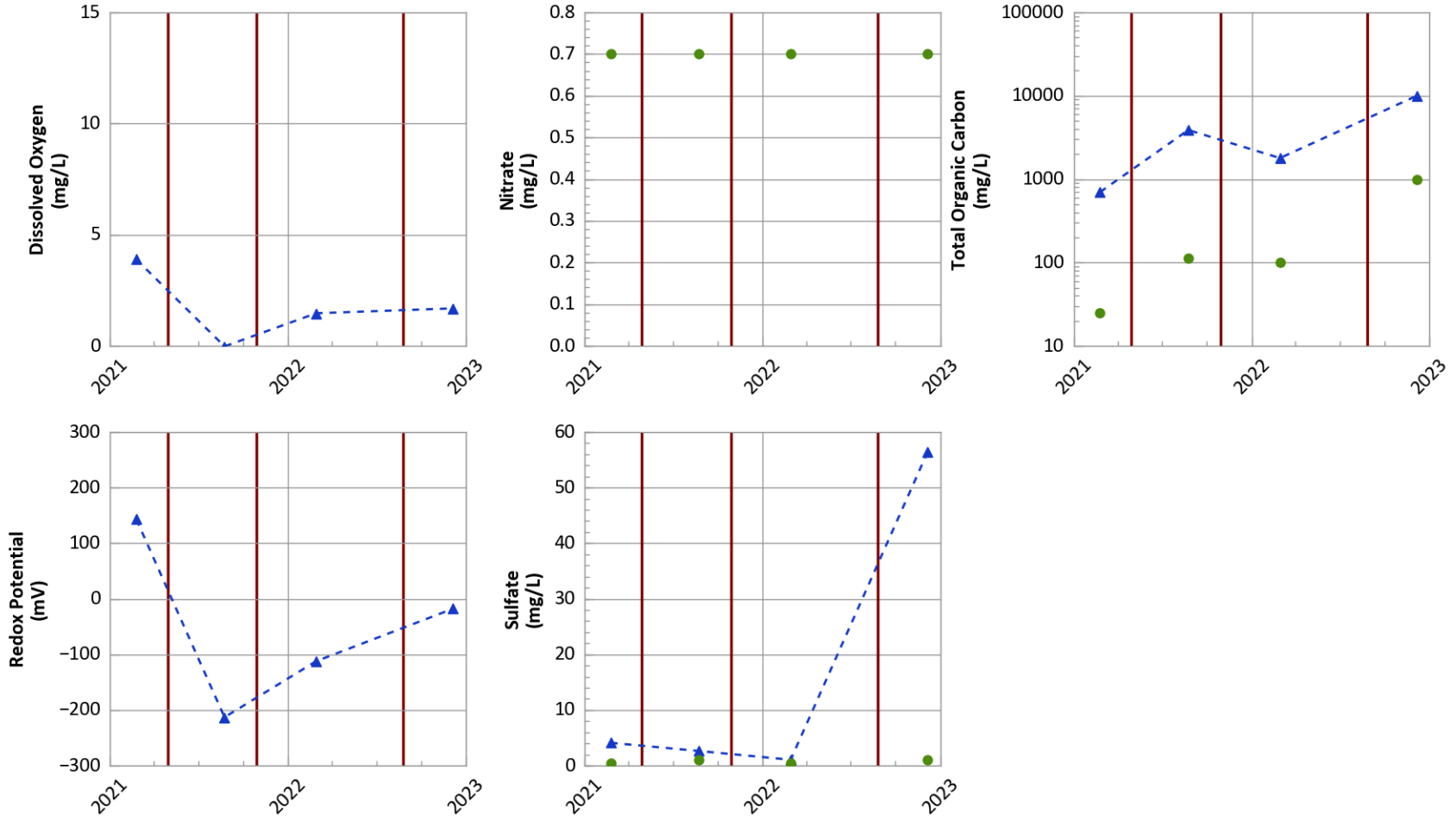
Typical Baseline Concentrations in Perched Groundwater

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



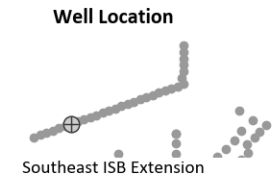
**PTX06-ISB307 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



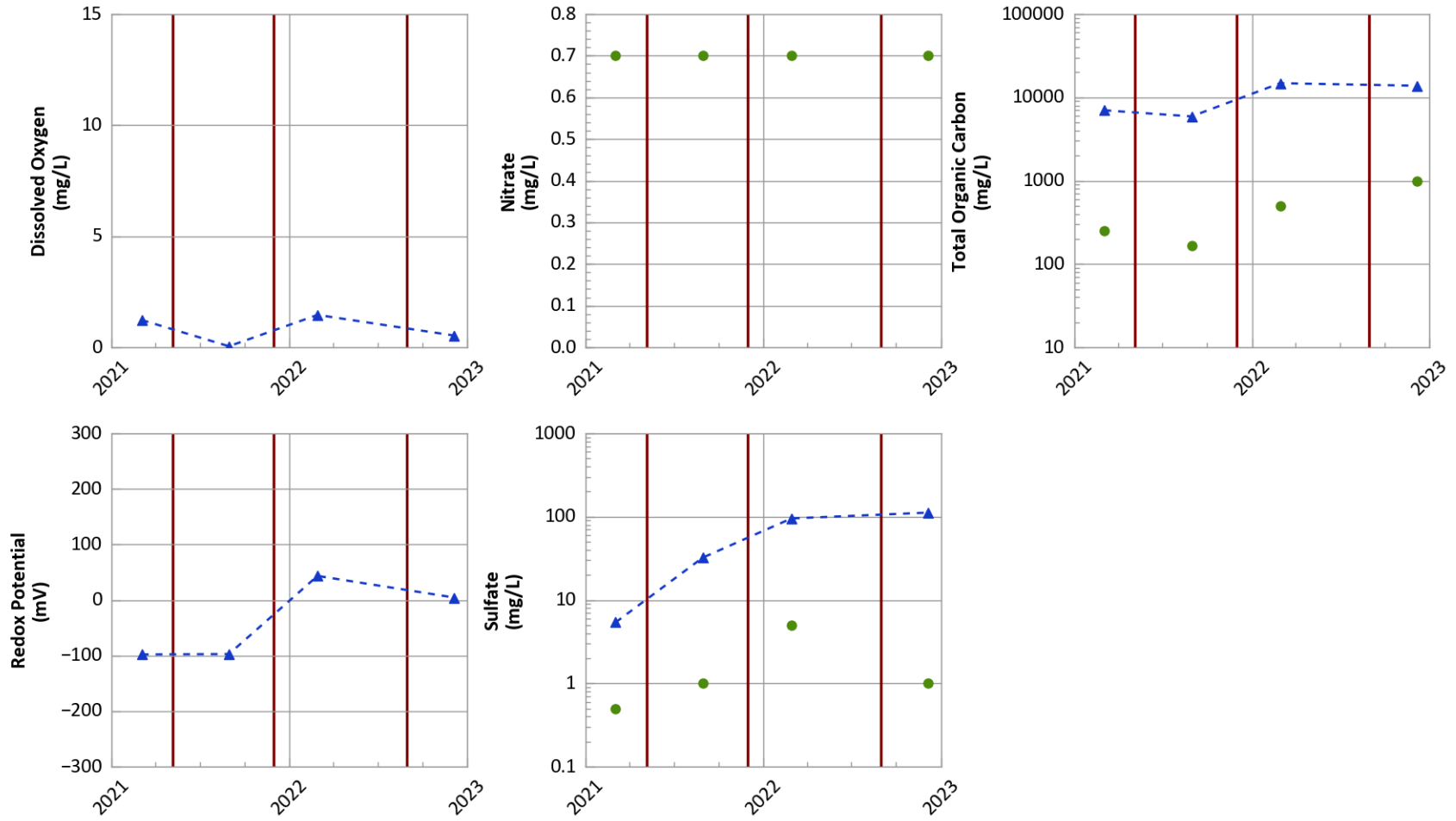
Typical Baseline Concentrations in Perched Groundwater

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



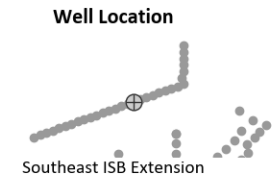
PTX06-ISB317 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant



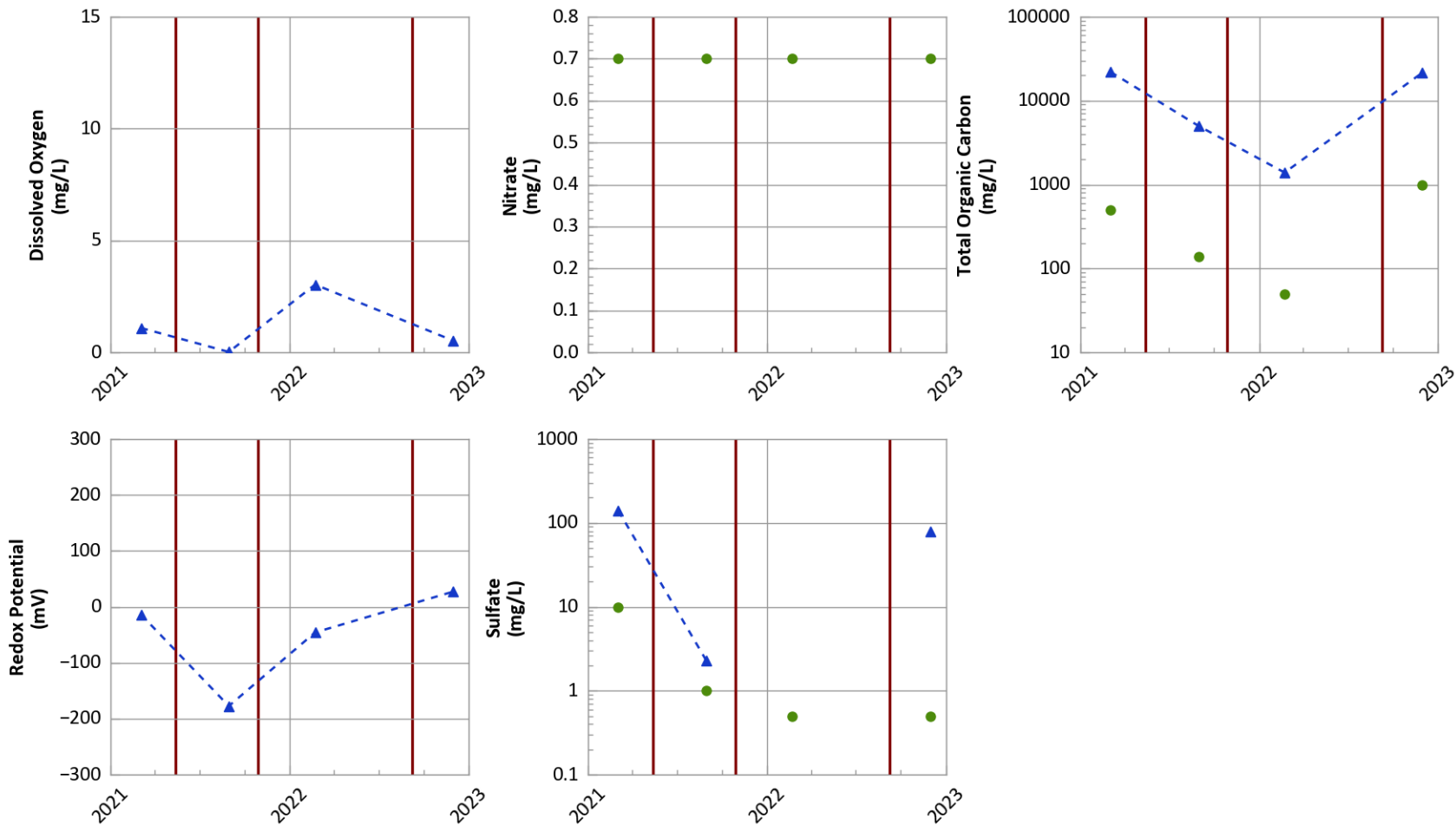
Typical Baseline Concentrations in Perched Groundwater

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



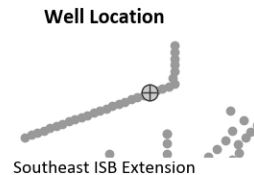
**PTX06-ISB321 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



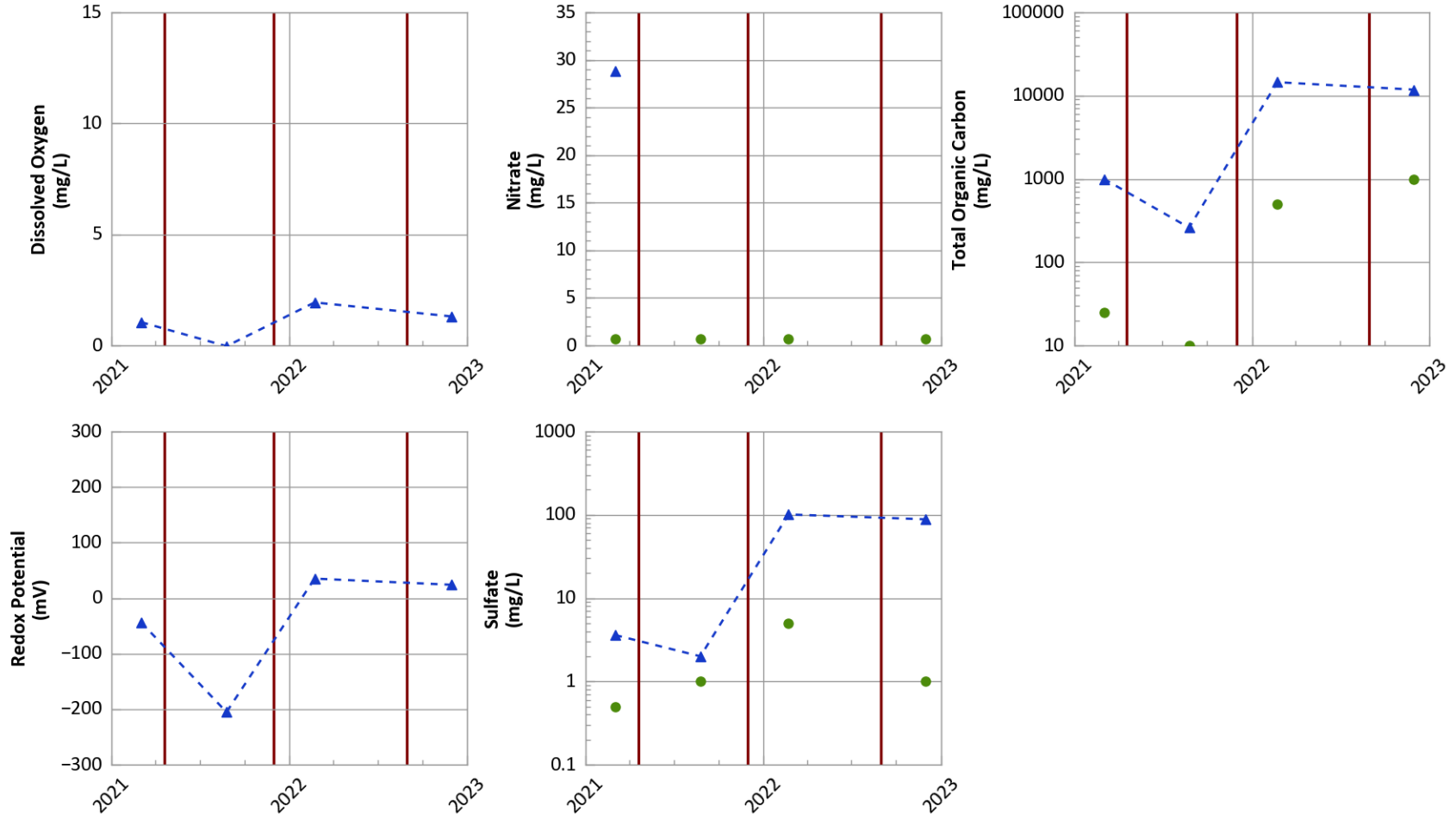
Typical Baseline Concentrations in Perched Groundwater

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



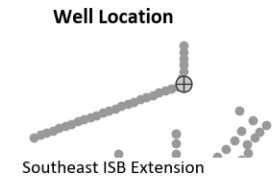
PTX06-ISB325 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant



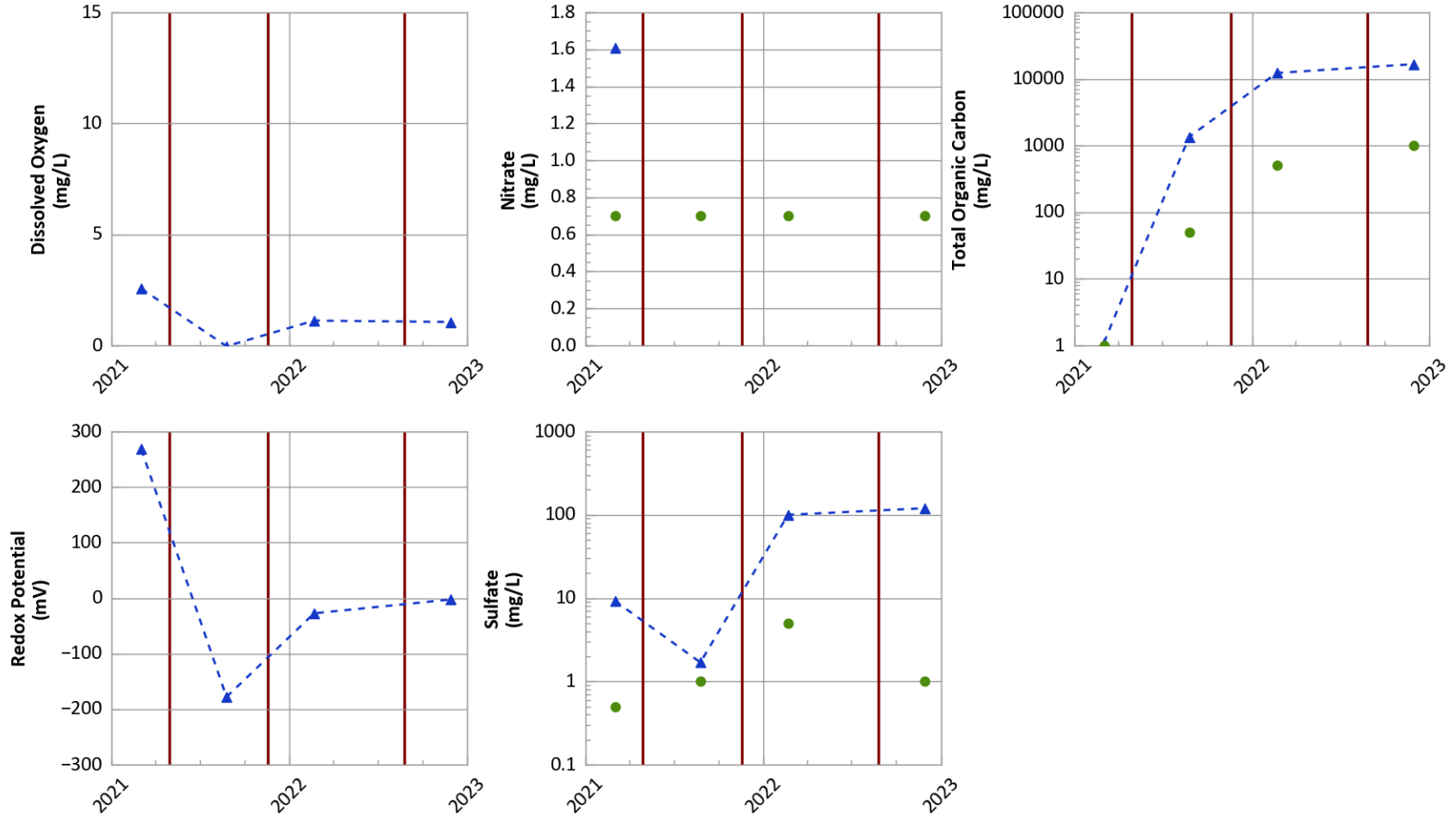
Typical Baseline Concentrations in Perched Groundwater

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



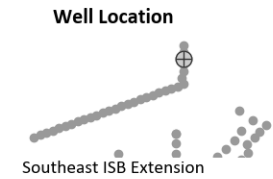
**PTX06-ISB329 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



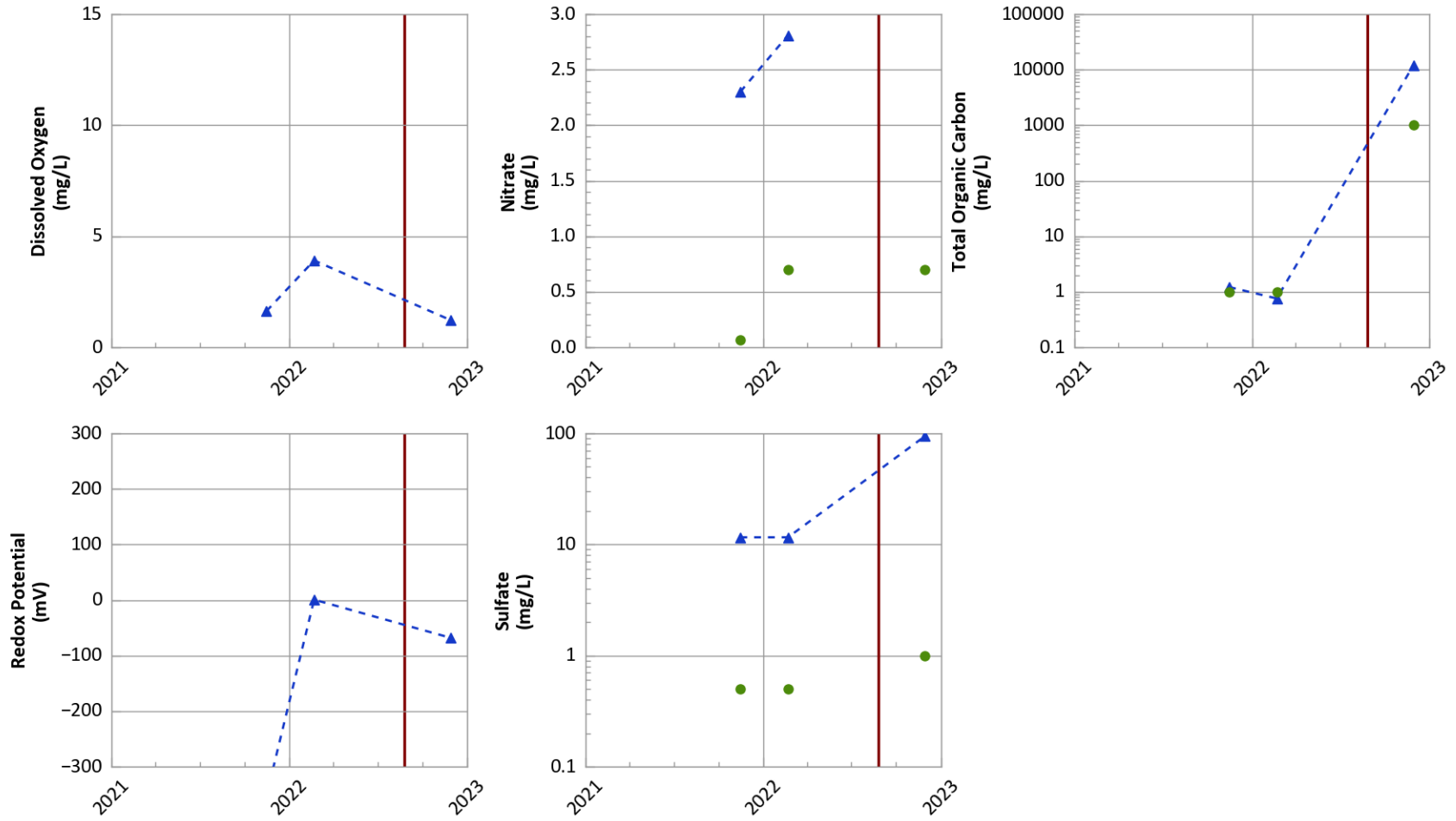
Typical Baseline Concentrations in Perched Groundwater

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



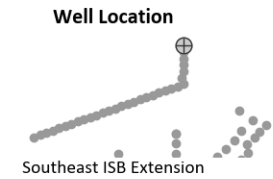
PTX06-ISB331 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant



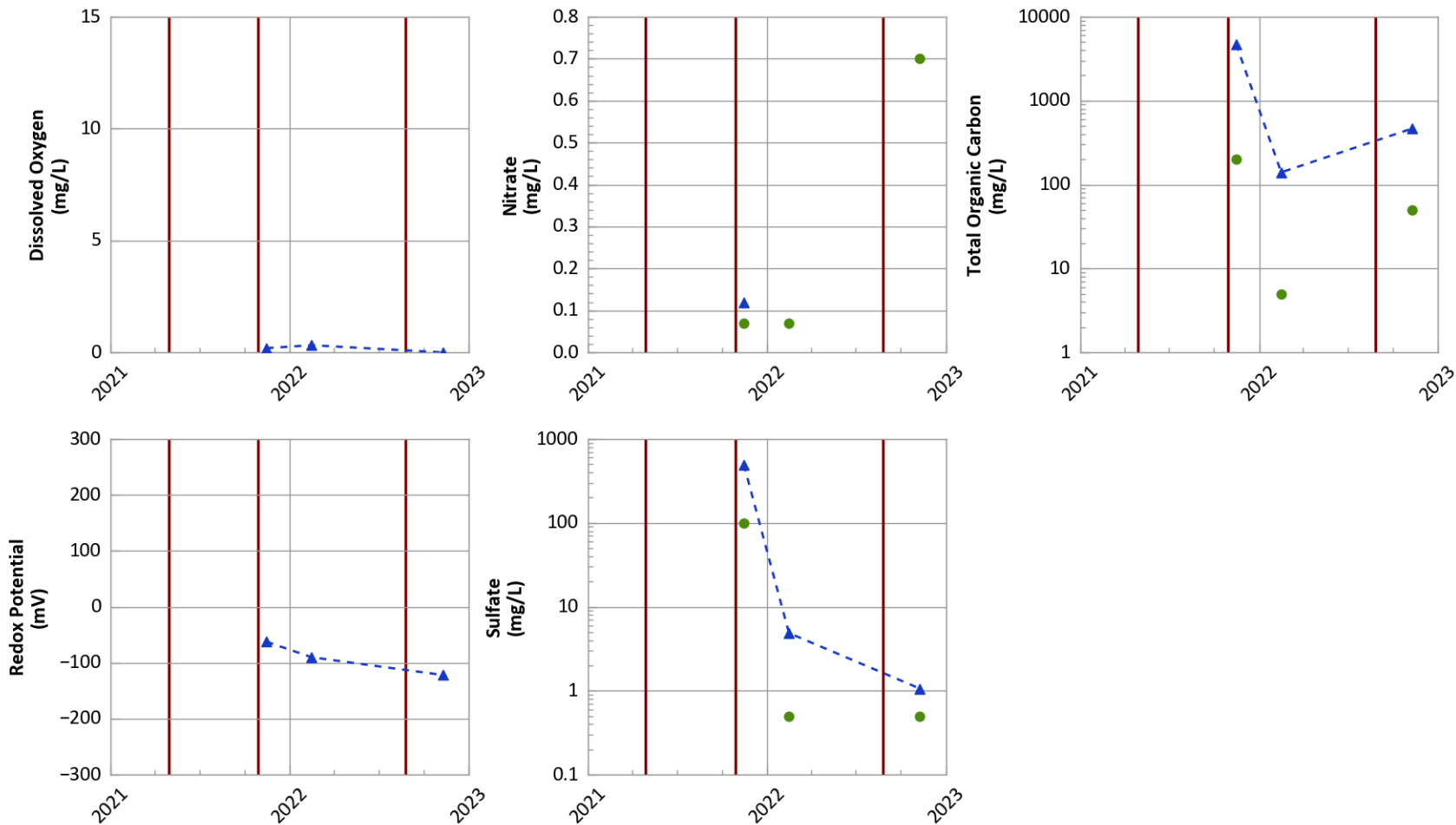
Typical Baseline Concentrations in Perched Groundwater

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



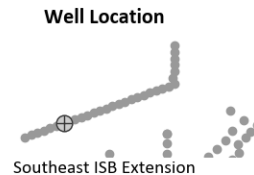
**PTX06-1213 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



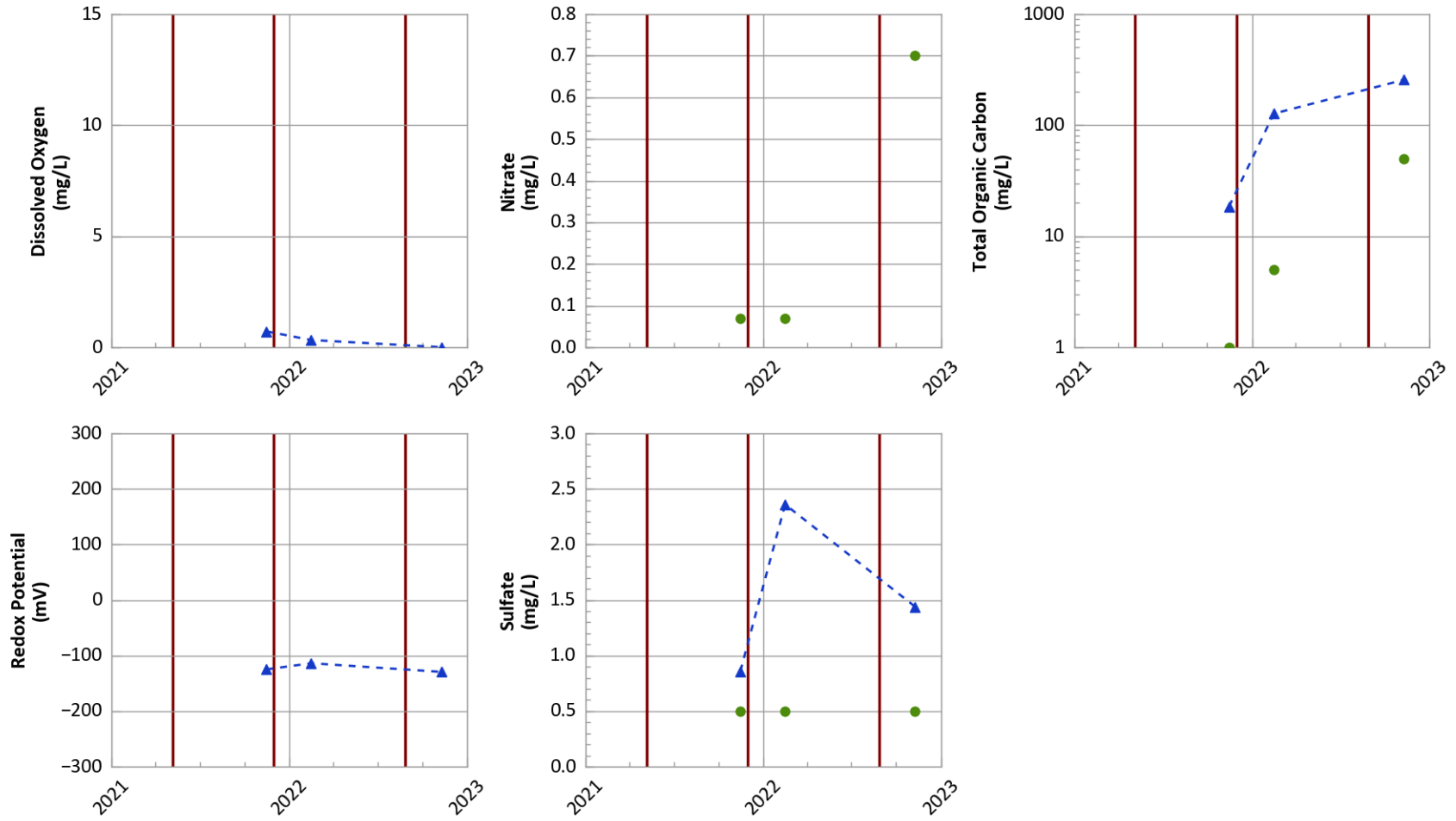
Typical Baseline Concentrations in Perched Groundwater

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



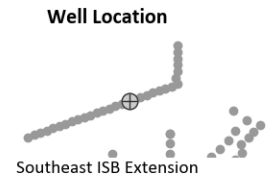
**PTX06-1214 Treatment Zone Performance Indicators
USDOE/NNSA Pantex Plant**



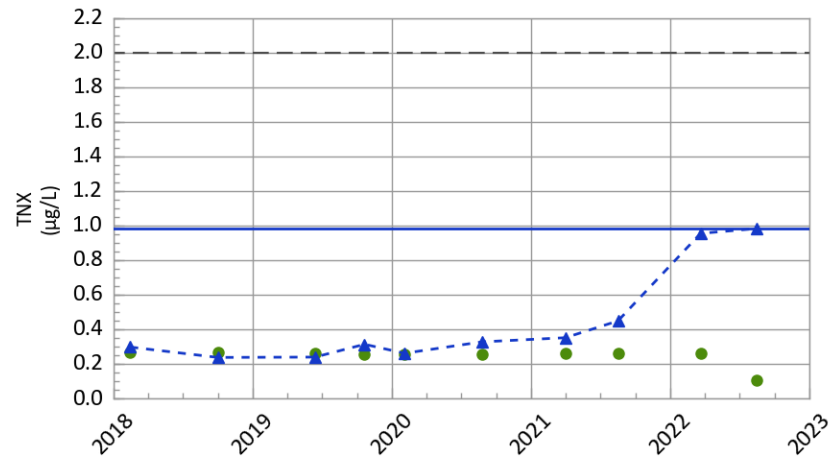
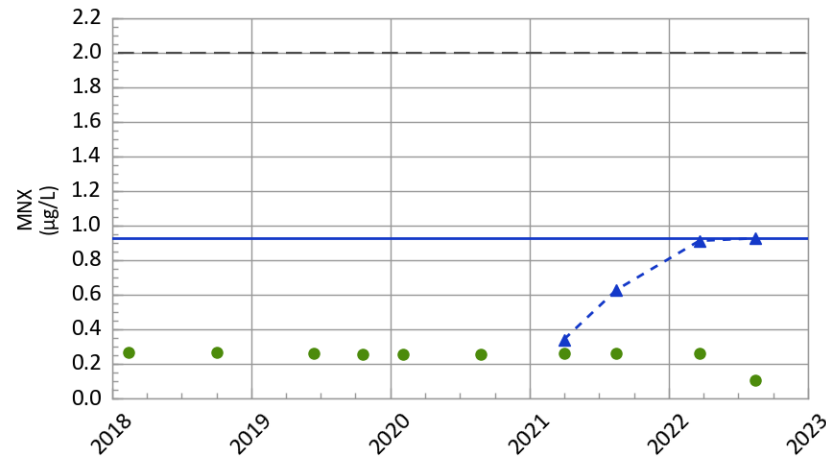
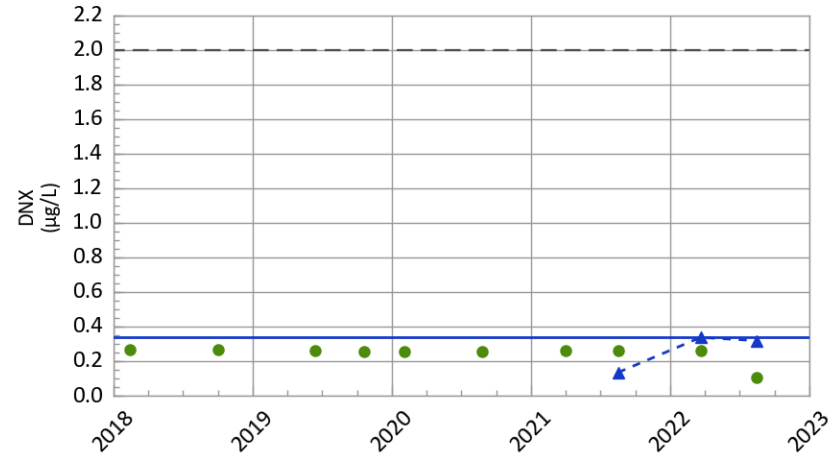
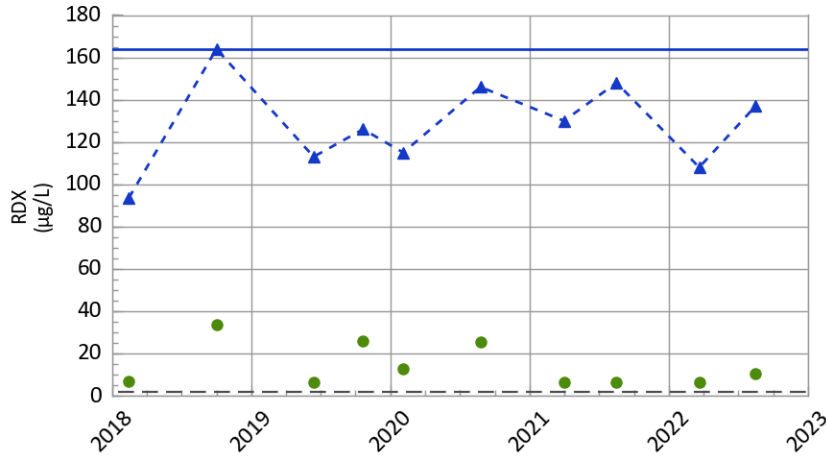
Typical Baseline Concentrations in Perched Groundwater

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



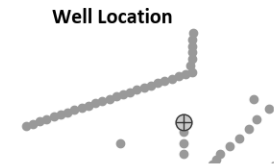
**PTX06-1191 Downgradient Performance Indicators
Southeast Ext In Situ Bioremediation System
USDOE/NNSA Pantex Plant**



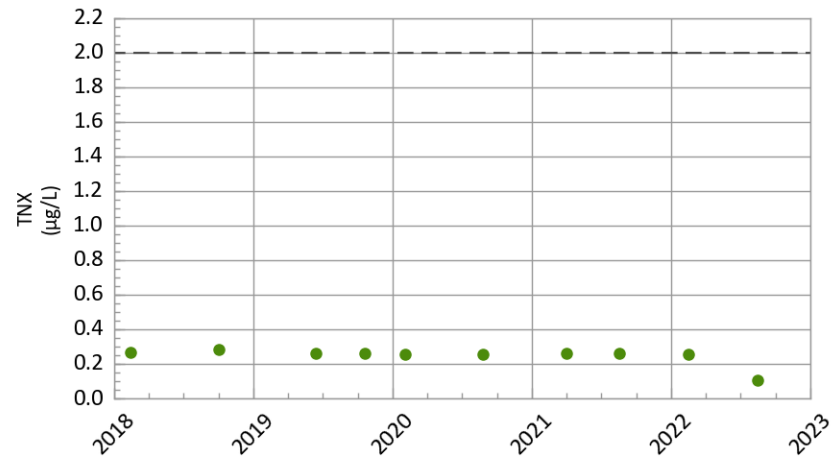
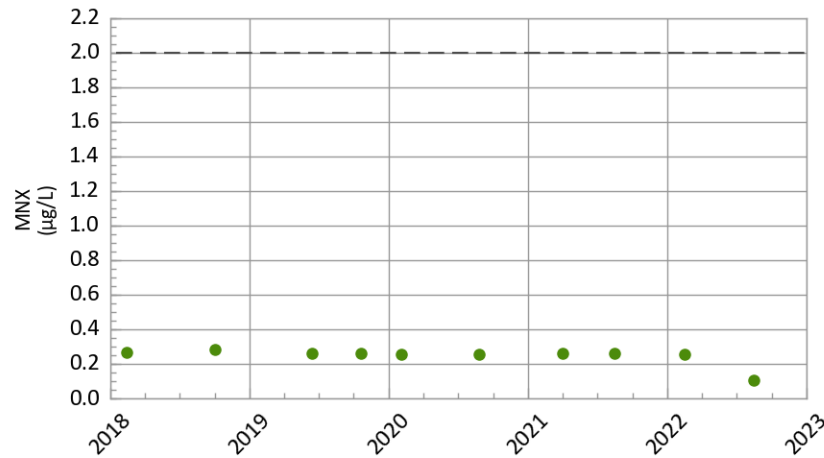
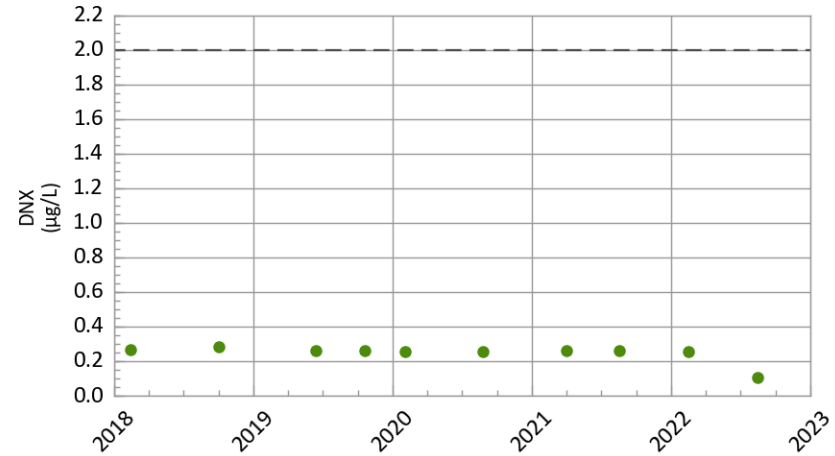
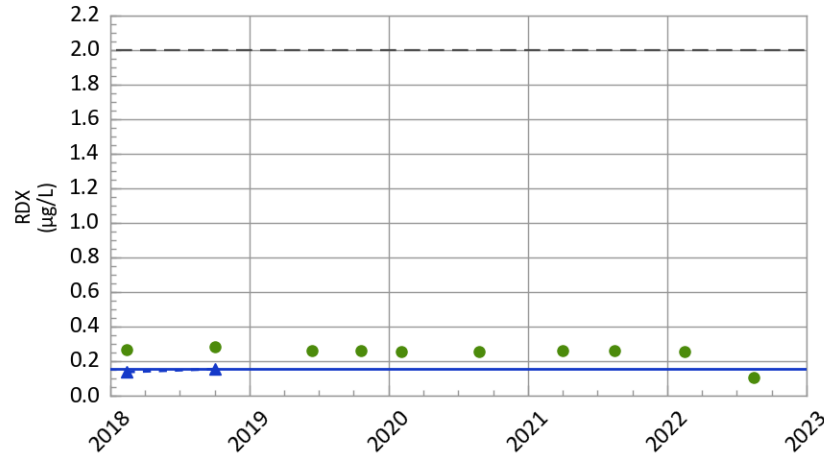
Most Recent Measured COC Concentrations (Aug 16, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|-----|----------------------|-------------|
| RDX | 137.0 | 2.0 |
| MNX | 0.926 | 2.0 |
| DNX | 0.318 | 2.0 |
| TNX | 0.982 | 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**



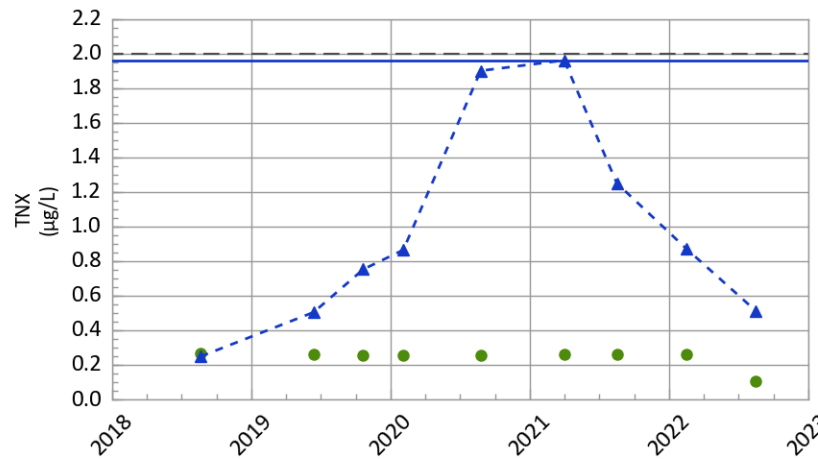
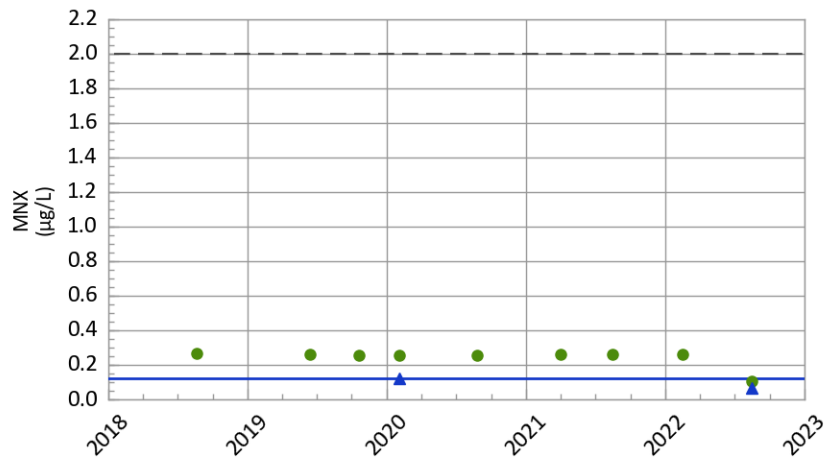
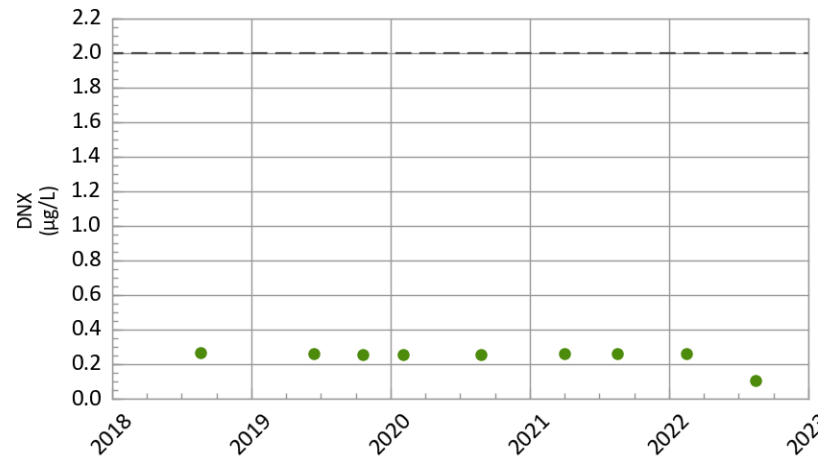
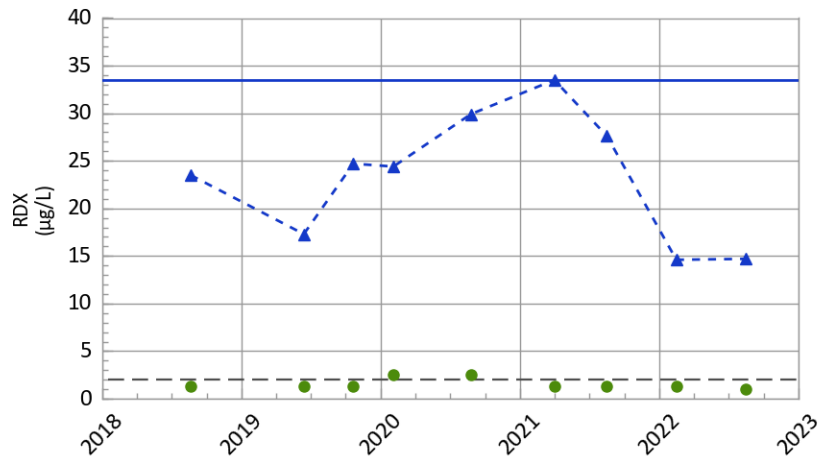
Most Recent Measured COC Concentrations (Aug 16, 2022)

| 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 (Aug 16, 2022)

| COC | Concentration (µg/L) | GWPS (µg/L) |
|-----|----------------------|-------------|
| RDX | 14.7 | 2.0 |
| MNX | 0.0672 | 2.0 |
| DNX | Non-Detect | 2.0 |
| TNX | 0.511 | 2.0 |

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

