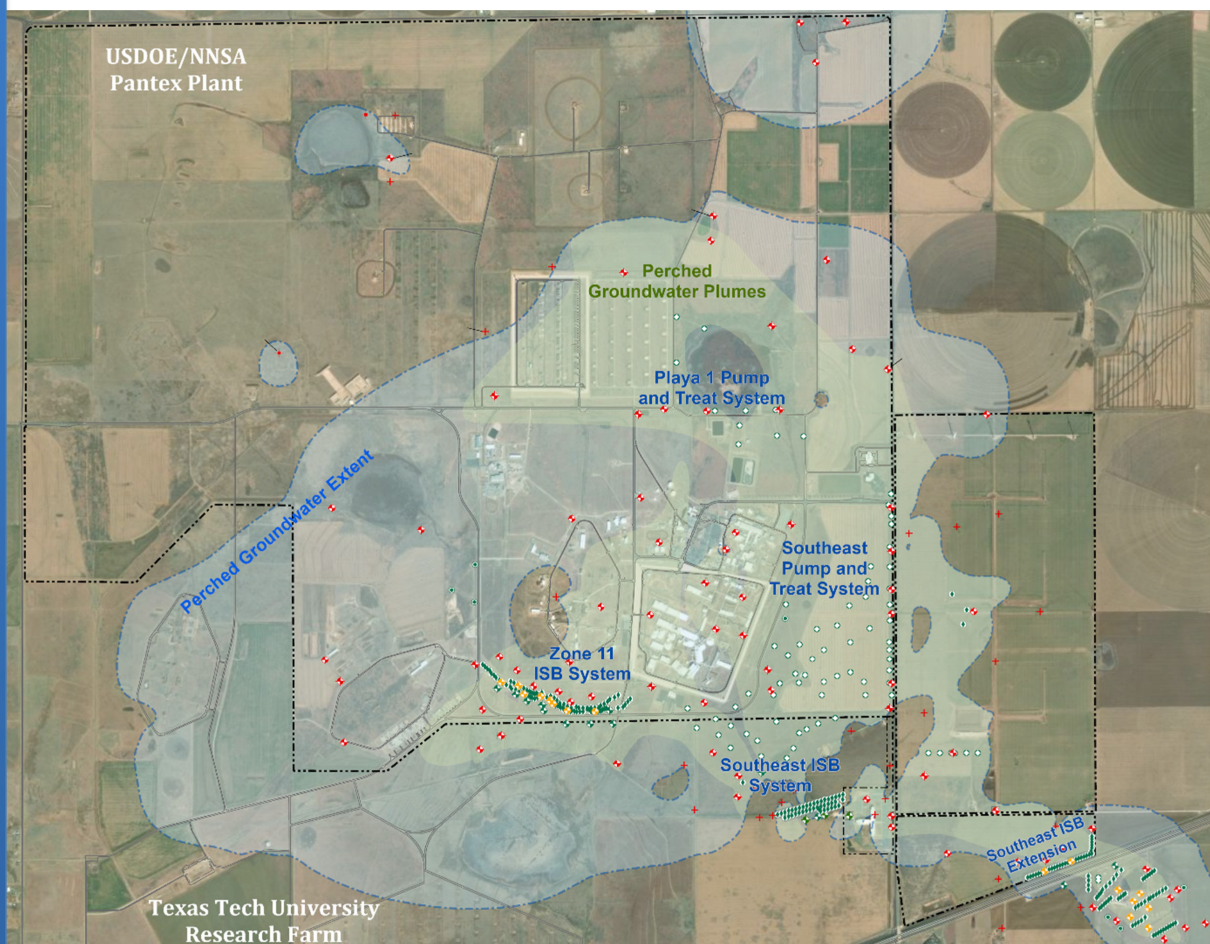
Update to the Long-Term Monitoring System Design Report

For USDOE/NNSA Pantex Plant
Groundwater Remedial Action Progress

Pantex Plant



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Update to the Long-Term Monitoring System Design Report
for the U.S. Department of Energy/
National Nuclear Security Administration
Pantex Plant, Amarillo, Texas

October 2024

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CNS — Date

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ACRONYMS

AFCEE	Air Force Center for Engineering and the Environment
B&W Pantex	Babcock & Wilcox Technical Services Pantex, LLC
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
CNS	Consolidated Nuclear Security, LLC
COC	Contaminants of concern
COV	Coefficient of variation
EPA	United States Environmental Protection Agency
FM	Farm-to-Market Road
GWPS	Groundwater Protection Standard
HGL	HydroGeoLogic, Inc.
HW	Hazardous Waste Permit
IAG	Inter-Agency Agreement
ISB	In Situ Bioremediation
ISPM	In Situ Performance Monitoring
LTM	Long-term monitoring
LTMO	Long-term monitoring optimization
MAROS	Monitoring and Remediation Optimization System
NNSA	National Nuclear Security Administration
P1PTS	Playa 1 Pump and Treat System
POC	Point of Compliance
POE	Point of Exposure
PQL	Practical quantitation limit
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RDX	Research Development Explosive (hexahyrdro-1,3,5-trinitro-1,3,5-triazine)
RFI	RCRA Facility Investigation
ROD	Record of Decision
RRS	Risk Reduction Standard
SAP	Sampling and Analysis Plan
SEPTS	Southeast Pump and Treat System
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TZM	treatment zone monitoring
USDOE	U.S. Department of Energy
WMG	Waste management group
WL	Water level

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1. INTRODUCTION

This report presents proposed modifications to the long-term groundwater monitoring well network that was originally developed in 2009 and updated in 2014 and 2019. The original network was developed using statistical methods, fate and transport modeling, and site-specific knowledge for the evaluation of response actions (corrective/remedial actions) for Pantex Plant and monitoring uncertainties near source areas. The 2014 and 2019 updates were based on evaluations of the perched aquifer monitoring system and data collected during the first and second Five-Year Reviews, as well as updated expected conditions based on changing aquifer conditions. Similarly, this update proposes modifications based on an evaluation of the perched aquifer monitoring system during the third Five-Year Review along with updated expected conditions based on changing aquifer conditions. Contingency actions for unexpected conditions are provided in the *Pantex Plant Ogallala Aquifer and Perched Groundwater Contingency Plan* (CNS, 2019).

Pantex Plant is located on the plains of the Texas Panhandle, 17 miles northeast of Amarillo as shown in Figure 1-1. The Ogallala Aquifer, part of the High Plains aquifer system, is the principal water-bearing unit and provides a primary source of water for the region. Additionally, bodies of perched groundwater above the Ogallala Aquifer occur beneath much of Pantex Plant. Areas of this perched groundwater zone have been contaminated as a result of past wastewater discharges from legacy operations at the facility. Contaminated sites at the surface are separated from groundwater in either the perched zone or the Ogallala Aquifer by a 200- to 500-ft (61- to 153-m) thick unsaturated zone. In areas where perched groundwater is present, a second vadose zone occurs above the Ogallala Aquifer. A full description of the hydrogeology for Pantex is provided in the *Long-Term Monitoring System Design Report* (B&W Pantex and Espey Consultants, 2009).

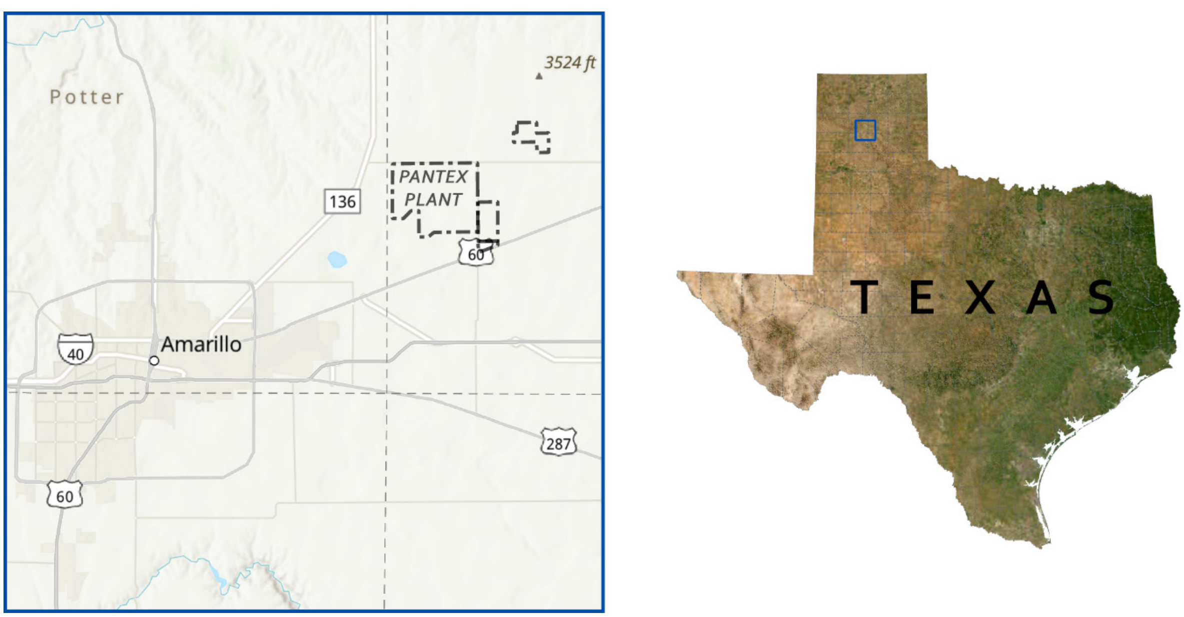

Figure 1-1. Pantex Plant Location Map

The primary purpose of the Long-Term Monitoring (LTM) network is to provide data to determine if Remedial Action Objectives (RAOs) are being achieved. The data collected from the LTM network is evaluated in annual progress reports with a full evaluation of the effectiveness of the response actions in a five-year review. The LTM network is also reevaluated during each Five-Year Review to determine if changes are required to the network or the remedies to meet remedial action objectives presented in the *Record of Decision (ROD)* (B&W Pantex and Sapere Consulting, 2008).

The perched groundwater monitoring network is designed to monitor plume stability, response action effectiveness, and uncertainty management. The many components of the selected remedy for perched groundwater are intended to work together to create conditions that both stabilize the extent of the plume and remove contaminants. The pump and treat systems in the southeast perched groundwater and the Playa 1 area focus on affecting the hydraulics of the groundwater system, that is groundwater removal as a means of reducing the potential for both vertical and lateral migration of contaminants. With this understanding, the primary metric for success of the pump and treat systems is reduction in perched groundwater thickness, as determined through periodic water level measurements. Routine monitoring for this parameter will provide the basis for determining flow directions, gradients, and saturated thickness. These determinations aid in prediction of plume movement and rate, as well as vertical flux of contaminants. A secondary benefit of the pump and treat systems is contaminant mass removal. Therefore, chemical analytical data are also important in evaluating remedial response effectiveness and the risk posed by the contaminant plumes.

The ISB treatment systems target contaminant mass removal as a means of cleaning up the perched groundwater and protecting the underlying Ogallala Aquifer from future degradation that could affect its use as a drinking water source. These systems are either downgradient of the perched groundwater plumes in the areas that pose the greatest potential for vertical migration to the Ogallala Aquifer or are positioned to treat plumes that have moved beneath neighboring offsite property. The ISB systems can function as barriers to limit further downgradient contaminant movement or serve to reduce contaminant mass in high impact areas. Chemical analyses and parameters associated with redox conditions in perched groundwater provide the most important information for determining the effectiveness of these systems. Evaluation of groundwater chemistry in downgradient wells is used as the metric for the effectiveness of the treatment on the perched groundwater.

1.1. REGULATORY REQUIREMENTS

Long-term monitoring is required to confirm expected future conditions within perched groundwater and the Ogallala Aquifer at Pantex Plant. The LTM Design was originally developed as part of the Remedial Design Submittal Package required by the Interagency Agreement (IAG) for the United States Department of Energy/ National Nuclear Security Administration (USDOE/NNSA) Pantex Plant. This report is prepared in conjunction with the Sampling and Analysis Plan (SAP, Pantex, 2024) which provides detailed information on sampling and analysis methods to be implemented for the groundwater remedial progress reporting in accordance with Hazardous Waste Permit (HW) 50284 and per agreements with the U.S. Environmental Protection Agency (EPA) and the Texas Commission on Environment Quality (TCEQ). The LTM Design defines the wells to be sampled, provides information on the methods for evaluating the data for the corrective action monitoring, and contains details of sampling intakes and design of wells and sampling equipment used in the wells.

Uncertainty management objectives are included in the development of the plan to fulfill conditions of approval for the Resource Conservation and Recovery Act (RCRA) Facility Investigation Reports presented by TCEQ and EPA. Long-term monitoring of perched groundwater and the Ogallala Aquifer will result in obtaining data to identify any unknown contaminant migration pathways. Should data be acquired that confirms an unexpected condition, the conceptual site model assumptions would be evaluated to determine the cause and mitigation measures would be assessed and implemented, as necessary, to maintain protection of human health and the environment. Contingency actions for unexpected conditions are presented in the *Pantex Plant Ogallala Aquifer and Perched Groundwater Contingency Plan* (CNS, 2019).

1.2. LONG-TERM MONITORING NETWORK OBJECTIVES

1.2.1 Perched Groundwater

Three objectives were identified for monitoring wells in perched groundwater: Plume Stability, Response Action Effectiveness, and Uncertainty Management. Some of the Response Action Effectiveness wells will be used to satisfy requirements under HW-50284 for Point of Compliance (POC) with the Groundwater Protection Standards (GWPS). Some of the Uncertainty Management Wells will be used to satisfy requirements in the HW-50284 for periodic evaluation of the closest water bearing unit near sources of contamination.

Plume Stability

The purpose of plume stability wells is to determine if impacted areas (plumes) of perched groundwater are expanding and affecting clean perched groundwater and to monitor the changes occurring within the perched plumes. Plume stability wells are located along the edges of the perched plumes where GWPSs are currently being met (note that some areas of perched groundwater are currently impacted above GWPSs to the extent of perched saturation and should show a decline in concentrations over time) and within perched plumes in areas where plumes may be expanding. The focus of monitoring in plume stability wells will be on constituents specific to the plume, Zone, waste management group (WMG), or unit where the well is located. The expected conditions for the plume stability wells are that changes in concentrations of constituents can be identified over time at various locations within and around the plumes.

Response Action Effectiveness

The purpose of response action effectiveness wells is to determine the effectiveness of response measures, indicate when RAOs for perched groundwater have been achieved, and validate modeling results or provide data that can be used to refine modeling. The focus of monitoring in response action effectiveness wells will be on constituents specific to the plume, Zone, WMG, or unit where the well is located. The expected conditions for the response action effectiveness wells are that, over time, indicators of the reduction in volume, toxicity and mobility of constituents will be observed. These indicators may include stable or decreasing concentrations of constituents or declining water levels in areas where response measures have been implemented.

Uncertainty Management

The purpose of uncertainty management wells in perched groundwater is to confirm expected conditions identified in the RCRA Facility Investigations (RFIs) and ensure there are not any deviations, fill potential data gaps, and fulfill LTM requirements for soil units evaluated in a baseline risk assessment.

Uncertainty management wells are located downgradient of risk assessment units, using a Zone or WMG approach, in areas where perched groundwater is the underlying groundwater or downgradient of known source areas, such as the ditches and playas that contributed much of the constituent mass currently found in perched groundwater. Uncertainty management wells will be used to confirm expected conditions for each Zone, WMG, or unit through monitoring.

Some of the Uncertainty Management Wells will also be used to satisfy requirements in the Compliance Plan for periodic evaluation of wells near sources of contamination to ensure that new contamination is not found over time. Pantex recommends this sampling be conducted every 5 years to correspond to the 5-year review and will focus on wells near the source areas.

1.2.2 Ogallala Aquifer

Two objectives were identified for monitoring wells in the Ogallala Aquifer: Early Detection and Uncertainty Management. Specific wells in the Ogallala Aquifer serve as Point of Exposure (POE) wells to also satisfy requirements in HW-50284. Some of the Uncertainty Management Wells were used to satisfy requirements in HW-50284 for periodic evaluation of the closest water bearing unit near sources of contamination.

Early Detection

The purpose of early detection wells is to identify breakthrough of constituents to the Ogallala Aquifer from overlying perched groundwater, if present, or potential source areas in the unsaturated zone before potential points of exposure have been impacted. Early detection wells are located downgradient of potential source areas, such as impacted areas of perched groundwater, along the edge of the known extent of impacted perched groundwater, and upgradient of potential points of exposure (i.e., the Pantex property boundary). Wells downgradient of potential source areas are located as close to the source area as possible; in some cases these wells must be moved further downgradient because of the risk of creating a migration pathway to the Ogallala Aquifer by drilling through impacted perched groundwater. The focus of monitoring in early detection wells will be on indicator constituents, defined as contaminants of concern (COCs) and degradation products in overlying or upgradient perched groundwater that will most likely be detected following breakthrough to the aquifer. Because of the cleanup actions that have been implemented to protect the Ogallala Aquifer, the expected conditions for the early detection wells are that constituents are not detected above GWPSs and that constituents do not reach potential points of exposure above GWPSs.

Uncertainty Management

The purpose of uncertainty management wells in the Ogallala Aquifer is to confirm expected conditions identified in the RFIs and ensure there are not any deviations, fill potential data gaps, and fulfill LTM requirements for soil units closed to Risk Reduction Standard (RRS) 3. Uncertainty management wells will be located downgradient of RRS 3 units, using a Zone or WMG approach, in areas where perched groundwater is not present, or downgradient of potential source areas, such as impacted areas of perched groundwater and along the edge of the known extent of impacted perched groundwater.

Some of the Uncertainty Management Wells were also used to satisfy requirements in the Compliance Plan for periodic evaluation of wells near sources of contamination to ensure that new contamination is not found over time. Pantex recommends this sampling be conducted every 5 years to correspond to the 5-year review and will focus on wells near the source areas.

1.3. CURRENT LONG-TERM MONITORING NETWORK

For the original LTM Network Design (B&W Pantex and Espey Consultants, 2009) a step-wise approach was developed by the Pantex Core Team:

- Develop monitoring objectives for each water bearing unit,
- Evaluate the existing well networks, and
- Design the final proposed monitoring network.

As outlined in the final 2009 LTM Network Design, monitoring objectives of plume stability, uncertainty management, and response action effectiveness were established for the perched aquifer and uncertainty management and early detection were assigned for the Ogallala Aquifer. Based on these objectives, the final monitoring network was proposed, approved, and implemented by September 2009.

The 2014 LTM Network Update (B&W Pantex, 2014) did not result in changes to the monitoring objectives, monitoring of soil release units, or methods for evaluation of the response actions. The update did result in the following changes to the long-term groundwater monitoring well network:

- Addition of five perched aquifer LTM wells;
- Plugging, abandonment, and replacement of one Ogallala Aquifer LTM Well;
- Conversion of three LTM wells installed downgradient of the Zone 11 In Situ Bioremediation (ISB) system to In Situ Performance Monitoring (ISPM) wells; and
- Adjustment of expected conditions of several perched aquifer monitoring wells based on the effects of remedial actions, as well as changes in water level along the fringes of perched groundwater.

No changes to the monitoring objectives, monitoring of soil release units, or methods for evaluation of the response actions were recommended in the 2019 LTM Network Update (CNS and Carollo, 2019). The changes recommended in the 2019 LTM Update included:

- Addition of 23 new perched aquifer LTM wells installed since the 2014 update;
- Proposed installation of two additional new perched wells in the Southeast indicator area;
- Monitoring of water levels only for nine perched groundwater wells in which water levels were below the bottom of the screen;
- Removal of 14 dry, redundant, or previously plugged and abandoned wells from the perched LTM network;
- Reduced monitoring frequency in 41 perched and four Ogallala LTM wells;
- Removal of the 5-year modified Appendix IX sampling from four Ogallala LTM wells; and
- Removal of two previously plugged and abandoned wells from the Ogallala LTM network.

The previous 2019 LTM network consisted of 129 perched aquifer wells and 24 Ogallala wells. A total of 12 new perched aquifer wells have been proposed for addition to the LTM network since 2019; eight perched aquifer wells have been proposed for removal, including two wells previously converted to ISB injection wells, three wells changed to treatment zone monitoring (TZM) wells, and one well that had to be relocated and replaced with a new well because of building construction. For the Ogallala Aquifer, seven new wells have been added since 2019 and one Ogallala aquifer well has been removed and will be replaced with a new well. Table 1-1 summarizes monitoring frequency for wells in the 2019 LTM network and the recommendations in this 2024 LTM System Design Update. The basis and rationale for the proposed changes are provided in Sections 2 and 3 of this update for the perched groundwater and Ogallala Aquifer, respectively.

Table 1-1. Monitoring Frequency and Number of Wells in LTM Network in 2019 and 2024

Monitoring Frequency	2019 LTM Network (Number of Wells)	Recommended 2024 LTM Network (Number of Wells)
Perched Aquifer		
Quarterly	0	0
Semi-Annual	54	44
Annual	43	49
5 Year	10	12
Water Level Only	22	28
Total Perched Aquifer Wells	**129**	**133**
Ogallala Aquifer		
Semi-Annual	16	22
Annual	8	8
Total Ogallala Aquifer Wells	**24**	**30**

2. PERCHED GROUNDWATER

The primary goal of the LTM network in the perched aquifer is to confirm progress toward RAOs. Data collected from the monitoring network are used to evaluate the performance and efficacy of the remedies and are used to compare actual site conditions to expected conditions. The three primary monitoring objectives for the perched groundwater network are to manage uncertainty, evaluate plume stability, and evaluate remedial efficacy. All monitoring wells are assigned one or more of these monitoring objectives.

This section summarizes the proposed changes to the LTM network for perched groundwater beneath Pantex Plant. The strategy used to develop the original monitoring network has not changed. A quantitative statistical evaluation of the site was conducted using the Monitoring and Remediation Optimization System (MAROS) software. The MAROS results were qualitatively reviewed for consistency with the goals and objectives of the monitoring program and the conceptual site model. Final recommendations for the monitoring network are a combination of the quantitative analysis and qualitative review.

Groundwater plumes in the perched aquifer for the four major COCs, RDX (hexahyrdro-1,3,5-trinitro-1,3,5-triazine), hexavalent chromium, perchlorate, and trichloroethene (TCE), are shown in Figures 2-1 through 2-4, respectively. The site wide LTM network is shown in Figures 2-5 through 2-7.

2.1. EVALUATION OF PERCHED AQUIFER LONG-TERM MONITORING NETWORK

The current groundwater monitoring network and groundwater concentration data were quantitatively evaluated relative to the stated monitoring objectives using statistical tools found in the MAROS software by HydroGeoLogic, Inc. (HGL) as described in the *Long-Term Monitoring Optimization Review, Perched Groundwater Unit, October 2022* (Appendix A). MAROS is a decision-support software developed for the Air Force Center for Engineering and the Environment (AFCEE) to assist in formulating cost-effective long-term groundwater monitoring plans. MAROS optimizes an existing groundwater monitoring program using both temporal and spatial data analyses to determine the locations and frequency of sampling for future compliance monitoring.

Recommendations for perched groundwater sampling frequency and location are based on current hydrogeologic conditions and defined LTM goals for the system. These recommendations have been developed based on the technical review, balancing both the statistical results from MAROS with goals of the monitoring system and anticipated site management decisions.

2.1.1 Perched Aquifer Long-Term Monitoring Goals and Objectives

The goal of the long-term monitoring optimization (LTMO) process is to review the current groundwater monitoring program and provide recommendations for improving the efficiency and accuracy of the network in supporting monitoring objectives. Specifically, the LTMO process provides information on site characterization, plume stability, sufficiency and redundancy of monitoring locations, and the appropriate frequency of network sampling. The end product of the LTMO process at Pantex Plant is a recommendation for specific sampling locations and frequencies that best address site monitoring goals and objectives while minimizing time and expense associated with collecting and interpreting analytical data.

2.1.2 Results

The monitoring system for perched groundwater was evaluated using analytical and hydrogeologic data collected between 2017 and 2021; analytical data from the previous LTM investigations (2000 through 2016) were used to supplement analyses of long-term trends. For the MAROS analysis, perched groundwater was divided into three sectors, Southeast, Southwest, and North, based on the direction of groundwater flow, source areas, and major constituents associated with each sector. Investigation wells were grouped into networks according to the defined sectors.

The Southeast Sector monitoring network consists of wells in perched groundwater extending south from Playa 1 to the eastern and southern extent of perched groundwater including Zone 12. The Southwest Sector monitoring network includes and extends west and south of Zone 11 and also overlaps the Southeast Sector in the area south of Zone 12. Investigation wells south of Zone 12 were included in both the Southwest and Southeast Sector spatial analyses to account for possible variability in groundwater flow in this area. The North Sector includes groundwater north of Zones 11 and 12 in the vicinity of Playa 1; the Burning Ground and Old Sewage Treatment Plant areas are also included in the North Sector.

Southeast Sector

The results of the MAROS spatial analyses indicated overall low concentration uncertainty and low variability between monitoring locations in the Southeast Sector. Evenly spaced monitoring locations, low concentration uncertainty and relatively low variability, along with stable individual well trend and moment analysis results indicated that the network is well designed to address priority monitoring goals of plume stability and uncertainty assessment.

The MAROS analysis did not identify any wells for removal from the Southeast Sector routine monitoring program. However, monitoring locations with low spatial uncertainty were considered for reduced sampling frequency.

Two additional monitoring wells were recommended for the area east of the Southeast ISB Extension: one between PTX06-1195 and PTX06-1196, and one northeast of PTX06-1199 to reduce uncertainty and identify the northeastern plume boundary near Highway 60. An additional monitoring well was recommended east of PTX06-1042 to track higher RDX concentrations moving towards the Southeast ISB Extension and line of extraction wells located around PTX06-1147. Planned new monitoring wells in the area of the Offsite ISB were determined to be sufficient to assess the performance of the Offsite ISB and to delineate the extent of offsite plume migration to the southeast.

While the MAROS results indicated that a biennial sampling frequency would be sufficient to evaluate the rate of concentration change in the network and at most wells, an overall annual sampling frequency was recommended for most locations in the Southeast Sector. Semiannual sampling was recommended at wells used to evaluate the ISB and SEPTS remedies and potential plume migration along the east and southeast edges of the perched unit.

Southwest Sector

Results for the moment analyses for both TCE and perchlorate plumes indicate statistically stable and decreasing trends for total dissolved mass within the network. Centers of mass for TCE and perchlorate had stable trends. While individual wells within the network may show strong trends, the plumes are not migrating or significantly changing distribution on a larger sector scale.

The MAROS analysis found overall low spatial uncertainty within the network; no wells in the routine sampling network were recommended for elimination. The software identified the area outside of the monitoring network south of the ISB as potentially requiring additional monitoring. One additional monitoring well was recommended for the area downgradient from the Zone 11 ISB to manage uncertainty about migration of the TCE and perchlorate plumes downgradient of PTX06-1035. An additional well south of PTX08-1008 and between PTX06-1156 and PTX06-1052 was recommended to monitor the movement of perchlorate and 1,4-dioxane toward the SEPTS.

Monitoring wells in the Zone 11 and Zone 12 source areas show largely stable trends resulting in recommendations for annual sampling. ISB area wells were recommended for semiannual sampling frequency. Wells outside of the main plumes to the west are minimally affected by site COCs and were recommended for sampling every five years.

North Sector

No changes to the North Sector monitoring network were recommended by the MAROS analysis. concentration trends in the North Sector are not changing rapidly. Generally, an annual sampling frequency was recommended for the Playa 1 area. Perched groundwater wells in the Burning Ground and northern boundary areas were recommended for 5-year sampling frequency except for POC wells that were recommended for annual sampling.

MAROS Summary

Recommendations of the MAROS analysis were used to guide the recommendations for the LTM network proposed in this report. The proposed implementation of the MAROS recommendations in the perched groundwater LTM network is discussed in detail by indicator area in the following sections.

2.2. MONITORING RECOMMENDATIONS FOR INDICATOR AREAS

The proposed LTM network is shown in Table 2-1 and Figure 2-8. The indicator areas described in the following sections are shown on Figure 2-9. The recommended sampling frequencies for all perched aquifer wells are shown on Figure 2-10. Proposed changes to the LTM network for 2024 include:

- Addition of eight new perched aquifer LTM wells installed since the 2019 update;
- Three additional new wells proposed as part of this 2024 Update;
- Replacement of one existing perched aquifer well that had to be relocated and replaced with a new well because of building construction;
- Reduced monitoring frequency in 13 LTM wells.
- Addition of monitoring for one previously dry LTM well in which water levels have recovered and have been increasing since 2020.
- Water level (WL) monitoring only for six wells in which water levels have declined as expected and are below the bottom of the screen.
- Removal of eight wells from the LTM network, including two wells previously converted to ISB injection wells, three wells changed to TZM wells, and one well that had to be relocated. The remaining two wells are dry, do not provide useful data, or are redundant with other wells.

2.2.1 Southeast Indicator Area

The Southeast indicator area extends from Playa 1 to the south and southeast including most of Zone 12 (Figure 2-9). The Southeast indicator area encompasses the SEPTS, the Southeast ISB System, and the Southeast ISB Extension. A total of 76 perched aquifer LTM wells are located in this indicator area. Along the eastern edge of the Southeast indicator area are five wells that generally establish the extent of the perched zone. These wells are either dry or have water levels below the screened interval and are monitored for water level only.

The central section of the Southeast indicator area includes wells that monitor the mid-plume area (Figures 2-8 and 2-9). These wells have gradually declining water levels and COCs (RDX and breakdown products) above the GWPS. The long-term RDX trend since the start of remedial action is decreasing in these wells. The monitoring frequency in most of these mid-plume wells is annual.

The southern portion of the Southeast indicator area includes a grouping of LTM wells associated with the Southeast ISB (Figure 2-12). These wells are on the fringe of the perched saturated zone. The water levels in most of these wells are just above or just below the bottom of the screened interval; COCs are present in concentrations greater than the GWPS except in downgradient wells demonstrating treatment.

Pantex installed the Southeast ISB Extension system in 2017 to address another area of contamination in the far southeast perched groundwater. The system consists of 31 ISB injection wells, 2 TZM wells, and 2 ISPM wells as shown in Figure 2-13. Another ISB system was installed in 2020 southeast of Pantex owned property to address HE contamination that moved south of Highway 60 beneath a neighboring property. This offsite ISB system currently consists of 56 ISB injection wells, 44 ISB extraction wells (REC-named wells), and 6 TZM wells, as depicted in Figure 2-14.

Recommended changes in LTM monitoring for the Southeast indicator area include:

- Addition of five monitoring wells installed since 2019 in the far southeast extent of perched groundwater. Three of these wells (PTX06-1215, PTX06-1216, and PTX06-1222) are recommended for semi-annual monitoring for at least the next five years to develop a solid baseline of information for this area. Two ISB TZM wells for the Southeast ISB Extension, PTX06-1218 and PTX06-1221, have been designated as POC wells and are proposed for semi-annual monitoring.

- Addition of PTX06-1205, located in the far southeast extent of perched groundwater. This dry well was installed in 2019 and is recommended for water level monitoring only.

- Addition of PTX06-1212, located at the extent of perched groundwater south of Zone 12. This dry well was installed in 2021 and is recommended for water level monitoring only.

- Monitoring frequency reduced from semi-annual to annual in nine wells (PTX06-1005, PTX06-1037, PTX06-1041, PTX06-1095A, PTX06-1133A, PTX06-1154, PTX06-1182, PTX06-1183, and PTX06-1208). This reduction in frequency is recommended because the COC concentration trends in these wells can be adequately assessed on an annual basis.

- Water level monitoring only in six wells (PTX06-1015, PTX06-1030, PTX06-1040, PTX06-1103, PTX06-1123, and PTX06-1130). This change is recommended because the water levels are below the bottom of the screen or the wells contain insufficient water to collect samples and are not expected to recover.

- Removal of six wells from the LTM system (PTX06-1098, PTX06-1153, PTX06-1191, PTX06-1197, PTX06-1201, and PTX06-1203). Three of these wells (PTX06-1197, PTX06-1201, and PTX06-1203) have been converted to TZM wells within the Offsite ISB treatment area. Two wells, PTX06-1153 and PTX06-1191, have been converted to ISB injection wells. The remaining well, PTX06-1098, was installed as part of the ISB Pilot System and is redundant with PTX06-1101 because concentrations of all primary COCs have been non-detect or below GWPS since 2009.

Three new wells recommended from the MAROS analysis have not been included in the LTM Update at this time as follows:

- Two additional monitoring wells in the area east of the Southeast ISB Extension: one between PTX06-1195 and PTX06-1196, and one northeast of PTX06-1199 to reduce uncertainty and identify the northeastern plume boundary near Highway 60.
    - Between PTX06-1195 and PTX06-1196: This location is downgradient of the Southeast ISB Extension. Treatment zone results indicate that reducing conditions have been adequate to treat high explosives; therefore, an additional downgradient well is not needed in this area.
    - Northeast of PTX06-1199: Concentrations of RDX and DNT4A have been decreasing in PTX06-1199 since 2021. An additional well northeast of PTX06-1199 is not needed as long as these concentrations are stable or decreasing.
- East of PTX06-1042 and north of PTX06-1147 to track higher RDX concentrations moving towards the Southeast ISB Extension: A well in this location may be needed in the future but is not recommended at this time because of declining water levels in this area.

2.2.2 Zone 11 Indicator Area

The Zone 11 indicator area is centered on the Pantex Zone 11 operational area and extends northeast along the ditches to Playa 1 and to the southeast and southwest in the directions of groundwater flow from the southern part of Zone 11. The Zone 11 indicator area has been expanded to the east and southeast from previous LTM design reports based on the westward shift in the perched groundwater flow divide. The flow divide represents the change in perched groundwater flow direction from generally southwest to generally southeast. Historically, this flow divide was generally located between Zones 11 and 12, but in recent years the divide has shifted westward in response to declining water levels in the areas east and southeast of Zone 12 resulting from operation of the SEPTS. The indicator area includes 40 existing LTM wells and three proposed new monitor wells (Figure 2-9). ISB injection and monitoring wells are located south of Zone 11 (Figure 2-11).

The northern portion of the Zone 11 indicator area is influenced by Playa 1. Some wells near the playa have exhibited recently increasing water level trends in response to decreased extraction of perched groundwater at the Playa 1 Pump and Treat System (P1PTS) and release of wastewater to Playa 1. Pantex has recently completed two projects, a new pivot irrigation system east of Farm-to-Market Road (FM) 2373 and new injection capabilities near Playa 2, to provide a long-term solution to treated water management that is expected to allow consistent operation of both groundwater pump and treat systems going forward.

Recommended changes in LTM monitoring for the Zone 11 indicator area are:

- Addition of one monitoring well, PTX06-1211, installed since 2019 downgradient of Zone 11. This well is proposed for semi-annual monitoring.

- Addition of PTX06-1234 as a replacement for a well on the southeast side of Zone 11 where expansion of a building requires the well to be plugged and abandoned. The replacement well is proposed for semi-annual monitoring for the next five years to develop a baseline of results.

- Removal of PTX08-1006 from the LTM network because expansion of a building requires this well to be plugged and abandoned.

- Addition of two new wells near the south end of Zone 11, PTX06-1235 and PTX06-1236, proposed to provide additional monitoring of source areas within Zone 11. These wells are proposed for semi-annual monitoring for the next five years to develop a baseline of results.

- Addition of one new well (PTX06-1238) downgradient of PTX06-1035 on Texas Tech University property as recommended by the MAROS analysis to manage uncertainty about migration of the TCE and perchlorate plumes in this area. This well is proposed for semi-annual monitoring for the next five years to develop a baseline of results.

- Monitoring frequency reduced from semi-annual to annual in four wells (PTX06-1012, PTX06-1160, PTX06-1174, and PTX06-1183). This reduction in frequency is recommended because the COC concentration trends in these wells can be adequately assessed on an annual basis.

- Addition of monitoring for previously dry LTM well PTX07-1P05. Water levels in this well declined from 2000 through 2013 when the water level dropped below the bottom of the screen. Water levels in this well began increasing in 2020 and are now sufficient to allow for sampling. This uncertainty management well is proposed for sampling every five years.

The MAROS analysis recommended addition of a new well south of PTX08-1008 to monitor the movement of perchlorate and 1,4-dioxane to the southeast. A well in this location may be needed in the future but is not recommended at this time because of a planned expansion of Pantex Plant facilities in this area. A location for this well will be proposed in the next LTM update.

2.2.3 North Indicator Area

The North indicator area is generally the area north of Playa 1 and includes seven LTM wells. Recommended changes in LTM monitoring in the North indicator area are:

- Removal of one well, PTX07-1O01, from the LTM network. This well was previously recommended for water level monitoring only in the 2019 LTM Update because water levels had been below the bottom of the screen since 2013. Although water has re-entered the well, the water levels have been stable since 2022 and are not expected to increase further with resumed operation of the P1PTS. Adequate monitoring of any localized changes to the perched zone is provided by the other LTM wells in this area.

2.2.4 Burning Ground

A small body of perched groundwater is present beneath the Burning Ground; four LTM wells are used to monitor this area. No changes in LTM monitoring are recommended for the Burning Ground area.

2.2.5 Miscellaneous Areas

The Miscellaneous area includes wells near Zone 10, Playa 2, Pantex Lake, and the Old Sewage Treatment Plant and includes 13 LTM wells. Recommended changes in LTM monitoring in the Miscellaneous area are:

- Reduce monitoring frequency from annual to five years in one well PTX06-1131 located southwest of Zone 10. This change is recommended because COC concentrations have been non-detect in all samples collected from this well.

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Table 2-1. Proposed Long-Term Monitoring Network for Perched Groundwater

Indicator Area[1]	Well ID	LTM Objectives	Progress Report Metrics	Expected Condition	Indicator List[2] Monitoring Frequency	Modified Appendix IX Monitoring (5-Year Frequency)[3]
Zone 11	1114-MW4	Uncertainty Management	Trend/Compare to GWPS	Long-term decreasing trend	Annual	Y
North	OW-WR-38	Uncertainty Management, Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	Y
Burning Ground	PTX01-1001	Uncertainty Management	Trend/Compare to GWPS	Below GWPS	Annual	Y
Burning Ground	PTX01-1004	Plume Stability	Dry	Remain dry	WL	N
Burning Ground	PTX01-1008	Uncertainty Management	Compare to GWPS	Below GWPS	Annual	Y
Burning Ground	PTX01-1009	Plume Stability	Dry	Remain dry	WL	N
Miscellaneous	PTX04-1002	Uncertainty Management	Trend/Compare to GWPS	Below GWPS	5 Yrs	Y
Southeast	PTX06-1002A	Uncertainty Management, Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	Y
Southeast	PTX06-1005	Uncertainty Management, Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	Y
Zone 11	PTX06-1006	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Annual	N
Zone 11	PTX06-1007	Uncertainty Management	Trend/Compare to GWPS	Long-term decreasing trend	Annual	Y
Southeast, Zone 11	PTX06-1008	Uncertainty Management	Trend/Compare to GWPS	Long-term decreasing trend	Annual	Y
Southeast, Zone 11	PTX06-1010	Uncertainty Management	Trend/Compare to GWPS	Long-term decreasing trend	Annual	Y
Southeast, Zone 11	PTX06-1011	Uncertainty Management	Trend/Compare to GWPS	Long-term decreasing trend	Annual	Y
Zone 11	PTX06-1012	Plume Stability, Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Annual	N
Southeast	PTX06-1013	Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	N
Southeast	PTX06-1014	Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	N
Southeast	PTX06-1015	Plume Stability	Dry	Remain dry	WL	N
Southeast	PTX06-1023	Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	N
Southeast	PTX06-1030	Plume Stability	Dry	Remain dry	WL	N
Southeast	PTX06-1031	Response Action Effectiveness	Trend/Compare to GWPS	Long-term stabilization of concentrations	Semi-Annual	N
Southeast	PTX06-1034	Plume Stability, Response Action Effectiveness	Trend/Compare to GWPS	Long-term stabilization of concentrations	Semi-Annual	N
Zone 11	PTX06-1035	Plume Stability	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast, Zone 11	PTX06-1036	Plume Stability	Dry	Remain dry	WL	N
Southeast	PTX06-1037	Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Annual	N
Southeast	PTX06-1038	Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	N
Southeast	PTX06-1039A	Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	N
Southeast	PTX06-1040	Response Action Effectiveness	Water Level	Limited water	WL	N
Southeast	PTX06-1041	Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	N
Southeast	PTX06-1042	Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Semi-Annual	N
Southeast	PTX06-1045	Response Action Effectiveness	Water level, Trend/Compare to GWPS	Limited water, Below GWPS	Annual	N
Southeast	PTX06-1046	Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Semi-Annual	N
Southeast	PTX06-1047A	Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Semi-Annual	N
North	PTX06-1048A	Plume Stability, Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Annual	N

Indicator Area[1]	Well ID	LTM Objectives	Progress Report Metrics	Expected Condition	Indicator List[2] Monitoring Frequency	Modified Appendix IX Monitoring (5-Year Frequency)[3]
Miscellaneous	PTX06-1049	Plume Stability	Trend/Compare to GWPS	Long-term stabilization of concentrations	Annual	N
North	PTX06-1050	Uncertainty Management, Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	N
Southeast	PTX06-1051	Plume Stability	Dry	Remain dry	WL	N
Southeast, Zone 11	PTX06-1052	Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Semi-Annual	N
Southeast, Zone 11	PTX06-1053	Plume Stability, Uncertainty Management	Trend/Compare to GWPS	Below GWPS	Annual	N
Southeast	PTX06-1069	Plume Stability	Trend/Compare to GWPS	Below GWPS	Annual	N
Miscellaneous	PTX06-1071	Uncertainty Management	Compare to GWPS	Below GWPS	5 Yrs	Y
Zone 11	PTX06-1073A	Uncertainty Management	Dry	Remain dry	WL	N
Zone 11	PTX06-1077A	Uncertainty Management	Trend/Compare to GWPS	Below GWPS	Annual	Y
Miscellaneous	PTX06-1082	Uncertainty Management	Compare to GWPS	Below GWPS	5 Yrs	Y
Miscellaneous	PTX06-1083	Uncertainty Management	Trend/Compare to GWPS	Below GWPS	5 Yrs	Y
Miscellaneous	PTX06-1085	Uncertainty Management	Compare to GWPS	Below GWPS	5 Yrs	Y
Miscellaneous	PTX06-1086	Uncertainty Management	Compare to GWPS	Below GWPS	5 Yrs	Y
Southeast, Zone 11	PTX06-1088	Uncertainty Management, Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Semi-Annual	Y
Southeast	PTX06-1089	Plume Stability	Dry	Remain dry	WL	N
Southeast	PTX06-1090	Plume Stability	Dry	Remain dry	WL	N
Southeast	PTX06-1091	Plume Stability	Dry	Remain dry	WL	N
Southeast	PTX06-1093	Plume Stability	Dry	Remain dry	WL	N
Southeast	PTX06-1095A	Uncertainty Management, Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	N
Miscellaneous	PTX06-1097	Plume Stability	Dry	Remain dry	WL	N
Southeast, Zone 11	PTX06-1101	Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Long-term stabilization of concentrations	Annual	N
Southeast	PTX06-1102	Response Action Effectiveness	Dry	Remain dry	WL	N
Southeast	PTX06-1103	Response Action Effectiveness	Dry	Remain dry	WL	N
Southeast	PTX06-1120	Plume Stability	Water Level, Trend/Compare to GWPS	Limited water, Long-term stabilization of concentrations	Annual	N
Southeast	PTX06-1121	Plume Stability	Dry	Remain dry	WL	N
Southeast	PTX06-1122	Plume Stability	Dry	Remain dry	WL	N
Southeast	PTX06-1123	Response Action Effectiveness	Water Level	Limited water	WL	N
Southeast	PTX06-1125	Plume Stability	Dry	Remain dry	WL	N
Zone 11	PTX06-1126	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Zone 11	PTX06-1127	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Southeast	PTX06-1130	Plume Stability	Dry	Remain dry	WL	N
Miscellaneous	PTX06-1131	Uncertainty Management	Compare to GWPS	Below GWPS	5 Yrs	Y
Southeast	PTX06-1133A	Plume Stability	Water Level, Trend/Compare to GWPS	Limited water, Long-term stabilization of concentrations	Annual	N
Zone 11	PTX06-1134	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Southeast, Zone 11	PTX06-1135	Plume Stability	Dry	Limited water	WL	N

Indicator Area[1]	Well ID	LTM Objectives	Progress Report Metrics	Expected Condition	Indicator List[2] Monitoring Frequency	Modified Appendix IX Monitoring (5-Year Frequency)[3]
North	PTX06-1136	Plume Stability	Dry	Remain dry	WL	N
Southeast	PTX06-1146	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Southeast	PTX06-1147	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Zone 11	PTX06-1148	Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Zone 11	PTX06-1149	Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Zone 11	PTX06-1150	Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Zone 11	PTX06-1151	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Southeast	PTX06-1154	Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Annual	N
Zone 11	PTX06-1155	Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Zone 11	PTX06-1156	Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast	PTX06-1158	Plume Stability	Dry	Remain dry	WL	N
Zone 11	PTX06-1159	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Zone 11	PTX06-1160	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Annual	N
Southeast, Zone 11	PTX06-1166	Plume Stability	Trend/Compare to GWPS	Long-term stabilization of concentrations	Annual	N
Southeast	PTX06-1167	Response Action Effectiveness	Dry	Remain dry	WL	N
Zone 11	PTX06-1171	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Annual	N
Zone 11	PTX06-1173	Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Zone 11	PTX06-1174	Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Annual	N
Zone 11	PTX06-1175	Response Action Effectiveness	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Zone 11	PTX06-1180	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Southeast	PTX06-1182	Plume Stability	Trend/Compare to GWPS	Below GWPS	Annual	N
Southeast, Zone 11	PTX06-1183	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Annual	N
Southeast	PTX06-1184	Plume Stability	Dry	Limited water	WL	N
Southeast	PTX06-1185	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Southeast	PTX06-1190	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Southeast Extension	PTX06-1192	Plume Stability	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast	PTX06-1193	Plume Stability	Dry	Remain dry	WL	N
Southeast Extension	PTX06-1194	Response Action Effectiveness, Plume Stability	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast	PTX06-1195	Plume Stability	Trend/Compare to GWPS	Below GWPS	Annual	N
Southeast Extension	PTX06-1196	Response Action Effectiveness, Plume Stability	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast Extension	PTX06-1199	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Southeast Extension	PTX06-1200	Plume Stability	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast Extension	PTX06-1202	Plume Stability	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast Extension	PTX06-1204	Plume Stability	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast Extension	PTX06-1205	Plume Stability	Dry	Remain dry	WL	N
Zone 11	PTX06-1207	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N

Indicator Area[1]	Well ID	LTM Objectives	Progress Report Metrics	Expected Condition	Indicator List[2] Monitoring Frequency	Modified Appendix IX Monitoring (5-Year Frequency)[3]
Southeast Extension	PTX06-1208	Plume Stability	Trend/Compare to GWPS	Below GWPS	Annual	N
Zone 11	PTX06-1211	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Southeast, Zone 11	PTX06-1212	Plume Stability	Dry	Remain dry	WL	N
Southeast Extension	PTX06-1215	Response Action Effectiveness, Plume Stability	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast Extension	PTX06-1216	Plume Stability	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast Extension	PTX06-1218	Plume Stability	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast Extension	PTX06-1221	Plume Stability	Trend/Compare to GWPS	Below GWPS	Semi-Annual	N
Southeast Extension	PTX06-1222	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
Zone 11	PTX06-1234	Uncertainty Management	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	Y
Zone 11	PTX06-1235	Uncertainty Management	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	Y
Zone 11	PTX06-1236	Uncertainty Management	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	Y
Zone 11	PTX06-1238	Plume Stability	Trend/Compare to GWPS	Long-term decreasing trend	Semi-Annual	N
North	PTX07-1O02	Plume Stability, Uncertainty Management, Response Action Effectiveness	Trend/Compare to GWPS	Long-term decreasing trend	Annual	Y
North	PTX07-1O03	Plume Stability, Uncertainty Management, Response Action Effectiveness	Trend/Compare to GWPS	Long-term decreasing trend	Annual	Y
Zone 11	PTX07-1P02	Uncertainty Management	Trend/Compare to GWPS	Below GWPS	Annual	Y
Zone 11	PTX07-1P05	Uncertainty Management	Trend/Compare to GWPS	Below GWPS	5 Yrs	N
Miscellaneous	PTX07-1Q01	Uncertainty Management	Compare to GWPS	Below GWPS	5 Yrs	Y
Miscellaneous	PTX07-1Q02	Uncertainty Management	Compare to GWPS	Below GWPS	5 Yrs	Y
Miscellaneous	PTX07-1R03	Uncertainty Management	Compare to GWPS	Below GWPS	5 Yrs	Y
Zone 11	PTX08-1001	Uncertainty Management, Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	Y
Southeast	PTX08-1002	Uncertainty Management, Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	Y
Zone 11	PTX08-1003	Plume Stability	Trend/Compare to GWPS	Below GWPS	Annual	N
Zone 11	PTX08-1005	Uncertainty Management	Trend/Compare to GWPS	Long-term decreasing trend	Annual	Y
Southeast, Zone 11	PTX08-1007	Uncertainty Management	Trend/Compare to GWPS	Long-term decreasing trend	Annual	Y
Southeast, Zone 11	PTX08-1008	Uncertainty Management, Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Semi-Annual	Y
Southeast, Zone 11	PTX08-1009	Uncertainty Management, Response Action Effectiveness	Water Level, Trend/Compare to GWPS	Decreasing water levels, Long-term stabilization of concentrations	Annual	Y
Miscellaneous	PTX08-1010	Uncertainty Management	Trend/Compare to GWPS	Below GWPS	5 Yrs	Y
Southeast, Zone 11	PTX10-1014	Uncertainty Management	Trend/Compare to GWPS	Long-term decreasing trend	Annual	Y

1 The indicator monitoring lists are set according to the monitoring areas. The indicator monitoring lists can be found in the *Sampling and Analysis Plan*, CP Table IIIA of HW-50284; indicator areas are shown on Figure 2-9.
2 Refer to the latest approved Pantex Sampling and Analysis Plan or the HW-50284 CP Table IIIA for the indicator monitoring lists.
3 A full list of constituents to be monitored is required for uncertainty management. A modified Appendix IX has been recommended for the HW-50284 Renewal Application (CP Table III) and in the *Sampling and Analysis Plan*.
4 WL-Water Level monitoring only.

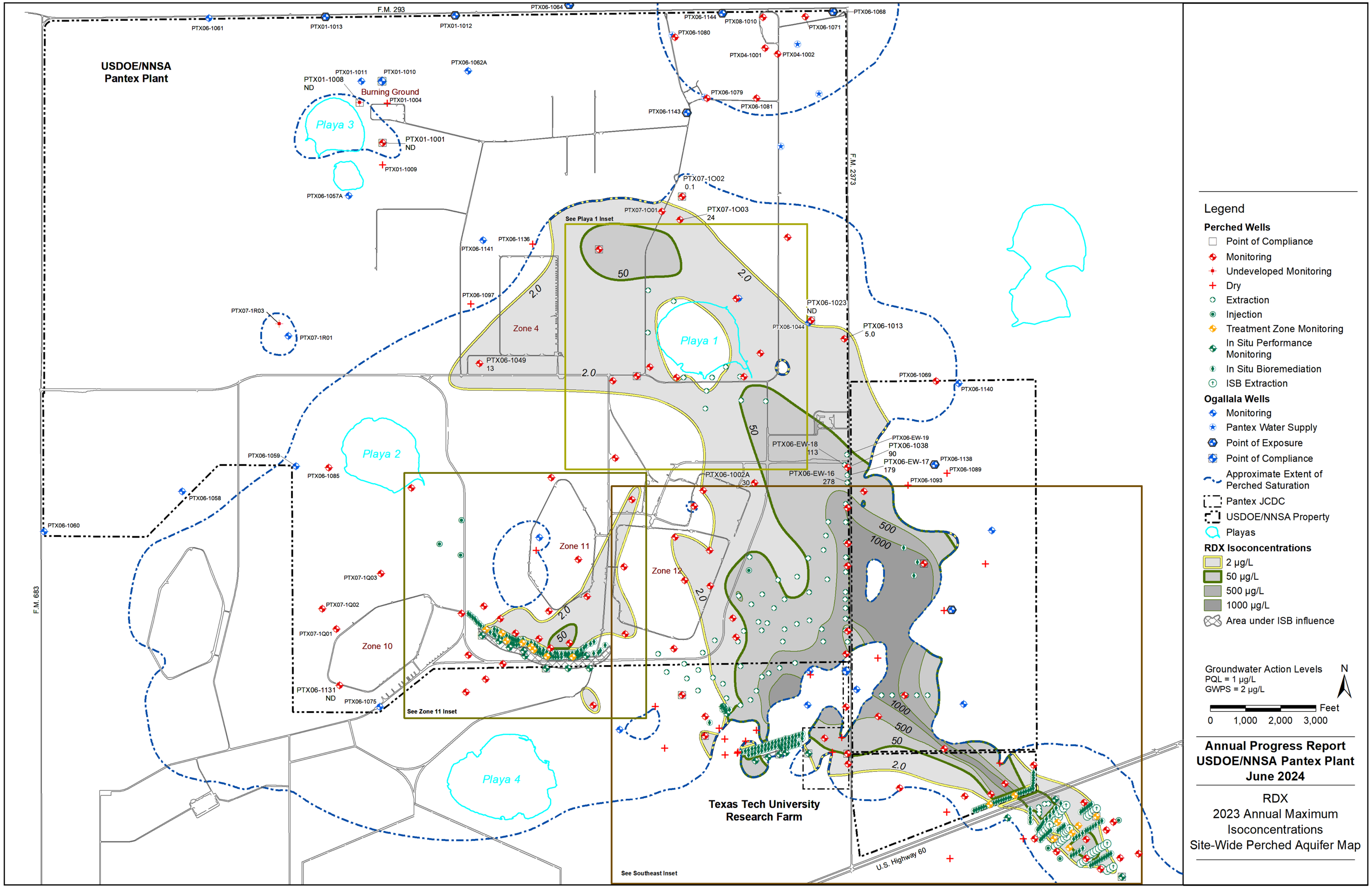

Figure 2-1. Perched Groundwater RDX Isoconcentrations

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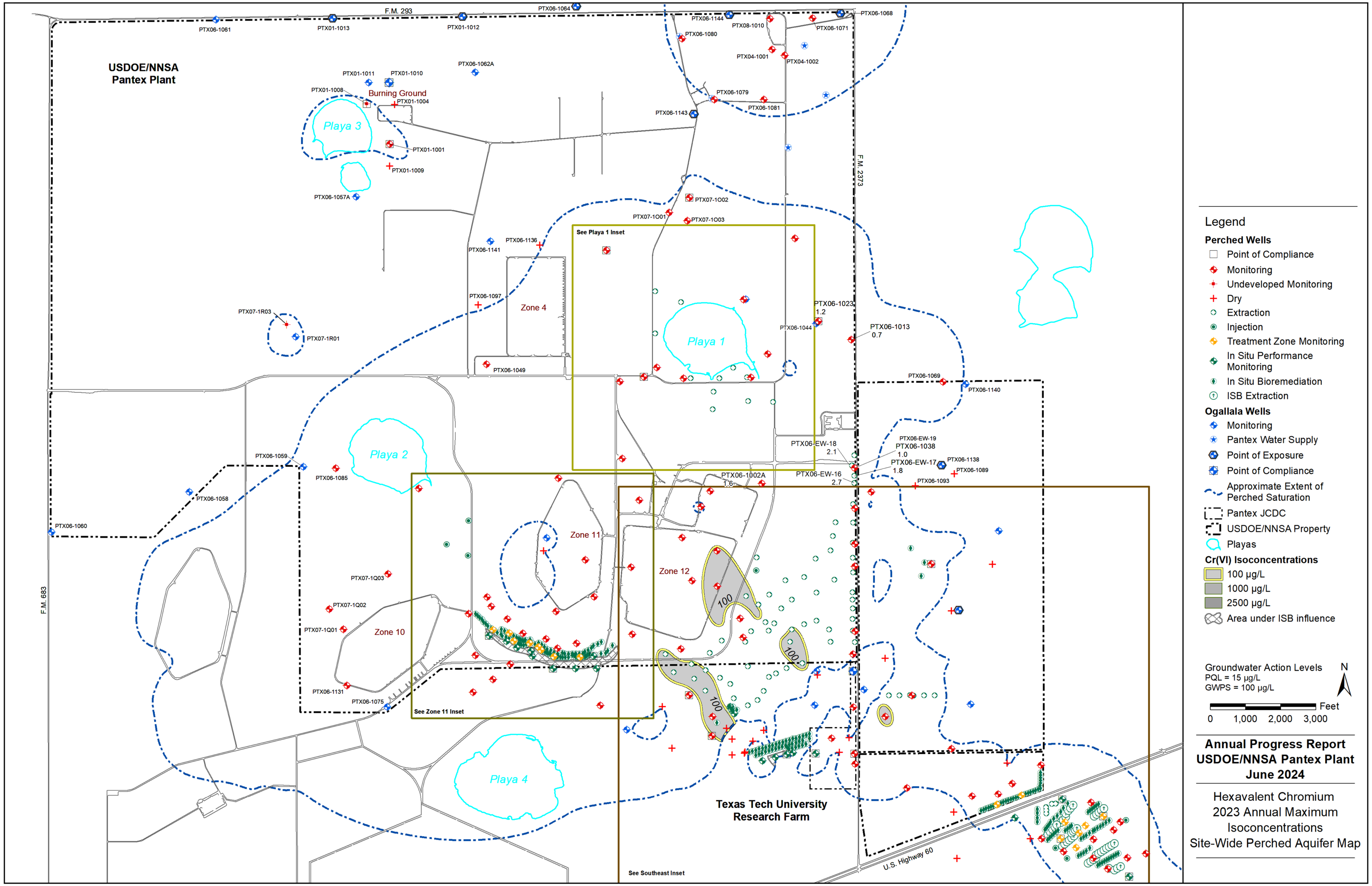

Figure 2-2. Perched Groundwater Hexavalent Chromium Isoconcentrations

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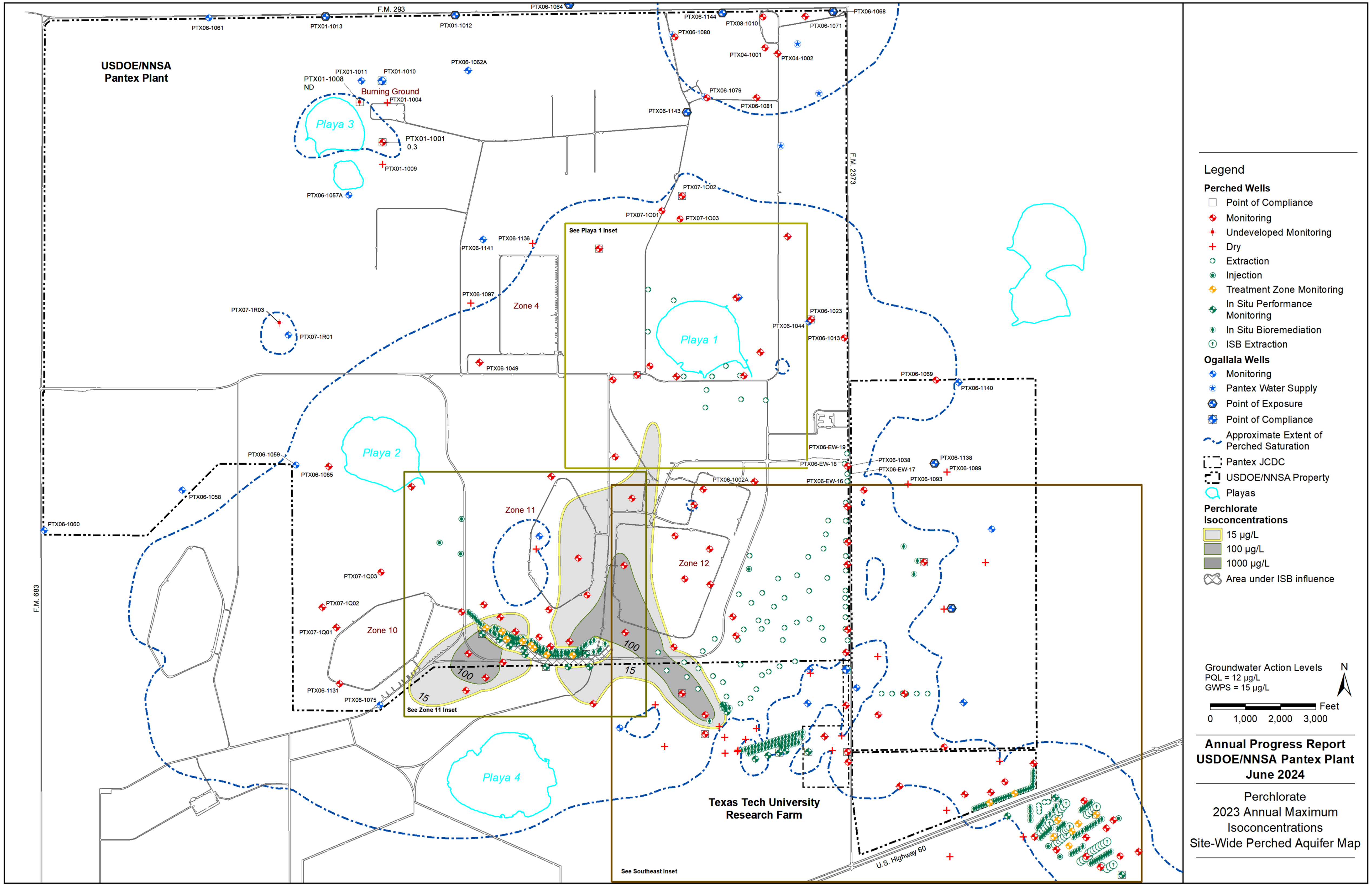

Figure 2-3. Perched Groundwater Perchlorate Isoconcentrations

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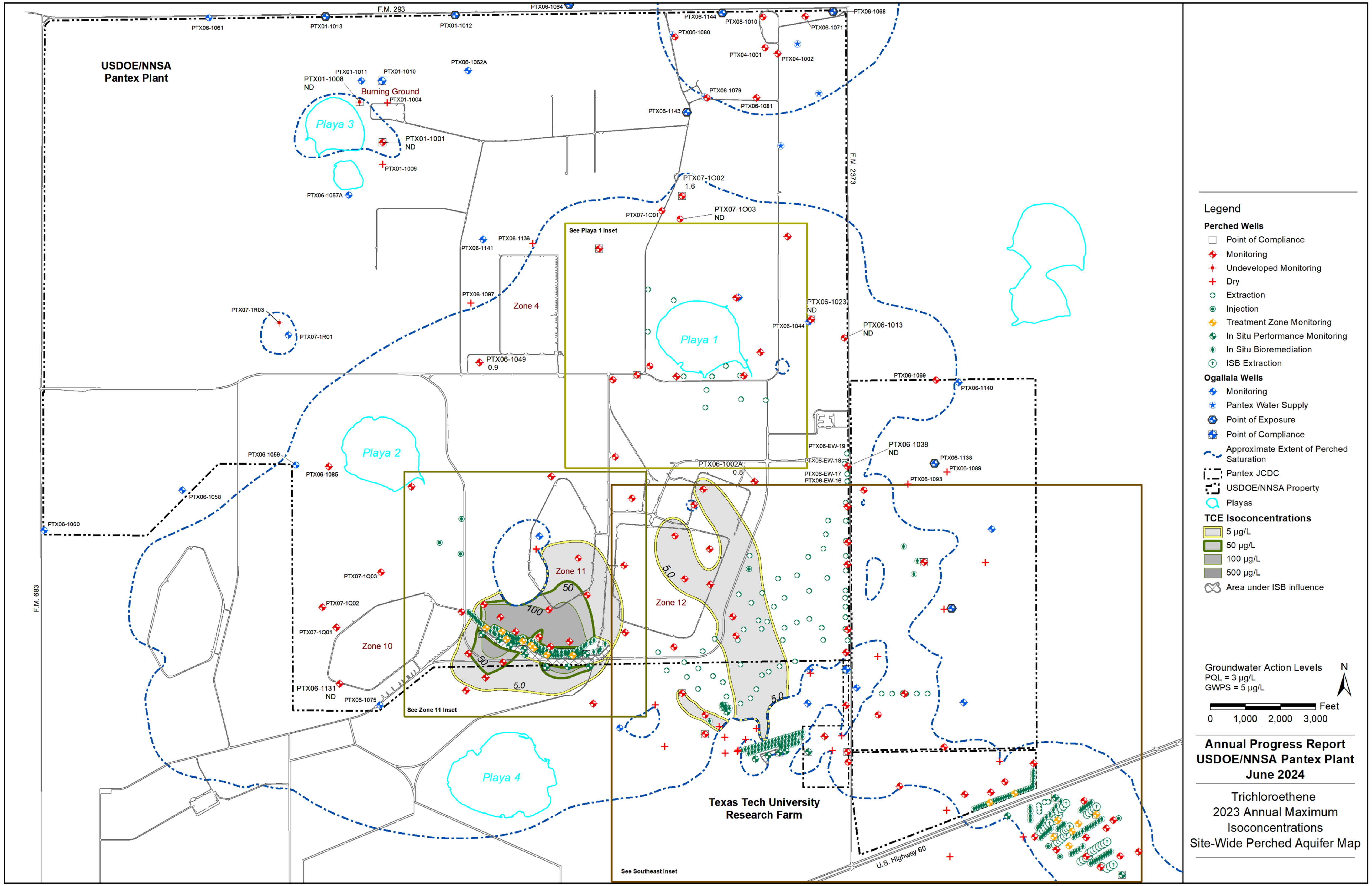

Figure 2-4. Perched Groundwater TCE Isoconcentrations

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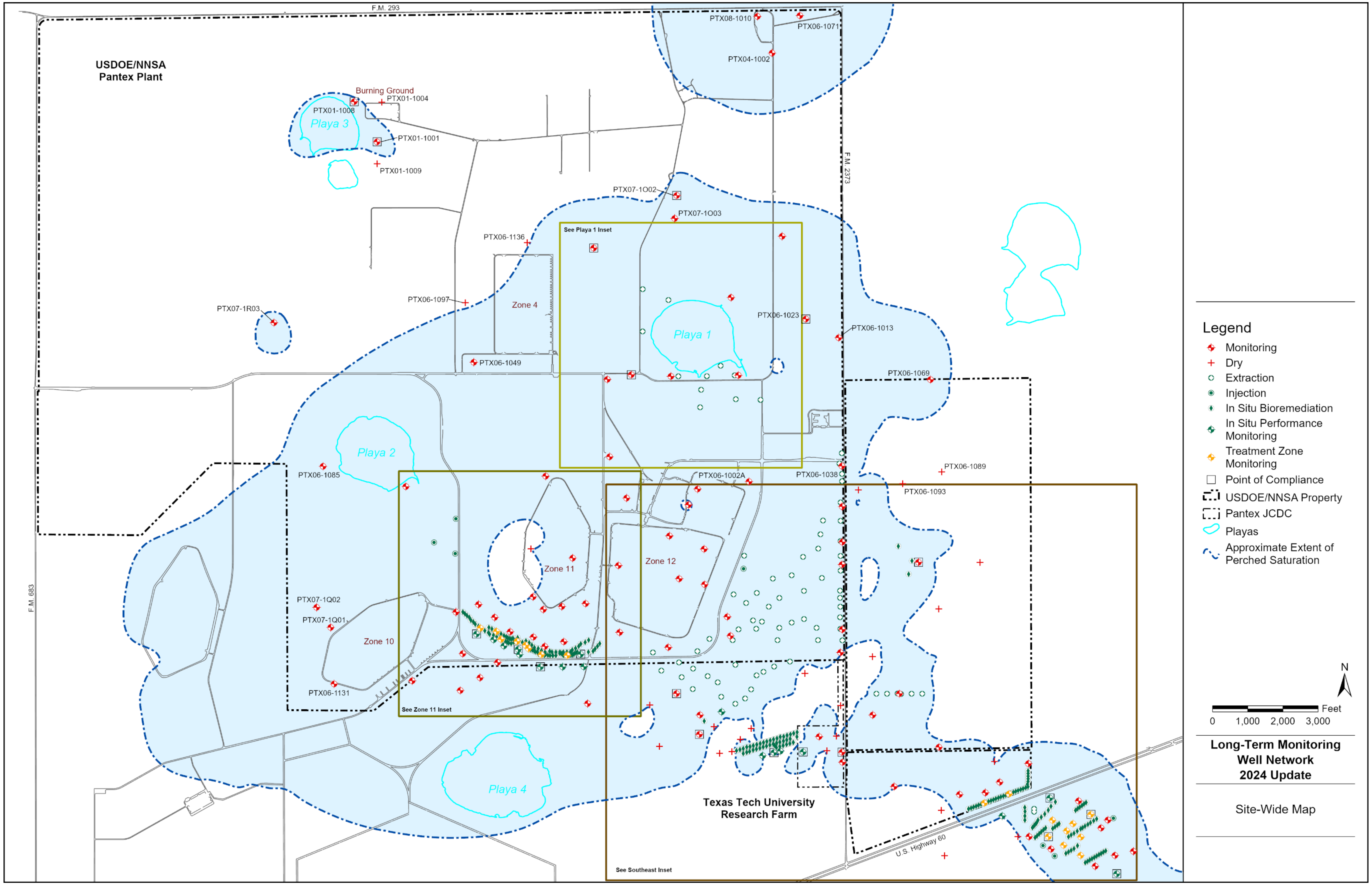

Figure 2-5. Perched Site-Wide LTM Well Location Map

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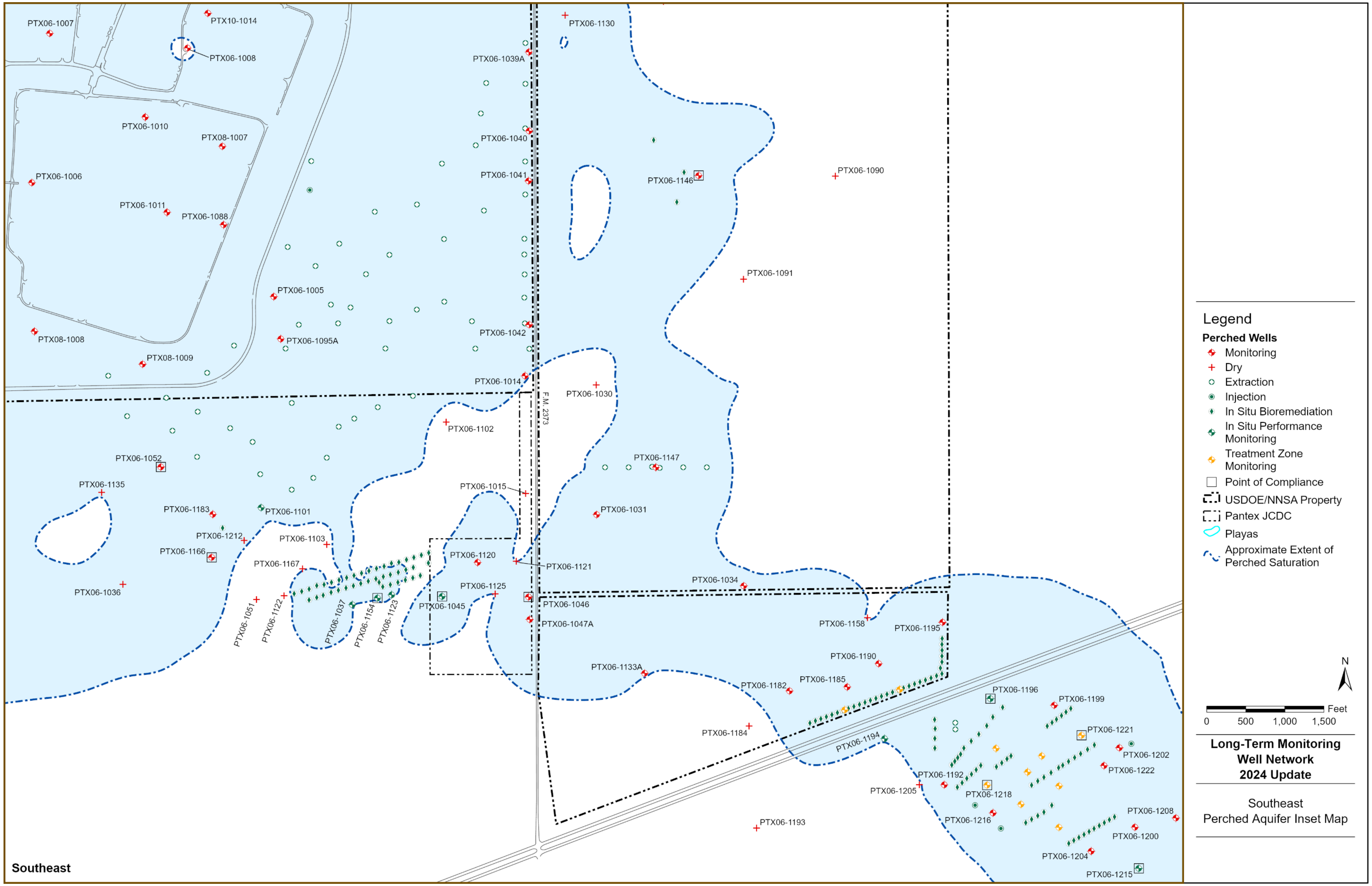

Figure 2-6. Perched Southeast Inset LTM Well Location Map

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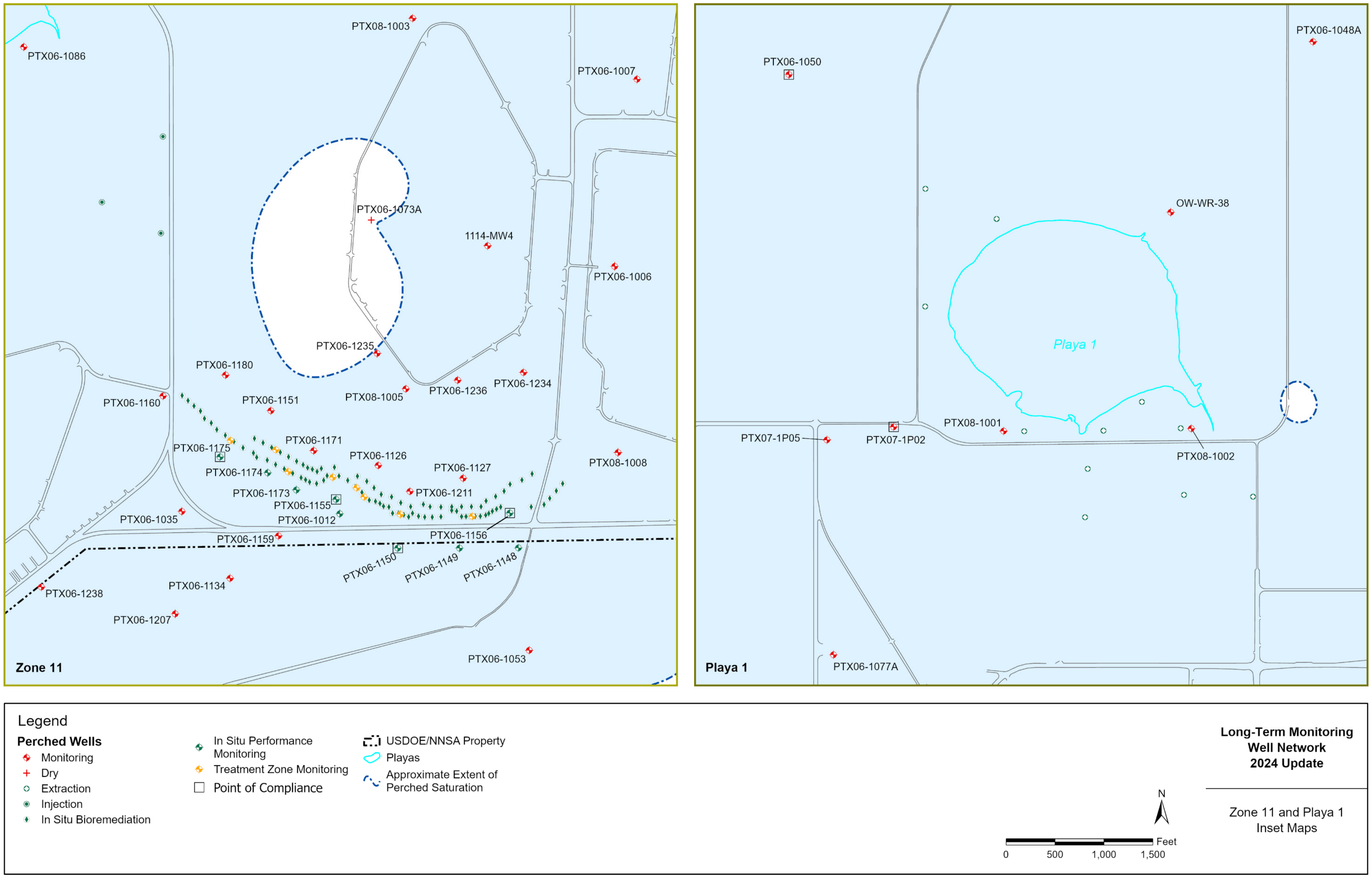

Figure 2-7. Perched Zone 11 and Playa 1 Inset LTM Well Location Maps

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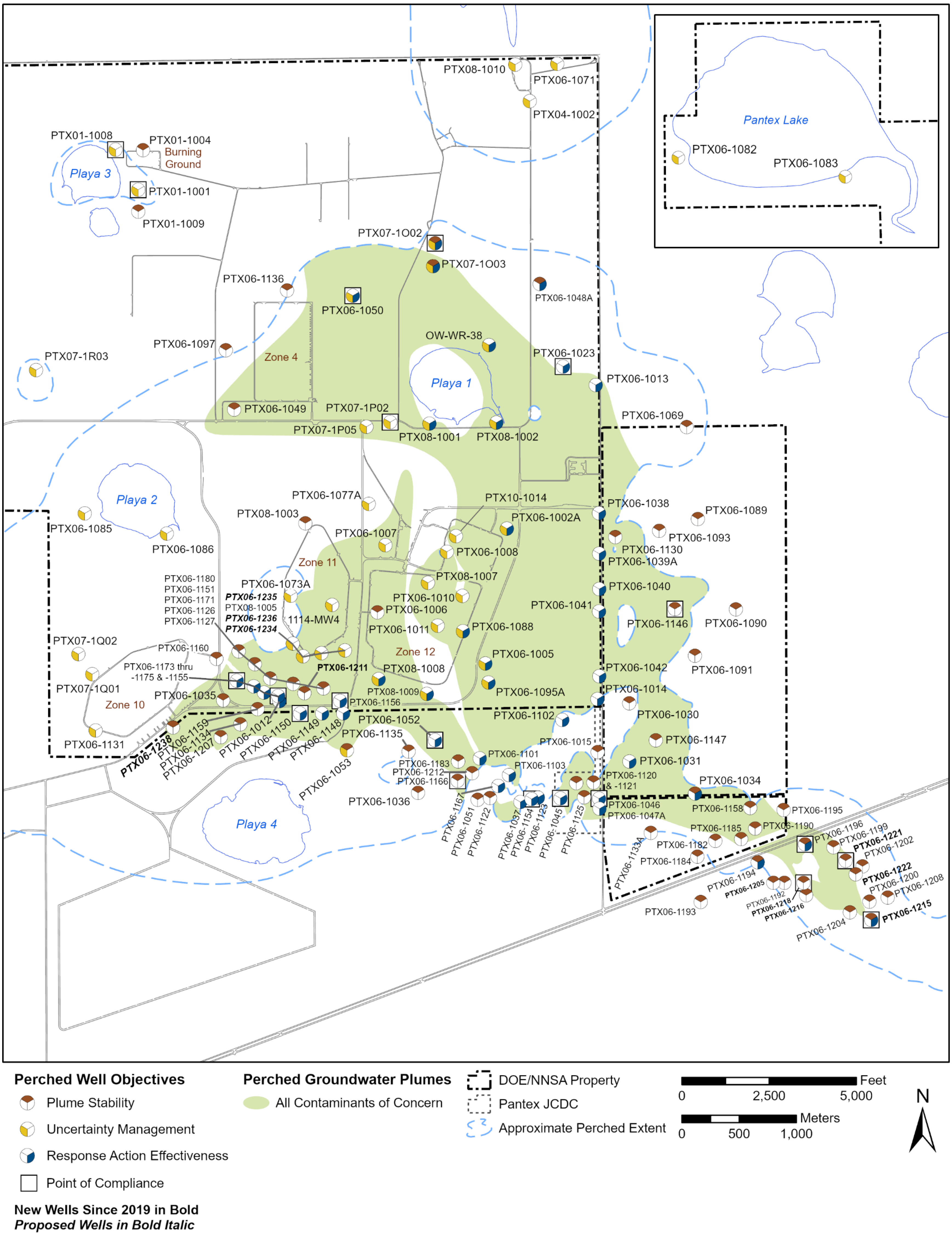

Figure 2-8. Perched Groundwater Long-Term Monitoring Network

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Indicator Constituents	Indicator Area			
	Burning Ground	North	Southeast	Zone 11
Primary List (Explosives, VOCs, Boron)	x	x	x	x
Chromium (Total & Hexavalent)			x	
1,4-Dioxane				x
Perchlorate	x			x

Primary Indicator Constituent List

High Explosives (12)

- RDX (Hexahydro-1,3,5-Trinitro-1,3,5-Triazine)
- MNX (Hexahydro-1-Nitroso-3,5-Dinitro-1,3,5-Triazine)
- DNX (Hexahydro-1,3-Dinitroso-5-Nitro-1,3,5-Triazine)
- TNX (Hexahydro-1,3,5-Trinitroso-1,3,5-Triazine)
- HMX (Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine)
- TNT (2,4,6-Trinitrotoluene)
- 2-Amino-4,6-Dinitrotoluene
- 4-Amino-2,6-Dinitrotoluene
- 1,3-Dinitrobenzene
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- 1,3,5-Trinitrobenzene

VOCs (7)

- 1,2-Dichloroethane
- Chloroform
- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- *cis*-1,2-Dichloroethene
- *trans*-1,2-Dichloroethene
- Vinyl Chloride

Metals (1)

- Boron

Figure 2-9. Indicator Constituent Areas for Perched Groundwater

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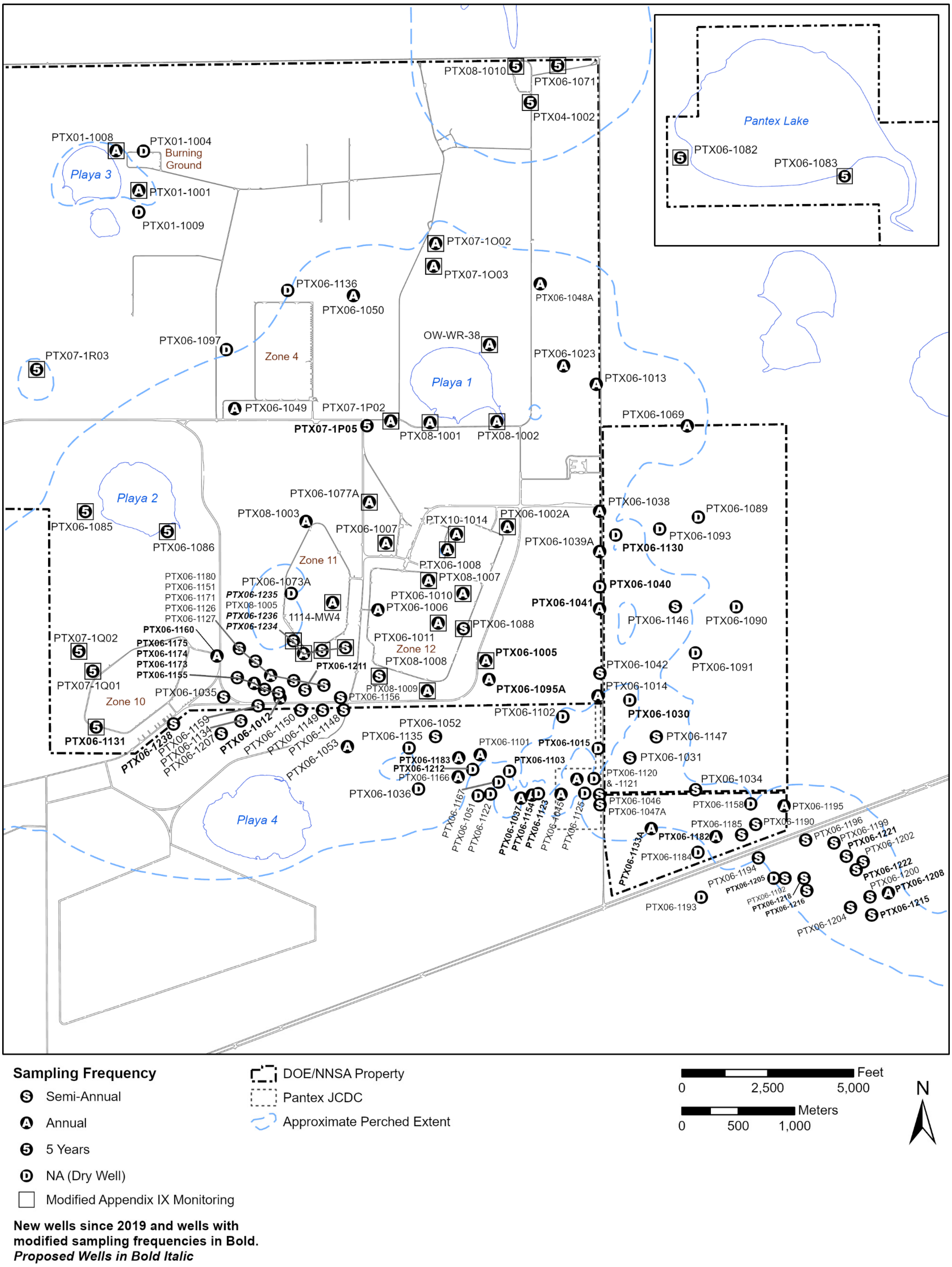

Figure 2-10. Sampling Frequency for Perched Groundwater

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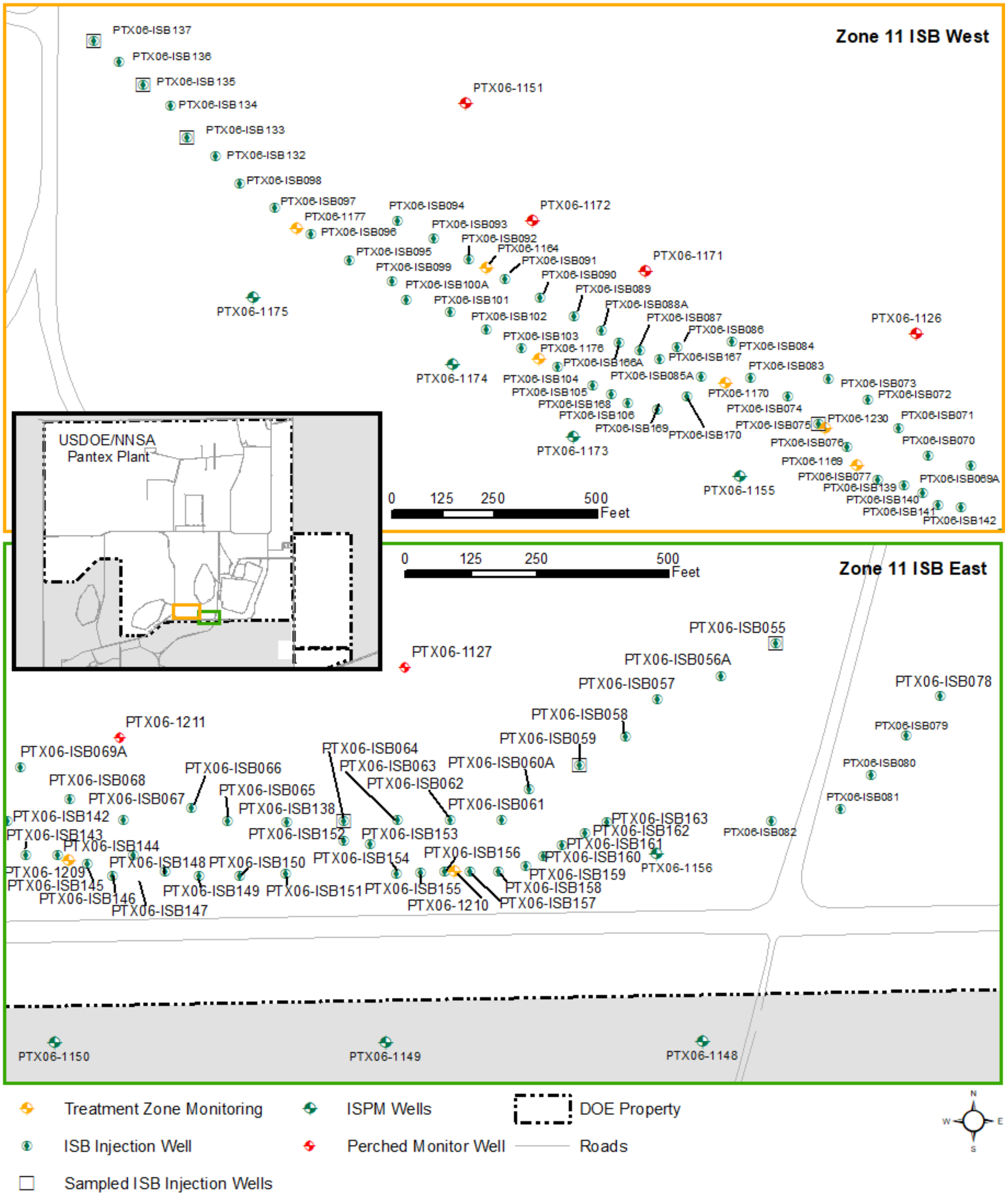

Figure 2-11. Zone 11 ISB Treatment Zone and Performance Monitoring Wells

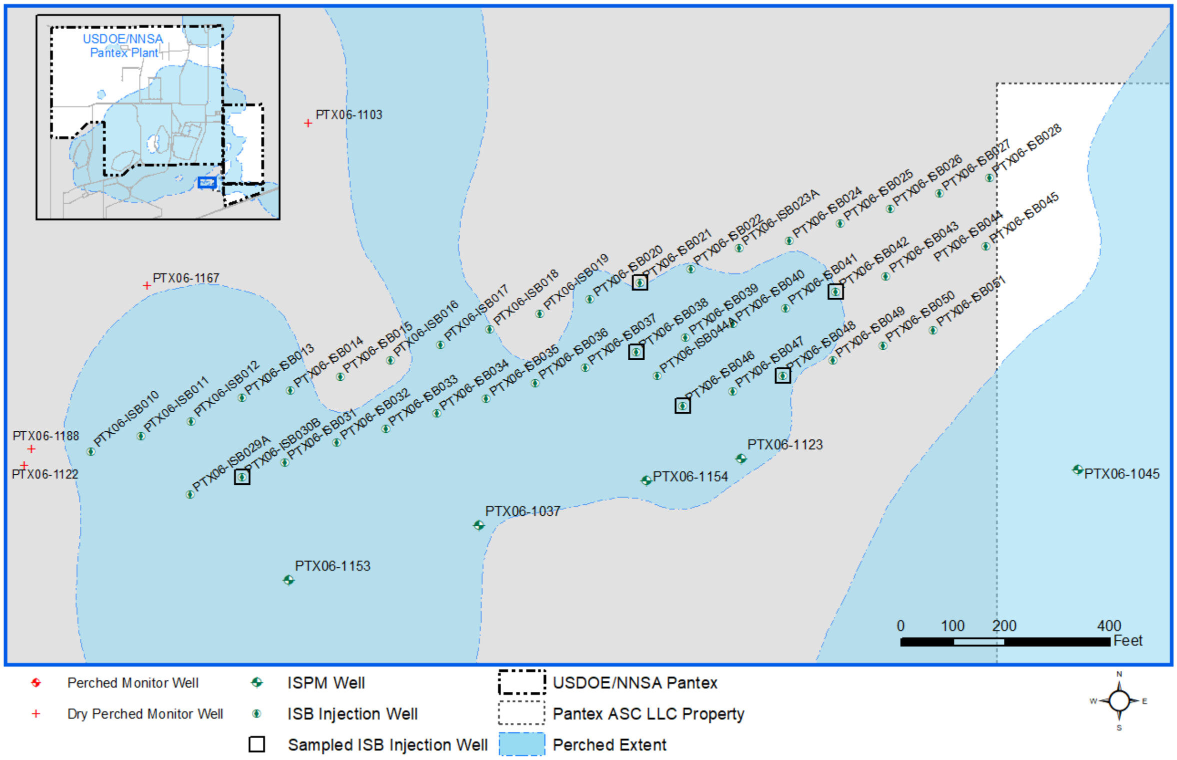

Figure 2-12. Southeast ISB Treatment Zone and Performance Monitoring Wells

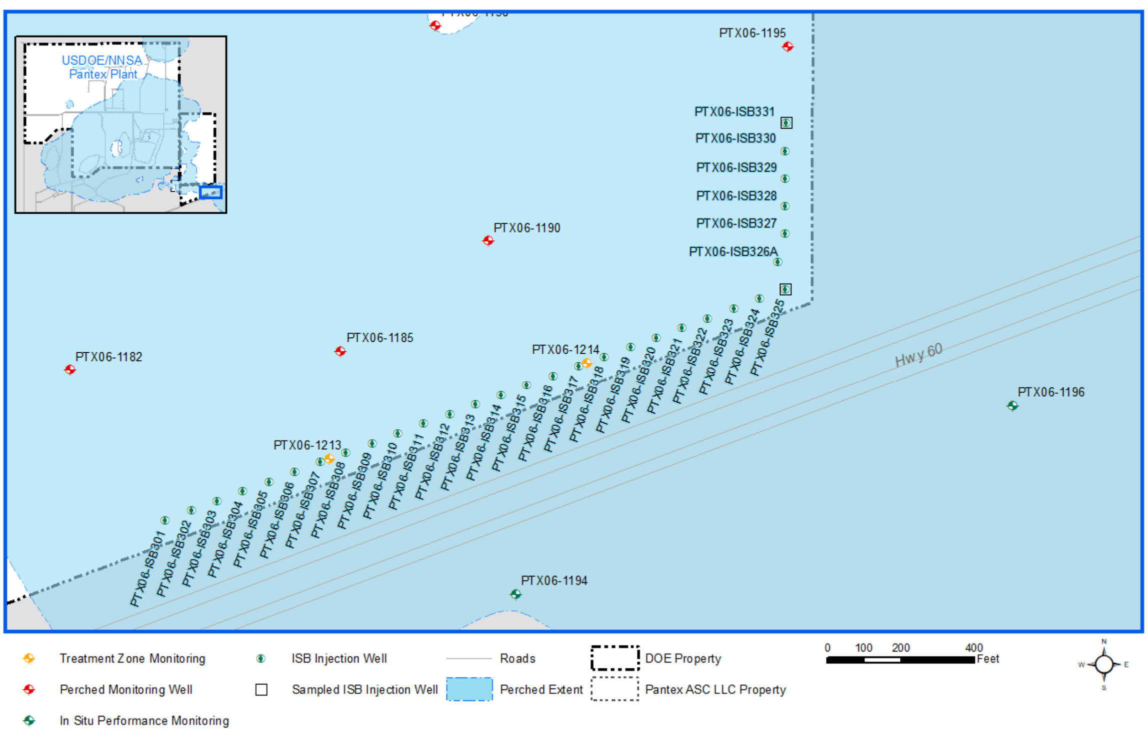

Figure 2-13. Southeast ISB Extension Treatment Zone and Performance Monitoring Wells

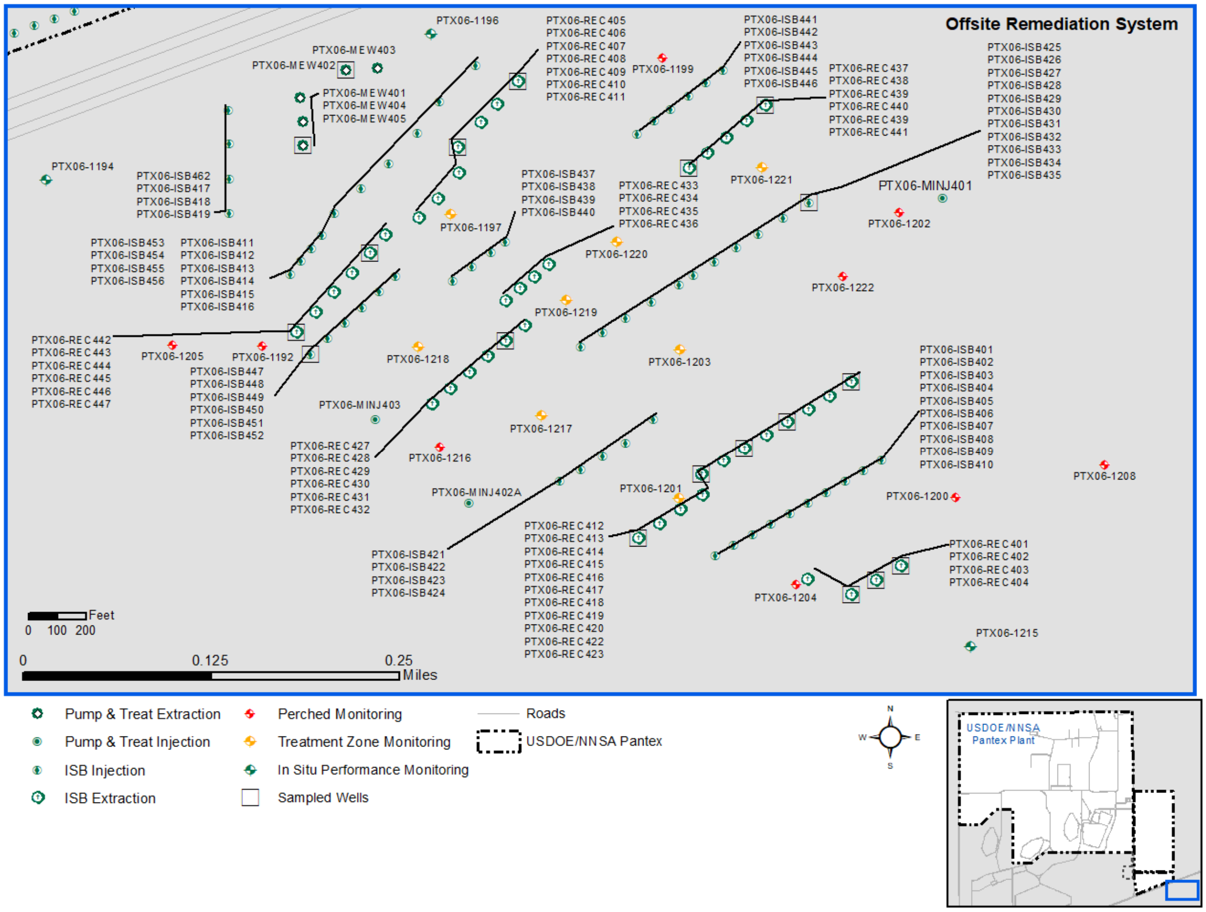

Figure 2-14. Offsite ISB Treatment Zone and Performance Monitoring Wells

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3. OGALLALA AQUIFER

The Ogallala Aquifer Monitoring Network was evaluated as part of the first and second Five-Year Reviews, and no changes to the monitoring network locations or sampling frequency were recommended. Recommendations for LTM improvements from the First FYR were incorporated into an *Ogallala Aquifer Sampling Improvement Plan* (B&W Pantex, 2013) and have been addressed by development of a Pantex well maintenance plan, use of diverters at a select group of wells, and implementation of a micropurge sampling method. These changes are described in Section 4 along with other changes to sampling methods and materials.

The Ogallala LTM network was evaluated qualitatively using the process described in Section 2.1. The recommendations for updating the Ogallala Aquifer LTM network are:

- Addition of three monitoring wells installed since 2019 (PTX06-1223, PTX06-1224, and PTX06-1229) southeast of Zone 12. These wells were installed in 2023 as part of continuing efforts to investigate recent detections of high explosives above GWPS at PTX06-1056. These wells are proposed for semi-annual monitoring. The deeper screened intervals of PTX06-1224 and PTX06-1229 will be monitored every five years.
- Addition of three new wells, PTX06-1231, PTX06-1232, and PTX06-1233, proposed in the areas southeast and east of Zone 12 to further evaluate the extent of the detections. These wells are proposed for semi-annual monitoring.
- Removal and replacement of well PTX06-1076 south of Zone 12 with proposed well PTX06-1237 located immediately downgradient. Sporadic, non-trending detections of DNT4A have been observed at PTX06-1076 since 2020. Review of installation logs for PTX06-1076 indicate that the well might not have been sealed properly at the fine-grained zone. Therefore, PTX06-1076 will be plugged and abandoned.

The Ogallala Aquifer LTM network, with the recommendations incorporated, is depicted in Figure 3-1 and summarized in Table 3-1. Ogallala Aquifer indicator areas and sampling frequencies are depicted in Figures 3-2 and 3-3, respectively.

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Table 3-1. Proposed Long-Term Monitoring Network for the Ogallala Aquifer

Indicator Area[1]	Well ID	LTM Objectives	Progress Report Metrics	Expected Condition	Indicator List[2] Monitoring Frequency	Multiple Sampling Depth Frequency[3]	Modified Appendix IX Monitoring[4] (5-Year Frequency)[5]
Northwest	PTX01-1010	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA	Y
Northwest	PTX01-1011	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA	Y
Northwest	PTX01-1012	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Annual	NA	N
Northwest	PTX01-1013	Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Annual	NA	N
Northwest	PTX06-1057A	Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Annual	NA	N
Northwest	PTX06-1058	Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Annual	NA	Y
Northwest	PTX06-1061	Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Annual	NA	N
Northwest	PTX06-1062A	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA	Y
Northwest	PTX06-1064	Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Annual	NA	N
Northwest	PTX06-1068	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA	N
Northwest	PTX06-1072	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA	Y
Northwest	PTX06-1141	Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Annual	5-Yr	Y
Northwest	PTX06-1143	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	5-Yr	Y
Northwest	PTX06-1144	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	5-Yr	N
Northwest	PTX07-1R01	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Annual	NA	N
Southeast	PTX06-1056	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA	N
Southeast	PTX06-1137A	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA*	N
Southeast	PTX06-1138	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	5-Yr	N
Southeast	PTX06-1139	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	5-Yr	N
Southeast	PTX06-1140	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	5-Yr	N
Southeast	PTX06-1157	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	5-Yr	N
Southeast	PTX06-1223	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA	N
Southeast	PTX06-1224	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	5-Yr	N
Southeast	PTX06-1229	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	5-Yr	N
Southeast	PTX06-1231	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA	N
Southeast	PTX06-1232	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	5-Yr	N
Southeast	PTX06-1233	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	5-Yr	N
Southeast/Northwest	PTX06-1237	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA	N
Southeast/Northwest	PTX06-1043	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA	N
Southeast/Northwest	PTX06-1044	Early Detection, Uncertainty Management	Compare to GWPS	Below background/PQL and GWPS	Semi-Annual	NA	N

1 The indicator monitoring lists are set according to the monitoring areas.
2 Refer to the current Pantex Sampling and Analysis Plan or the Compliance Plan Table IIIA for the indicator monitoring lists.
3 The wells that were completed with blanks between the screened intervals were selected for this sampling because the intervals could be isolated during sampling. Dedicated pumps used for standard sampling will be removed and sampling will be conducted to correspond to the 5-year sampling event for the Five-Year Review under CERCLA and the Compliance Plan. These samples will be analyzed for the indicator list of constituents.
4 A full list of constituents to be monitored is required for uncertainty management. A modified Appendix IX has been included in HW-50284 CP Table III and in the current Pantex Sampling and Analysis Plan.
5 The modified Appendix IX monitoring list and 5-year frequency are applied to wells near source areas where the uppermost aquifer may be affected (outside the perched groundwater).
* Multiple depth sampling removed from PTX06-1137A because the water level has declined below the bottom of the upper screened interval. Samples can only be collected from the lower screened interval.

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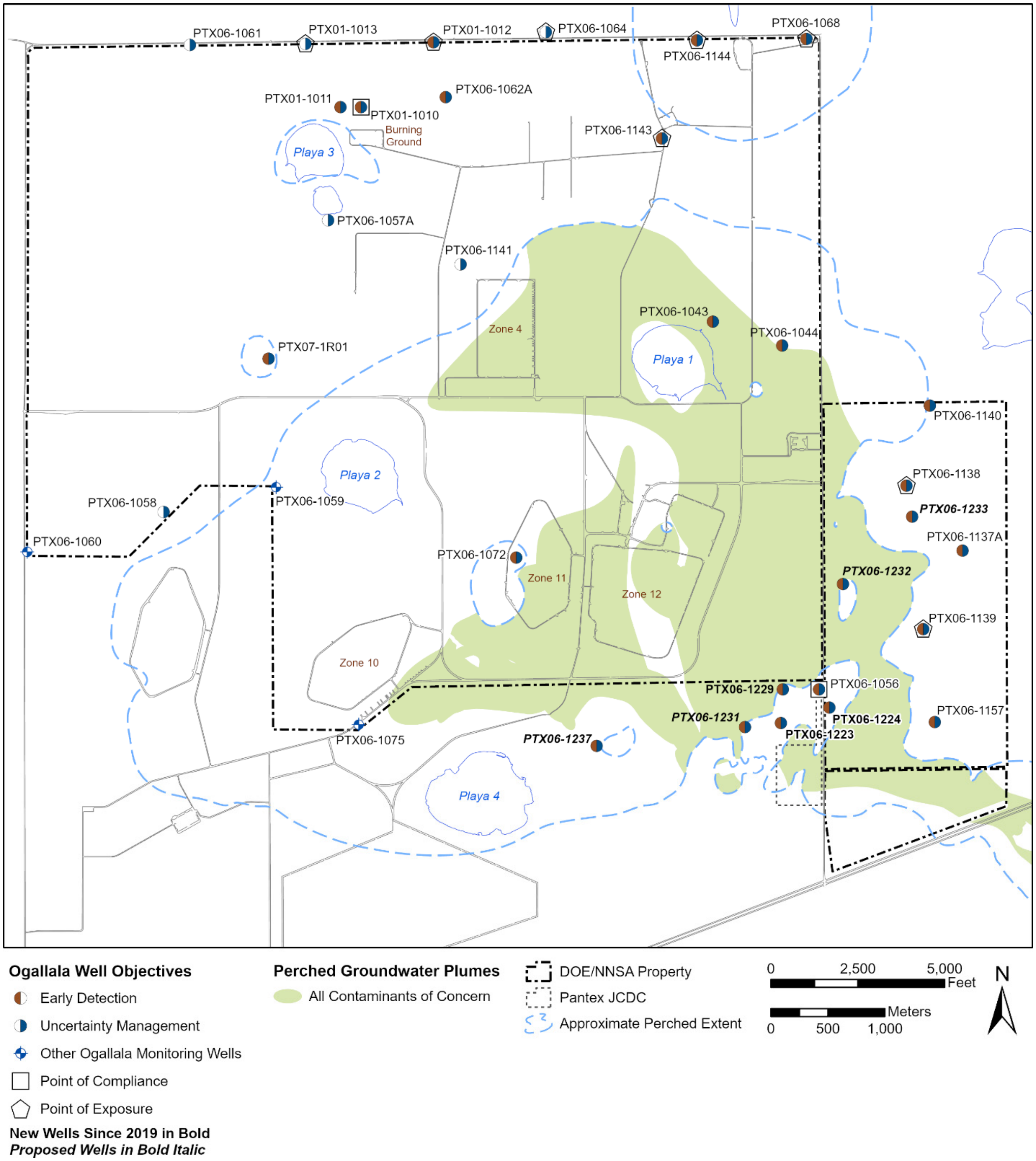

Figure 3-1. Ogallala Aquifer Long-Term Monitoring Network

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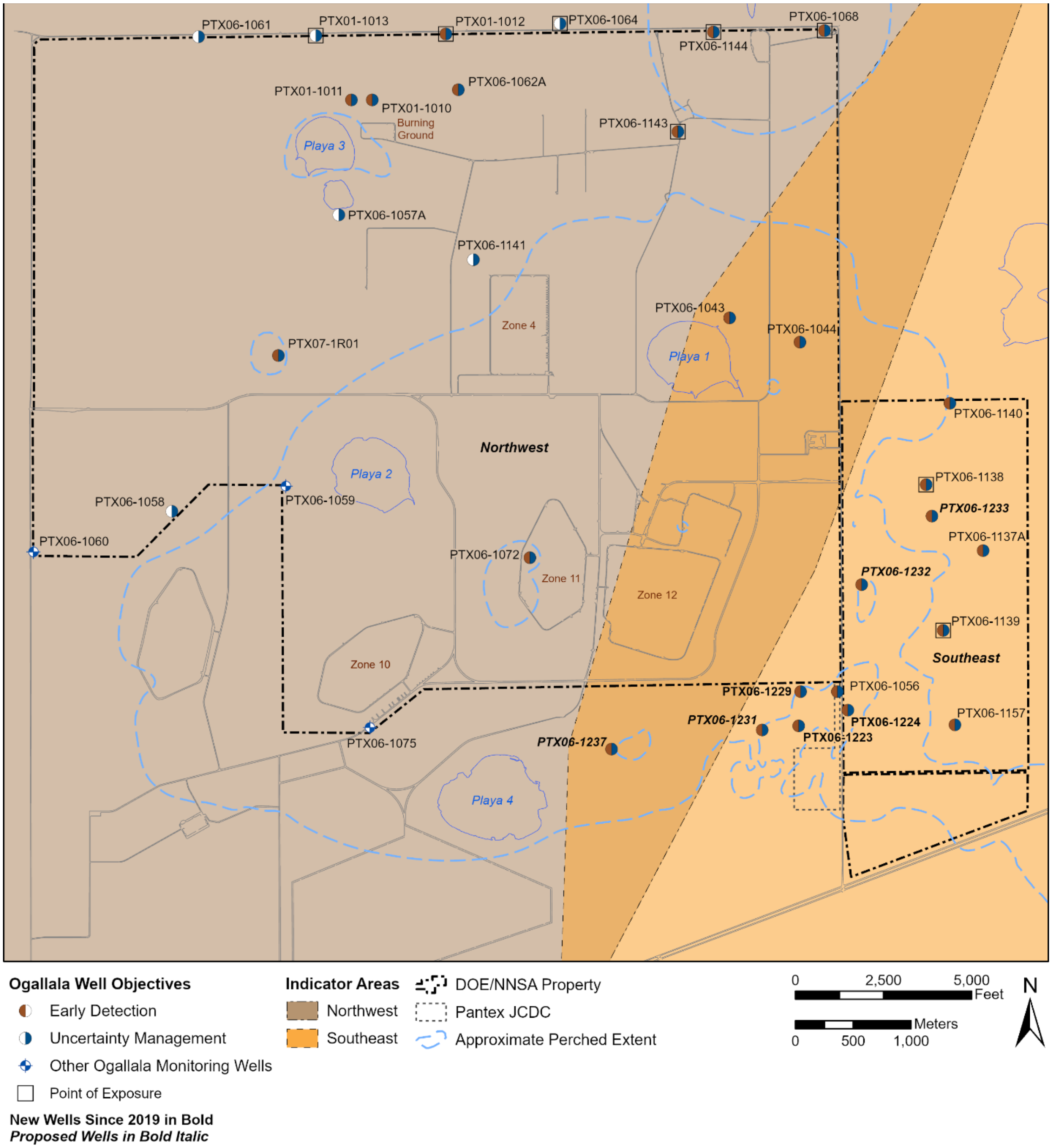

Indicator Constituents	Indicator Area	
	Southeast	Northwest
Primary List (Explosives, VOCs, Boron)	x	x
Chromium (Total & Hexavalent)	x	
Perchlorate		x

Figure 3-2. Indicator Constituent Areas for the Ogallala Aquifer

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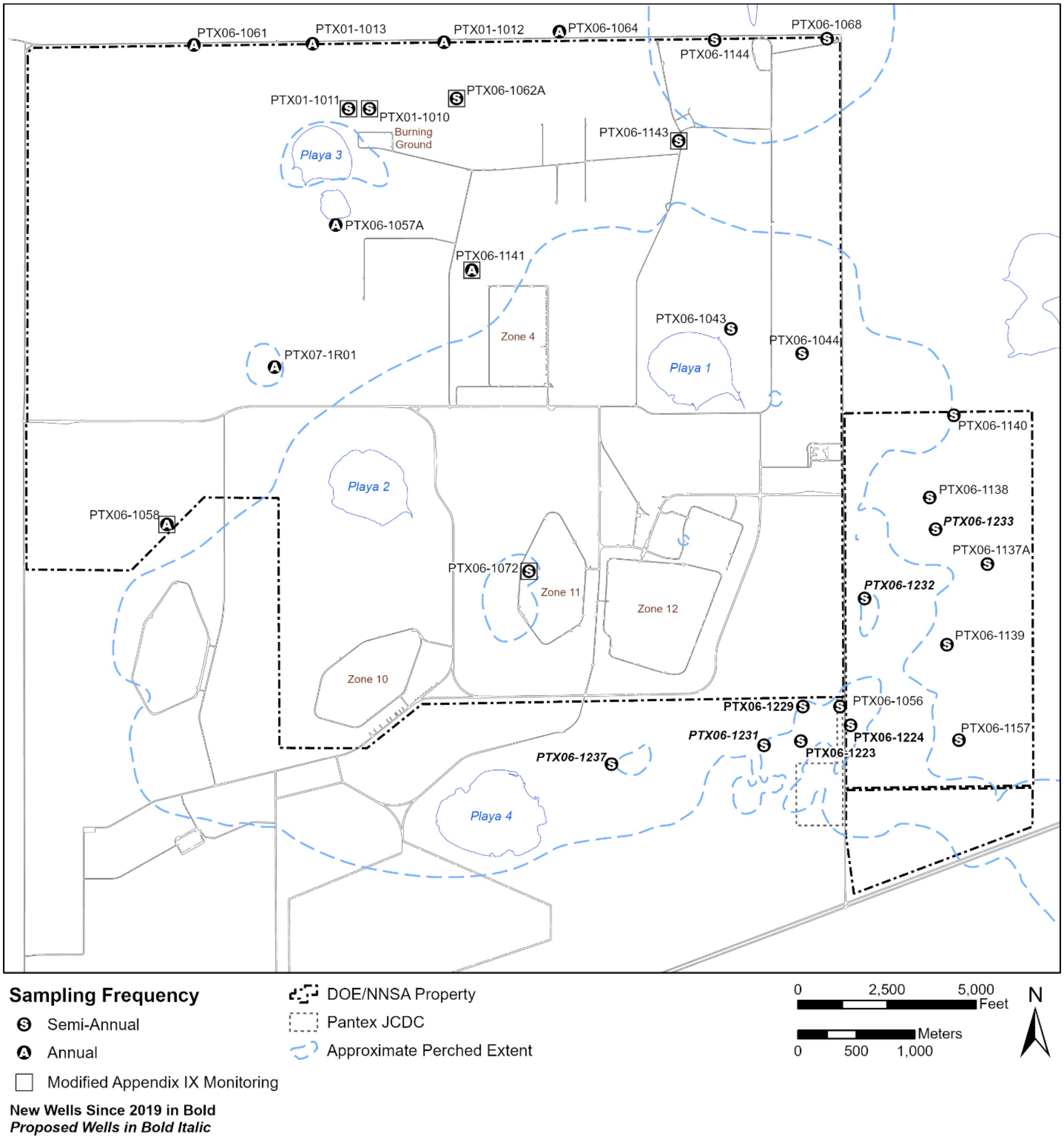

Figure 3-3. Ogallala LTM Network Sampling Frequency

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4. MONITORING WELL CONSTRUCTION

This section describes the screened intervals and the sample intake placement for each LTM Network well. The well construction information is presented for perched and Ogallala wells that will be part of the LTM Network.

4.1. PERCHED WELL CONSTRUCTION AND SCREENED INTERVALS

New perched monitoring wells will be constructed in accordance with the standard HW-50284 Attachment C Well Specifications with one exception. In cases where the perched aquifer saturated thickness exceeds 10 feet and the well is to be constructed in an area under the influence of a groundwater pump and treat system, the wells will be screened across the entire perched saturated interval, thus exceeding the design specification. This construction extends the effective well lifetime and allows for continued monitoring of declining perched groundwater in these areas. Any deviations from the Attachment C Specifications other than that described above will be requested via electronic mail from the TCEQ and EPA Project Managers prior to installation.

4.2. PERCHED WELL SAMPLE INTAKE PLACEMENT

Table 4-1 provides the current sample intake placement for perched monitoring wells. Because many sample intakes were installed in the upper saturated thickness of the groundwater, as water levels decline, the sample intake levels will require adjustment to maintain the ability to sample from the upper 5 to 10 feet of saturated thickness. Intakes for new wells will be placed in the upper 10 feet of water.

Table 4-1. Perched Aquifer Well Pump Intake Placement

Well ID[1]	Status	Groundwater Elevation[2] (ft amsl)	Sample Intake Elevation (ft amsl)	Sample Intake Depth (ft below top of GW)	Screened Saturated Thickness[3] (ft)	Bottom of Screen Elevation (ft amsl)
1114-MW4	Active	3276.73	3270.73	6.0	16.41	3260.32
OW-WR-38	Active	3308.04	3294.94	13.1	12.18	3295.86
PTX01-1001	Active	3287.76	3271.66	16.1	15.78	3271.98
PTX01-1004	Dry	Dry	NA	NA	0	3300.23
PTX01-1008	Active	3295.48	3289.78	5.7	5.72	3289.76
PTX01-1009*	Dry	3285.50	No Dedicated Pump	NA	4.82	3280.68
PTX04-1002	Active	3307.65	3302.25	5.4	18.82	3288.83
PTX06-1002A	Active	3284.58	3273.38	11.2	13.92	3270.66
PTX06-1005	Active	3256.11	3251.91	4.2	11.31	3244.8
PTX06-1006	Active	3275.42	3268.92	6.5	22.88	3252.54
PTX06-1007	Active	3277.70	3270.7	7.0	21.17	3256.53
PTX06-1008	Active	3282.08	3273.18	8.9	9.47	3272.61
PTX06-1010	Active	3286.56	3275.16	11.4	22.53	3264.03
PTX06-1011	Active	3269.17	3265.37	3.8	16.58	3252.59
PTX06-1012	Active	3271.66	3258.86	12.8	15.47	3256.19
PTX06-1013	Active	3295.94	3289.24	6.7	9.69	3286.25
PTX06-1014	Active	3253.24	3250.14	3.1	1.64	3251.6
PTX06-1015	Dry	Dry	NA	NA	0	3242.95
PTX06-1023	Active	3298.33	3291.43	6.9	6.39	3291.94
PTX06-1030	Dry	Dry	NA	NA	0	3247.15
PTX06-1031	Active	3242.81	3242.71	0.1	0.64	3242.17
PTX06-1034	Active	3239.82	3236.92	2.9	3.69	3236.13
PTX06-1035	Active	3271.89	3264.69	7.2	15.71	3256.18
PTX06-1036	Dry	Dry	NA	NA	0	3252.12
PTX06-1037	Active	3248.55	3246.85	1.7	0.68	3247.87
PTX06-1038	Active	3277.69	3269.29	8.4	16.96	3260.73
PTX06-1039A	Active	3267.51	3262.71	4.8	5.45	3262.06
PTX06-1040	Limited Water	3254.26	NA	NA	NA	3254.52
PTX06-1041	Active	3254.16	3247.76	6.4	14.55	3239.61
PTX06-1042	Active	3254.37	3253.37	1.0	2.27	3252.1
PTX06-1045	Active	3249.30	3245.2	4.1	4.46	3244.84
PTX06-1046	Active	3247.19	3238.79	8.4	14.15	3233.04
PTX06-1047A	Active	3248.66	3238.96	9.7	9.00	3239.66
PTX06-1048A	Active	3304.84	3297.04	7.8	7.83	3297.01
PTX06-1049	Active	3281.78	3276.58	5.2	38.39	3243.39
PTX06-1050	Active	3299.08	3283.38	15.7	34.12	3264.96
PTX06-1051	Dry	3239.39	NA	NA	0.15	3239.24
PTX06-1052	Active	3257.90	3254	3.9	11.44	3246.46

Well ID[1]	Status	Groundwater Elevation[2] (ft amsl)	Sample Intake Elevation (ft amsl)	Sample Intake Depth (ft below top of GW)	Screened Saturated Thickness[3] (ft)	Bottom of Screen Elevation (ft amsl)
PTX06-1053	Active	3269.34	3264.84	4.5	7.13	3262.21
PTX06-1069	Active	3278.81	3275.01	3.8	3.78	3275.03
PTX06-1071	Active	3308.25	3302.05	6.2	29.09	3279.16
PTX06-1073A	Dry	Dry	NA	NA	0	3273.73
PTX06-1077A	Active	3280.25	3272.95	7.3	7.81	3272.44
PTX06-1082	Active	3293.91	3287.91	6.0	6.97	3286.94
PTX06-1083	Active	3289.49	3277.9	11.6	19.59	3269.9
PTX06-1085	Active	3275.30	3254.8	20.5	28.78	3246.52
PTX06-1086	Active	3277.46	3232.5	45.0	51.74	3225.72
PTX06-1088	Active	3265.60	3260.9	4.7	18.07	3247.53
PTX06-1089	Dry	Dry	NA	NA	0	3263.28
PTX06-1090	Dry	Dry	NA	NA	0	3254.83
PTX06-1091	Dry	Dry	NA	NA	0	3261.3
PTX06-1093	Dry	Dry	NA	NA	0	3274.59
PTX06-1095A	Active	3256.33	3250.73	5.6	10.11	3246.22
PTX06-1097	Dry	Dry	NA	NA	0	3268.73
PTX06-1101	Active	3254.35	No Dedicated Pump	NA	10.55	3243.8
PTX06-1102	Dry	Dry	NA	NA	0	3248.3
PTX06-1103	Dry	Dry	NA	NA	0	3249.74
PTX06-1120	Active	3248.58	3243.58	5.0	4.05	3244.53
PTX06-1121	Dry	3247.73	3247.53	0.2	1.24	3246.49
PTX06-1122	Dry	Dry	NA	NA	0	3251.5
PTX06-1123	Limited Water	Dry	NA	NA	0	3248.83
PTX06-1125	Dry	Dry	NA	NA	0	3245.34
PTX06-1126	Active	3273.15	3265.45	7.7	20.60	3252.55
PTX06-1127	Active	3272.90	3266.6	6.3	24.32	3248.58
PTX06-1130	Dry	Dry	NA	NA	0	3258.74
PTX06-1131	Active	3270.37	3260.37	10.0	11.57	3258.8
PTX06-1133A**	Active	Dry	3241.65	NA	0	3241.62
PTX06-1134	Active	3271.99	3264.19	7.8	10.93	3261.06
PTX06-1135	Dry	Dry	NA	NA	0	3261.38
PTX06-1136	Dry	Dry	NA	NA	0	3277.21
PTX06-1146	Active	3255.69	3253.09	2.6	11.73	3243.96
PTX06-1147	Active	3241.55	3239.75	1.8	9.93	3231.62
PTX06-1148	Active	3270.92	3267.12	3.8	14.86	3256.06
PTX06-1149	Active	3271.75	3267.45	4.3	12.47	3259.28
PTX06-1150	Active	3272.29	3266.99	5.3	11.39	3260.9
PTX06-1151	Active	3274.28	3265.68	8.6	19.73	3254.55
PTX06-1154	Active	3249.04	3248.14	0.9	1.50	3247.54

Well ID[1]	Status	Groundwater Elevation[2] (ft amsl)	Sample Intake Elevation (ft amsl)	Sample Intake Depth (ft below top of GW)	Screened Saturated Thickness[3] (ft)	Bottom of Screen Elevation (ft amsl)
PTX06-1155	Active	3272.82	3263.67	9.1	15.93	3256.89
PTX06-1156	Active	3272.12	3261.42	10.7	21.85	3250.27
PTX06-1158	Dry	Dry	NA	NA	0	3235.24
PTX06-1159	Active	3272.57	3265.87	6.7	18.64	3253.93
PTX06-1160	Active	3275.19	3266.59	8.6	28.68	3246.51
PTX06-1166	Active	3250.86	3248.46	2.4	6.50	3244.36
PTX06-1167	Dry	Dry	NA	NA	0	3248.22
PTX06-1171	Active	3273.64	3266.54	7.1	16.22	3257.42
PTX06-1173	Active	3272.57	3265.97	6.6	16.71	3255.86
PTX06-1174	Active	3272.99	3266.29	6.7	16.87	3256.12
PTX06-1175	Active	3273.19	3265.29	7.9	15.04	3258.15
PTX06-1180	Active	3275.07	3266.37	8.7	16.78	3258.29
PTX06-1182	Active	3238.82	3234.32	4.5	5.52	3233.3
PTX06-1183	Active	3253.82	3249.32	4.5	7.46	3246.36
PTX06-1184	Dry	Dry	NA	NA	0	3242.11
PTX06-1185	Active	3237.07	3232.87	4.2	3.78	3233.29
PTX06-1190	Active	3236.29	3231.59	4.7	5.78	3230.51
PTX06-1192	Active	3231.62	3226.32	5.3	13.39	3218.23
PTX06-1193	Dry	Dry	NA	NA	0	3241.28
PTX06-1194	Active	3235.25	3234.25	1.0	0.57	3234.68
PTX06-1195	Active	3235.08	3228.88	6.2	7.25	3227.83
PTX06-1196	Active	3233.65	3227.95	5.7	10.98	3222.67
PTX06-1199	Active	3231.40	3225.9	5.5	10.66	3220.74
PTX06-1200	Active	3227.24	3222.24	5.0	9.96	3217.28
PTX06-1202	Active	3229.61	3223.11	6.5	6.45	3223.16
PTX06-1204	Active	3227.32	3222.92	4.4	15.42	3211.9
PTX06-1205	Dry	Dry	NA	NA	0	3231.46
PTX06-1207	Active	3271.29	3266.19	5.1	14.23	3257.06
PTX06-1208	Active	3226.71	3222.11	4.6	3.67	3223.04
PTX06-1211	Active	3272.87	3268.27	4.6	15.14	3257.73
PTX06-1212	Dry	Dry	NA	NA	0	3250.62
PTX06-1215	Active	3226.37	3221.67	4.7	7.82	3218.55
PTX06-1216	Active	3229.42	3227.72	1.7	1.81	3227.61
PTX06-1218	Active	3231.12	3226.22	4.9	4.39	3226.73
PTX06-1221	Active	3230.51	3226.81	3.7	3.19	3227.32
PTX06-1222	Active	3228.75	No Dedicated Pump	NA	2.46	3226.29
PTX07-1O02	Active	3300.43	3291.83	8.6	7.17	3293.26
PTX07-1O03	Active	3301.61	3293.51	8.1	8.39	3293.22
PTX07-1P02	Active	3301.99	3285.89	16.1	18.54	3283.45

Well ID[1]	Status	Groundwater Elevation[2] (ft amsl)	Sample Intake Elevation (ft amsl)	Sample Intake Depth (ft below top of GW)	Screened Saturated Thickness[3] (ft)	Bottom of Screen Elevation (ft amsl)
PTX07-1P05	Active	3299.42	3294.6	4.8	4.64	3294.78
PTX07-1Q01	Active	3271.95	3262.55	9.4	22.09	3249.86
PTX07-1Q02	Active	3271.87	3249.07	22.8	33.93	3237.94
PTX07-1R03	Active	3318.30	3314.5	3.8	3.40	3314.9
PTX08-1001	Active	3301.76	3278.86	22.9	60.13	3241.63
PTX08-1002	Active	3297.61	3276.01	21.6	42.90	3254.71
PTX08-1003	Active	3277.89	3273.49	4.4	23.51	3254.38
PTX08-1005	Active	3273.42	3263.72	9.7	13.82	3259.6
PTX08-1007	Active	3277.81	3274.81	3.0	32.26	3245.55
PTX08-1008	Active	3269.17	3261.47	7.7	22.13	3247.04
PTX08-1009	Active	3263.70	3262.2	1.5	13.61	3250.09
PTX08-1010	Active	3308.22	3302.72	5.5	22.00	3286.22
PTX10-1014	Active	3288.08	3277.18	10.9	16.24	3271.84

amsl—above mean sea level
1 Proposed wells and wells installed in 2024 are not included in this table.
2 Based on water level measurements collected June-August 2024.
3 Saturated thickness above the bottom of the well screen.
* Well historically dry since 2003. Water levels began increasing in 2020 in response to large rain events. This well is downgradient of PTX01-1001 and is not recommended for sampling at this time.
** Water level has recently dropped below the bottom of the well screen.

4.3. OGALLALA WELL CONSTRUCTION, SCREENED INTERVALS, AND DIVERTERS

The 2009 LTM Network Design Report (B&W Pantex and Espey Consultants, 2009) recommended that all new Ogallala Aquifer monitoring wells be installed with screens that provide flexibility to sample from both the uppermost part of the aquifer and the deeper part of the aquifer. The *Sampling Evaluation for High Plains Aquifer Monitoring Wells* (RPS Espey, 2012) found that this well construction design provides flexibility for sampling from multiple intervals, allows isolation of individual screen intervals, and extends the life span of wells in relation to the declining water table of the aquifer.

However, Pantex experience with sampling multi-level Ogallala Aquifer wells since 2009 has identified potential issues with multi-level well construction and sample collection in some cases. First, monitoring wells installed in the deeper portions of the Ogallala Aquifer that have hundreds of feet of saturated screen in the northern part of Pantex Plant are susceptible to excessive silting within the screen. In some existing wells, this silting has been observed to almost completely fill the lower screened intervals of the wells. Second, Pantex has found that the diverters used to isolate screened intervals for collection of discrete samples may not create a complete seal within the well; therefore, samples collected using the multi-level sampling equipment may not provide a representative sample of the intended screened interval in some areas where the silts and clays in the formation may impact horizontal flow in the well. Third, the Ogallala Formation is underlain by the Lower Dockum Aquifer beneath Pantex, and in some areas, no water is present within the Ogallala Formation. Because of the potential difficulties with drilling, evaluating, and constructing multi-level wells, wells constructed with single screened intervals may provide better data for evaluation of the groundwater in these areas. Nested well construction will be considered where appropriate for evaluation of known plumes.

Based on these recent observations in existing Ogallala Aquifer wells, Pantex has amended the approach for construction of new Ogallala Aquifer monitoring wells as follows:

(1) Pantex will continue to use multi-screened wells in specific locations, particularly when the well is installed across the Ogallala Formation only. New wells will be installed with screens that provide flexibility to sample from the uppermost part of the aquifer near the water table and deeper parts of the aquifer, but new wells will not be completed and screened to the bottom of the Ogallala Aquifer unless needed to meet specific sampling objectives. Screen placement for each well will be determined by the observed lithology of the borehole with more transmissive zones of the saturated sediments screened and blank casing installed across finer silt and/or clay intervals. Well completions will generally intercept the upper 30 to 100 feet of saturation using multiple screened intervals (no greater than 40 ft each) separated by blank casing. The anticipated decline of the water table may also affect selection of the length of the upper screened intervals for each well. The blank casing sections will enable placement of diverters to isolate the upper screened interval. The diverters and dedicated pumps will be adjusted as necessary to account for the declining Ogallala Aquifer water table.

(2) In areas of the Ogallala or Dockum Aquifer where complete assurance is needed that samples are representative of specific depth intervals in the aquifer, Pantex may elect to install single screen wells or to install nested wells individually screened across different aquifer layers. The decision to construct a well with a single or multiple screened intervals or to install nested wells to monitor different depth intervals at one location will be based on the specific goals for the well, saturated thickness of the aquifer, and the geologic formation of interest, i.e., Ogallala or Dockum formation. As with multi-screened wells, well screens will not exceed 40 ft in length.

4.3.1 Diverter Placement

Several older wells were identified in the *Ogallala Aquifer Sampling Improvement Plan* (B&W Pantex, 2013) that are not sampled as multi-level wells, but have multiple screen segments. Of these wells, four were identified that have relatively short saturated screen intervals (i.e. < 100 ft) that could potentially yield more representative samples with diverters installed. Table 4-2 summarizes the diverter placement in these wells.

Table 4-2. Diverter Placement

Well ID	Year Installed	Thickness of Upper Screened Interval (ft)	Diverter Depth (ft bgs)
PTX01-1010	2000	~70	570
PTX01-1011	2000	~95	604
PTX01-1013	2000	~85	590
PTX06-1072	2001	~85	505

bgs—below ground surface

4.4. OGALLALA WELL INTAKE PLACEMENT

Table 4-3 provides the current sample intake placement for Ogallala Aquifer monitoring wells. Figure 4-1 presents the Ogallala Aquifer wells and their sample intake placements and approximate saturated thickness (some wells are not completed to the base of the aquifer, so only the in-well saturated thickness can be calculated). As discussed in the *Long-Term Monitoring System Design Report* (B&W Pantex and Espey Consultants, 2009), initial sampling in newly installed Ogallala Aquifer wells will be conducted at multiple depths using procedures described in the *Sampling and Analysis Plan*.

Dedicated sample pumps are installed in the wells at the stated sample intake depth. As illustrated in Table 4-3, sample pump intake depths are typically set in the upper 20-feet of the uppermost screened interval. Some wells were chosen to sample from deeper depths on a routine basis to evaluate potential flow paths at those depths. Routine samples at the proposed frequency for indicator constituents will be obtained from this depth.

At the five-year sampling event, the dedicated sample pumps will be removed after collecting the sample. Samples at the remaining screened intervals will be collected using the equipment described in the *Long-Term Monitoring System Design Report* (B&W Pantex and Espey Consultants, 2009). As summarized in Table 4-4, the sampling equipment is designed for the intake to be set 10 feet below the bottom of the upper blank in every screened interval where the dedicated pump is not installed.

Table 4-3. Dedicated Sample Intake Information for Ogallala Aquifer Wells

Well ID[1]	Status	Groundwater Elevation[2] (ft amsl)	Sample Intake Elevation (ft amsl)	Sample Intake Depth (ft below top of GW)	Screened Saturated Thickness[3] (ft)	Bottom of Screen Elevation (ft amsl)
PTX01-1010	Active	3,055.45	3,061.15	21.3	326.4	2,729.01
PTX01-1011	Active	3,056.57	3,019.07	37.5	273.8	2,782.81
PTX01-1012*	Active	3,042.76	3,014.76	28.0	365.3	2,677.49
PTX01-1013	Active	3,056.40	3,016.30	40.1	339.2	2,717.16
PTX06-1043	Active	3,068.74	2,912.64	156.1	172.7	2,896.09
PTX06-1044	Active	3,033.61	2,998.51	35.1	104.9	2,928.69
PTX06-1056	Active	3,130.96	3,124.96	6.0	70.2	3,060.77
PTX06-1057A*	Active	3,084.90	3,065.10	19.8	273.4	2,811.52
PTX06-1058*	Active	3,161.75	3,147.55	14.2	123.3	3,038.45
PTX06-1061*	Active	3,069.54	3,049.94	19.6	339.9	2,729.65
PTX06-1062A*	Active	3,050.36	3,029.96	20.4	366.5	2,683.88
PTX06-1064*	Active	3,037.23	3,016.63	20.6	265.2	2,771.99
PTX06-1068	Active	2,999.41	2,966.71	32.7	262.9	2,736.55
PTX06-1072	Active	3,127.80	3,111.80	16.0	121.5	3,006.31
PTX06-1137A*	Active	3,047.31	3,027.61	19.7	94.8	2,952.50
PTX06-1138*	Active	3,061.70	3,041.70	20.0	112.2	2,949.46
PTX06-1139	Active	3,085.93	3,071.73	14.2	106.5	2,979.42
PTX06-1140	Active	3,026.39	3,005.39	21.0	179.1	2,847.33
PTX06-1141*	Active	3,071.03	3,050.73	20.3	185.5	2,885.57
PTX06-1143*	Active	3,041.34	2,991.94	19.4	275.3	2,766.00
PTX06-1144	Active	3,021.78	2,886.58	135.2	295.4	2,726.34
PTX06-1157	Active	3,127.45	3,008.95	14.5	128.9	2,998.59
PTX06-1223	Active	3,155.36	3,131.16	24.2	59.3	3,096.02
PTX06-1224	Active	3,136.43	3,125.13	11.3	102.4	3,034.07
PTX06-1229**	Active	3,133.93	3,122.25	11.7	90.5	3041.33
PTX07-1R01	Active	3,106.87	3,107.87	67.0	132.4	2,974.47

amsl—above mean sea level
1 Proposed wells and wells installed in 2024 are not included in this table.
2 Based on June/July 2024 measurements for most wells.
3 Saturated thickness above bottom of the well screen.
* Proposed sample intake elevation based on water level recently declining below or near the existing intake depth.
** Proposed sample intake elevation for new well.

Table 4-4. Pump Intake depths for Multi-level Wells

Well ID	**Approximate pump intake depths (ft bgs)**					**Comments**
	Screened Interval					
	1	**2**	**3**	**4**	**5**	
PTX06-1137A	--	**DP**	--	--	--	no water in first interval
PTX06-1138	**DP**	507	--	--	--	
PTX06-1139	--	**DP**	--	--	--	no water in first interval
PTX06-1140	**--**	**DP**	572	647	--	no water in first interval
PTX06-1141	**DP**	532	587	--	--	
PTX06-1143	**DP**	542	597	697	772	
PTX06-1144	517	552	**DP**	672	792	pump set in third screened interval
PTX06-1157	**DP**	467	517	--	--	
PTX06-1224	**DP**	474.5	--	--	--	
PTX06-1229	**DP**	473	--	--	--	

bgs—below ground surface
-- No water in/well not constructed with this interval
DP—dedicated pump

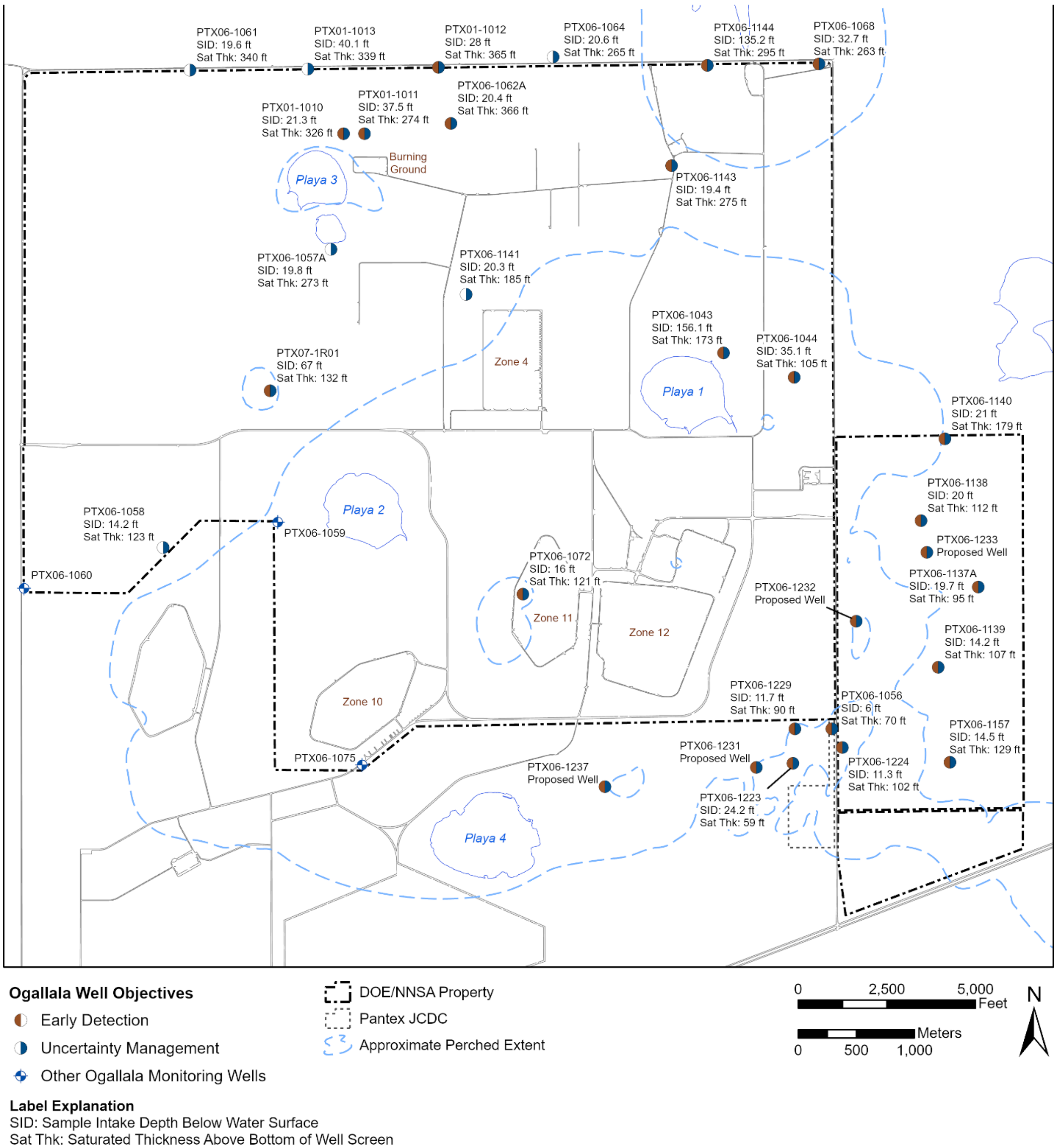

Figure 4-1. Sample Intake Depths for Ogallala Aquifer Wells

5. EVALUATION OF MONITORING DATA

This section discusses methods that will be used to evaluate monitoring data with respect to the various objectives identified in this report. Monitoring data are collected at various frequencies including semi-annually, annually, and every 5 years. All data are reviewed as received from the laboratories as part of the data validation process. The data also undergo an automated review process as received to identify anomalies such as first-time detections, all-time high detections, or off-trend values. Monitoring data are further reviewed at various frequencies according to the purpose for collection of the data. For example, semi-annual data collected from ISB treatment zones are reviewed after validation to evaluate redox conditions within the barrier and determine the need for amendment injection. A comprehensive review and evaluation is conducted annually with findings documented in an annual progress report. A semi-annual progress report supplements the annual report by providing snapshots of monitoring data, evaluation of redox conditions, charts of pump and treat system performance, and evaluation of key uncertainty management well data. The data also support the Five-Year Review required under the IAG and HW-50284.

5.1. ANNUAL PROGRESS REPORT EVALUATION

For the annual progress report, data are compared to the GWPS and evaluated with respect to the remedial action objectives in the ROD and the response actions installed for Pantex. The following are evaluated:

- Plume stability
- Response Action Effectiveness: performance of individual response actions and the combination of response actions as a total remedy, achievement of cleanup standards
- Uncertainty Management: evaluation of data relative to expected conditions
- Early Detection: COC concentrations in the Ogallala Aquifer
- Natural attenuation of COCs

The expected conditions identified for each well in Tables 2-2 and 3-1 are used in data evaluations.

5.1.1 Plume Stability

Plume stability is evaluated through examination of water level and concentration data. Water levels are used to generate hydrographs and trends for individual wells, maps of water elevations and contours, water level trends, and saturated thickness. Data from dry wells (e.g., continuing dry conditions or influx of water) support this analysis.

Concentration data are used to perform concentration trend analysis. Concentration trend data are mapped for each COC to identify trends in the spatial distribution of COCs. The concentration data are also combined with the water level data to generate plume maps for each COC. The maps and trends together form the basis for an evaluation of overall plume stability.

5.1.2 Response Action Effectiveness

In Situ Bioremediation Systems

Data collected at wells within and downgradient of the in situ bioremediation systems are used to evaluate system performance and to determine when subsequent injections of bioremediation amendment are needed as described in the bioremediation system operations and maintenance plans. At TZM wells within the treatment zone, data are evaluated to demonstrate that appropriate reducing conditions have been achieved and are being maintained, that amendment degradation products are available to support microbial growth, and that concentrations of primary COCs and degradation products are decreasing. Separate from the evaluation for the annual report, these data are also used to determine when additional injections of bioremediation amendment are needed to ensure that reducing conditions are maintained and that amendment availability is not a limiting factor in overall ISB treatment performance. At the ISPM wells downgradient of the treatment zone, the data evaluation must demonstrate that objectives of the response action have been achieved; specifically, concentrations of COCs and degradation products must be below GWPS within an appropriate timeframe after initial injection, generally 3 to 5 years, although a longer time period is required for wells located further downgradient from the injection wells. Data collected from ISPM wells are used in trend analyses of concentrations of COCs and degradation products, geochemical parameters, and amendment performance indicators to support evaluation of ISB effectiveness. Estimates of groundwater velocities and plume migration rates also support determination of amendment injection frequency.

Pump and Treat Systems

Because the primary metric for success of the pump and treat systems is decreasing perched groundwater thickness, well hydrographs and water level trends are used to demonstrate pump and treat system effectiveness. The water level data are also used to determine the effects of the extraction systems on flow direction, hydraulic gradient, and saturated thickness. Although hydraulic containment is not a primary objective of either system, extraction well capture zones are determined through available data and modeling. Concentration data collected at extraction wells also benefit the plume stability analysis.

Comparison of process monitoring data to GWPS demonstrate that the treatment processes are achieving cleanup standards.

Overall Response Action Effectiveness

The derived data outputs described previously, including plume maps, concentration and water level trends, potentiometric surface maps, and capture zone analysis, together provide the basis for analysis of overall response action effectiveness. Over time, these data evaluations must demonstrate overall declines in perched saturated thickness, decreases in perched hydraulic gradients and rates of COC plume migration, and effective treatment of COC plumes downgradient of the in situ bioremediation systems.

5.1.3 Uncertainty Management

Uncertainty management monitoring is designed to obtain data to identify any unknown contaminant migration pathways. Indicator parameter data collected from uncertainty management wells are compared to the GWPS. For wells located near known groundwater contaminant source areas, trend analyses are used to confirm the expected conditions that source strength and mass flux are decreasing over time. Data for the broader suite of constituents collected every 5 years are reviewed to identify new groundwater constituents, if any.

5.1.4 Early Detection

Data for indicator constituents collected in Ogallala Aquifer wells are compared to background levels or PQLs and GWPS. Trend analyses are also used for naturally-occurring constituents and for low-level detections of site-related constituents to help identify impacts to the Ogallala Aquifer. Contingency actions for unexpected conditions are provided in the *Pantex Plant Ogallala Aquifer and Perched Groundwater Contingency Plan* (CNS, 2019).

5.1.5 Natural Attenuation

In addition to regular monitoring of COC and daughter product concentrations, natural attenuation parameters are collected from all perched wells on a two-year interval to permit screening and evaluation of natural degradation processes. These data are compared to screening values that may indicate favorable conditions for natural attenuation to occur. The results of these comparisons are combined with COC trend analysis results and estimates of plume migration and variability to determine if natural attenuation is occurring and to possibly estimate degradation rates. Because of the observed slow attenuation rates for most COCs, quantitative analysis of natural attenuation based solely on monitoring data is not feasible.

5.2. SEMI-ANNUAL PROGRESS REPORTS

The semi-annual progress reports are intended to provide intermediate data summaries for response action systems throughout the year without requiring time-intensive, comprehensive data analyses. The semi-annual progress reports address three of the five evaluations included in the annual progress report: response action effectiveness, uncertainty management, and early detection. Analyses of plume stability are not provided semi-annually because the analyses require the full dataset collected annually. Because natural attenuation data are collected only every two years, no analyses of natural attenuation are included in the semi-annual reports. Analytical data reports and comparison of data to GWPS are provided in the annual progress reports.

The evaluation of response action effectiveness for the ISB systems includes a statement of treatment zone status (e.g., maintenance of reducing conditions and need for amendment injection) and trend charts of target COCs and degradation products at downgradient performance monitoring locations. For the pump and treat systems, the evaluation includes a summary of operational efficiency for the reporting period (such as a chart of monthly flow rate compared to a target flow rate) and graphs of treatment volumes and contaminant mass removed.

For uncertainty management and early detection objectives, the semi-annual progress reports provide summaries of any unexpected conditions or a statement that no unexpected conditions were observed.

5.3. FIVE-YEAR REVIEW

A five-year review is required under the IAG in accordance with CERCLA §121(c) and the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300.430(f)(4)(ii)). Data collected for the LTM system also support the five-year review. The evaluations performed for the annual report are reviewed collectively to determine the performance of the response actions across a five-year time period to determine if the response actions need to be adjusted to better meet the RAOs.

Evaluation of the Pantex Plant groundwater monitoring network for the five-year review consists of both quantitative and qualitative methods. A quantitative statistical evaluation of the site is conducted using tools in the MAROS software. Statistical analysis at individual wells are used to assess contaminant concentrations and trends at monitoring locations within the plume. Statistical analysis provides metrics to assess the magnitude, trend and variability in contamination at each monitoring location to help assess the importance of each well in characterizing the plume and attaining its specific monitoring objectives. Plume-Level Analysis in MAROS assesses plume-wide and area-level stability by tracking plume migration on a level above that of the individual well. Metrics such as total dissolved mass, center of mass, and spread of mass plume-wide for each contaminant are combined with trend analysis to assess remedial performance and monitoring needs.

MAROS uses estimates of concentration uncertainty to select and prioritize groundwater monitoring locations. Low values of concentration uncertainty indicate potentially redundant monitoring locations while wells are recommended to be added in areas within the plume with high spatial uncertainty. Sampling frequency recommendations for each well are based on the rate of concentration change over the most recent five years of data and long-term (ten year) time intervals. Locations with rapid or high magnitude concentration changes and increasing trends are recommended for more frequent sampling.

The qualitative evaluation reviews hydrogeologic conditions, well construction and placement as well as contaminant geochemistry in the context of monitoring objectives. Both quantitative statistical and qualitative evaluations are combined using a 'lines of evidence' approach to recommend a final groundwater monitoring strategy to support site monitoring objectives.

In addition, recommendations of the five-year review are used in the evaluation of the LTM system design. Adjustments that need to be made to the network will be documented in an updated design report and submitted for approval.

5.4. EVALUATION METRICS

Most methods for the evaluation are based on simple comparisons to established values, such as the PQL, background, or GWPS. Statistical analyses of concentration trends in each well are conducted using the methods described in the following sections. Well hydrographs are provided for all monitoring wells, and a linear regression trend analysis is used to determine if water levels are declining as stated in the cleanup objectives for the perched groundwater.

5.4.1 Statistical Concentration Trend Analysis

The general change in concentration, or trend, of a particular constituent in a well can be quantified using a statistical trend analysis method. The methods used, including a nonparametric Mann-Kendall analysis and a parametric linear regression, were adapted from the MAROS Software. The following descriptions of the statistical trend analysis methods were adapted from the MAROS Version 2.2 User's Guide (AFCEE, 2007).

With actual site measurements, apparent concentration trends may often be obscured by data scatter arising from non-ideal hydrogeologic or sampling and analysis conditions. However, even though the scatter may be of such magnitude as to yield a poor fit (typically characterized by a low correlation coefficient, e.g., $R^2 << 1$) for the first-order relationship, parametric and nonparametric methods can be utilized to obtain confidence intervals on the estimated first-order coefficient, i.e., the slope of the log-transformed data. Nonparametric tests such as the Mann-Kendall test for trend are suitable for analyzing data that do not follow a normal distribution. Nonparametric methods focus on the location of the probability distribution of the sampled population, rather than specific parameters of the population. The outcome of the test is not determined by the overall magnitude of the data points, but depends on the ranking of individual data points. Assumptions on the distribution of the data are not necessary for nonparametric tests. The Mann-Kendall test for trend is a nonparametric test which has no distributional assumptions and irregularly spaced measurement periods are permitted. The advantage gained by this approach involves the cases where outliers in the data would produce biased estimates of the least squares estimated slope.

Parametric tests such as first-order regression analysis make assumptions on the normality of the data distribution, allowing results to be affected by outliers in the data in some cases. However, more accurate trend assessments using parametric methods result from data where there is a normal distribution of the residuals. Therefore, when the data are normally distributed, the nonparametric Mann-Kendall test is not as efficient.

Mann-Kendall Analysis

General

The Mann-Kendall test is a non-parametric statistical procedure that is well suited for analyzing trends in data over time (Gilbert, 1987). The Mann-Kendall test can be viewed as a nonparametric test for zero slope of the first-order regression of time-ordered concentration data versus time. The MAROS tool includes this test to assist in the analysis of groundwater plume stability. The Mann-Kendall test does not require any assumptions as to the statistical distribution of the data (e.g. normal, lognormal, etc.) and can be used with data sets which include irregular sampling intervals and missing data. The Mann-Kendall test is designed for analyzing a single groundwater constituent, multiple constituents are analyzed separately. For this evaluation, a decision matrix was used to determine the "Concentration Trend" category for each well, as presented in Table 5-1.

Mann-Kendall Statistic (S)

The Mann-Kendall statistic (S) measures the trend in the data. Positive values indicate an increase in constituent concentrations over time, whereas negative values indicate a decrease in constituent concentrations over time. The strength of the trend is proportional to the magnitude of the Mann-Kendall statistic (i.e., large magnitudes indicate a strong trend). Data for performing the Mann-Kendall Analysis must be in time sequential order. The first step is to determine the sign of the difference between consecutive sample results. Sign(x_j–x_k) is an indicator function that results in the values 1, 0, or –1 according to the sign of (x_j–x_k), where j > k. The function is calculated as follows:

$$\operatorname{sgn}(x_j - x_k) = 1 \qquad \text{if } x_j - x_k > 0$$

$$\operatorname{sgn}(x_j - x_k) = 0 \qquad \text{if } x_j - x_k = 0$$

$$\operatorname{sgn}(x_j - x_k) = -1 \qquad \text{if } x_j - x_k < 0$$

The Mann-Kendall statistic is defined as the sum of the number of positive differences minus the number of negative differences or

$$S = \sum_{k=1}^{n-1} \sum_{j=k+1}^{n} \operatorname{sgn}\left(x_j - x_k\right).$$

The ***confidence in the trend*** for the Mann-Kendall statistic is calculated using a Kendall probability table (e.g. Hollander, M. and Wolfe, D.A., 1973). By assessing the S result along with the number of samples, n, the Kendall table provides the probability of rejecting the null hypothesis (H_0 = no trend) for a given level of significance. MAROS calculates a "confidence level" percentage by subtracting the probability

(p) from 1 (Confidence = 1-p %). Confidence of 90% represents a significance level of $\alpha = 0.1$, and 95% confidence corresponds to $\alpha = 0.05$. The resulting confidence in the trend is applied in the Mann Kendall trend analysis.

Average

The arithmetic mean of a sample of n values of a variable is the average of all the sample values written as

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

Standard Deviation

The standard deviation is the square root of the average of the square of the deviations from the sample mean written as

$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}\ .$$

The standard deviation is a measure of how the value fluctuates about the arithmetic mean of the data.

Coefficient of Variation (COV)

The Coefficient of Variation (COV) is a statistical measure of how the individual data points vary about the mean value. The coefficient of variation, defined as the standard deviation divided by the average or

$$C.O.V. = \frac{s}{\bar{x}}$$

Values less than or near 1.00 indicate that the data form a relatively close group about the mean value. Values larger than 1.00 indicate that the data show a greater degree of scatter about the mean.

Results and Interpretation of Results: Mann-Kendall Analysis

The concentration data are used to calculate COV and S for each well with at least four sampling events. A “Concentration Trend” and “Confidence in Trend” are reported for each well with at least four sampling events. If data are insufficient, the well trend analysis is not conducted.

The COV is a statistical measure of how the individual data points vary about the mean value. Values less than or near 1.0 indicate that the data form a relatively close group about the mean value. Values larger than 1.0 indicate that the data show a greater degree of scatter about the mean. The Mann-Kendall statistic (S) measures the trend in the data. Positive values indicate an increase in constituent concentrations over time, whereas negative values indicate a decrease in constituent concentrations over time. The strength of the trend is proportional to the magnitude of S (i.e., larger magnitudes indicate a stronger trend). The

"Confidence in Trend" (1-*p*) is the statistical probability that the constituent concentration is increasing (S>0) or decreasing (S<0). The null hypothesis (no trend) is rejected for confidence above 90%.

The "Concentration Trend" for each well is determined according to the rules in the decision matrix (Table 5-1), where COV is the coefficient of variation. The MAROS Mann-Kendall Analysis Decision Matrix was developed by Groundwater Services Inc. for AFCEE. Strongly increasing or decreasing trends indicate a higher level of statistical significance. The confidence can be used as a qualitative measure of the statistical strength of the trend when evaluating the overall stability of the plume.

Linear Regression Analysis

General

Linear regression is a parametric statistical procedure that is typically used for analyzing trends in data over time. However, with the usual approach of interpreting the log slope of the regression line, concentration trends may often be obscured by data scatter arising from non-ideal hydrogeologic or sampling and analysis conditions. Even though the scatter may be of such magnitude as to yield a poor goodness of fit (typically characterized by a low correlation coefficient, e.g., $R^2 << 1$) for the first-order relationship, confidence intervals can nonetheless be constructed on the estimated first-order coefficient, i.e., the slope of the log-transformed data. Using this type of analysis, a higher degree of scatter simply corresponds to a wider confidence interval about the average log slope. Assuming the sign (i.e., positive or negative) of the estimated log slope is correct, a level of confidence that the slope is not zero can be easily determined. Thus, despite a poor fit, the overall trend in the data may still be ascertained, where low levels of confidence correspond to "Stable" or "No Trend" conditions (depending on the degree of scatter) and higher levels of confidence indicate the stronger likelihood of a trend. The coefficient of variation, defined as the standard deviation divided by the average, is used as a secondary measure of scatter to distinguish between "Stable" or "No Trend" conditions for negative slopes. The linear regression analysis is designed for analyzing a single groundwater constituent, multiple constituents are analyzed separately. For this evaluation, a decision matrix was used to determine the "Concentration Trend" category for each well, as presented in Table 5-1.

Linear Regression

The objective of linear regression analysis is to find the trend in the data through the estimation of the log slope as well as placing confidence limits on the log slope of the trend. Regression begins with the specification of a model to be fitted. A linear relationship is one expressed by a linear equation. The linear regression analysis is performed on log(concentration) versus time. The regression model assumes that for a fixed value of x (sample date) the expected value of y (log concentration) is some function. For a particular value, x_i or sample date the predicted value for y (log concentration) is given by

$$\hat{y}_i = a + bx_i$$

The fit of the predicted values to the observed values (x_i, y_i) are summarized by the difference between the observed value y_i and the predicted value $\hat{y}_i$ (the residual value). A reasonable fit to the line is found by making the residual values as small as possible. The method of least squares is used to obtain estimates of the model parameters (a, b) that minimize the sum of the squared residuals, S^2 or the measure of the distance between the estimate and the values we want to predict (the y's).

$$S^2 = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2$$

The values for the intercept (a) and the slope (b) of the line that minimize the sum of the squared residuals (S^2), are given by

$$b = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \qquad \text{and} \qquad a = \bar{y} - b\bar{x}$$

where $\bar{x}$ and $\bar{y}$ are the mean x and y (log concentration) values in the dataset.

In order to test the confidence on the regression trend, there is a need to place confidence limits on the slope of the regression line. In this stage of the trend analysis, it is assumed that for each x value, the y-distribution is normal. A t-test may be used to test that the true slope is different from zero. This t-test is preferentially used on data that is not serially correlated or seasonally cyclic or skewed.

The variance of y_i (σ^2) is estimated by the quantity $S^2_{y|x}$ where this quantity is defined as

$$S^2_{y|x} = \frac{\sum_{i-1}^{n}(y_i - \hat{y}_i)^2}{n-2}$$

where n is the number of samples.

The estimation of the standard deviation or standard error of the slope (s.e.b.) is defined as

$$s.e.b. = \sqrt{\frac{S^2_{y|x}}{\sum_{i-1}^{n}(x_i - \bar{x}_i)^2}}$$

To test significance of the slope calculated, the following t-test result can be used to find the confidence interval for the slope.

$$t = \frac{b}{s.e.b.}$$

The t result along with the degrees of freedom (n–2) are used to find the confidence in the trend by utilizing a t-distribution table found in most statistical textbooks (e.g. Fisher, L.D. and van Belle, G., 1993). The resulting confidence in the trend is utilized in the linear regression trend analysis.

Results and Interpretation of Results: Linear Regression Analysis

The concentration data are used to calculate the COV and the first-order coefficient (log slope) for each well with at least four sampling events. A “Concentration Trend” and “Confidence in Trend” are reported for each well with at least four sampling events. If data are insufficient, the well trend analysis is not conducted.

The COV is a statistical measure of how the individual data points vary about the mean value. Values less than or near 1.0 indicate that the data form a relatively close group about the mean value. Values larger than 1.0 indicate that the data show a greater degree of scatter about the mean.

The Log Slope measures the trend in the data. Positive values indicate an increase in constituent concentrations over time, whereas negative values indicate a decrease in constituent concentrations over time.

The "Confidence in Trend" is the statistical probability that the constituent concentration is increasing (log slope > 0) or decreasing (log slope < 0).

The "Concentration Trend" for each well is determined according to the rules in the decision matrix (Table 5-2), where COV is the coefficient of variation. The MAROS Linear Regression Analysis Decision Matrix was developed in-house by Groundwater Services Inc. for AFCEE.

5.4.2 Water Level Trend Analysis

A similar linear regression trend analysis is used with water level measurements to determine if water levels are declining as stated in the cleanup objectives for the perched groundwater. For water level trend analysis, the measured water levels are the y values. These values are not log-transformed before applying the regression analysis.

5.4.3 Comparison to GWPS

Data collected at each well are directly compared to the GWPS for each constituent to determine if concentrations exceed the GWPS. Wells that exceed the GWPS are highlighted.

5.4.4 Dry

Dry wells are checked semi-annually for water. If sufficient water is found to allow sample collection, the well will be sampled according to the appropriate indicator list, and the data collected will be evaluated accordingly.

5.5. EXPECTED CONDITIONS

The expected condition designated for each well provides a context for evaluating the monitoring data from the well based on the monitoring history, knowledge of plume movement and source area conditions, and expected impacts of remedial action systems. The range of expected conditions were classified into five categories presented below.

Below GWPS: Concentrations are not expected to exceed the GWPS. This condition applies to (1) wells that are located outside the extent of a plume or that have not produced exceedances of RRS1 in historical sampling data; (2) wells that have exhibited a decline of concentrations to below the GWPS or that have a history of detections below the GWPS; or (3) wells that are downgradient of the ISB systems where concentrations are expected to decrease as groundwater passing through the treatment zone migrates to the wells.

Decreasing water levels, Long-term stabilization of concentrations: These wells are within the influence of the groundwater extraction systems, so water levels are expected to decline over time. Concentrations are expected to stabilize as the pump and treat systems continue to remove contaminant mass from the perched groundwater.

Long-term decreasing trend: These wells are outside the zone of influence of the groundwater extraction systems and are not downgradient of an ISB system. Concentrations in these wells are expected to slowly decrease through natural attenuation processes including dispersion, dilution, and degradation.

Limited water: These wells are either installed in areas of limited perched groundwater thickness or along the fringes of the extent of perched groundwater in areas that are not likely under the effects of remedial actions. These wells have been observed to have variable low water levels, likely due to slight perched aquifer expansion or other hydrogeologic conditions in these areas, but are not expected to have measured water over 5 feet in the screened interval. If appropriate, these wells have been assigned a sampling frequency and expected condition in Table 2-1 and will be attempted to be sampled each event; however, if there is not enough water in the screened interval for sampling, the well is dry, or a slight increasing water level trend is calculated, these will not be considered to be unexpected conditions.

Remain dry: These wells are well beyond the extent of perched saturation in areas likely affected by remedial actions and serve as plume stability wells. These wells are monitored for perched groundwater and contaminant plume expansion in these areas. The expected condition for these wells is that water will not be observed in the screen.

Table 5-1. MAROS Mann-Kendall Analysis Decision Matrix

Mann-Kendall Statistic	Confidence in Trend	Concentration Trend
$S > 0$	> 95%	Increasing
$S > 0$	90–95%	Probably Increasing
$S > 0$	< 90%	No Trend
$S \leq 0$	< 90% and COV $\geq$ 1	No Trend
$S \leq 0$	< 90% and COV < 1	Stable
$S < 0$	90–95%	Probably Decreasing
$S < 0$	> 95%	Decreasing

Table 5-2. MAROS Linear Regression Analysis Decision Matrix

Log Slope	Confidence in Trend	Concentration Trend
Positive	> 95%	Increasing
Positive	90–95%	Probably Increasing
Positive	< 90%	No Trend
Negative	< 90% and COV $\geq$ 1	No Trend
Negative	< 90% and COV < 1	Stable
Negative	90–95%	Probably Decreasing
Negative	> 95%	Decreasing

6. SUMMARY AND CONCLUSIONS

This report documents recommended updates to the long-term groundwater monitoring well network based on quantitative and qualitative analyses of hydrogeologic and analytical data. For perched groundwater, the changes include:

- Addition of 8 new wells to the perched LTM network installed since the 2019 update. Three of these wells were installed to define and track the movement of the RDX plume in the far southeast extent of perched groundwater, and two ISB TZM wells for the Southeast ISB Extension have been designated as POC wells. One well was installed to monitor plumes emanating from Zone 11. Two additional wells are dry and are recommended for water level monitoring only.
- Three additional new wells proposed as part of this 2024 Update;
- Replacement of one existing perched aquifer well that had to be relocated and replaced with a new well because of building construction;
- Reduced monitoring frequency in 12 perched LTM wells based on well location, evaluation of historical trends, and groundwater flow conditions.
- Addition of monitoring for one previously dry LTM well in which water levels have recovered and have been increasing since 2020.
- Monitoring of water levels only for six perched groundwater wells in which water levels have declined as expected and are below the bottom of the screen.
- Removal of eight wells from the LTM network, including two wells previously converted to ISB injection wells, three wells changed to TZM wells, and one well that had to be relocated. The remaining two wells are dry, do not provide useful data, or are redundant with other wells.

For the Ogallala Aquifer, the changes include:

- Addition of three monitoring wells installed since 2019 as part of continuing efforts to investigate recent detections of high explosives above GWPS at PTX06-1056.
- Addition of three new wells proposed in the areas southeast and east of Zone 12 to further evaluate the extent of the detections.
- Replacement of one existing Ogallala aquifer well that may not have been sealed properly at the fine-grained zone with a proposed well located immediately downgradient.

No changes to the monitoring objectives, monitoring of soil release units, or methods for evaluation of the response actions are recommended at this time.

The LTM network will be evaluated and this document will be updated as necessary as part of the next Five-Year Review, scheduled for completion in 2028. This document is updated in conjunction with the Sampling and Analysis Plan, which is updated every five years according to the schedule in HW-50284, with the first update occurring by November 15, 2024.

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Appendix A

Long-Term Monitoring Optimization Review Perched Groundwater Unit (HGL, 2022)

LONG-TERM MONITORING OPTIMIZATION REVIEW PERCHED GROUNDWATER UNIT PANTEX PLANT CARSON COUNTY, TEXAS

Final

Issued: October 27, 2022

Prepared for:

Consolidated Nuclear Security, LLC
P.O. Box 30020
Pantex Plant
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Managed and Operated by Consolidated Nuclear Security, LLC

Purchase Order No. 0000088047 / Contract No. DE-NA0001942

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FINAL
Long-Term Monitoring Optimization Review
PANTEX PLANT, CARSON COUNTY, TX

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Contract Number:	DE-NA0001942
Purchase Order Number:	0000088047
Preparation Date:	October 27, 2022

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10/27/22
Date

EXECUTIVE SUMMARY

SITE-SPECIFIC BACKGROUND

The Pantex Plant Site (site) is located approximately 17 miles northeast of Amarillo, Texas in Carson County in U.S. Environmental Protection Agency (EPA) Region VI. The site covers roughly 10,000 acres with additional property consisting of a 1,000-acre tract at Pantex Lake. The primary mission of the Pantex Plant is to assemble, disassemble, and evaluate nuclear weapons from the U.S. stockpile, to develop, fabricate, and test explosives and explosive components, and to provide secure storage for material from the above activities. Historical Plant waste management activities have resulted in impacts to soil and perched groundwater above risk-based, human health standards.

The site was added to the National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act in 1994. A corrective action program has been developed to address unacceptable risks for a perched groundwater unit at the facility. The purpose of the following study is to review the current groundwater monitoring network for the perched unit relative to the stated monitoring objectives and provide recommendations for improving the efficiency and accuracy of the network for supporting site management decisions.

SUMMARY OF CONCEPTUAL SITE MODEL AND KEY FINDINGS

The Pantex Plant lies on the High Plains portion of the Great Plains Physiographic Province in the Texas Panhandle. The area is a flat plateau with topographic elevation across the site ranging between 3,501 feet above mean sea level (ft amsl) to 3,595 ft amsl. A distinguishing feature of the surface of the plain is the presence of numerous shallow circular basins called *playas*. Playas are ephemerally moist depressions that are the location of much of the recharge to groundwater in the region. The hydrostratigraphy below the Pantex Plant consists of the Blackwater Draw underlain by the Ogallala Formation. Within the Ogallala Formation are an upper perched saturated unit and a lower groundwater unit. Permeable units within the Ogallala are composed of coarse-grained fluvial sequences including channel sands and gravels overlain by finer overbank deposits.

The perched groundwater unit is present between about 215 and 280 feet below ground surface (ft bgs) and is underlain by a Fine-Grained Zone (FGZ). The FGZ is composed of silts and clays and separates the upper perched zone from the lower Ogallala Formation. Below the FGZ is an unsaturated zone of variable thickness. The lower Ogallala Aquifer is present between about 400 to 500 ft bgs and is the primary source of drinking water for the city of Amarillo, Texas.

Because of mounding in the main perched unit near Playa 1 and the topography of the FGZ, groundwater flow tends to be radial, with the surface sloping to the southeast, south and east. The thickness of the perched unit varies between a maximum of about 60 ft under Playa 1 to trace levels of saturation at the edges. Smaller, isolated areas of perched groundwater are present under other playa formations at the Plant.

The primary sources of constituents of concern (COCs) to groundwater at the Pantex Plant arose from infiltration of historical wastewater discharges through areas of focused recharge to the vadose zone and perched groundwater unit. Historically, effluent from industrial processes, sanitary wastewater, cooling water discharge and storm water runoff were released to unlined ditches and directed to playas.

Primary COCs affecting the perched unit include trichloroethene (TCE), perchlorate, hexavalent chromium [Cr (VI)] and the high explosives (HE) RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine) and trinitrotoluene (TNT) as well as degradation products such as 4-amino-2,6-dinitrotoluene (DNT4A).

Remedies selected in the 2008 Record of Decision (ROD) include groundwater extraction and treatment and injection of amendments to enhance anaerobic degradation of COCs. Two groundwater pump and treat (P&T) systems are currently operational. The Southeast Pump and Treat System (SEPTS) consists of 65 active groundwater extraction wells (EWs), 1 active injection well, and a 300-gallon-per-minute (gpm) treatment plant. The Playa 1 Pump and Treat System (P1PTS) consists of 11 EWs and a 250-gpm treatment plant. Treated groundwater has historically been discharged through a crop irrigation system, but an irrigation system filter bank break in June 2017 reduced operation for the SEPTS and P1PTS with reduced discharge to Playa 1 from the Pantex Plant Wastewater Treatment Facility as a result of discharge permit constraints. Four in situ bioremediation (ISB) systems have been installed. The Southeast ISB (SEISB) is located along the southeast edge of the perched unit to treat RDX and other COCs in an area where the FGZ thins. The SEISB Extension is located along the southeastern boundary of the Pantex Plant property, along the fence line and north of Highway 60, to act as a barrier for offsite RDX and other COC migration. The Offsite ISB is located southeast of the SEISB Extension on a neighboring property to treat COC-impacted perched groundwater that has already migrated off site. The final ISB system, the Zone 11 ISB (Z11ISB) is located south of industrial Zone 11 to treat TCE and perchlorate migrating to the south/southwest. Groundwater monitoring is part of the selected remedy for the site.

The SEISB Extension and Offsite ISB were installed in 2017 and 2020, respectively, subsequent to the previous Five-Year Review (FYR). The first injections into the SEISB Extension were completed in February 2019, with additional injections conducted in September 2019, August 2020, and May 2021. The first injections into the Offsite ISB occurred in June 2021.

The primary goal of the monitoring network is to confirm progress toward Remedial Action Objectives. Data collected from the monitoring network are used to evaluate the performance and efficacy of the remedies and are used to compare actual conditions to expected site conditions. The three primary monitoring objectives for the perched groundwater network are to manage uncertainty, evaluate plume stability, and evaluate remedial efficacy. All monitoring wells are assigned monitoring objectives.

Evaluation of the groundwater monitoring network for the Pantex Plant consisted of both quantitative and qualitative methods. A quantitative statistical evaluation of the site was conducted using tools in the Monitoring and Remediation Optimization System (MAROS) software. All results returned by the MAROS software were reviewed for consistency with the goals and objectives of the monitoring program and the conceptual site model (CSM). Final recommendations for the monitoring network are a combination of quantitative and qualitative review.

Groundwater analytical data collected between 2017 and 2021 from the Pantex Plant long-term monitoring (LTM) network were supplied in a site database. Received data include geographic coordinates of the wells, sample dates, analytical results, detection limits, and data flags. Analytical data from the previous LTM investigations (2000 through 2016) were used to supplement analyses of long-term trends.

For the current report, analytical data from 214 different sampling locations were received including data from investigation monitoring wells (IW), EW and ISB wells. Only data from the 122 active perched zone IWs were used in the statistical analyses. Data from the Lower Ogallala Aquifer were not evaluated for this report. The database contained data for 23 different COC analytes. As in the previous analyses, IWs were grouped by sector of dominant groundwater flow direction. IWs were grouped into North, Southeast and Southwest Sectors. Statistical findings for each sector are summarized below.

SOUTHEAST SECTOR FINDINGS

- RDX was identified as the priority COC at 40 of the 61 monitoring locations in the Southeast Sector based on the magnitude of the exceedance of remedial goals. Perchlorate and Cr (VI) were prioritized in the area south of industrial Zones 11 and 12. DNT4A was selected as a priority COC for optimizing the monitoring network due to its wide distribution in the Southeast Sector. Other monitoring locations show priority exceedances for 1,2-dichloroethane, total chromium, TCE, RDX degradation products, barium, and boron.
- Individual well concentrations for priority COCs showed largely *stable/no trend* to *decreasing* statistical trends within the Plant property and *increasing* trends southeast of Highway 60 in the offsite area. Overall RDX trend results from 2017 through 2021 include proportionally fewer *decreasing* and more *increasing* statistical trend results for the Southeast Sector relative to the 2016 analysis.
- Source area wells showed largely *stable* to *decreasing* trends indicating a reduction in mass export from primary release areas. Tools in the MAROS software estimated that less than 1 percent of RDX mass and about 2 percent of DNT4A mass remains in the Zone 12 source area.
- None of the SEPTS monitoring wells show an *increasing* trend for RDX or DNT4A, although PTX06-1147, south of the other SEPTS monitoring wells, shows an *increasing* trend for DNT4A in an area where the FGZ thins. Data indicate that the SEPTS has stabilized plume migration downgradient from primary sources.
- The far southeastern area of the perched unit shows *increasing* individual well trends for RDX and increasing trends for DNT4A at wells near the recently installed Offsite ISB.
- Monitoring wells immediately downgradient from the SEISB remedy show *decreasing* trends for RDX and are primarily non-detect for RDX degradation products TNX, DNX, and MNX, indicating that the ISB remedy is successfully removing contaminant mass. However, well PTX06-1153, the westernmost ISB monitoring well, has an *increasing* trend for RDX with persistent high concentrations (200 to 300 μg/L) that spiked suddenly in 2019 (>800 μg/L) before returning to relatively consistent concentrations of 200 to 300 μg/L.

- Total dissolved mass of RDX and DNT4A showed *stable* statistical trends from 2017 through 2021 and *decreasing* statistical trends when data from 2012 through 2021 was considered. These results indicate that recent additional monitoring wells in the southeast did not increase the estimate of total dissolved mass significantly. Centers of plume mass remained in the area of the SEPTS, with some migration of the center of the RDX and DNT4A plumes to the southeast when including data from 2012 through 2021. This indicates that contaminant mass is moving from the source area toward the SEPTS and is also likely influenced by the additional plume delineation to the southeast.
- The results of the MAROS spatial analyses indicate overall low concentration uncertainty and low variability between monitoring locations in the Southeast Sector. Evenly spaced monitoring locations, low concentration uncertainty and relatively low variability, along with the *stable* individual well trend and moment analysis results indicate that the network is well designed to address priority monitoring goals of plume stability and uncertainty assessment.
- The MAROS software recommended an overall biennial (every two years) monitoring frequency based on the rate of concentration change for most wells and mass within the network as a whole.

SOUTHWEST SECTOR FINDINGS

- TCE is the priority COC at 22 of 51 sampling locations, and perchlorate is the priority at 6 of the 43 wells sampled for perchlorate in the Southwest Sector. Priority COCs at individual wells other than TCE and perchlorate include RDX, Cr (VI), and degradation products of TCE and RDX. 1,4-Dioxane was detected above remedial goals at 19 sampling locations in the Southwest Sector.
- The Southwest Sector monitoring well network has several wells that have been installed since 2017, many in the eastern Z11ISB area for remedial action monitoring (PTX06-1209, PTX06-1210, and PTX06-1211). New wells and uncertainty management (UM) wells that are sampled infrequently do not have a sufficiently large dataset for statistical trend analysis.
- For TCE, *decreasing* statistical trends were found in the central and western Z11ISB areas. Other ISB wells have variable concentration results. Some downgradient wells (PTX06-1035, PTX06-1155, PTX06-1150, and PTX06-1149) had *increasing* statistical trends that may be the result of ISB injection timing where pulses of TCE have moved through the ISB between injections.
- Wells PTX06-1035 and PTX06-1134, and PTX06-1159, also show *increasing* trends for perchlorate.
- Results for the moment analyses for both TCE and perchlorate plumes indicate statistically *stable* and *decreasing* trends for total dissolved mass within the network. Centers of mass for TCE and perchlorate had *stable* trends. While individual wells within the network may show strong trends, the plumes are not migrating or significantly changing distribution on a larger sector scale.

- Unlike the Southeast Sector, more contaminant mass is present in the Zone 11 source area. The MAROS tool estimated that 23 percent of TCE mass and 70 percent of perchlorate mass remain in the source area.
- In the spatial analysis, uncertainty and variability between sampling locations was found to be low. Wells PTX06-1156 and PTX06-1148 had slightly higher uncertainty and variability when compared to other wells, and a new downgradient monitoring well is recommended to better delineate perchlorate and 1,4-dioxane to the southeast and track plume movement toward the SEPTS.
- The software identified the area outside of the monitoring network south of the ISB as potentially requiring additional monitoring. *Increasing* concentration trends at leading edge wells PTX06-1035, PTX06-1134 and PTX06-1159 indicate that at least one additional monitoring well may be required to the southwest to delineate the edge of the plume and confirm flow to the east if TCE concentrations in PTX06-1207 have an *increasing* or *probably increasing* trend once additional sampling has been completed.
- Most wells in the program were recommended by the software for biennial sampling for both TCE (36 of 51 wells) and perchlorate (36 of 43 wells). The biennial recommendation is consistent with the finding that concentrations are not changing rapidly, and plumes are largely stable.

NORTH SECTOR MONITORING NETWORK

- RDX is the only priority COC on a sector-wide basis in the north. Constituents that exceed remedial goals at individual wells are RDX, boron, DNT4A, and total chromium. Many wells north of Zones 11 and 12 are UM wells and have low to no detections of site COCs.
- North of Playa 1, PTX06-1050 monitors groundwater with historical high concentrations of RDX, boron, and DNT4A. PTX06-1050 showed *decreasing* and *probably decreasing* trends between 2008 and 2011 and between 2012 and 2016. The most recent data shows *increasing* RDX trends in PTX06-1050, which may be related to increased treatment plant discharge to Playa 1 because irrigation system failures in 2017 have not been successfully repaired. Well PTX06-1136, downgradient from PTX06-1050, has recently been dry, and a new monitoring well between PTX06-1136 and PTX06-1050 may be necessary to maintain delineation of RDX northwest of Playa 1.
- Total dissolved mass for RDX was found to have *no trend* within the network, and the center of mass was found to be *decreasing*. DNT4A was found to have a decreasing total dissolved mass and stable center of mass between 2017 and 2021.
- The North Sector show significant spatial uncertainty between monitoring locations, which is consistent with the finding that the North Sector has variable groundwater flow and source locations, as well as disconnected saturated zones.
- As with Southeast and Southwest Sectors, concentration trends in the North Sector are not changing rapidly. Overall, most wells in the North Sector were recommended for biennial sampling by the MAROS algorithm

RECOMMENDATIONS

SOUTHEAST SECTOR RECOMMENDATIONS

- At least two additional monitoring wells are recommended for the area east of the SEISB Extension: one between PTX06-1195 and PTX06-1196, and one northeast of PTX06-1199 to reduce uncertainty and identify the northeastern plume boundary near Highway 60.
- An additional monitoring well is recommended east of PTX06-1042 to track higher RDX concentrations moving towards the SEISB Extension and line of extraction wells located around PTX06-1147.
- Planned new monitoring wells in the area of the Offsite ISB are likely sufficient to assess the performance of the Offsite ISB and to delineate the extent of offsite plume migration to the southeast based on concentrations in existing offsite monitoring wells PTX06-1200, PTX06-1204, and PTX06-1208.
- Continued investigation of the area around in situ performance monitoring well PTX06-1153 is recommended to address uncertainty related to RDX concentration trends in this area. Additional monitoring wells are not recommended, but periodic sampling of previously dry wells is recommended along with data review to update the CSM in this area.
- No wells are recommended for removal from the Southeast Sector routine monitoring program, at this time. Monitoring locations with very low spatial uncertainty (e.g., where the nearest neighboring wells can predict concentrations at a well node) were considered for reduced sampling frequency.
- While the MAROS results indicate that a biennial sampling frequency would be sufficient to evaluate the rate of concentration change in the network and at most wells, an overall annual sampling frequency is recommended for most locations in the Southeast Sector. Semiannual sampling is recommended at wells used to evaluate the ISB and SEPTS remedies and potential plume migration along the east and southeast edges of the perched unit.

SOUTHWEST SECTOR RECOMMENDATIONS

- One additional monitoring well is recommended for the area downgradient from the Z11ISB to manage uncertainty about migration of the TCE and perchlorate plumes downgradient of PTX06-1035 if TCE concentrations in PTX06-1207 have an *increasing* or *probably increasing* trend once additional sampling has been completed.
- Site data indicate high and increasing concentrations of perchlorate at PTX08-1008, cross gradient from the ISB remedy, and increasing concentrations of 1,4-dioxane in PTX06-1156 and PTX06-1148. An additional well south of PTX08-1008 and between PTX06-1156 and PTX06-1052 is recommended to monitor the movement of perchlorate and 1,4-dioxane toward the SEPTS. Additionally, it is recommended to monitor PTX08-1009, PTX06-1052, and PTX06-1183 for 1,4-dioxane.

- Overall, there is very low spatial uncertainty within the network, and no wells in the routine sampling network are recommended for elimination.
- Monitoring wells in the Zone 11 and Zone 12 source areas show largely *stable* trends resulting in recommendations for annual sampling. ISB area wells are recommended for a semiannual sampling frequency. Wells outside of the main plumes to the west are minimally affected by site COCs and are recommended for sampling once before each FYR (or as regulatory permitting requires).

NORTH SECTOR RECOMMENDATIONS

- No additional monitoring wells are recommended in the North Sector at this time. RDX and perched unit water levels in PTX06-1050 should be watched and PTX06-1136 should be checked periodically to ensure that it remains dry. No additional wells are recommended for the isolated perched water units at the Burning Ground or along the northern Plant boundary.
- For the northern perched unit, a largely annual sampling frequency is recommended for the Playa 1 area based on the rate of concentration change and the outstanding remedy management questions. Perched groundwater in the Burning Ground and northern boundary are recommended for 5-year sampling frequency except for POC wells that are recommended for annual sampling.

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LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

AEC	Atomic Energy Commission
amsl	above mean sea level
bgs	below ground surface
BDF	Blackwater Draw Formation
C	Carcinogenic
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMS	corrective measure study
CNS	Consolidated Nuclear Security, L.L.C.
COC	constituent of concern
COV	coefficient of variation
Cr (III)	trivalent chromium
Cr (VI)	hexavalent chromium
CSM	conceptual site model
DOE	U.S. Department of Energy
DNT2A	2-Amino, 4,6-dinitrotoluene
DNT4A	4-Amino, 2,6-dinitrotoluene
DNX	Hexahydro-1,3-Dinitroso-5-Nitro-1,3,5-Triazine
EM	DOE Environmental Management
EPA	U.S. Environmental Protection Agency
EW	Extraction Well
FGZ	Fine-Grained Zone
FS	Feasibility Study
FYR	Five-Year Review
GAC	granular activated carbon
GW-Res	TCEQ Standard No. 2 Groundwater MSC for Residential Use
HA	Hazard Assessment
HE	high explosive
HMX	High melting explosive (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
IAG	Interagency Agreement
IC	Institutional Control
ICM	Interim Corrective Measures
ISB	*In Situ* Bioremediation
ISM	Interim Stabilization Measure
ISPM	In Situ Performance Monitoring Well
IW	Investigation Well

LTM	Long-Term Monitoring
LTMO	Long-Term Monitoring Optimization
MAROS	Monitoring and Remediation Optimization System
MCL	maximum contaminant level
MNX	Hexahydro-1-Nitroso-3,5-Dinitro-1,3,5-Triazine
MK	Mann-Kendall Trend
MSC	Medium Specific Concentration
N/A	Not Analyzed/Not Applicable
NC	Non-carcinogenic
NNSA	National Nuclear Security Administration
NPL	National Priorities List
P1PTS	Playa 1 Pump and Treat System
POC	point of compliance
PQL	Practical Quantitation Limit
PS	Plume Stability
R^2	Coefficient of Determination
RA	Response Action
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RDX	Research Department Explosive (Hexahydro-1,3,5-trinitro-1,3,5-triazine)
RFI	RCRA Facility Investigation
ROD	Record of Decision
RRR	Risk Reduction Rules
SAP	Sampling and Analysis Plan
SEISB	Southeast In Situ Bioremediation
SEPTS	Southeast Pump and Treat System
SF	Slope Factor
SVE	soil vapor extraction
TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality
TNT	trinitrotoluene
TNX	Hexahydro-1,3,5-Trinitroso-1,3,5-Triazine
TTU	Texas Tech University
UM	Uncertainty Management
VOC	Volatile Organic Compound

WWTF	Wastewater Treatment Facility
Z11ISB	Zone 11 In Situ Bioremediation

Statistical Trends

D	*decreasing*
PD	*probably decreasing*
S	*stable*
PI	*probably increasing*
I	*increasing*
ND	non-detect
NT	*no trend*

Units

μg/L	micrograms per liter
mg/L	milligrams per liter
gpd	gallons per day
gpm	gallons per minute
ft	feet

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LONG-TERM MONITORING OPTIMIZATION REVIEW
PERCHED GROUNDWATER UNIT, PANTEX PLANT
CARSON COUNTY, TEXAS

1.0 OBJECTIVES OF THE OPTIMIZATION REVIEW

The Pantex Plant Site (site) is located approximately 17 miles northeast of Amarillo, Texas in Carson County in U.S. Environmental Protection Agency (EPA) Region VI. The site covers roughly 10,000 acres with additional property consisting of a 1,000-acre tract at Pantex Lake. Over 5,000 acres are owned by Texas Tech University (TTU) as a buffer around the site. Industrial operations occur on approximately 2,000 acres of the Plant (**Figure 1**).

The Pantex Plant is currently managed as a government-owned, contractor-operated facility, overseen by the Department of Energy/National Nuclear Security Administration (DOE/NNSA) and operated by Consolidated Nuclear Security, L.L.C. (CNS). As the prime contractor, CNS also directs environmental activities including investigation, construction and operation and maintenance of remedial systems.

Historical Plant waste management activities have resulted in impacts to soil and perched groundwater above risk-based, human health standards. A corrective action program has been developed to address unacceptable risks for soil and perched groundwater at the facility. Corrective measures for perched groundwater have been implemented to stabilize and control contaminant migration while reducing the contaminant mass.

This report focuses on optimization strategies for long-term monitoring (LTM) of remedial response actions (RAs) for the perched groundwater unit at the Pantex Plant. Groundwater monitoring plays a critical role in long-term environmental restoration of the Pantex Plant site. Long-term monitoring optimization (LTMO) is part of overall remediation optimization for affected groundwater. The perched groundwater network was the subject of LTMO reviews in 2007, 2012, and 2017 with results published in reports (GSI, 2008; GSI, 2012; HGL, 2017).

The purpose of this study is to review the current groundwater monitoring network relative to the stated monitoring objectives and provide recommendations for improving the efficiency and accuracy of the network for supporting site management decisions. The evaluation includes new groundwater data collected from 2017 to 2021 as well as historical site characterization and monitoring data collected from 2012 through 2016. Documents and data sources used in the analysis are listed in Appendix A.

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2.0 SITE BACKGROUND

2.1 SITE BACKGROUND

The primary mission of the Pantex Plant is to assemble, disassemble, and evaluate nuclear weapons from the U.S. stockpile, to develop, fabricate, and test explosives and explosive components, and to provide secure storage for material from the above activities. Pantex Plant operations began in 1942 under the Army Ordnance Corps, manufacturing conventional munitions and high explosives (HE) such as trinitrotoluene (TNT). The Plant was briefly deactivated at the end of the World War II, and the property sold to TTU. In 1951, the site was reclaimed for use by the Atomic Energy Commission (AEC) to produce both nuclear weapons and HE compounds. Radioactive materials have not been manufactured at the facility but components containing radioactive materials are managed at the site. Compounds such as TNT, High Melting Explosive (HMX, octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine) and Research Department Explosive (RDX, hexahydro-1,3,5-trinitro-1,3,5-triazine) have been manufactured, tested, and disposed of at the site.

In 1988, the EPA conducted a *Resource Conservation and Recovery Act (RCRA) Facility Assessment* of the Pantex Plant, identifying Solid Waste Management Units and areas of concern containing environmental media possibly subject to interim corrective measures (ICMs). The RCRA Facility Investigation (RFI) identified operational areas at the site and groupings of corrective action units in common watersheds termed waste management groups. The Pantex Plant was proposed for addition to the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1991 and formally listed in 1994. The Pantex Plant is, therefore, subject to the provisions of CERCLA in addition to RCRA and State of Texas requirements.

In 2008, an Interagency Agreement (IAG) went into effect between EPA, DOE/NNSA and Texas Commission on Environmental Quality (TCEQ), setting forth the roles and responsibilities of each of the agencies for performance and oversight of remedial activities. The IAG is a binding agreement between the parties outlining procedures to ensure that remediation is accomplished pursuant to requirements under CERCLA and related statutes. The DOE/NNSA is the lead federal agency to investigate, assess, plan and remediate affected media at the Pantex Plant. The TCEQ and EPA share oversight of remedial requirements under a 1994 Memorandum of Agreement and the IAG. All non-radiological environmental restoration activities under both state and federally-authorized programs at the Pantex Plant are conducted under the State of Texas Risk Reduction Rules (RRR) (30 TAC §335 Subchapter S, 1993).

A Corrective Measure Study/Feasibility Study (CMS/FS) was completed in 2007 and conditionally approved by TCEQ and EPA in 2008 with the Pantex Site-Wide Record of Decision (ROD) finalized in the same year. The CMS/FS and ROD outline the interim corrective and stabilization measures (ICMs and interim stabilization measures [ISMs] respectively) for the perched groundwater unit. A comprehensive long-term groundwater monitoring strategy (LTM Design Report) supporting assessment of the proposed remedies was developed and finalized in 2009 (B&W Pantex, 2009a) and updated in 2014 (B&WPantex, 2014). Pantex produced an updated LTM Design Report (Pantex, 2019a) and Sampling and Analysis Plan (SAP) (Pantex, 2019b) in 2019.

The Long-Term Monitoring Optimization (LTMO) Report and second Five-Year Review (FYR) were completed in 2017 and 2018, respectively (HGL, 2017; HGL, 2018). Results from the LTM and FYR indicated possible expansion of the RDX plume to the southeast. Subsequent investigations in 2018 and 2019 confirmed the presence of impacted perched groundwater offsite to the southeast. As a result, the conceptual site model (CSM) and existing numerical groundwater flow and solute transport model for the perched groundwater system were updated to evaluate and recommend treatment options for the Southeast Offsite Plume Area (HGL, 2021a). The perched groundwater monitoring network described in the 2021 document is the subject of the following report. **Figure 2** illustrates the location of investigation monitoring wells in the program and the approximate location of the Southeast, Southwest and North Sectors of the perched groundwater unit used in the following analysis.

A chronology of key site events is presented in **Table 1**. Remedies are described in detail in Section 3.3.

Table 1. Pantex Plant Site Chronology

Date	Action
1942	Army Ordnance Corps Pantex Plant begins operations.
1951	Plant Site is transferred to AEC.
1980s	DOE Environmental Management (EM) initiates Environmental Restoration Project.
1988	RCRA facility investigation is conducted.
1991	EPA and TCEQ issue RCRA Hazardous Waste Permit to Pantex Plant; Pantex Plant is proposed for addition to the NPL.
1994	Pantex Plant is listed on the NPL.
1995	Southeast Pump and Treat System (SEPTS) pilot system installed
1999-2005	RI/FS is approved.
1999-2000	SEPTS is expanded from pilot installation.
2000	USDOE/NNSA succeeds DOE EM as lead federal agency.
2004	Pantex Plant Groundwater Modeling Report is completed.
2007	SEPTS is expanded.
2007-2008	CMS/FS is completed.
2008	ROD is signed (benchmark for FYR schedule), IAG is executed, and SEISB is installed.
2009	LTM Design and SAP are completed, and Playa 1 Pump and Treat System (P1PTS) is installed. Zone 11 In Situ Bioremediation (Z11ISB) is installed.
2010	All remedial design and construction is approved.
2013	First FYR and LTMO Review are completed.
2014	LTM Design and SAP updated.
2017	LTMO review is completed.
2017-2018	SEISB Extension is installed, and SEPTS is expanded.
2018	Second FYR is completed.
2019	Z11ISB Extension is installed and updated LTM Design and SAP are updated.
2020	Offsite ISB and Extraction System is installed.
2021	Perched Groundwater CSM and Numerical Groundwater Model are updated; Southeast Offsite Remediation system is updated; and P&T system is optimized. Significant expansion of Z11 ISB

2.2 REGULATORY BACKGROUND

The Pantex Plant is permitted as a hazardous waste facility under RCRA and regulated under CERCLA as well as the state of Texas RRR.

Remedial actions for all inactive areas at the Pantex Plant and perched groundwater unit were selected in the 2008 ROD. Many interim remedial actions were implemented before 2008 and were included as selected remedies in the ROD. The schedule for FYRs was, therefore, initiated by the ROD signature.

Remedial Action Objectives (RAOs) articulated in the ROD have the primary goals of restoring perched groundwater to drinking water standards and protecting the deeper Ogallala Aquifer. Specific RAOs include:

- Reduce the risk of exposure to perched groundwater through prevention of human or ecological contact;
- Achieve cleanup standards for all constituents of concern (COCs);
- Prevent growth of the perched groundwater contaminant plumes;
- Prevent contaminants from exceeding cleanup standards in the lower Ogallala Aquifer.

The remedy selected for perched groundwater in the ROD is:

- Operation of the existing Southeast Pump and Treat System (SEPTS) to stabilize migration of the plume and treat groundwater in the perched unit;
- Construction and operation of the Playa 1 Pump and Treat System (P1PTS) to reduce mounding of perched groundwater under Playa 1;
- Continued operation of the in situ bioremediation system (ISB) to treat HE southeast of Zone 12 and to treat trichloroethene (TCE) and perchlorate downgradient of Zone 11;
- Institutional controls (IC) to prevent exposure to contaminants in the soils and perched groundwater, and to prevent cross-contamination to the regional Ogallala Aquifer.

Effectiveness of the selected remedies for the Pantex Plant Site perched groundwater is determined through groundwater monitoring implemented through the Long-Term Groundwater Monitoring Plans. Results of groundwater monitoring are summarized in annual reports and used to support remedial action effectiveness in FYRs.

Additional remedies selected for other site media include soil vapor extraction (SVE) in the area of the Burning Ground, lining drainage ditches, capping landfills and ICs. The efficacy of these remedies is not specifically considered in this report but may be assessed indirectly by data from the perched groundwater monitoring program.

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3.0 CONCEPTUAL SITE MODEL

3.1 GEOLOGY AND HYDROGEOLOGY

The Pantex Plant lies on the High Plains portion of the Great Plains Physiographic Province in the Texas Panhandle. The area, known as the Llano Estacado, is a broad, flat, plateau with topographic elevation across the site ranging between 3,500 feet above mean sea level (ft amsl) to 3,595 ft amsl. A distinguishing feature of the area is the presence of numerous shallow circular basins called *playas* (**Figure 1**). Playas are ephemerally moist depressions that are the location of much of the recharge to groundwater in the region. When inundated, the playas form shallow lakes and wetlands, contributing to animal and plant diversity in the region. During TNT and later ordnance production through the early 2000s, industrial wastewater was discharged directly to unlined ditches that drained the active industrial areas to the playas. These unlined ditches also served as a historical source of recharge to groundwater. The average topographic slope across the Plant area is approximately 0.006 ft, and most Plant surface water tends to drain to the on-site playas.

The hydrostratigraphy below the Pantex Plant is summarized in **Table 2**. The uppermost hydrostratigraphic unit at the Pantex Plant is the Blackwater Draw Formation (BDF). The BDF extends up to 90 ft below ground surface (bgs) at the site and is largely unsaturated. The unit consists of silts and sands and an approximately 20-foot-thick lower unit composed of silty sand and caliche. The playas are depressions in the BDF.

Table 2. Pantex Hydrostratigraphic Units

Name	Elevation and Thickness	Description
Blackwater Draw Formation		
BDF	Surface at 3,575 to 3,500 ft amsl (~ 90 ft thick)	Unsaturated silts and sands, lower 20 ft interval of silty sand and caliche
Ogallala Formation		
• Caprock Caliche	Surface at ~3,500 to 3,415 ft amsl (0 to >40 ft thick). Sometimes absent, particularly underneath playas	Hard, dense and finely crystalline caliche
• Upper Ogallala	Surface at 3,495 to 3,405 ft amsl (145 to 250 ft thick)	Fine to medium sand, sands with clays and gravel
• Perched Groundwater Unit	Perched groundwater between 3,305 and 3,205 ft amsl (215 and 280 ft bgs, 0 to 60 ft saturated thickness)	Fine to medium sand, saturated sands with clays and gravel
• Fine-Grained Zone (FGZ)	Surface at 3,300 to 3,190 ft amsl with variable thickness (<5 to 150 ft thick)	Silts and clays, separate upper from lower Ogallala
• Lower Ogallala	Surface at 3,300 to 3,190 ft amsl with variable thickness (45 to 300 ft thick)	Coarse-grained fluvial, channel sands and gravels
• Lower Ogallala Saturated Zone (High Plains Aquifer)	Surface at 3,215 to 3,030 ft amsl (350 to 520 ft bgs, 1 to 400 ft saturated thickness)	Saturated coarse-grained sands, gravel, drinking water supply for Amarillo, irrigation water supply
Red Beds		
• Red Beds / Dockum Group	Surface at 3,180 ft amsl dipping to 2,870 ft amsl	Siltstone, confining layer

Elevations are approximate from previous reports (B&WPantex, 2004 and HGL, 2021a) and 2020 hydrographs.

The Ogallala Formation underlies the BDF. A Caprock Caliche layer generally defines the top of the Ogallala Formation but is not continuous across the entire Pantex Plant. The Caprock, where present, consists of a hard, dense and finely crystalline caliche. Below the Caprock Caliche, the Ogallala Formation consists of upper and lower permeable units separated by the FGZ. The permeable units are composed of coarse-grained fluvial sequences including channel sands and gravels overlain by finer overbank deposits.

The upper unit of the Ogallala Formation contains discontinuous areas of perched groundwater underlain by the FGZ. Perched groundwater is found in three main areas under the Pantex Plant. The largest area of perched groundwater is associated with recharge from Playas 1, 2 and 4 and drainage ditches associated with industrial Zones 11 and 12 (see **Figure 1**). Isolated areas of perched groundwater also occur under the Burning Ground (near Playa 3) and in the northeast corner of the Pantex Plant (near Pratt Playa).

Groundwater elevation is highest under Playa 1 (about 3,305 ft amsl) with radial groundwater flow primarily to the southwest and to the southeast beneath Zones 11 and 12, pinching out on the TTU property to the south and offsite to the southeast in a thin band (3,205 ft amsl). Saturated thickness of perched groundwater varies across the unit and over time with a historical maximum of 70 ft beneath Playa 1 to 0 ft at the extreme edges of the unit. Depth to groundwater varies from about 215 ft near Playa 1 to approximately 280 ft southeast of Highway 60 and 300 ft in the southwest area under TTU property.

Because of mounding near Playa 1 and the topography of the FGZ, groundwater flow in the main perched unit tends to be radial. To the south and east of Zone 12, the groundwater surface slopes to the southeast, and to the west of Zone 11 the groundwater surface slopes to the southwest. Groundwater north of Playa 1 tends to flow to the north. Radial flow within the main perched unit is the reason why the monitoring network was divided into three sectors based on dominant groundwater flow directions—the Southeast, Southwest, and North Sectors—for the LTMO analysis (see sectors identified on **Figure 2**).

The perched groundwater unit meets the yield and water quality criteria to be considered a potential drinking water source in the state of Texas. However, no water supply wells are drilled into the unit for either drinking water or industrial water supply on-site. Public drinking water supply wells in the vicinity are drilled into the Lower Ogallala Aquifer, except for one perched groundwater well on offsite property northeast of Pantex near Pratt Playa. The perched groundwater does not discharge to surface water bodies and hydraulic connection with the Ogallala is limited by the FGZ.

The FGZ is a zone of fine-grained sediment (consisting of sand, silt, and clay, with caliche intervals) within the Ogallala Formation. The FGZ varies in thickness from over 150 ft to less than 10 ft and slopes downward from the center of the Plant toward the southeast corner of the property. The FGZ tends to isolate perched water from deeper strata; however, the FGZ becomes coarser, thinner, and more permeable in areas to the south and east of the main Plant.

The surface of the Lower Ogallala Saturated Zone or High Plains Aquifer (Ogallala Aquifer) beneath the Pantex Plant slopes downward from south to north and is approximately 350 ft bgs on the south side of the plant and 500 ft bgs on the north side of the plant. An unsaturated zone between 50 and 100 ft in thickness is present between the FGZ and the saturated portion of the Lower Ogallala. The saturated thickness of the Ogallala Aquifer varies from 1 to 100 ft in the southern regions of the site and approximately 250 to 400 ft in the northern regions. The Ogallala Aquifer is the principal municipal water supply for the city of Amarillo, Texas. The city operates a municipal water supply field north of the Pantex Plant. The Aquifer has, historically, provided potable and industrial water for the Pantex Plant as well as agricultural water for the surrounding properties. Removal of water from the Ogallala Aquifer for municipal, industrial, and large-scale agricultural uses has reduced the saturated thickness in many areas of the aquifer. The following report does not consider monitoring of the deeper Ogallala Aquifer.

3.2 CONSTITUENTS AND SOURCES

The primary sources of COCs to groundwater at the Pantex Plant arose from infiltration of historical wastewater discharges through areas of focused recharge to the vadose zone and perched groundwater unit. Major historical industrial operational areas are Zone 10, Zone 11 and Zone 12 (see **Figure 1**) in the central portion of the Pantex Plant. Historically, effluent from industrial processes, sanitary wastewater, cooling water discharge and storm water runoff were released to unlined ditches. Discharges directed to Playas 1, 2 and 4 created linear sources as well as point sources to the subsurface. Subsequent infiltration has resulted in numerous co-mingled plumes and an artificially expanded perched groundwater unit under Playa 1 and areas southwest and southeast of the main industrial zones.

All wastewaters are currently directed to the sanitary sewer system and to the Pantex Plant Wastewater Treatment Facility (WWTF). Treated wastewater, including extracted groundwater, is designed to be discharged to the agricultural irrigation system for surface application, but an irrigation system filter bank break in June 2017 necessitated discharge of treated wastewater to Playa 1 under reduced flow to comply with Playa 1 permitted discharge limits. The irrigation system break was repaired, but the system continued to experience issues through 2021. Work on the irrigation system is ongoing, including installing a pivot system to the east. The upgraded irrigation system should be operational near the end of 2022.

3.2.1 Zone 12

Historical industrial wastewater generated in Zone 12 was discharged to the eastern ditch running to Playa 1. Industrial operations in Zone 12 included development, testing, and manufacture of HE components. Wastewater discharge from Zone 12 varied between 200,000 and 300,000 gallons per day (gpd), historically. Discharges originating in Zone 12 infiltrated along the unlined ditch discharging to Playa 1, resulting in groundwater mounding under Playa 1. Groundwater mounding resulted in plumes exceeding drinking water standards migrating north, east and southeast of Zone 12. Contamination is present to the extent of the groundwater unit to the east and southeast. Constituents remaining in the vadose zone may represent a continuing low-level, long-term, source of contamination to the perched unit.

Constituents in wastewater from Zone 12 included RDX, TNT, other HEs, hexavalent chromium (Cr VI) from cooling waters, and some chlorinated volatile organic compounds (VOCs). TNT is photo-reactive, decaying to products like 2-amino-4,6-dinitrotoluene (DNT2A) and 4-amino-2,6-dinitrotoluene (DNT4A) causing the characteristic colored ‘red water’ discharge in surface water.

RDX degrades to TNX, MNX and DNX under anaerobic conditions stimulated by the ISB remedies. These constituents, which are often short-lived, are monitored for remedy effectiveness rather than as priority risk drivers. RDX and degradation products of TNT are the priority COCs originating from Zone 12 and define the extent of affected groundwater in the southeast. Hexavalent chromium [Cr (VI)] is found in limited areas in the Southeast Sector with most of the mass occurring directly south of Zone 12.

3.2.2 Zone 11

Industrial operations in Zone 11 were diverse, consisting of quality assurance testing and machining operations that included cleaning of components with chlorinated solvents. Discharges from Zone 11 also infiltrated along ditches to the north and to Playa 1 resulting in linear sources extending north to Playa 1. Constituents associated with Zone 11 include chlorinated solvents such as TCE, and perchlorate, and Cr (VI). The groundwater flow from Zone 11 is predominantly to the southwest where the TCE and perchlorate plumes are located. 1,4-Dioxane is also associated with releases from Zone 11. Zone 10 is located downgradient to the southwest of Zone 11. Zone 10 has limited releases, and constituents in this area are not distinct from plumes emanating from Zone 11.

A groundwater flow divide runs through Zone 11. The flow divide has moved to the east under the long-term influence of pumping from SEPTS. Constituents associated with Zone 11 such as perchlorate and Cr (VI) are migrating southeast under the influence of groundwater extraction in the east. Flow west of the center of Z11ISB is to the southwest.

3.2.3 Burning Ground and Northern Property

The Burning Ground area is northwest of the main Zone 11 and 12 industrial areas and west of Playa 1. The Burning Ground has a small and, apparently, isolated perched groundwater unit associated with Playa 3. The Burning Ground is an active operation area used for thermal treatment of HE. Historical activities have resulted in some releases to shallow and deep soils. Selected remedies at the Burning Ground include an SVE system to remove VOCs from soil. Perched groundwater below the Burning Ground has limited detections of chlorinated VOCs and some HEs.

Most of the area north of Playa 1 did not have known industrial sources. An isolated perched groundwater unit is present in the northeast corner of the main property. A historical WWTF was located in the area, but only limited, non-trending, low-level contamination associated with the facility has been found sporadically in perched groundwater. Monitoring wells north of Zones 11 and 12 and north of Playa 1 do not indicate consistent or high concentrations of constituents.

3.2.4 Constituents of Concern

Groundwater analyses indicate that several contaminants are found above EPA Maximum Contaminant Levels (MCLs) or Texas Medium Specific Concentrations (MSCs) in perched groundwater. The 2008 ROD identified MCLs and MSCs as the primary remedial standards for the site constituents. Constituents and standards used for optimization of the monitoring network are listed in **Table 3** along with the maximum concentration results from groundwater analyses between 2017 and 2021 and from 2012 through 2016.

Table 3. Perched Groundwater Remedial Goals

Constituent Name	Standard	Basis of Standard	Maximum Concentration 2017 – 2021	Maximum Concentration 2012 – 2016
1,3,5-Trinitrobenzene	220	GW-Res NC Adj	526	1,260*
1,2-Dichloroethane	5	MCL	77.3	50.8
1,3-Dinitrobenzene	3.7[a]	GW RESc	0.091	0.093
1,4-Dioxane	7.7	GW RESc	70.3	77
2,4-Dinitrotoluene	1	PQL	5.39	18*
2,6-Dinitrotoluene	1	PQL	1.29	1.9
2-Amino-4,6-Dinitrotoluene (DNT2A)	1.2 (6.1[a])	GW Res NC Adj	6.8	23.4
4-Amino-2,6-Dinitrotoluene (DNT4A)	1.2 (6.1[a])	GW Res NC Adj	48.5	37.3
Arsenic	12	Background	620**	430**
Barium	2,000	MCL	21,000	21,000
Boron	7,300† (500)	†GW-Res NC	2,710	1,900*
Chloroform	80	MCL for Trihalomethanes	91.4	46.2
Chromium, Hexavalent [Cr (VI)]	100	MCL	2,301.91	6,031
Chromium, Total	100	MCL	2,780	6,840
cis-1,2-Dichloroethene	70	MCL	390	490
Hexahydro-1,3-Dinitroso-5-Nitro-1,3,5-Triazine (DNX)	2	EPA Lifetime HA for RDX	33.6	24*
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine (HMX)	360	EPA Lifetime HA for HMX	396	530*
Lead	15	MCL	Non-detect	0.644
Manganese	1,715.5	GW-Res NC	99,000**	26,000
Hexahydro-1-Nitroso-3,5-Dinitro-1,3,5-Triazine (MNX)	2	EPA Lifetime HA for RDX	26.2	145
Molybdenum	182.5		46	43.9
Perchlorate	15	GW-Res NC	724	1290
Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX)	2	EPA Lifetime HA	2,850	3850
Selenium	50	MSC	51	59.2
Tetrachloroethene (PCE)	5	MCL	21.8	20.1
2,4,6-Trinitrotoluene (TNT)	3.6	GW-Res NC Adj	77.4	89*
Hexahydro-1,3,5-Trinitroso-1,3,5-Triazine (TNX)	2	EPA Lifetime HA for RDX	217	333
Trichloroethene (TCE)	5	MCL	1,500	500

All concentrations in µg/L—micrograms per liter

a ROD identified values for these constituents were adjusted below the calculated MSC because they target the same organs from a cumulative risk perspective.

N/A = Data not analyzed; * Sample from extraction well. **Sample from ISB well.

GW-Res—TCEQ Standard No. 2 Groundwater MSC for Residential Use

MCL—EPA Maximum Contaminant Level; PQL—Practical Quantitation Limit C—Carcinogenic; NC—Noncarcinogenic; HA – Health Advisory

† Boron exceeds background, posing potential threat to agricultural applications. Remedial goal is 500 ug/L.

Boron concentrations in the perched unit are below drinking water standards and are protective for human consumption. However, the concentrations of boron present in some areas of the perched aquifer are harmful to crops, posing potential problems for agricultural application of treated wastewater. For this reason, boron is removed in the groundwater extraction treatment systems before application to crops. The standard for boron for the statistical analysis was set to 500 micrograms per liter (µg/L).

3.3 REMEDIES

Interim remedies implemented at the Pantex Plant were described in the 2003 *Compliance Plan for Industrial Solid Waste Management Sites*, with final remedies provided in the 2010 update to the *Compliance Plan* (TCEQ, 2010). Selected remedies are described in the 2008 ROD. Remedy components are summarized in **Table 4** and are illustrated on **Figure 2**.

Table 4. Perched Groundwater Remedies

Location	Remedy	Goal	Contingency
Playa 1	P1PTS –Groundwater Extraction and Treatment – GAC and boron Ion Exchange; Effluent to industrial supply or irrigation system	Reduce groundwater elevation and head causing downgradient movement; reduce mass of RDX, other HEs and boron	Additional extraction wells and expanded treatment
Southeast	SEPTS – Groundwater Extraction and Treatment Effluent – GAC, Cr and Boron Ion Exchange; Perchlorate treatment to be initiated fall of 2022. Effluent to industrial supply, irrigation system or re-injection	Reduce groundwater elevation and mass of RDX and other HE, VOCs and Cr (VI)	Expand P1PTS, improve irrigation system or find alternatives for disposal of treated water; Addition of perchlorate treatment unit; re-grading ditch
Southeast and Southeast Offsite	In Situ Bioremediation – Injection of carbon and nutrients to create reducing conditions	Create conditions supporting biological reduction of RDX	Change formulation for amendment, addition of more injection points, maintenance for biofouling
Zone 11	In Situ Bioremediation – Injection of carbon and nutrients to create reducing conditions	Create conditions supporting biological reduction of TCE (VOCs), perchlorate	Change formulation for amendment, addition of more injection points, maintenance for biofouling
Site-Wide	ICs	Prevent human and ecological exposure and potential cross-contamination	None

GAC = Granular Activated Carbon

Performance of the selected remedies is evaluated through groundwater monitoring implemented as described in periodic updates to the long-term groundwater monitoring design and sampling and analysis plan and by reports including the *Long-Term Monitoring System Design Report* (Pantex, 2019a), the *Sampling and Analysis Plan* (Pantex, 2019b), the *Pantex Plant Ogallala Aquifer and Perched Aquifer Contingency Plan* (Pantex, 2019c), and the *2018 Annual Progress Report* (Pantex, 2019d). The expected performance of the remedies has been identified based on the CSM, groundwater modeling and engineering estimates. Results of groundwater monitoring are compared to expected performance in annual reports . Significant deviation from expected remedy performance may result in modifications to RAs. Contingency plans for remedies are detailed in the *Pantex Plant Ogallala Aquifer and Perched Groundwater Contingency Plan* (Pantex, 2019c) and are summarized below.

The overall remedy strategy for the perched unit is to reduce the volume and driving force of groundwater, particularly around Playa 1. Downgradient portions of the plumes are treated using biological and geochemical reduction of contaminants facilitated by in situ amendments. The individual remedy components are designed to work together to stabilize plumes in the perched unit and to reduce contaminant mass and mobility.

Plumes within the perched groundwater unit are somewhat unique relative to most groundwater plumes in that the abiotic, natural attenuation processes of advection, dilution and dispersion are not anticipated to reduce constituent concentrations to below remedial goals due to the contained nature of the unit. Therefore, several active remedies were selected in the regulatory decision documents to address contaminant plumes in the perched unit.

3.3.1 Playa 1 Pump and Treat System

A groundwater extraction and treatment system was installed in the Playa 1 area consisting of 10 extraction wells (EWs) and lines conveying water to a treatment plant. The system became fully operational in 2009. Water treatment consists of GAC and ion exchange units capable of removing contaminants from about 250 gallons per minute (gpm). The goal of the P1PTS is to reduce groundwater mounding under Playa 1 and to remove contaminant mass. Perched groundwater elevations are highest under Playa 1, with groundwater flow radiating from this location. Treated water has historically been discharged to the irrigation system supporting agricultural crops covering much of the Pantex and TTU properties. However, ongoing issues with the irrigation system have resulted in discharge of treated water to Playa 1. The irrigation system is currently being upgraded, and it is expected that once the system is operational, the infiltration of irrigation water will not exceed evapotranspiration losses, thereby preventing additional water from entering the perched unit.

The P1PTS has reduced saturated thickness in perched groundwater beneath Playa 1 since it became operational in 2009. Success of the P1PTS is defined as reduction in the groundwater elevation mound in the area, reducing the hydraulic gradient and therefore flux of contaminants to the edges of the perched unit.

Monitoring to confirm performance of the P1PTS includes measuring groundwater elevations around Playa 1 and developing potentiometric surface maps and elevation trends for the north-central Pantex Plant. Remedy performance expectations included a reduction in RDX concentrations and RDX mass flux to the southeast. Decreases in mass were anticipated to level off after several years of pumping. Should the P1PTS fail to meet performance objectives for head reduction, the proposed contingent remedy includes addition of EWs and treatment capacity.

3.3.2 Southeast Pump and Treat System

The SEPTS was piloted in 1995 and has since been expanded and modified to meet the RAOs and final remedy established in the ROD and Hazardous Waste Permit 50284. The SEPTS was a part of the ISM in the original Compliance Plan. The system consists of 65 active groundwater EWs, 1 active injection well, and lines conveying extracted water to a 300-gpm treatment plant with GAC, chromium ion exchange, and boron ion exchange units. A perchlorate treatment unit is being installed as part of the overall treatment process. Treated water is used for irrigation, beneficial reuse through ISB or industrial uses, and is discharged to Playa 1 if irrigation is not an option. When necessary, treated water is reinjected into wells in the southeast perched unit or through injection wells located near Playa 2. A subsurface irrigation system that was developed to discharge treated water broke down in 2017 and is no longer operational. The subsurface irrigation system is being replaced by a pivot irrigation system expected to become operational in summer 2022.

Performance objectives for the SEPTS are to reduce groundwater volume and lateral flux in the southeast portion of the perched unit, reducing transport potential to the edges of the plume and possible vertical migration to the Lower Ogallala Aquifer. The SEPTS is also anticipated to reduce total contaminant mass and mass flux of RDX and other HEs in the southeast, stabilizing the plumes. The SEPTS is designed to work in concert with both the P1PTS and the ISB remedies in the southeast.

The function of the monitoring network relative to the SEPTS is to demonstrate reduction in groundwater elevation and to monitor concentrations in the southeast area. Potential concerns for the SEPTS include migration of constituents from the southwest across the groundwater divide (running through Zone 11), and migration of plumes beyond the SEPTS and toward adjacent properties to the southeast.

Several conditions may result in under performance of the remedy, triggering possible contingency actions. If the P1PTS does not reduce flux to the south, additional EWs may be added around Playa 1 and the P1PTS treatment plant expanded. Infiltration from the 5/12a Ditch could be greater than expected, overloading the SEPTS. In this case, the contingent action would involve re-grading or lining portions of the 5/12a Ditch to reduce infiltration. As has occurred recently, when the irrigation system is unable to handle the treated groundwater, reinjection of treated water and discharge to Playa 1 are implemented, undermining the volume reduction function of the SEPTS. For this scenario, expansion of the irrigation system or finding alternative uses for the treated water may be required. If perchlorate or 1,4-dioxane are detected in the groundwater EWs at levels that exceed discharge criteria, then the extraction from wells closest to the plume fronts migrating from Zone 11 will need to be modified temporarily until the treatment system can be upgraded to treat these COCs. Data collected from the perched groundwater monitoring network are used to determine if the selected remedies are operating effectively and attaining remedial performance objectives.

3.3.3 Southeast In Situ Bioremediation (ISB) Systems

The SEISB system is designed to create strongly reducing geochemical conditions on the southeast edge of the perched unit to facilitate reduction of RDX and Cr (VI). The system consists of 42 injection wells where a mixture of bioavailable carbon and nutrients have been injected approximately every 18 to 24 months to stimulate anaerobic conditions. The in situ amendment consists of an emulsion of carbon substrates. Installation and preliminary injections were completed in March 2008. Injections have continued through 2022. Contaminant concentrations in the treatment zone will determine if the system is achieving its performance objective. RDX (and other HEs) and Cr (VI) approximately 200 ft downgradient of the treatment zone are expected to show strongly decreasing trends.

The function of the monitoring network relative to the ISB system is to provide data to demonstrate the efficacy of treatments downgradient from the injection points. One challenge for the monitoring network design is locating wells in areas of adequate saturated thickness along the southeast edge of the perched unit so that representative samples can be collected. Several wells drilled in the area are either dry, intermittently or apparently dry for some time after drilling. Delineating the edge of saturation of the perched unit to the east and southeast is a challenge due to the limited saturated thickness and response of the aquifer to changes in SEPTS operation.

Should monitoring data indicate the remedy is not performing as expected the contingent remedy includes changing the amendments to respond to specific geochemical needs, bioaugmentation with microorganisms, or installation of additional injection wells. Biofouling of the SEISB has occurred and caused the amendments to be changed from an emulsified vegetable oil carbon source to a molasses carbon source. This change has led to greater distribution of amendments but requires more frequent injections.

The RDX contaminant plume has been observed to be migrating further south and east from the main Pantex Plant, including into offsite areas. To prevent further offsite migration, the SEISB Extension system was installed in 2017 and expanded in 2020 and 2021. The SEISB Extension system consists of 25 injection wells installed along Highway 60 and 6 injection wells installed along the eastern fence property boundary, extending north away from Highway 60.

CNS began installation of an Offsite ISB system with limited pump and treat to address impacted perched groundwater off site. When complete, the Offsite ISB system will include 105 injection and extraction/recirculation wells and eight additional monitoring wells. The first two phases of system installation have been completed, with the remainder of the system, including additional performance monitoring wells, to be installed by the end of 2023.

3.3.4 Zone 11 In Situ Bioremediation System

An ISB system was installed in 2009 in the southwest portion of the Pantex Plant to create anaerobic conditions conducive to biological break down of TCE and perchlorate. The system consists of 85 active injection wells and 9 in situ performance monitoring wells (ISPM). The Zone 11 ISB (Z11ISB) was expanded between 2019 and 2021 by adding a second row of 26 injection wells in the lower portion of the system in-filling 5 injection wells on the near the center of the system due to performance issues with nearby wells, and adding 6 injection wells at the far western end of the system to limit COC migration around the western edge of the Z11ISB . In situ amendments are the same as those used in the SEISB.

The function of the ISB monitoring network is to confirm that amendments are stimulating biodegradation of chlorinated compounds (TCE) and perchlorate and reduction of Cr (VI) to trivalent chromium [Cr (III)]. Concentrations of parent compounds should decrease, approaching cleanup goals over the next five-year period.

Contingent remedies for the Z11ISB include installation of upgradient EWs to reduce the flow of water through the ISB area. Biofouling of the injection wells may require more rigorous maintenance or reconfiguration of the system. Breakthrough of perchlorate above cleanup goals may require reformulation of the amendments delivered to the subsurface to optimize treatment of this constituent.

3.4 CURRENT MONITORING PROGRAM

The current groundwater monitoring program at Pantex was designed in a formal process that included setting monitoring objectives, evaluating the function of each well relative to the objectives and using statistical, mathematical, modeling and qualitative tools to locate wells spatially.

The primary goal of the monitoring network is to confirm progress toward RAOs. Data collected from the monitoring network are used to evaluate the performance and efficacy of the remedies and are used to compare actual conditions to expected site conditions. Three primary monitoring objectives have been identified for the Pantex perched groundwater network:

- Plume stability (PS) – Identify areas of increasing and decreasing concentrations on the edge of the plumes and identify where the plume may be expanding into clean areas.
- RA efficacy – Evaluate the RA to determine its ability to reduce the elevation of groundwater in the Playa 1 area, reduce the mass in the Playa 1 and southeast areas, reduce the spread of contamination in the southeast and southwest areas, prevent further offsite migration of impacted groundwater, and remediate offsite impacted groundwater.
- Uncertainty management (UM) – Confirm whether expected conditions identified in the RFI exist and identify any deviations; compare results to expected conditions and identify deviations that may alter assumptions about existing conditions.

Most wells in the LTM network have been assigned at least one monitoring objective under the Pantex LTM Plan: PS, RA, and/or UM. Many wells have also been designated as point of compliance (POC) or point of exposure wells under the Compliance Plan as per Texas RRR. Some wells within ISB remedies have been identified as treatment zone monitoring locations. Wells in the current program used for this analysis, along with the monitoring objectives for each well are listed in **Table B-1** (**Appendix B**) and shown on **Figure 2**.

Secondary objectives of the monitoring network include the following:

- Delineating groundwater exceeding applicable regulatory standards (and delineation of the extent of saturation in the perched zone);
- Providing sufficient data to evaluate risks (under State of Texas RRR);
- Supporting calibration and development of site groundwater models;
- Providing early warning for potential impacts to the lower Ogallala Aquifer (lower saturated Ogallala);
- Providing data to optimize remedy performance and efficacy; and

- Complying with regulatory requirements.

For this report, 139 individual LTM program locations were evaluated, and of these 122 perched unit wells were actively sampled for COCs during the 2017 to 2021 time frame. Several wells in the network are intermittently dry and help define the extent of perched groundwater. No active ISB injection or extraction remedy wells were included in the monitoring network analysis. Some well locations not in the LTM program, particularly those that were drilled in dry locations, were included in the spatial analysis to prevent recommending additional wells where decommissioned wells currently exist.

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4.0 ANALYTICAL METHOD

Evaluation of the groundwater monitoring network for the Pantex Plant consisted of both quantitative and qualitative methods. A quantitative statistical evaluation of the site was conducted using tools in the Monitoring and Remediation Optimization System (MAROS) software (version 3.0 Beta). The qualitative evaluation reviewed hydrogeologic conditions, well construction and placement as well as contaminant geochemistry in the context of monitoring objectives. Both quantitative statistical and qualitative evaluations were combined using a 'lines of evidence' approach to recommend a final groundwater monitoring strategy to support site monitoring objectives. The analytical method for the current report is similar to that conducted for the 2012 *Perched Groundwater Monitoring Network Optimization* (GSI, 2012) (referred to below as the 2011 evaluation) and the 2017 *Optimization Review Report Long-Term Monitoring Optimization – Perched Groundwater Unit* (HGL, 2017) (referred to below as the 2016 evaluation).

Details of the MAROS tool, including algorithms used in the analysis are provided in MAROS User and Technical Manuals (AFCEE, 2004; AFCEC, 2012). A summary of the analytical process is provided below.

4.1 INPUT DATA AND REPORTS REVIEWED

Groundwater analytical data collected between 2017 and 2021 from the Pantex Plant perched groundwater LTM network were supplied by CNS from the site database (CNS, 2022). Received data include geographic coordinates of the wells, sample dates, analytical results, detection limits, and data flags. Analytical data from the previous LTM investigations (2000 through 2016) were used to supplement analyses of long-term trends.

Analytical data from 214 different sampling locations were received including investigation monitoring wells (IW), EW, and ISB wells. Only data from the 122 active IWs were used in the statistical analyses. The database contained data for 23 different COC analytes. Remedial goals for each of the COCs are those specified in site decision documents such as the ROD. Water quality and geochemical parameters were not included in the statistical analyses. Non-detect values are treated as half the detection limit within MAROS, with the exception of statistics calculated using Kaplan-Meier method.

Well construction data including depth, saturated unit, screened intervals, elevations, installation dates, well monitoring objectives, and other details were provided by CNS. Well construction details were used to identify active monitoring locations in the perched unit and monitoring objectives for each well. Water level trend data, geochemical data, and remedy performance data were received from CNS in various reports, with data through 2020 included in the CSM report (HGL, 2021a). These data were reviewed qualitatively to support monitoring recommendations.

As in the previous analyses, IWs were grouped by sector of dominant groundwater flow direction, with the elevation maximum under Playa 1. IWs were grouped into three sectors, Southeast, Southwest, and North. Wells used in the analysis, their monitoring objectives, and sector location are shown in **Table B-1**. The spatial sectors defined for the analysis are illustrated on **Figure 2**. Aquifer parameters used in the MAROS analyses are listed in **Table B-2** and were taken from the previous LTMO analyses and site documents.

For the time frame of 2017 through 2021, 61 monitoring wells were included in the Southeast Sector analysis, 51 wells were included in the Southwest Sector analysis and 23 wells were included in the North Sector analysis. Some wells were considered in two different Sectors to provide more complete spatial coverage. Data from extraction or ISB wells were not considered in the formal analysis but were reviewed qualitatively to support monitoring recommendations.

Documents reviewed for the report are listed in **Appendix A**.

4.2 MONITORING GOALS AND OBJECTIVES

Pantex site managers have developed three primary objectives for monitoring data collection discussed in Section 3.4: PS, RA, and UM. Most wells in the network have been assigned at least one of these objectives. **Table B-1** lists all the wells used in the LTMO and primary monitoring objectives defined by Pantex Plant managers.

For the LTMO analysis, wells were also assigned secondary monitoring objectives including source wells and tail wells. 'Source' wells are those wells closest to initial release areas in Zones 11 and 12 or with high historical concentrations. 'Tail' or plume wells are downgradient from sources. The purpose of identifying source and tail wells is to evaluate the trend for a group of wells. Trends in source wells will indicate if the source discharge is attenuating or remaining stable. Trends in tail wells will indicate if remedies are affecting the downgradient concentrations relative to discharge from the source.

Wells were also assigned secondary monitoring objectives for evaluating specific remedies (e.g., SEPTS for the southeast pump and treatment system; ISPM for in situ performance monitoring) and for COCs with limited spatial distribution [e.g., 1,4-dioxane, Cr (VI)].

A summary of the secondary monitoring objectives by well provided in **Table B-3, Table B-9,** and **Table B-15** for each sector in **Appendix B.**

4.3 INDIVIDUAL WELL ANALYSES

In MAROS, the goal of statistical analysis at individual wells is to assess contaminant concentrations and trends at monitoring locations within the plume. Statistical analysis provides insight into critical questions about point concentrations such as variability and stability over time, increasing or decreasing trends, attainment of remedial goals, magnitude and rate of concentration change and whether expectations about concentration change are being met.

Analytical data from individual wells were analyzed statistically to provide metrics to assess the magnitude, trend and variability in contamination at each monitoring location. One goal of the individual well analyses is to help assess the importance of each well in characterizing the plume and attaining its specific monitoring objectives. The statistical methods and procedures used to evaluate individual well locations at the Pantex Plant are summarized below and described in more detail in the MAROS User and Technical Manuals (AFCEE, 2004; AFCEC, 2012).

Statistical methods encoded in the MAROS software for individual wells are taken, primarily, from the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance* (USEPA, 2009). MAROS calculates the detection frequency, maximum concentration, date of maximum concentration, and whether the maximum is above the remedial goal for each priority constituent and well. The Individual Well Statistics module also includes the following functions:

- *Priority COCs* for each well are determined by identifying the maximum value for the average concentration normalized by the cleanup goal. The priority COC for each well was used to identify the primary plume associated with each well and to select COCs for calculation of summary statistics. Sector-wide priority COCs are also identified in the software based on toxicity (concentrations above remedial goals), prevalence (number of wells exceeding remedial goals) and mobility (partition coefficient).
- *Summary statistics* by Kaplan-Meier method identify the mean, median, percentiles, standard deviation, and coefficient of variation (COV) for each dataset. The Kaplan-Meier method provides a more precise way to estimate statistics for datasets that have non-detect (i.e., left censored) data.
- *Outlier* identification by Dixon's method (USEPA, 2009). High or low outliers are not removed from the dataset, but rather the User can identify outliers and review sampling documentation to determine if the outlier is likely a result of laboratory or sampling artifacts.
- *Distribution* test by Shapiro-Wilk. Datasets are identified that are likely normally or log-normally distributed. Data distribution determination is important to identify an appropriate statistical framework to apply to the analyses.
- *Concentration Trend* determination by Mann-Kendall (MK) method and by Linear Regression. For the following analysis, the non-parametric MK trend is used because it does not rely on normally or log-normally distributed data. (In the text, statistical MK trend results are indicated in *italics.*)
- Identification of locations that have 'attained' cleanup goals by Sequential T-Test (USEPA, 1992).

4.4 PLUME LEVEL ANALYSES

The Plume-Level Analysis in MAROS was developed to assess plume-wide and area-level stability by tracking plume migration on a level above that of the individual well. The Moment Analysis module estimates the total dissolved mass, center of mass, and spread of mass plume-wide for each contaminant. Trends for each of the plume-level metrics are found by applying the non-parametric MK trend test. Remedial performance and monitoring needs can be assessed based on whether total dissolved mass and centers of mass are *increasing, decreasing,* or *stable*.

MAROS also contains tools to estimate how much of the plume area and mass each well "represents" relative to other wells in the network using the Delaunay/Voronoi spatial geometry engine described below as well as to evaluate concentration trends for groups of wells in an area. The Plume Area Trend module automatically groups source wells and tail wells and allows selection of two additional custom groups of related wells (e.g., upgradient vs. downgradient of a remedy). The software weights results of the individual well MK trend analysis to calculate an aggregate trend for the group of wells. The software also estimates the amount of mass each group represents relative to the total mass in the plume. In this way, the software determines if the source wells have an aggregate trend and what percentage of total mass the wells represent (e.g., the tail wells have a *stable* trend and represent about 77 percent of the total dissolved mass of TCE in the Southwest Sector plume). Identifying the amount of mass in the source wells relative to the tail wells may help inform decisions on source monitoring or treatment.

Moving from concentration data at individual wells to evaluating concentrations on a plume or area-wide basis requires spatial interpolation of discreet data. The primary tool for spatial analysis in MAROS is a mesh-creation method known as Delaunay triangulation/Voronoi diagram spatial geometry (also known as Thiessen polygons).

In MAROS, Delaunay triangulation is first used to generate a grid for the site with existing/potential sampling locations as its nodes. The Delaunay triangulation includes triangulation of a point set with the property that no point in the point set falls in the interior of the circumcircle of any triangle in the network. In this application, triangles are drawn such that all wells are located on vertices of triangles and the circumcircle defined by the triangle does not contain more than the three wells defining the triangles' vertices. Voronoi diagrams are polygons generated by bisecting the sides of the Delaunay triangles connecting centers of the circumcircles. In MAROS, Voronoi diagrams are polyhedral regions that correspond to the set of points on a plane closest to one specific well in a network and form the 'monitoring area' for the well. Monitoring volumes are calculated by multiplying the 2- dimensional area by the plume thickness and porosity.

The Delaunay triangles are used in the Moment Analysis to assign concentrations to areas, which are then summed to estimate total dissolved mass in the plume (zeroth moment), center of mass (first moment), and spread of mass in the direction of and perpendicular to groundwater flow (second moments). These values are then assessed for MK trends. The Delaunay triangles and Voronoi diagrams are also used in the Spatial Optimization modules to assess concentration uncertainty, to prioritize regions for new wells, and to identify potentially redundant well locations.

Using the Voronoi polygons, the Plume Mass by Well tool in the Plume-Level analysis estimates a percentage of total plume mass and area represented by each well. In practical application, this tool may indicate that data from one source well constitutes 50 percent of the total estimated plume mass but monitors only 10 percent of plume area. With this information, analysts may prioritize sampling at wells that monitor high percentages of mass or large areas.

4.5 SPATIAL ANALYSES

The Spatial Optimization module in MAROS includes tools to select and prioritize groundwater monitoring locations based on estimates of concentration uncertainty. Two modules are available to select appropriate sampling frequencies.

The quantitative spatial optimization tool relies on calculation of a Slope Factor (SF) to estimate concentration uncertainty between monitoring locations. The SF is calculated by finding the difference between the known concentration at a well and a concentration estimated for the well from the nearest neighbors, then dividing by the maximum of the two. A SF is calculated for each sample event and an average value is returned for the full monitoring time frame. SF values fall between 1 and 0, with low values indicating potentially redundant locations and high values indicating areas with higher concentration uncertainty. Potentially redundant wells with low SF are then removed from the calculation, and the network is tested to make sure that the estimate of total plume area or total plume mass does not change significantly when the wells are removed. Wells are then recommended to be removed in areas with low spatial uncertainty (low SF) for priority constituents, and wells are recommended to be added in areas within the plume with high spatial uncertainty.

The COV (standard deviation divided by the mean) of SFs is calculated to assess the level of variability of uncertainty over time. COVs over 1 indicate high variability between locations over time, potentially requiring additional monitoring effort to understand and predict the causes of variability.

In addition, the MAROS spatial analysis uses the area of the Voronoi polygon surrounding each well to assess the spatial coverage for each well location. The well monitoring area or area of influence represents all points nearer to the node well than any other well in the network. Large areas of influence may mean there is insufficient spatial density of wells while extremely small areas may indicate that a well is redundant.

MAROS includes an additional decision logic module for spatial optimization. Under the decision logic framework, "good" monitoring networks have sampling locations that are evenly spaced, monitor similar sized areas, reduce concentration uncertainty, and thoroughly monitor edges of the network and areas where concentration trends are statistically *increasing*. Redundant locations are those with low SF and monitor relatively small Voronoi polygons with predictable concentrations over time. Conversely, areas on the edges of the existing network with *increasing* concentration trends or high uncertainty are recommended for additional well locations.

4.6 SAMPLING FREQUENCY ANALYSES

Sampling frequency recommendations for each well in MAROS are based on the rate of concentration change over recent (2016 through 2021) and long-term (2012 through 2021) time intervals (calculated from linear regression of concentration versus time) and on the MK trends over the same time intervals. Locations with rapid or high magnitude concentration changes and *increasing* trends are recommended for more frequent sampling.

An additional sampling frequency module is included to estimate a sampling frequency for the network as a whole. The idea behind the tool is that networks where the estimates of total dissolved mass are predictable, that is with a linear trend and low variability, require less monitoring effort; but networks that display high variability, determined from variability about the linear regression of total dissolved mass (zeroth moment), require more sampling effort.

To determine the recommended sampling frequency, MAROS plots the natural log of total dissolved mass for each sample event from the Moment Analysis against time to determine the linear regression of total mass in the plume and the COV for the sample set of mass estimates. MAROS determines the slope and coefficient of determination (R^2) for the linear regression of total mass over time, and then the software calculates an average network sampling frequency by counting how often each well is sampled each year and dividing that number by the number of sampled wells in the network. MAROS also estimates and outputs the advective groundwater travel time between the source and each monitoring location for the user's consideration. Decision logic is then employed within MAROS to make a sampling frequency recommendation based on the current sampling frequency and the results of the regression of total mass estimates. A network-level sampling frequency is returned for each priority contaminant.

4.7 QUALITATIVE REVIEW

All results returned by the MAROS software are reviewed for consistency with the goals and objectives of the monitoring program and the CSM. Statistical results are compiled for the priority COCs and compared, on a well-by-well basis, with results for spatial sufficiency and redundancy, and sampling frequency. Final recommendations for the monitoring network are a combination of quantitative and qualitative review.

5.0 RESULTS

5.1 SOUTHEAST SECTOR RESULTS

5.1.1 Priority COCs

Priority constituents evaluated for individual wells in the Southeast Sector are listed in **Table B-3**. Priority COCs are those for which average concentrations relative to the cleanup goal are the highest when compared to all other analytes (note that not all priority COCs exceed the cleanup goal, but rather, are present at higher concentrations relative to the cleanup goal and other COCs). RDX is the priority COC at 40 of the 61 locations sampled from 2017 through 2021. Seventy wells are included in the 2012 through 2021 dataset. RDX is currently considered the priority COC in the Southeast sector and over much of the site as its extent over regulatory limits defines the extent of the groundwater plume to the east and south.

Source area wells PTX06-1008, PTX06-1010, and PTX06-1011 monitor areas of higher total Cr [combined Cr (VI) and Cr (III)], Cr (VI), and other COCs. High concentrations of total Cr are associated with stainless steel well construction. However, Cr (VI) exceedances are likely the result of industrial activities. Other monitoring locations show priority exceedances for 1,2-dichloroethane, TCE, perchlorate, RDX degradation products, and some metals. Exceedances for metals such as barium and arsenic are related to oxidation/reduction changes stimulated by the ISB remedy. Boron exceeds standards for discharge of irrigation water at some locations.

A sector-wide evaluation of priority COCs was performed in the MAROS software, and the results are indicated in the MAROS COC Assessment for the Southeast Sector (**Appendix C**). Based on toxicity and prevalence metrics, the two priority COCs for the Southeast Sector are RDX (and its degradation products TNX and MNX) and perchlorate. The extent of the perchlorate plume in the Southeast Sector is limited to the area south of Zones 11 and 12. Perchlorate was identified as a priority COC due to the magnitude of concentrations relative to the remedial goal over this small area. Wells affected by perchlorate are included in the Southeast Sector analysis to account for mobility of constituents from the Southwest to the Southeast under the influence of SEPTS groundwater extraction. Perchlorate is also considered as a priority COC in the Southwest Sector analysis.

Historically, the TNT degradation product DNT4A was a priority COC in the Southeast Sector, but concentrations have been stable to decreasing over the past 10 years. DNT4A concentrations exceeded remedial goals at 23 of 61 well locations during the 2017 to 2021 time frame. Several locations exceeding remedial standards are near the northeast line of SEPTS EWs (PTX06-1038, PTX06-1039A, PTX06-1040, PT0X6-1041, PT06-1042, PTX06-1146), upgradient of the eastern boundary of the plume. Well PTX06-1120 is near the SEISB system in an area of low to intermittent saturation. Other wells exceeding the remedial goal are in the SEISB Extension/Offsite ISB area of the plume (PTX06-1182, PTX06-1190, PTX06-1203). Because DNT4A is widely distributed in the Southeast Sector and has the potential for early migration through the FGZ it is, considered as a priority COC for monitoring optimization.

The Southeast Sector-wide monitoring network was optimized for RDX with consideration of the extent of DNT4A. However, consideration was given to COCs indicating remedy performance (e.g., TNX, DNX and MNX), as well as to Cr (VI), perchlorate, and COCs potentially untreated by current remedies (e.g., 1,4-dioxane) when optimizing the Southeast Sector-wide monitoring network. Perchlorate concentrations exceed the remedial goals by a higher percentage than the other COCs, with the exception of RDX, but at fewer wells. The perchlorate plume is localized between the Southwest and Southeast Sectors' monitoring networks, and the monitoring networks do not define the extent of affected groundwater. Due to its limited extent, perchlorate does not control the assessment of the Southeast Sector monitoring network.

5.1.2 Individual Well Statistics

Individual well exploratory statistics for the Southeast Sector are shown in **Tables B-4** and **B-5**. Detection frequencies, maximum concentrations, and average concentrations indicate locations that consistently exceed cleanup goals or delineate the edges of high concentration plumes with concentrations below remedial goals. The COV provides a measure of the variability in concentration measurements over time.

Individual well concentration trends were determined using the MK non-parametric trend method. General MK trend results for both RDX and DNT4A are summarized in **Table 5**. Results of the trend analysis for individual wells for RDX and DNT4A for the years 2017 through 2021 are detailed in **Table B-4**. Included in **Table B-4** are trend results from the 2012 through 2016-time frame for comparison. MK trend results and average concentrations normalized by remedial goals for RDX are shown on **Figure 3.** Normalized average concentrations and trend results for DNT4A are shown on **Figure 4.** Concentrations relative to remedial goals illustrated alongside concentration trends help locate processes of interest in the plumes, supporting decisions on the spatial distribution of monitoring locations. A detailed MAROS report of MK trends for all wells is provided in **Appendix C**.

Table 5. Southeast Sector Individual Well Trend Summary

COC	Total Wells	Pantex Plant Southeast Perched Groundwater Mann-Kendall Trend Results by Number of Wells				
		Non-Detect	Decreasing or Probably Decreasing	Stable	Increasing or Probably Increasing	No Trend or Insufficient Data
RDX						
All wells	61	4 (7%)	11 (18%)	16 (26%)	13 (21%)	17 (28%)
DNT4A						
All wells	61	14 (23%)	16 (26%)	9 (15%)	9 (15%)	13 (21%)

Overall RDX trend results from 2017 through 2021 show proportionally fewer *decreasing* trends and more *increasing* trends when compared to the results from 2012 through 2016. This is due to changes in the number and identity of wells in the network, most notably the addition of several new wells in the SEISB Extension/Offsite ISB area. Wells in the far southeast with increasing RDX trends include PTX06-1190, PTX06-1196, PTX06-1197, PTX-1199, PTX06-1201, and PTX06-1203. Increasing trends for DNT4A were also observed in this area at PTX06-1199, PTX06-1201, PTX06-1202, and PTX06-1204. Several wells in the Offsite ISB area do not have sufficient data to evaluate a trend (N/A result), but continued sampling should resolve trends going forward.

Seven of nine wells with statistically *increasing* or *probably increasing* trends for DNT4A have concentrations below remedial goals and are located in the source area or the leading edge of the plume to the southeast. The remaining two wells with *increasing* or *probably increasing* trends, PTX06-1147 and PTX06-1199, had concentrations above remedial goals and are located downgradient of the SEPTS.

Well PTX06-1002A, in the northern source area, showed *increasing* and *probably increasing* trends for DNT4A, RDX and TNX, and Cr (VI). However, only RDX and TNX exceed remedial goals at this location. The cause of increasing trends may be related to changes in remedy operation, notably issues with groundwater extraction and discharge of treated groundwater, and to major precipitation/recharge events during this time period that may have recharged mass from the vadose zone beneath ditches and source areas.

Wells designated to monitor remedy performance of the SEPTS, PTX06-1013, PTX06-1014, PTX06-1038, PTX06-1039A, PTX06-1040, and PTX06-1042, located along FM 2373, show residual RDX concentrations significantly above cleanup goals. However, these wells show largely *stable* to *decreasing* concentration trends. None of the SEPTS remedial action monitoring wells show an *increasing* trend for RDX or DNT4A. These results indicate that the EWs along FM 2373 are successfully stabilizing the plume within the area of influence. Well PTX06-1146 had a *probably increasing* trend for RDX indicating that the RDX plume is continuing to move to the east outside of the SEPTS area of influence. The *increasing* trend for DNT4A at PTX06-1147, south of the other SEPTS monitoring wells, is of interest as the well is located near the area where the FGZ top elevation is deeper than expected. This may result in a thinner area of the FGZ around PTX06-1147 and around the nearby extraction wells.

Chromium (VI) Individual Well Results

Table 6, below, includes a list of monitoring wells exceeding remedial goals for Cr (VI) for the Southeast Sector with maximum concentrations and the MK trends indicated. Wells where high Cr (VI) concentration results are identified as statistical outliers are not included in the table. Results for Cr (VI) are presented on **Figure 5**.

Table 6. Trend Results for Chromium Affected Wells

Well Name	Cr (VI) Trend 2012 to 2016	Cr (VI) Trend 2017 to 2021	Maximum Concentration 2017-2021 [mg/L]	Well Location
PTX06-1052	Decreasing	Decreasing	0.63	Mid Plume
PTX06-1010	Stable	Decreasing	2.3	Source Area
PTX08-1008	Decreasing	Decreasing	0.007	Source Area
PTX06-1166	Probably Increasing	Increasing	0.13	Plume Toe
PTX06-1183*	(Insufficient Data)	Decreasing	1.56	Plume Toe
PTX06-1088	Stable	Increasing	0.10	Mid Plume

Note: The remedial goal for Cr (VI) is the same as that for total chromium, 0.1 milligrams per liter (mg/L).
* Well PTX06-1183 is included in the Southwest Sector analysis.

Cr (VI) is found in a comingled, U-shaped plume between the Southeast and Southwest Sectors. The Cr (VI) plume is contained within the Southeast and Southwest monitoring networks; therefore, it typically does not drive decisions for adding or removing well locations. Well PTX06-1010 is located near one suspected Cr (VI) source and showed an *increasing* trend from 2008 through 2011. However, the trend for 2012 through 2016 was *stable*, and the current 5-year trend is *decreasing.* This supports the observation that mass in the source may be depleting.

All other wells exceeding remedial goals for Cr (VI) show a decreasing trend except for PTX06-1166, which is downgradient from PTX06-1183 and PTX06-1088 near the source area and upgradient from the SEISB remedy. Concentration data support the conclusion that the Cr (VI) plume is likely becoming more dilute in most locations but may be migrating in the area of PTX06-1088 and PTX06-1166. PTX06-1088 is near the source with sufficient monitoring locations downgradient. PTX06-1166 is near the edge of the saturated perched unit with dry wells located to the east and south. Increasing trends in PTX06-1166 may be caused by the Cr (VI) plume migrating to the south where the edge of saturation is encountered at an area where the FGZ has a local high.

5.1.3 Plume-Level Analysis

MK trends for total dissolved mass, center of mass, and spread of mass within the Southeast Sector monitoring network (zeroth, first and second moments, respectively) were calculated for annually consolidated data from the 2017 through 2021 and the 2012 through 2021-time frames. Calculation of these trends provides a measure of plume stability. Trend estimates of the zeroth, first and second moments for both RDX and DNT4A for the Southeast Sector are summarized in **Table 7**, and first moments (center of mass) for RDX and DNT4A are illustrated on **Figures 3** and **4**, respectively. MAROS reports for zeroth, first and second moments for other COCs are in **Appendix C**.

Table 7. Southeast Sector Moment Analysis Results*

Moment Type	RDX Trend		DNT4A Trend	
	2017 – 2021	2012 – 2021	2017 – 2021	2012 – 2021
Zeroth (Total Dissolved Mass)	Stable	Decreasing	Stable	Decreasing
First (Center of Mass)	Stable	Increasing	Increasing	Increasing
Second (Spread of Mass X/Y)	Stable/No Trend	Increasing/Probably Increasing	Increasing/No Trend	Increasing/Increasing

*Result for uniform saturated thickness

The number of wells in the annually consolidated dataset varied between 41 and 59 between 2017 and 2021 from the 61 wells in the dataset. This reflects a variation in the number and identity of the wells and in the analyte list in the time frame of interest.

The zeroth moment analysis (estimate of total dissolved mass) shows a *stable* trend for RDX between 2017 and 2021. The overall total dissolved mass trend 2012 through 2021 is *decreasing.* Similar results were obtained for DNT4A. The recent s*table* trend for total dissolved mass is consistent with the observation that many individual wells have recent *stable* trends. The result also indicates that additional wells monitoring the Southeast Extension/Offsite Area did not increase the estimate of total dissolved mass significantly or move the center of mass away from the eastern SEPTS even though the footprint of affected groundwater increased.

The center of mass estimates for RDX are *stable* for 2017 through 2021 and *increasing* for 2012 through 2021. *Increasing* trends were obtained for both the short and long term for the center of DNT4A mass. Movement of the center of mass to the east was likely caused by the addition of wells in the southeast, extending the known footprint of the plume. Contaminant mass is also moving away from the source areas to the east and southeast with the center of mass located east of the SEPTS and northwest of the SEISB Extension.

Second moments, indicating the spread (dilution) of mass to the edges relative to the center of the plume show *no trend* or high variability for both RDX and DNT4A in the direction perpendicular to groundwater flow (Y direction). Spread in the direction of groundwater flow is *stable* for RDX and *increasing* for DNT4A in the recent time period. Increasing trends for second moments from 2012 to 2021 indicate that the plume is becoming more dilute in the center relative to the edges over the longer time frame.

For the Cr (VI) plume in the 2017 through 2021 time frame, estimates of total dissolved mass are *stable*, and the center of mass is *increasing* (moving to the southeast) with *increasing/no trend* in the spread of mass, indicating the continued dilution of the plume. The results indicate that the Cr (VI) plume in the Southeast is largely stable, with the plume core migrating slowly to the east.

Aggregate trends for areas within the Southeast Sector plumes were evaluated based on grouping of individual well trends. Aggregate trends were found for the source area (near the original ditch line release from Zone 12 to Playa 1), the tail (non-source wells), the area downgradient of the SEISB remedy area, and the area of the SEISB Extension.

The number of wells in each group is indicated in **Table 8**, and the identity of wells in the group is provided in **Table B-3**. Wells assigned to the southeast source area (Zone 12) are PTX06-1002A, PTX06-1003, PTX06-1005, PTX06-1010, PTX06-1011, and PTX06-1088. A small proportion of the total dissolved contaminant mass, < 1 percent for RDX and 2 percent for DNT4A, remains in the source wells. The source area shows an overall *stable* trend for RDX and DNT4A, indicating restoration actions (e.g., discontinued discharges to on-site ditches, and lining of key segments of ditches) have reduced mass flux to perched groundwater in the source area.

Table 8. Aggregate Trends for RDX and DNT4A in the Southeast Sector

Area	Number of Wells	RDX Aggregate Trend	RDX Aggregate Mass %	DNT4A Aggregate Trend	DNT4A Aggregate Mass %
Source	7	S	<1%	S	1%
Tail	53	NT	>99%	S	99%
Downgradient of SEISB	9	S	6%	S	2%
Downgradient of Offsite ISB	12	PI	1%	PD	1%

S=Stable
NT= No Trend
PI = Probably Increasing
PD = Probably Decreasing

Monitoring locations downgradient of the SEISB system show an aggregate *stable* trend and represent approximately 6 percent and 2 percent of plume mass for RDX and DNT4A, respectively. For the area of the Southeast Extension and Offsite ISB remedy, RDX accounts for 1 percent of the total Southeast Sector plume mass and shows a *probably increasing* trend. This result is consistent with the observation that low levels of contaminant mass are still migrating to the southeast. However, additional monitoring in the Offsite area did not result in a significant increase in the estimated total mass in the plume. DNT4A in this area also represents about 1 percent of the total mass in the plume but shows a *probably decreasing* trend, likely indicating that additional mass is either not migrating to the southeast or that DNT4A is being effectively addressed by the combined remedies.

The MAROS Percent of Mass by Well tool uses the Voronoi area and concentration at the well to estimate the percentage of the total plume mass closest to each well. The analysis for COCs in 2021 (annually consolidated data from 61 wells) calculated the mass at each well based on the annually averaged concentration and the distance between other monitoring locations. The tool is intended to identify wells that monitor disproportionately high or low amounts of plume mass and thereby determine areas that may require the addition of new wells or the elimination of wells that do not provide significant information about the distribution of mass. The MAROS reports for Percentage of Mass by Well are in **Appendix C** and are summarized below.

Monitoring areas showing the highest estimated percentage of RDX in the plume are PTX06-1146 (52 percent), PTX06-1041 (10.5 percent), PTX06-1034 (10.4 percent), and PTX06-1147 (7 percent). Most of the RDX mass is identified in the polygon around PTX06-1146, in part because of the large area that it monitors (10 percent of the total plume area). These mass estimates were made assuming a uniform saturated thickness, so for wells in thinner areas of the perched unit (e.g., PTX06-1034), the mass estimates are likely high (e.g., near the extent of perched saturation) and the converse is true in areas of greater saturated thickness (e.g., near Playa 1).

The well monitoring the most mass of DNT4A is also PTX06-1146 (51.6 percent), in part due to the large area that it monitors. The DNT4A plume is distributed more evenly, with several wells accounting for about 10 percent of mass (PTX06-1040, PTX06-1041, PTX06-1039A). The combination of mass due to movement under the influence of the EWs and the large distance between wells (resulting in a large monitoring area for each well) indicate that these wells are very important in characterizing the DNT4A plume.

Relatively few wells account for the majority of Cr (VI) mass in the network. The area around PTX06-1010 contains 74 percent of total mass, compared to 51 percent of the Cr (VI) in 2016. PTX06-1010 is also located near a leak in the plant's high pressure fire loop that has caused mounding, which may also be mobilizing Cr (VI). Other wells of importance in monitoring Cr (VI) are PTX06-1146 (5.6 percent of total mass comprising 10 percent of the total plume area) and PTX06-1005 (3 percent of total mass).

5.1.4 Spatial Analysis

The Southeast Sector network was evaluated for spatial sufficiency by calculation of SFs estimating concentrations at wells from the well's nearest neighbors. Average SFs, COVs, and monitoring areas for wells in the Southeast Sector for RDX and DNT4A are listed in **Table B-6**.

Overall, Southeast Sector SFs are low (below 0.5) for both priority COCs, indicating that there is low uncertainty within the current network. COV of SF is likewise low (below 1) for most locations, indicating stable relative concentrations between wells over time. The areas of influence (Voronoi polygons) are uniform in size relative to the overall extent of the monitoring network. Wells are fairly evenly spaced. Evenly spaced monitoring locations, low concentration uncertainty, and relatively low SF variability, along with the individual well trend analysis and moment analyses for plume stability, indicate that the network is well designed to address priority monitoring goals of plume stability and uncertainty assessment. Detailed results of the well sufficiency and redundancy analyses are presented below.

Well Sufficiency

One area of higher concentration uncertainty is found between wells in the Offsite area downgradient from the SEISB Extension remedy. Wells PTX06-1192, PTX06-1194, PTX06-1195, and PTX06-1214 show very low to non-detect results for RDX while neighboring wells in the core of the plume show much higher concentrations, resulting in higher estimates of uncertainty between monitoring locations.

Eight additional monitoring wells are planned in the Offsite ISB area based on modeling results (HGL, 2021a), seven within the system and one downgradient. These eight planned wells will monitor perched groundwater conditions in response to the Offsite ISB system operation and are expected to reduce uncertainty about concentrations between the ISB and beyond the ISB installations. Updates to the monitoring network are illustrated on **Figure 9**. Based on the MAROS well sufficiency analysis, an additional well may be beneficial at the midpoint between PTX06-1195 and PTX06-1196 to define the eastern edge of the ISB extension treatment area. An additional well east-northeast of PTX06-1199 to delineate the extent of groundwater contamination and further support delineation of the perched groundwater extent may also be beneficial. Groundwater monitoring in the Offsite area has a limited history. Additional data collection at planned and existing wells is likely to reduce uncertainty estimates in the area of the SEISB Extension and Offsite ISB remedies.

Higher concentration uncertainty is often found along the outer extent of the monitoring network. Two wells with higher concentration uncertainty estimates (SF >0.8), PTX06-1069 and PTX06-1023, are located on the northern edge of the network. These wells have intermittent detections of COCs with low concentrations and delineate the northern extent of the plumes. In this case, hull wells with low concentrations are compared against the higher concentration interior wells, resulting in higher uncertainty estimates. No additional sampling locations are needed in this area due to the low edge concentrations, limited area of saturation, and stable current trends.

Two wells, PTX06-1037 (SF 0.85) and PTX06-1153 (SF 0.83), are on the southern edge of the plume downgradient of the SEISB. Higher SFs at these locations are due to the large difference in concentrations and saturation between the two adjacent wells. PTX06-1153 shows an unusually high average concentration for 2017 through 2021 (337 µg/L) while PTX06-1037 is intermittently dry with concentrations, when available, below the remedial goal. The relatively high uncertainty between these two locations is related to the local hydrogeology on the edge of the plume. No additional wells are recommended in this location.

Well PTX06-1052, located between the Southwest and Southeast Sectors, shows higher uncertainty for RDX. The higher concentration uncertainty estimate for PTX06-1052 results from the location on the edge of the high concentration RDX plume.

PTX06-1133A is another monitoring network hull location on the southern edge of the RDX plume with high concentration uncertainty (SF = 0.92 up from 0.83 in 2016). Similarly, well PTX06-1184 (SF 0.98) delineates the southern edge of the RDX and DNT4A plumes. PTX06-1133A and PTX06-1184 show intermittent detections below remedial goals. PTX06-1133A and PTX06-1184 are upgradient of the recently installed SEISB Extension. The southeastern area is a priority monitoring zone due to the concerns about potential vertical migration and ongoing delineation of horizontal impacts

PTX06-1182, a neighboring well to PTX06-1133A and PTX06-1184, was installed in July 2016, 2,000 ft east of PTX06-1133A, to further define the edge of the RDX plume. PTX06-1182 shows concentrations above cleanup goals for RDX and DNT4A but with *decreasing* concentration trends. Well PTX06-1034 (average RDX concentration 996 µg/L) defines part of the triangle of interest near PTX06-1133A, along the eastern edge of the plume in the southeast. Since 2016, extensive work has been conducted in the Southeast/Offsite area to define and delineate concentrations. There remains some uncertainty related to concentrations along the eastern edge of the RDX plume east of the SEISB Extension/Offsite area. The top of the FGZ to the east is elevated (HGL, 2021b), likely limiting the area of perched groundwater saturation and preventing plume migration to the east, but additional wells in this area could confirm that the plume is not migrating further to the east.

Well PTX06-1008 is located in the general source area but has non-detect results for RDX. Neighboring wells show higher concentrations for RDX which leads to greater uncertainty for PTX06-1008. No additional well is recommended in this area, as the higher uncertainty is related to the geometry of the source area.

Well Redundancy

While many of the calculated SFs and COVs for RDX and DNT4A are low (< 0.3), no wells were identified by the software for removal from the network for all COCs. Several wells that are redundant to define the extent and stability of the RDX plume are important to the DNT4A, Cr (VI), perchlorate, or other COC plumes. All wells with low SF were reviewed for their value in addressing the priority monitoring objectives. Results of the qualitative review are shown in **Table B-6**, with key points summarized below.

Sampling locations with the lowest SFs are PTX06-1042, PTX06-1038, and PTX06-1040, a line of wells monitoring efficacy of the SEPTS. RDX concentrations in this area show low uncertainty and *stable* to *decreasing* trends, likely stabilized by pumping from the SEPTS. Wells are not recommended for removal from the network as they are required to evaluate efficacy of the SEPTS and identify potential plume migration.

Wells with low SF such as PTX06-1005 and PT06-1014 are near source areas and provide information on complex source geometries and inputs to the downgradient plume. Wells PTX06-1015 and PTX06-1031 are along the plume migration pathway to the southeast.

5.1.5 Sampling Frequency Analysis

Sampling frequency analysis included assessment of the rates of concentration change at individual well locations and the trend over both the long term (2012 through 2021) and the recent time period (2017 through 2021). Results of the individual well sampling frequency analysis for RDX are shown in **Table B-7**.

MAROS recommended a biennial (every 2 years) sampling frequency for 35 wells out of 61 for RDX and 49 wells out of 61 for DNT4A. The biennial frequency recommendation is based on the slow rate of change and *stable* to *decreasing* trends at these locations. However, it is recommended that most of these wells be sampled annually to collect sufficient data to develop trends for model development and the next LTMO report and FYR.

Monitoring locations with statistically *increasing/probably increasing* trends (PTX06-1002A, PTX06-1088, PTX06-1146, PTX06-1153, PTX06-1190, PTX06-1191, PTX06-1196, PTX06-1197, PTX06-1201, PTX06-1203, and PTX08-1002) were recommended for quarterly monitoring by the software. The majority of these wells are located in the Southeast Extension/Offsite ISB area, and trends would be expected to decrease over the next 5 years. Two wells, PTX06-1002A and PTX06-1088, are located in the source area, and increasing trends may be related to higher-than-normal precipitation that has caused a COC flux in the perched groundwater. Several of these wells, PTX06-1146, PTX08-1002, and PTX06-1153, are influenced by the operation of the pump and treat systems and may have increasing trends as a result of decreased operation of the SEPTS and P1PTS caused by irrigation system problems. After a qualitative review of monitoring objectives, an overall semiannual to annual sampling frequency was determined to be sufficient for supporting site monitoring objectives for these wells. Data from these wells are not required for monitoring exit pathways, points of exposure, or for short-term decision making.

A biennial frequency was recommended by the software for the network-level sampling frequency analysis. The overall biennial monitoring frequency recommendation for most wells is consistent with the findings from the plume-level, individual well, and spatial analyses indicating stable plumes, low uncertainty, and low rates of concentration change.

MAROS recommended sampling frequencies were reviewed qualitatively with respect to the monitoring goals of the network and individual wells. Recommendations included four wells for biennial sampling, 28 wells for annual sampling, and 28 wells for semiannual sampling. Semiannual sampling was recommended for remedial action efficacy, POC, and UM monitoring. No locations are recommended for quarterly sampling. Final recommendations for sampling frequency for the Southeast Sector are provided in **Table B-8**.

5.2 SOUTHWEST SECTOR RESULTS

5.2.1 Priority COCs

Priority COCs for individual wells in the Southwest Sector are listed in **Table B-9**. TCE is the priority COC at 22 of 51 locations, and perchlorate is the priority at 6 of the 43 wells sampled for perchlorate. Priority COCs at individual wells other than TCE and perchlorate include DNT4A, RDX, Cr (VI), cis-1,2-dichloroethene, and the degradation products of TCE and RDX. Metals such as arsenic and manganese are produced as byproducts of the ISB remedy and are elevated in some areas. Boron is a lower priority COC in the Southwest Sector as groundwater is not intercepted for treatment and subsequent surface application from this area.

Sector-wide priority COCs for the Southwest Sector are TCE and perchlorate. The Southwest Sector monitoring network was optimized for TCE and perchlorate as these COCs are more widely distributed at levels exceeding remedial goals. However, lower priority constituents such as 1,4-dioxane, metals, Cr (VI), and TCE degradation products were considered as monitoring priorities at specific locations.

1,4-Dioxane was detected above remedial goals at sampling locations in the Southwest Sector: PTX06-1012, PTX06-1126, PTX06-1127, PTX06-1148, PTX06-1149, PTX06-1151, PTX06-1155, PTX06-1156, PTX06-1169, PTX06-1170, PTX06-1171, PTX06-1173, PTX06-1174, PTX06-1175, PTX06-1209, PTX06-1210, PTX06-1211, PTX08-1007, and PTX08-1008. COCs such as TCE and perchlorate exceed remedial goals by a greater magnitude at each of these locations. The highest 1,4-dioxane concentrations were found at PTX06-1127, upgradient of the eastern Z11ISB remedy, and PTX06-1210, immediately downgradient of PTX06-1127 and within the ISB remedy. Wells downgradient from PTX06-1127 such as PTX06-1156 and PTX06-1148 previously had concentrations below the 1,4-dioxane remedial goal of 7.7 µg/L, but more recent sampling has shown increasing 1,4-dioxane concentrations in this region that now exceed the remedial goal. The farthest downgradient well, PTX06-1053, has been consistently non-detect, with a single 1,4-dioxane detection of 0.933 µg/L in November 2017. The 1,4-dioxane plume is not well delineated and may be migrating to the southeast in the region north of PTX06-1053 toward PTX06-1052.

The ISB and P&T remedies do not treat 1,4-dioxane. Monitoring of 1,4-dioxane is, therefore, conducted with the goal of assessing mobility through the groundwater divide toward the SEPTS remedy. Additional monitoring wells between PTX06-1148 and the SEPTS will be required to ensure that 1,4-dioxane is not reaching the SEPTS at concentrations above the remedial goal.

Wells in the immediate vicinity of the Z11ISB (PTX06-1170, PTX06-1173, PTX06-1155, PTX06-1012, and PTX06-1169) show high concentrations of cis-1,2-dichloroethene, generally exceeding TCE concentrations at these wells between 2017 and 2021. While TCE concentrations continue to exceed remedial goals at these locations, sampling degradation products of TCE is an important aspect of assessing ISB remedy performance. Therefore, monitoring the distribution and trends of TCE degradation product formation in the ISB area is important for remedy performance and efficacy monitoring.

5.2.2 Individual Well Statistics

Individual well exploratory data analysis statistics for the Southwest Sector are shown in **Tables B-10** and **B-11**. General MK trend results for both TCE and perchlorate are summarized in **Table 9**. Results of the trend analysis for individual wells for TCE and perchlorate for the years 2017 through 2021 are detailed in **Table B-10**. Included in **Table B-10** are trend results from the 2012 through 2016-time frame for comparison. MK trend results and average concentrations normalized by remedial goals for TCE are shown on **Figure 6.** Normalized average concentrations and trend results for perchlorate are shown on **Figure 7.**

Table 9. Southwest Sector Individual Well Trend Summary

Well Group	Total Wells	Pantex Plant Southeast Perched Groundwater Mann-Kendall Trend Results by Number of Wells				
		Non-Detect	Decreasing or Probably Decreasing	Stable	Increasing or Probably Increasing	No Trend or Insufficient Data
TCE						
All Wells	51	10 (20%)	10 (20%)	5 (10%)	13 (25%)	13 (25%)
Perchlorate						
All Wells	43	5 (12%)	18 (42%)	11 (25%)	4 (9%)	5 (12%)

The Southwest Sector monitoring well network has several wells that have been installed since 2016, most in the area of the Z11ISB for RA monitoring. These wells, PTX06-1207, PTX06-1209, PTX06-1210, and PTX06-1211, have insufficient data to determine a statistical trend (fewer than four sampling events).

Wells south of the eastern Z11ISB area, PTX06-1148, PTX06-1149, and PTX06-1150, show *increasing* trends for TCE and 1,4-dioxane. Since 2019, concentrations of TCE have consistently exceeded remedial goals at these three locations, and concentrations of 1,4-dioxane exceeded remedial goals at PTX06-1148 and PTX06-1149. Downgradient well PTX06-1052, southeast of the eastern Z1ISB area, shows an increasing trend in TCE, with levels below the remedial goal of 5 µg/L. PTX06-1052 has not been sampled for 1,4-dioxane.

Southwest Sector downgradient wells PTX06-1035 and PTX06-1134 show *increasing* or *probably increasing* statistical trends for TCE with remedial goal exceedances. Recently installed well PTX06-1207 bounds PTX06-1134 downgradient, but there is a large gap between PTX06-1035 and the closest downgradient well, PTX06-1131.

The number of wells with *increasing* or *probably increasing* perchlorate trends is lower than the number of *increasing* or *probably increasing* TCE trends. PTX06-1035, PTX06-1134, and PTX06-1149, south of the Z11ISB, had increasing trends for perchlorate. PTX06-1035 and PTX06-1134 are only bounded by PTX06-1207; PTX06-1131 is located further downgradient but is not currently sampled for perchlorate. PTX06-1207 is a recently installed well that has had low detections of perchlorate at or near the remedial goal of 15 µg/L.

Wells with *increasing* or *probably increasing* statistical trends downgradient of the Z11ISB may indicate that pulses of TCE and perchlorate have moved through the ISB when reducing conditions are attenuated between injections. For wells located further downgradient, *increasing* or *probably increasing* trends may indicate that high COC concentrations that were already beyond the Z11ISB at the time of installation are migrating to those locations as a disconnected plume. The TCE concentrations downgradient of the Z11ISB are generally an order of magnitude lower than concentrations upgradient of the ISB, with two exceptions in PTX06-1175 and PTX06-1159. Both PTX06-1175 and PTX06-1159 have *decreasing* statistical trends of TCE.

5.2.3 Plume-Level Analysis

MK trends for total dissolved mass, center of mass and spread of mass (zeroth, first, and second moments, respectively) were calculated for annually consolidated data 2017 through 2021 and for the 2012 through 2021-time frame. Trend estimates of the zeroth, first and second moments for both TCE and perchlorate for the Southwest Sector are summarized in **Table 10**, and first moments (center of mass) for TCE and perchlorate are illustrated on **Figure 6** for TCE and **Figure 7** for perchlorate. MAROS reports for zeroth, first and second moments for other COCs are in **Appendix C**.

Results for the moment analyses for both TCE and perchlorate plumes indicate statistically *stable* overall trends within the network. The total dissolved mass for perchlorate (zeroth moment) shows decreasing trends for both the recent data and between 2012 and 2021. While individual wells within the network may show strong trends, the plumes are not migrating or significantly changing distribution on a larger landscape level. There is no change in the trends calculated during the longer versus the more recent time frame, with the exception of the zeroth moment for TCE switching from *probably decreasing* to *stable*. *Stable* conditions for total dissolved mass indicate that additional mass mobilizing into the monitoring network from the source is balanced by degradation and attenuation within the plumes, while *decreasing* conditions for total dissolved mass indicate that the degradation and attenuation within the plumes is exceeding additional mass mobilizing from the source. *Stable* to *decreasing* conditions indicate that the interior network is adequate to evaluate the distribution of contamination.

Table 10. Southwest Sector Moment Analysis Results

Moment Type	Constituent			
	TCE Trend 2012 – 2021	**TCE Trend 2017 – 2021**	**Perchlorate Trend 2012 – 2021**	**Perchlorate Trend 2017 – 2021**
Zeroth (Total Dissolved Mass)	Probably Decreasing	Stable	Decreasing	Decreasing
First (Center of Mass)	Stable	Stable	Stable	Stable
Second (Spread of Mass X/Y)	No Trend/Stable	Stable/Stable	Increasing/ No Trend	Increasing/ No Trend

*Result for uniform saturated thickness

MAROS estimates the percentage of contaminant mass monitored by each well in the network, based on the Voronoi area and concentrations. Results indicate that wells monitoring the highest percentage of TCE plume mass are PTX06-1127 at 11 percent, PTX06-1180 at 11 percent, and PTX08-1006 at 9 percent. PTX06-1127 and PTX06-1180 are located upgradient of the Z11ISB with an *increasing* trend and *no trend*, respectively. PTX08-1006 monitors a large area near Zone 11 with a *stable* trend. For perchlorate, wells monitoring higher percentages of plume mass are PTX08-1008 at 25 percent, PTX06-1035 at 17 percent, and PTX06-1007 at 11 percent. PTX08-1008 is in the southwest corner of Zone 11 and east of the Z11ISB remedy with a *decreasing* trend. PTX06-1035 is southwest of the Z11ISB and monitors a large area with an *increasing* trend. PTX06-1007 monitors a large area upgradient in Zone 11 with a *stable* trend.

Overall, the aggregate trend analyses (**Table 11**) indicate that the source area has *no trend* for TCE. Individual well trends in the source area are largely *stable/no trend* for TCE and *decreasing* for perchlorate. Wells with *increasing* TCE trends include 1114-MW4, PTX06-1008, and PTX10-1014; wells with *increasing* perchlorate trends include only PTX08-1007. The combination of multiple trend designations for TCE and perchlorate results in an overall *no trend* or *stable* assessment for TCE and perchlorate in the source area, respectively. The analysis indicates that about 16 percent of TCE mass and 64 percent of perchlorate mass remain in the source area. For TCE, most of the contaminant mass is in the downgradient plume, with about 10 percent accounted for by ISPM wells and 22 percent in the five downgradient wells on the leading edge of the plumes (PTX06-1035, PTX06-1053, PTX06-1134, PTX06-1159, and PTX06-1207).

Table 11. Aggregate Trends for TCE and Perchlorate in the Southwest Sector

Area	Number of Wells (TCE / Perchlorate)	TCE Aggregate Trend	TCE Aggregate Mass %	Perchlorate Aggregate Trend	Perchlorate Aggregate Mass %
Source	10 / 10	NT	16%	S	64%
Tail	40 / 33	S	84%	PD	36%
ISPM	9	PI	10%	PD	5%
Downgradient Z11ISB	4 / 5	S	22%	PI	18%

5.2.4 Spatial Analysis

Results of the spatial sufficiency and redundancy analysis for the Southwest Sector are summarized in **Table B-12**.

Overall, Southwest Sector SFs are low (below 0.5) for priority COCs, indicating that there is low uncertainty within the current network. COV of SF is low (below 1) for most locations, indicating stable relationships among wells over time. Higher variability was found in wells downgradient from the central Z11ISB remedy, such as PTX06-1155, PTX06-1169, and PTX06-1173. These locations have high concentrations that respond to amendment injections that cause concentrations to decrease and subsequently rebound between amendments. The amendment injections schedule causes variability in concentrations within these wells over time.

The areas of influence (Voronoi polygons) for the Southwest Sector are variable due to the close spacing of wells around the Z11ISB to assess remedy performance and the larger spacing between wells in the source area and wells west of Zone 10. The variability in monitoring areas is consistent with the stated objectives of assessing remedy performance over a short spatial extent and managing uncertainty on the outer edges of the plume.

Well Sufficiency

Increasing 1,4-dioxane concentration trends and a large gap in the monitoring well network downgradient of wells PTX06-1149 and PTX06-1148 indicate that at least one additional monitoring well may be helpful to track the movement of 1,4-dioxane toward the SEPTS. Perchlorate concentrations at PTX06-1035 are above remedial goals and statistically *increasing,* while TCE concentrations are at or just below remedial goals and *increasing*. It is unknown if the ISB remedy is reducing the flux of TCE downgradient or whether a portion of the plumes were already downgradient of the ISB prior to installation and is now moving downgradient as an isolated plume.

Well Redundancy

Wells PTX06-1085 and PTX06-1086, located adjacent to Playa 2, are non-detect for priority COCs and are side-gradient from source areas based on the July 2020 perched zone water table. SFs for these wells are low (0.0 and 0.16), and the COV in the SF is also low (0.16 and 0.15). Removal of PTX06-1085 from the network spatial analysis did not increase uncertainty or change estimates of the mass or distribution of TCE in the plume (this location was not monitored for perchlorate). Therefore, PTX06-1085 was found to be redundant with PTX06-1086. It is recommended that the well be eliminated from routine monitoring but that it not be plugged and abandoned in case additional characterization is required.

Other wells located close together, such as those around the Z11ISB remedy show more spatial concentration variability and are required to evaluate the efficacy and provide data to optimize the ISB injections.

Several wells on the western side of the perched unit in Zone 10 such as PTX07-1Q01, PTX07-1Q02, PTX07-1Q03 and PTX06-1131 show low to non-detect concentrations with no *increasing* trends and low SFs. These UM wells are monitored to confirm low to non-detect conditions on the outer edge of the western perched unit, and are, therefore, not redundant.

5.2.5 Frequency Analysis

Results of the sampling frequency analysis for the Southwest Sector are listed in **Table B-13**. Most wells in the program were recommended by the software for biennial sampling for both TCE (36 of 51 wells) and perchlorate (36 of 43 wells). The biennial recommendation is consistent with the finding that concentrations are not changing rapidly, and plumes are largely stable. The MAROS software defaults to a recommendation of quarterly sampling at locations with fewer than four sampling results in the recent (2017 through 2021) time frame. As noted above, one well (PTX06-1207) in the network has been installed since 2017 and has not been sampled four times.

MAROS recommended sampling frequencies were reviewed qualitatively with respect to the monitoring goals of the network and individual wells. For the Southwest Sector, 6 wells are recommended for sampling once every 5 years, 4 wells for biennial sampling, 21 wells for annual sampling, and 20 wells for semiannual sampling. Semiannual sampling frequencies are recommended for wells in the ISB remedy area to monitor remedy performance and to provide data to optimize RAs.

No wells are recommended for routine quarterly sampling; however, quarterly sampling may be performed if short-term data are required to evaluate Z11ISB remedy performance after injections or if the injection protocol is optimized. Final recommendations for sampling frequency are provided in **Table B-14**. Sampling recommendations are illustrated on **Figure 9**.

5.3 NORTH SECTOR RESULTS

5.3.1 Priority COCs

Priority constituents for the 23 individual wells included in the North Sector analysis are listed in **Table B-15**. Four North Sector wells were included in the Southeast Sector analysis, and two wells were included in the Southwest Sector analytical group. The North Sector is characterized by radial groundwater flow, isolated saturated zones, and limited areas of continuous plumes. RDX is the only priority COC on a sector-wide basis. Boron also exceeds the standard for irrigation re-use (500 µg/L) at many locations, which is critical for the P1PTS operation. Many wells north of Zones 11 and 12 are UM wells and have low to no detections of site COCs. Constituents that exceed remedial goals at individual wells are RDX, boron, DNT4A, and total chromium.

5.3.2 Individual Well Statistics

Summary statistics for North Sector wells are shown in **Table B-16**. Concentration ratios and trend results for RDX in the North Sector are shown on **Figure 8**. Many monitoring locations in the North Sector either have low or no detections of site COCs. Overall, the magnitude and extent of contamination in the North is less than the Southeast and Southwest Sectors.

Higher concentrations of RDX are centered around Playa 1, which was a source of contamination through historical infiltration of industrial discharge. Monitoring locations with high concentrations of RDX south of Playa 1 include PTX08-1002, considered as a source well for the Southeast Sector, PTX08-1001, PTX06-1117, and PTX07-1P02. North of Playa 1, OW-WR-38 shows concentrations above remedial goals. OW-WR-38 and PTX07-1P02 show *increasing* trends for RDX in the recent time frame, while PTX08-1001 and PTX08-1002 show *no trend* trends.

North of Playa 1, PTX06-1050 monitors groundwater with historical high concentrations of RDX, boron, and DNT4A, which showed *decreasing* and *probably decreasing* trends between 2008 and 2016 but has recently shown *increasing* trends of RDX and boron. Northern well PTX07-1O03 exceeded remedial goals for RDX and had a *stable* concentration trend for RDX.

PTX06-1013, near the eastern edge of the perched unit, has shown exceedances of RDX. The well shows *stable* trends for RDX. Concentrations of COCs downgradient from PTX06-1013 at PTX06-1069 remained below remedial goals in the single sampling event between 2017 and 2021. Individual well results for these locations indicate the plumes are still not expanding to the east.

Concentration trends in the main perched unit of the North Sector may be influenced by varying recharge from rainfall to Playa 1 and discharge of treated water from the SEPTS and P1PTS. The site experienced wetter conditions in 2017 and 2019, with drier conditions in 2018, 2020, and 2021. Changes in recharge from precipitation and discharge to Playa 1 may influence the extent of perched zone saturation in some areas over long time scales.

The Burning Ground is located over a perched groundwater unit separate from and west of the main perched unit. Concentrations of COCs in the Burning Ground area are below remedial goals and have shown non-detect results in the recent time frame. Perched groundwater along the northern boundary of the Pantex Plant, isolated from the main perched unit, also shows low to non-detect concentrations of COCs.

5.3.3 Plume-Level Analysis

MK trends for total dissolved mass, center of mass and spread of mass (zeroth, first and second moments, respectively) were calculated for annually consolidated data from 2017 through 2021 for wells in the main perched unit around Playa 1 (excluding the detached perched units). The results are shown in **Table 12**. Total dissolved mass for RDX had *no trend* within the network. The P1PTS may be mobilizing RDX from below Playa 1 based on *increasing* and *probably increasing* RDX trends immediately adjacent to Playa 1, but the groundwater extraction system is preventing migration of the center of mass of the plume. Metrics were *decreasing* to *stable* or *no trend* for DNT4A.

Table 12. North Sector Moment Analysis Results

Moment Type	Constituent	
	RDX Trend 2017 - 2021	DNT4A Trend 2017 - 2021
Zeroth (Total Dissolved Mass)	No Trend	Decreasing
First (Center of Mass)	Decreasing	Stable
Second (Spread of Mass X/Y)	Stable/Decreasing	No Trend/No Trend

*Result for uniform saturated thickness

The MAROS tool that identifies the percentage of total plume mass represented by each well identified well OW-WR-38 as accounting for 46 percent of RDX in the North Sector. PTX06-1050 monitors a large area and shows relatively high concentrations of priority COCs. Other North Sector wells that are important in monitoring total plume mass are PTX07-1O03 (25 percent of RDX) and PTX06-1049 (9 percent of RDX).

5.3.4 Spatial Analysis

The MAROS quantitative network spatial analyses require monitoring locations in areas of consistent groundwater flow directions relative to source material to evaluate spatial redundancy and sufficiency. The SF analysis indicated significant spatial uncertainty, which is consistent with the finding that the North Sector has variable groundwater flow and sources, as well as disconnected saturated zones. For the North Sector, well redundancy and sufficiency were evaluated using qualitative methods and consideration of site monitoring objectives, as well as findings from previous LTMO efforts.

The primary monitoring objectives for the North Sector are to evaluate uncertainty in the Burning Ground and other isolated groundwater units with limited impacts. UM and RA wells are also located on the edges of the higher concentration areas to delineate impacts around Playa 1 in the main perched unit. Wells that monitor the performance of the P1PTS are located around Playa 1. The North Sector well network has been optimized formally and informally over many years. The current distribution of wells is mostly sufficient to address monitoring objectives and does not include redundant wells. The addition of a well downgradient of PTX06-1050 could ensure the delineation of RDX to the west. Previously, PTX06-1136, which is downgradient of PTX06-1050, was sampled, but this well has been dry in recent sampling events.

5.3.5 Frequency Analysis

As with Southeast and Southwest Sectors, concentrations in the North Sector are not changing rapidly. Overall, most wells in the North Sector were recommended for biennial sampling by the MAROS algorithm. Wells OW-WR-38, PTX08-1002, PTX06-1050, and PTX06-1128 were recommended for quarterly sampling, and wells with fewer than four sampling results in the recent time frame were recommended for annual (no or low detections) or quarterly (higher concentrations) sampling. The final recommended sampling frequencies, after qualitative review, is listed in **Table B-17**.

Several wells were recommended for reduced sampling frequency. Wells in the Burning Ground and north plant boundary area are recommended for sampling every five years due to low and unchanging historical concentrations. Of the 23 wells considered in the North Sector, 8 are recommended for sampling every 5 years, 4 are recommended for biennial sampling, 10 are recommended for annual sampling, and 1 is recommended for semiannual sampling. The annual sampling frequency for North Sector wells around Playa 1 will provide sufficient data in a five-year interval to determine trends to evaluate the performance of the P1PTS.

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6.0 RECOMMENDATIONS

6.1 SOUTHEAST SECTOR RECOMMENDATIONS

6.1.1 Southeast ISB Extension and Offsite ISB

Based on the monitoring optimization analysis, two additional monitoring wells are recommended in this area. One well is recommended for the midpoint between PTX06-1195 and PTX06-1196 to define the eastern edge of the SEISB Extension treatment area and assess the performance of the north-south oriented line of injection wells. Another well is recommended for the area northeast of PTX06-1199 to delineate the eastern edge of the southeastern plume. Additionally, seven monitoring wells in the Offsite ISB area are planned to monitor ISB performance between the two rows of injection wells and at the downgradient-most edge of the RDX plume.

Additional monitoring wells downgradient of the Offsite ISB may be required if data suggests that COC-impacted groundwater continues to migrate to the southeast. Additional wells may also be useful in defining the extent of perched zone saturation to the southeast.

6.1.2 Southeast ISB

Continued monitoring of the area around ISPM well PTX06-1153 is recommended to address uncertainty related to RDX concentration trends and saturation in this area. The limited saturated thickness in this area may mean that small migrations of affected groundwater may impact concentrations downgradient of the SEISB. Additional monitoring wells are not recommended, but periodic sampling of previously dry wells is recommended. PTX06-1051, PTX06-1188, PTX06-1167 and PTX06-1122 are dry wells located west of the ISB remedy. Monitoring saturation at these locations may indicate if untreated water is circumventing the ISB from the west (PTX06-1166), causing variable concentrations at ISPM well PTX06-1153. The ISB CSM can be strengthened by monitoring water levels and geochemistry in the ISB injection wells and downgradient ISPM wells. The potential effect of injections on the distribution of saturation in the area should be considered and incorporated into the CSM for the remedy.

The southeast trending Cr (VI) plume, observed in PTX06-1052 and PTX06-1183, may be migrating to the south when it encounters the edge of the perched unit saturation near PTX06-1166. The edge of the perched unit saturation in this area is likely caused by a local high in the FGZ that intersects the water table. Currently, the average concentration of Cr (VI) in PTX06-1166 is below remedial goals, but the concentration has an *increasing* statistical trend. If concentrations regularly exceed remedial goals in PTX06-1166, an additional well to the south/southwest should be considered to define the extent of Cr (VI). This Cr (VI) plume does not have any treatment downgradient because the Southeast ISB is disconnected from the plume by an unsaturated area. If water levels rise in the future, this Cr (VI) plume may be intercepted by the Southeast ISB.

6.1.3 Well Redundancy

The results of the MAROS analysis indicate overall low uncertainty and low variability between monitoring locations in the Southeast Sector. This result is consistent with the Plant history of optimizing the monitoring network over time. No wells are recommended for removal from the Southeast Sector routine monitoring program, now. Low spatial uncertainty results were considered when recommending sampling frequency. Locations with very low uncertainty (e.g., where the nearest neighboring wells can predict concentrations at a well node) were considered for reduced sampling frequency. An additional well is recommended east of PTX06-1042 to track higher RDX concentrations moving towards the SEISB Extension and line of extraction wells located around PTX06-1147.

6.1.4 Sampling Frequency

While the MAROS results indicate that a biennial sampling frequency would be sufficient to evaluate the rate of concentration change in the network and at most wells, an overall annual sampling frequency is recommended for most locations in the Southeast Sector. Semiannual sampling is recommended at wells used to evaluate the ISB remedies and wells near the edges of the perched unit where high COC concentrations have been observed. Final sampling recommendations are provided in **Table B-18** and shown on **Figure 9**.

6.2 SOUTHWEST SECTOR RECOMMENDATIONS

6.2.1 TCE Plume

Southwest downgradient wells PTX06-1035 and PTX06-1134 show *increasing* or *probably increasing* statistical trends for TCE with remedial goal exceedances. Recently installed well PTX06-1207 bounds PTX06-1134 downgradient, but there is a large gap between PTX06-1035 and the closet downgradient well, PTX06-1131. Because of the increasing trend and TCE exceedances in PTX06-1035, a new well is recommended downgradient approximately 750 ft to the southwest of PTX06-1035 if TCE concentrations in PTX06-1207 have an *increasing* or *probably increasing* trend once additional sampling has been completed.

6.2.2 Perchlorate Plume and 1,4-Dioxane Plume

Site data indicate high concentrations of perchlorate and increasing concentrations of 1,4-dioxane in monitoring wells downgradient of the eastern edge of the Z11ISB. The perchlorate plume and 1,4-dioxane may be migrating under the influence of the SEPTS from PTX08-1006 and PTX06-1148 southeast toward the SEPTS. An additional well south of PTX08-1008 and between the Z11ISB and SEPTS is recommended. Additionally, monitoring of wells PTX08-1009, PTX06-1052, and PTX06-1183 should be considered to ensure delineation of 1,4-dioxane and determine whether 1,4-dioxane is being drawn into the SEPTS. If 1,4-dioxane is determined to be present in the SEPTS area, appropriate steps may need to be taken to update the SEPTS to treat 1,4-dioxane. Additionally, a new monitoring well south of PTX08-1008 and between the Z11ISB and SEPTS should be considered to track 1,4-dioxane plume movement toward the SEPTS. The spatial analysis indicates low concentration uncertainty in this area, but monitoring effort should be directed toward quantifying perchlorate and 1,4-dioxane flux toward the SEPTS.

Southwest of the Z11ISB, PTX06-1035 and PTX06-1134 had *increasing* trends for perchlorate, with recently installed well PTX06-1207 not having enough samples to identify a trend. No wells downgradient of PTX06-1207 are currently being sampled for perchlorate. It is recommended that

PTX06-1131, east of PTX06-1207 and downgradient of wells with increasing perchlorate trends, be sampled for perchlorate to ensure that the plume is sufficiently delineated to the southwest.

6.2.3 Well Redundancy

As in the Southeast Sector, the monitoring network in the Southwest Sector has been optimized several times since initial site characterization. Overall, there is very low spatial uncertainty within the network. One well, PTX06-1085 was found to be redundant in the network. This well is not currently sampled routinely, and continued limited sampling is recommended.

6.2.4 Sampling Frequency

Monitoring wells in the Zone 11 and Zone 12 source areas show largely *stable* trends resulting in recommendations for annual sampling. Wells located within and downgradient from the Z11ISB remedy monitor changing conditions as the remedy is optimized and require more frequent monitoring to inform remedial decision making. Z11ISB area wells are recommended for largely a semiannual sampling frequency. Wells outside of the main plumes to the west are minimally affected by site COCs and are recommended for sampling once before each FYR (or as regulatory permitting requires). Final recommended sampling frequencies are provided in **Table B-18** and shown on **Figure 9**.

6.3 NORTH SECTOR RECOMMENDATIONS

6.3.1 Well Redundancy and Sufficiency

The North Sector monitoring network has been optimized previously based on the priority monitoring objectives. In the 2007 analysis, the area west of PTX06-1050 was recommended for a new monitoring location to delineate RDX to the west. PTX06-1136 had delineated an area of affected groundwater but is now dry. Recent concentrations at PTX06-1050 are *increasing*; therefore, an additional monitoring well located between PTX06-1136 and PTX06-1050 could ensure that delineation is achieved but is not recommended at this time. Increasing saturation in PTX06-1050 would make an additional well between PTX06-1136 and PTX06-1050 useful to track the plume movement if PTX06-1136 remains dry. No additional wells are recommended for the isolated perched water units at the Burning Ground or along the northern Plant boundary.

6.3.2 Sampling Frequency

For the northern perched unit, a largely annual sampling frequency is recommended for the Playa 1 area based on the rate of concentration change and the outstanding remedy management questions. Perched groundwater in the Burning Ground and northern boundary are recommended for 5-year sampling frequency except for POC wells that are recommended for annual sampling.

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FIGURES

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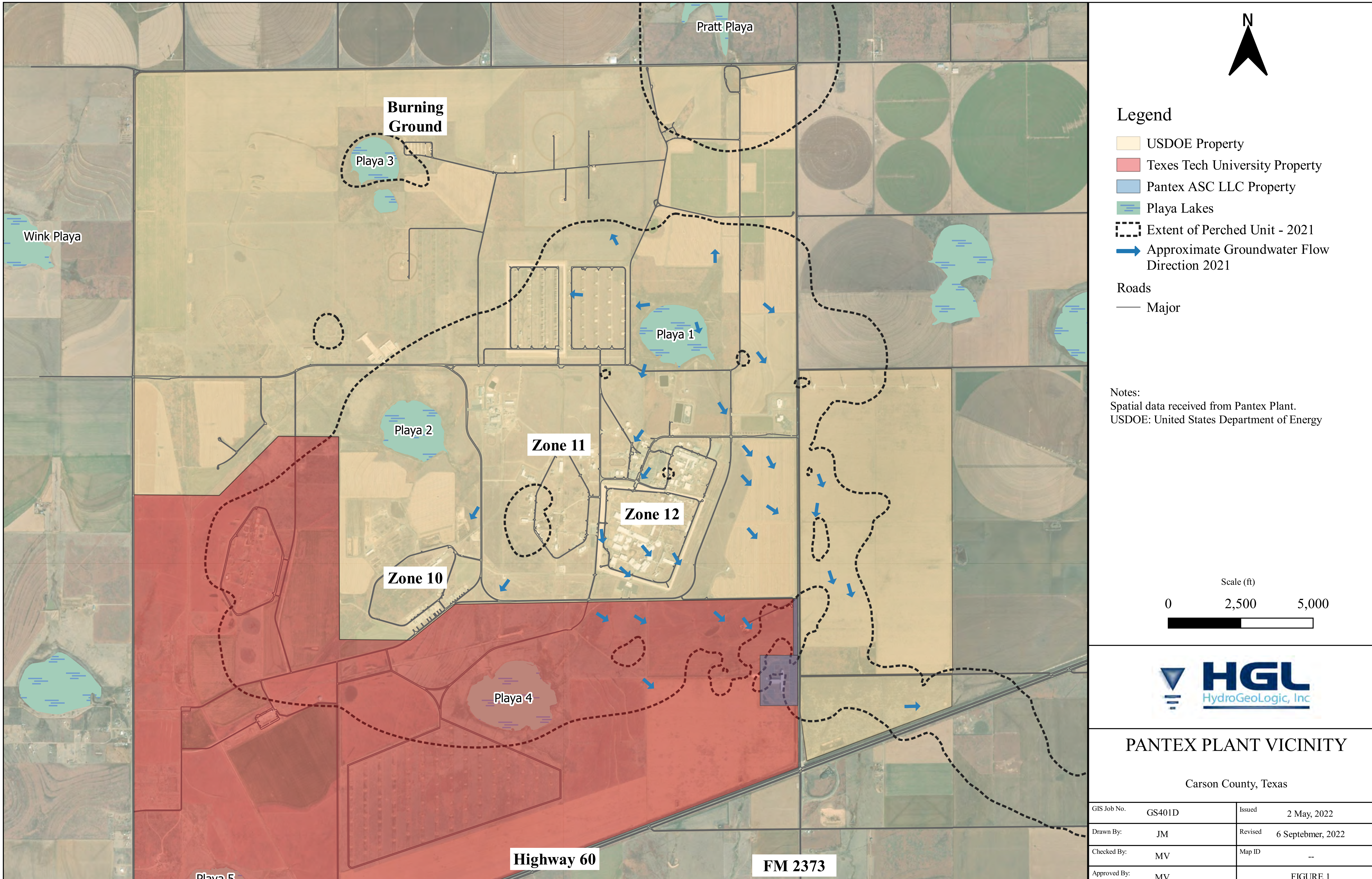

Pratt Playa
Burning Ground
Playa 3
Wink Playa
Playa 1
Playa 2
Zone 11
Zone 12
Zone 10
Playa 4
Highway 60
FM 2373
Playa 5
N
Legend
USDOE Property
Texes Tech University Property
Pantex ASC LLC Property
Playa Lakes
Extent of Perched Unit - 2021
Approximate Groundwater Flow Direction 2021
Roads
Major
Notes:
Spatial data received from Pantex Plant.
USDOE: United States Department of Energy
Scale (ft)
0
2,500
5,000
HGL HydroGeoLogic, Inc
PANTEX PLANT VICINITY
Carson County, Texas
GIS Job No. GS401D
Issued 2 May, 2022
Drawn By: JM
Revised 6 September, 2022
Checked By: MV
Map ID --
Approved By: MV
FIGURE 1

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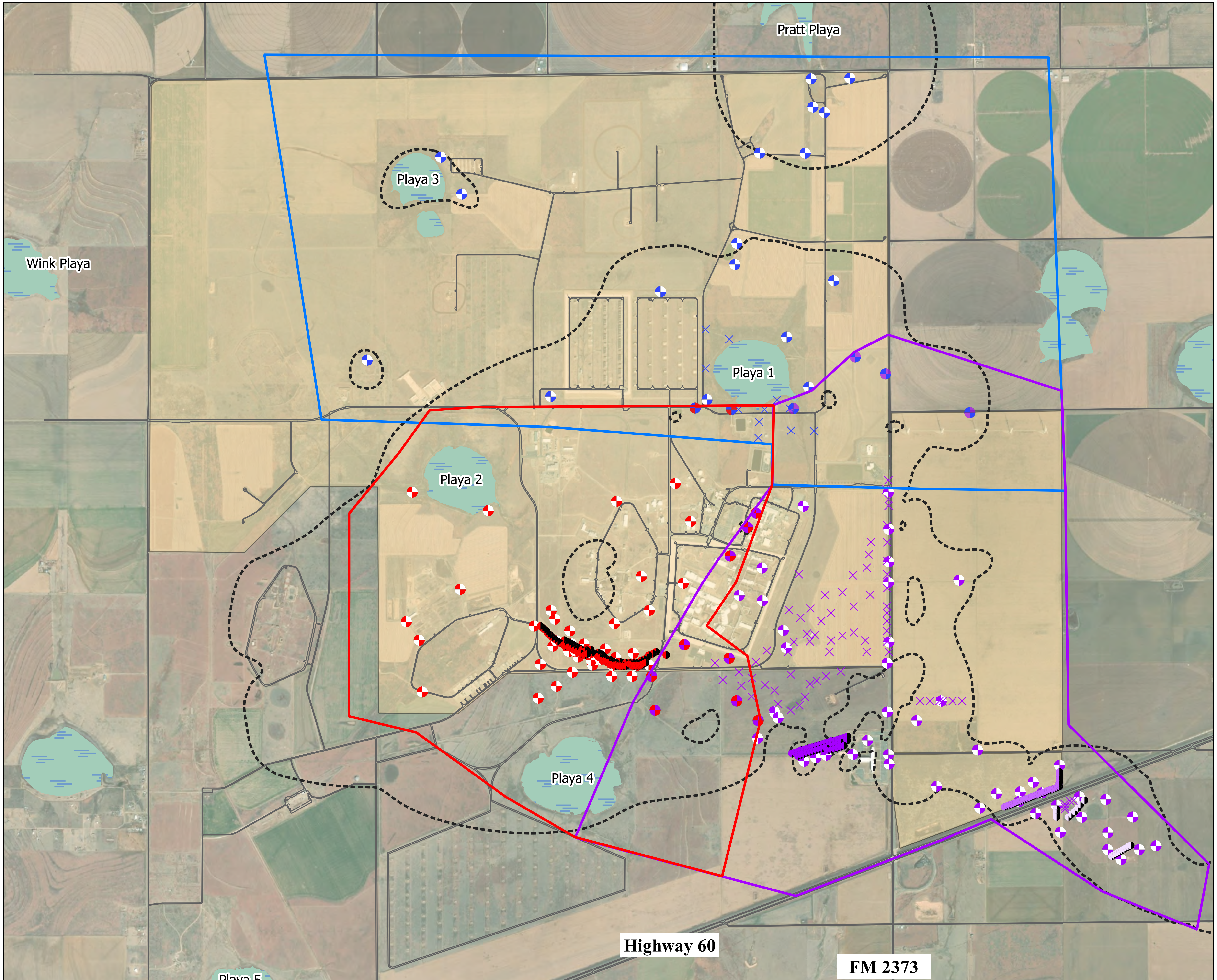

N

Legend

Remedies
- Southeast P&T Extraction Well
- Playa 1 P&T Extraction Well
- Zone 11 ISB
- Southeast ISB
- Southeast ISB Extension
- Offsite ISB

Investigation Wells
- North Sector
- North/Southeast Sectors
- North/Southwest Sectors
- Southeast Sector
- Southeast/Southwest Sector
- Southwest Sector
- Southwest Sector
- Southeast Sector
- North Sector
- USDOE Property
- Extent of Perched Unit - 2021
- Playas

Notes:
Spatial data received from Pantex Plant.
USDOE: United States Department of Energy

Scale (ft)
0 2,500 5,000

HGL HydroGeoLogic, Inc

PANTEX PERCHED GROUNDWATER INVESTIGATION AND REMEDY MONITORING WELL LOCATIONS
Carson County, Texas

GIS Job No.	GS401D	Issued	2 June, 2022
Drawn By:	JM	Revised	6 September, 2022
Checked By:	MV	Map ID	--
Approved By:	MV		FIGURE 2

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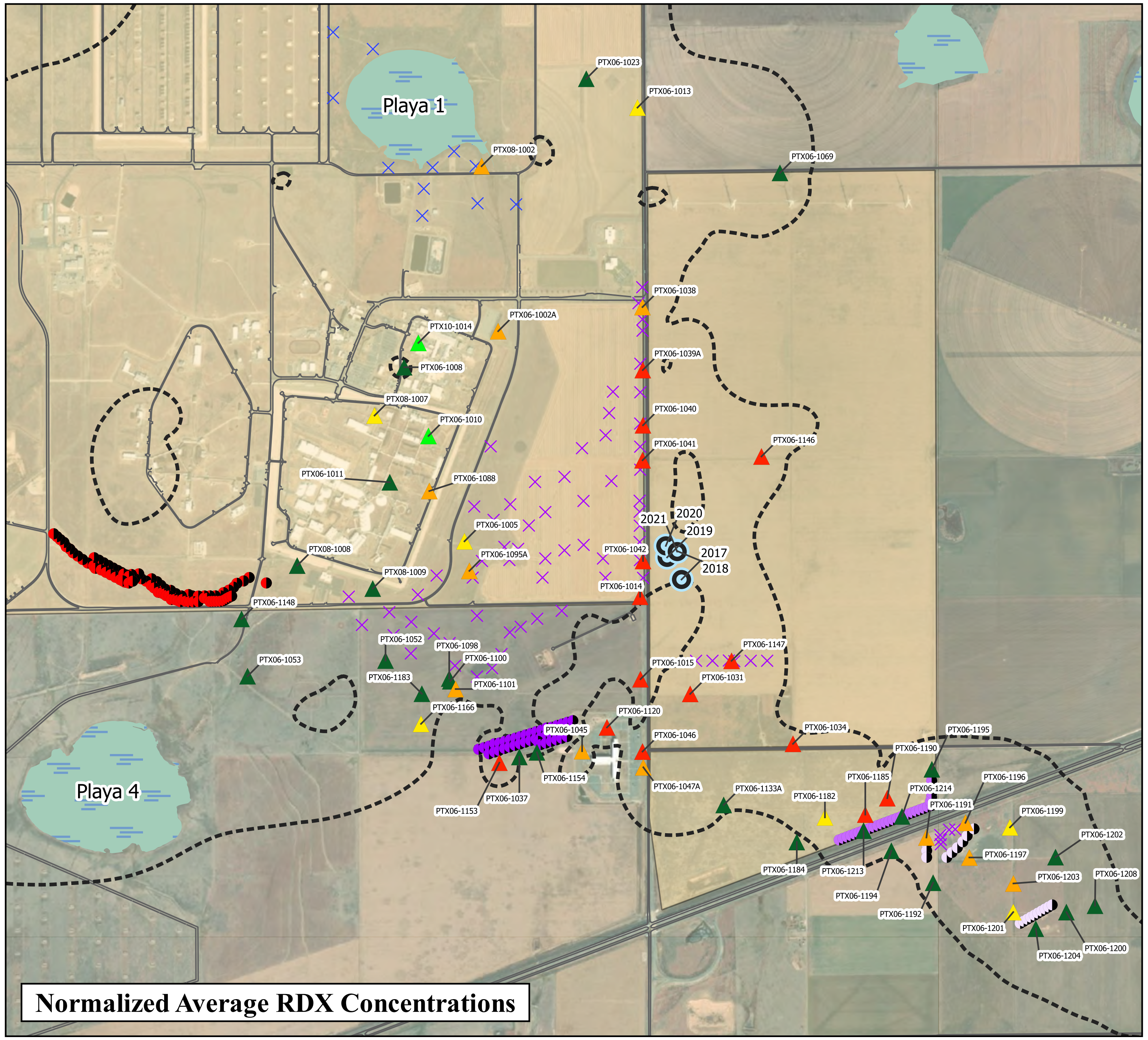

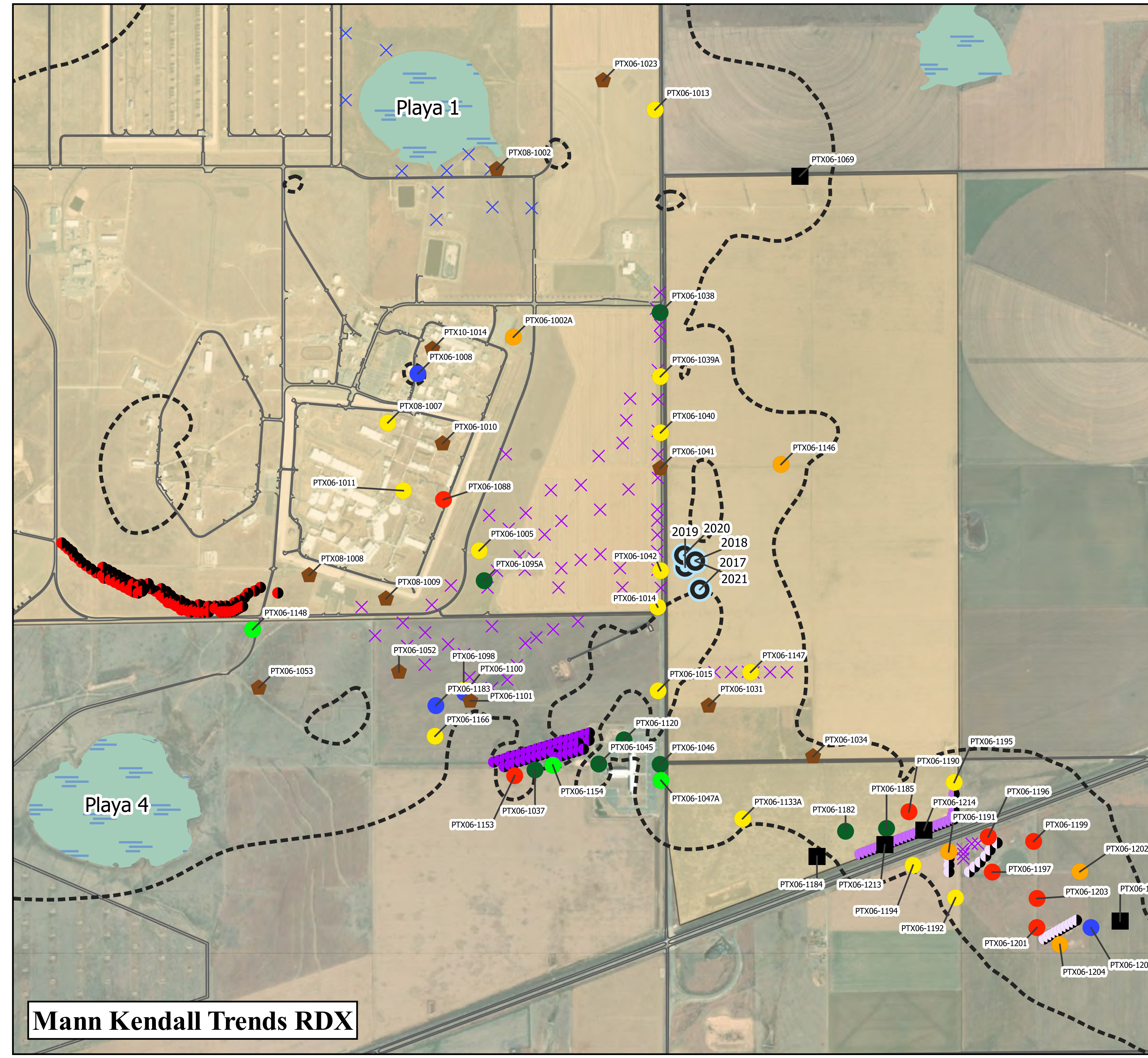

Legend

Normalized RDX Concentration
GWPS RDX = 2 ug/L

- < 0.5
- 0.5 - 1
- 1 -10
- 10 - 100
- 100 - 1000
- >1000

Mann Kendal Trend RDX

- Decreasing
- Probably Decreasing
- Stable
- Probably Increasing
- Increasing
- Non Detect (2017 - 2021)
- No Trend
- Insufficient Data

RDX First Moments

- First Moments

Remedies

- Southeast P&T Extraction Well
- Playa 1 P&T Extraction Well
- Zone 11 ISB
- Southeast ISB
- Southeast ISB Extension
- Offsite ISB
- Extent of Perched Unit - 2021
- USDOE Property

Scale (ft)
0 2,500 5,000

N

Notes:
1. Normalized average RDX concentrations calculated using the average concentration 2017 - 2021 divided by the GWPS.
2. First Moments are the center of mass for RDX using quarterly consolidated data.
3. Mann Kendall trends were determined for RDX 2017 - 2021.

RDX - Hexahydro-1,3,5-trinitro-1,3,5-triazine
GWPS - Groundwater Protection Standard
P&T - Pump and Treat
ISB - In Situ Bioremediation
USDOE - United States Department of Energy

HydroGeoLogic, Inc

PANTEX SOUTHEAST SECTOR PERCHED
RDX AVERAGE CONCENTRATIONS,
FIRST MOMENTS AND
MANN-KENDALL TRENDS

Carson County, Texas

GIS Job No.	GS401D	Issued	7 June, 2022
Drawn By:	JM	Revised	6 September, 2022
Checked By:	MV	Map ID	--
Approved By:	MV		FIGURE 3

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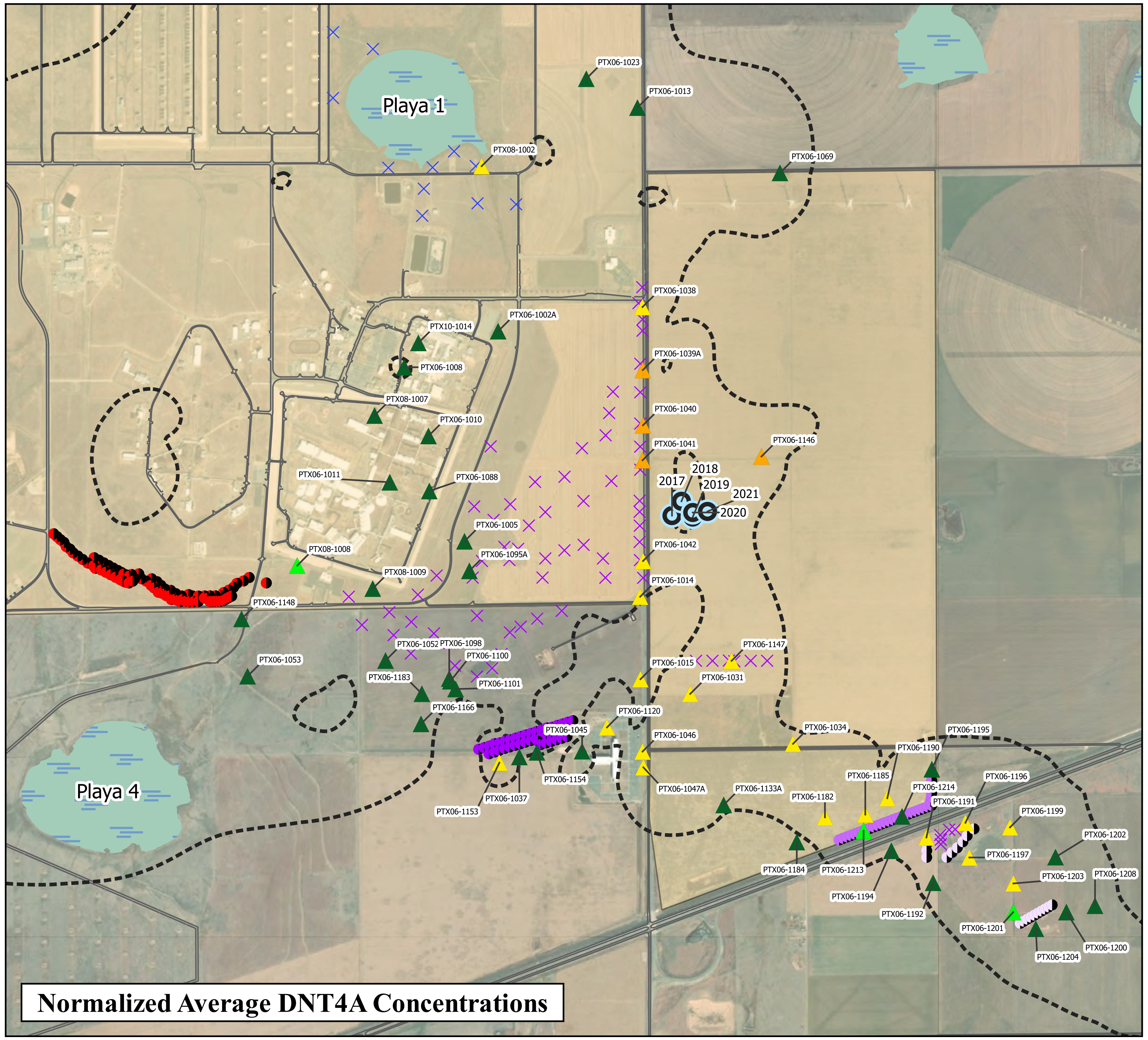
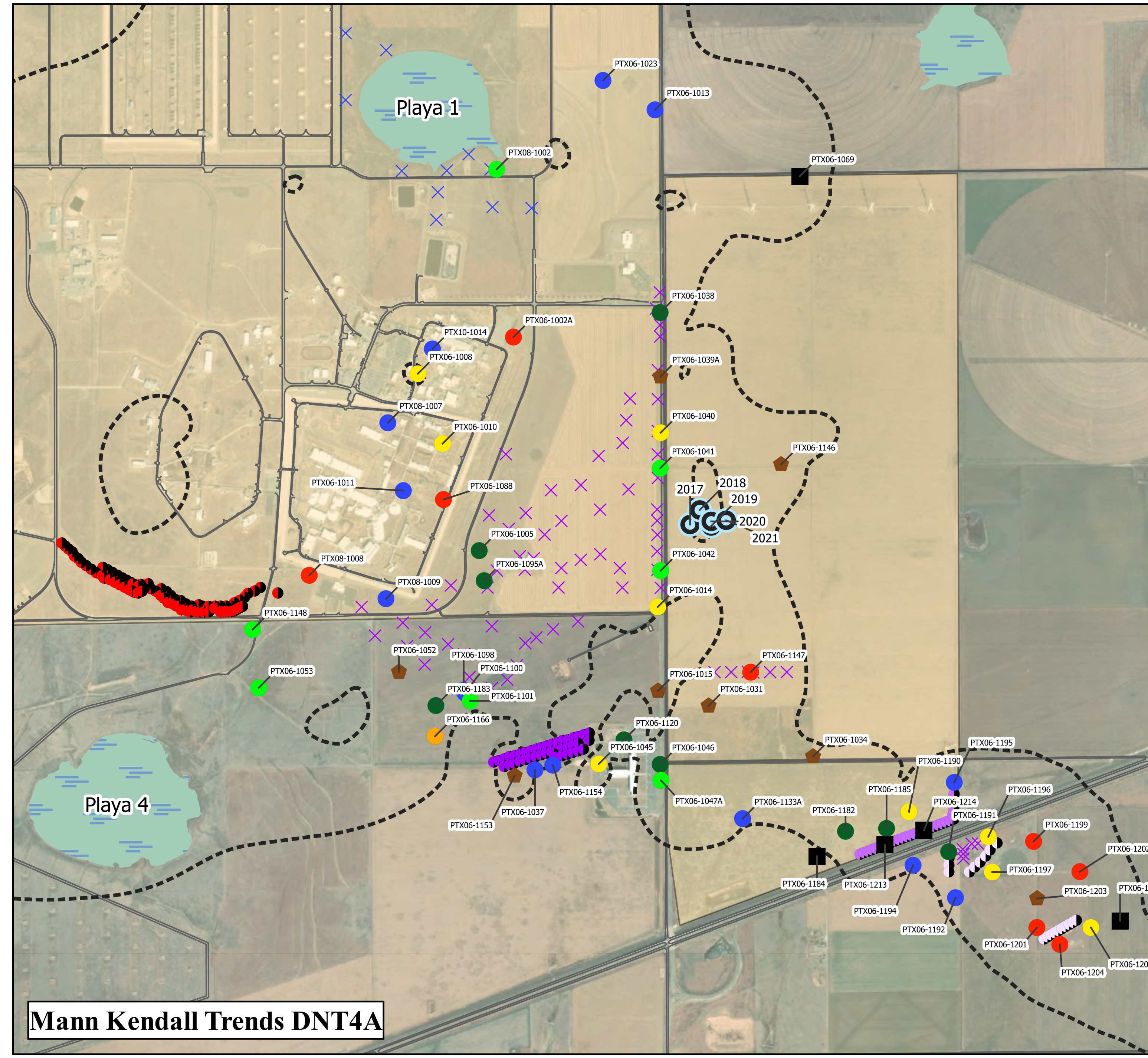




Legend

Normalized DNT4A Concentration GWPS DNT4A = 1.2 ug/L

- ▲ < 0.5
- ▲ 0.5 - 1
- ▲ 1 -10
- ▲ 10 - 100
- ▲ 100 - 1000
- ▲ >1000

Mann Kendal Trend DNT4A

- ● Decreasing
- ● Probably Decreasing
- ● Stable
- ● Probably Increasing
- ● Increasing
- ● Non Detect (2017 - 2021)
- ⬟ No Trend
- ■ Insufficient Data

DNT4A First Moments

- ◎ First Moments

Remedies

- × Southeast P&T Extraction Well
- × Playa 1 P&T Extraction Well
- Zone 11 ISB
- Southeast ISB
- Southeast ISB Extension
- Offsite ISB
- Extent of Perched Unit - 2021
- USDOE Property

Scale (ft)

0 2,500 5,000

N

Notes:

1. Normalized average DNT4A concentrations calculated using the average concentration 2017 - 2021 divided by the GWPS.
2. First Moments are the center of mass for DNT4A using quarterly consolidated data.
3. Mann Kendall trends were determined for DNT4A 2017 - 2021.

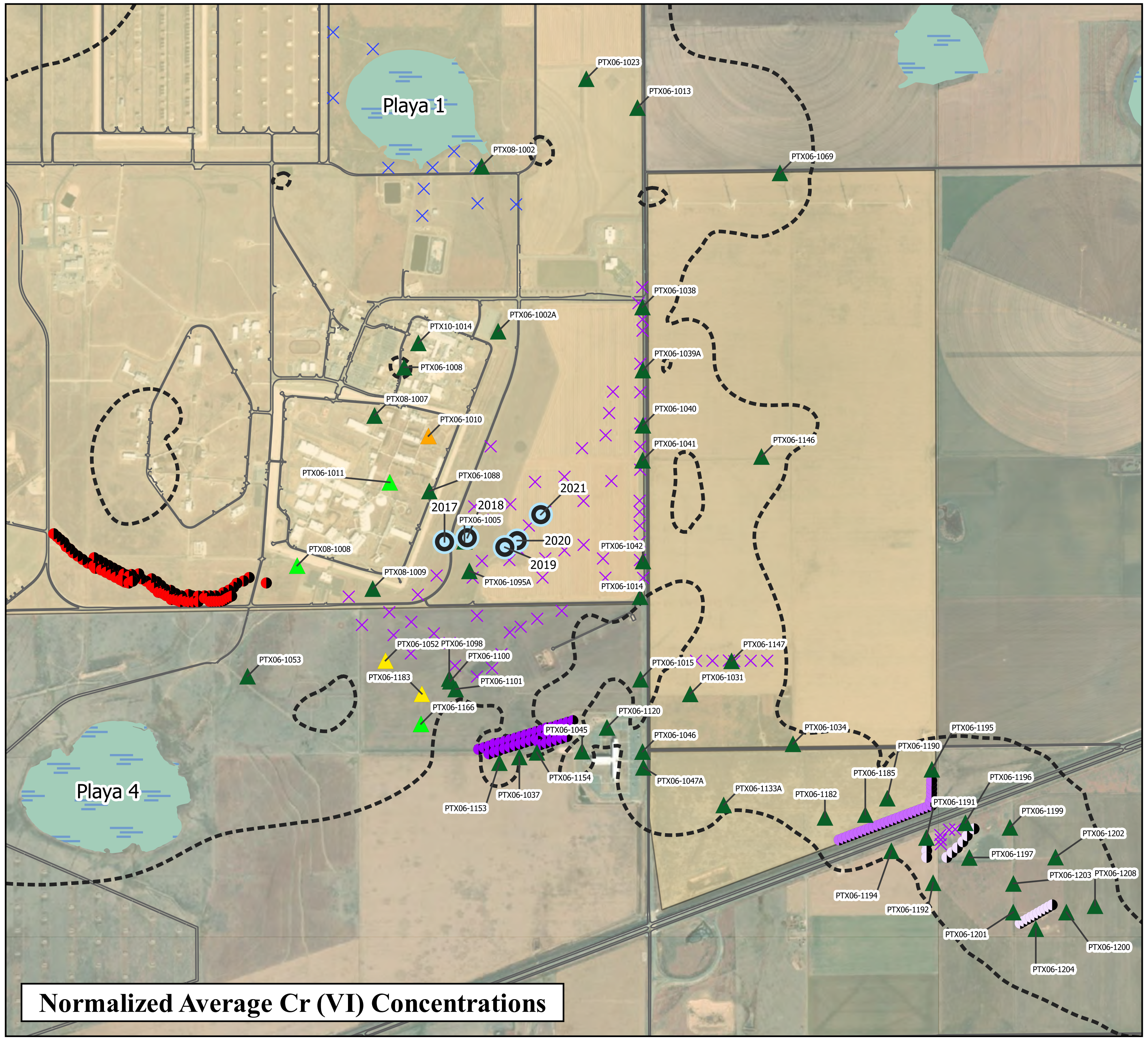
DNT4A - 4-amino-2,6-dinitrotoluene
GWPS - Groundwater Protection Standard
P&T - Pump and Treat
ISB - In Situ Bioremediation
USDOE - United States Department of Energy

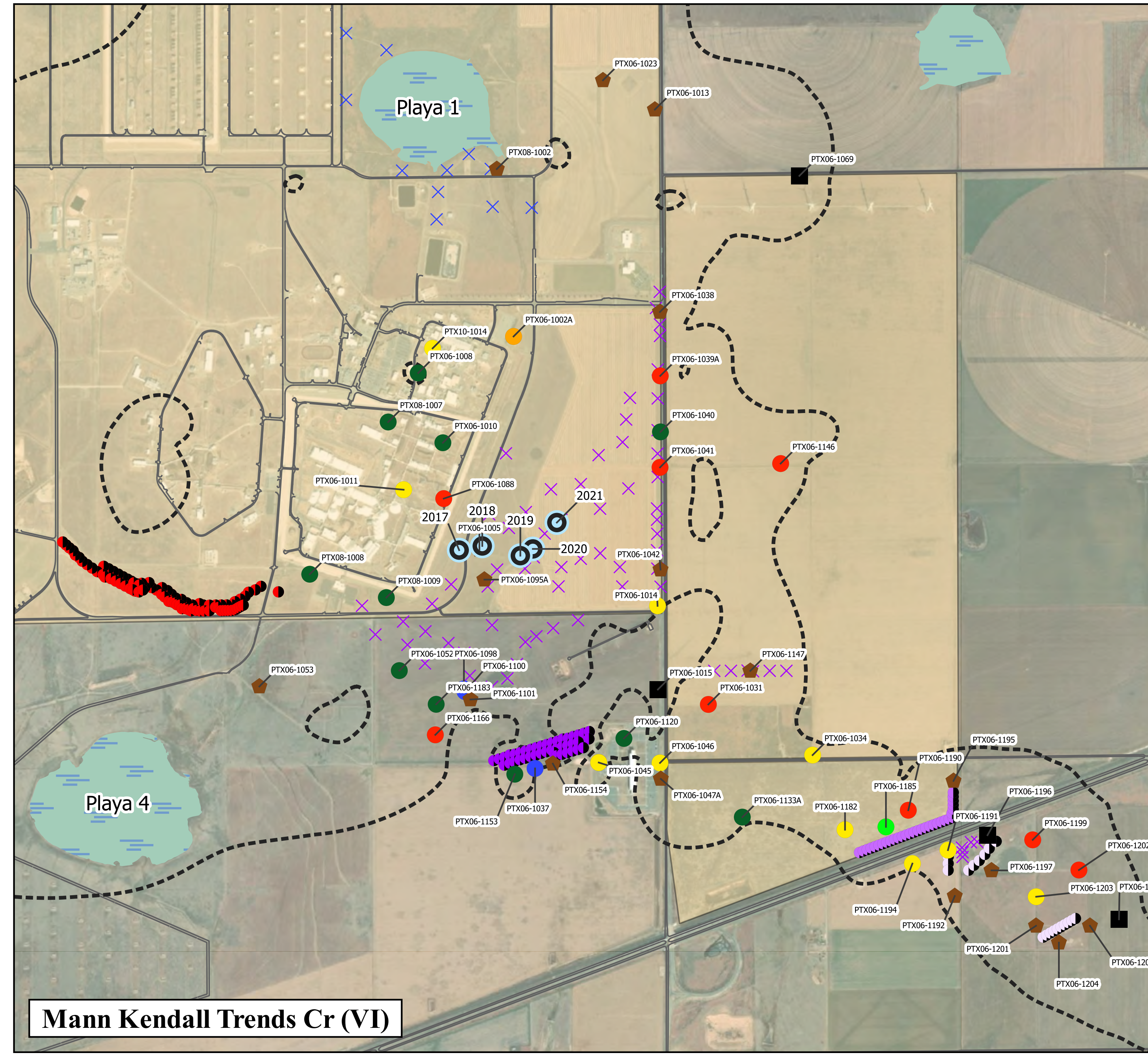
HGL HydroGeoLogic, Inc

PANTEX SOUTHEAST SECTOR PERCHED
DNT4A AVERAGE CONCENTRATIONS,
FIRST MOMENTS AND
MANN-KENDALL TRENDS

Carson County, Texas

GIS Job No.	GS401D	Issued	7 June, 2022
Drawn By:	JM	Revised	6 September, 2022
Checked By:	MV	Map ID	--
Approved By:	MV		FIGURE 4





Legend

Normalized Cr (VI) Concentration GWPS Cr (VI) = 100 ug/L

- < 0.5
- 0.5 - 1
- 1 -10
- 10 - 100
- 100 - 1000
- >1000

Mann Kendal Trend Cr (VI)

- Decreasing
- Probably Decreasing
- Stable
- Probably Increasing
- Increasing
- Non Detect (2017 - 2021)
- No Trend
- Insufficient Data

Cr (VI) First Moments

- First Moments

Remedies

- Southeast P&T Extraction Well
- Playa 1 P&T Extraction Well
- Zone 11 ISB
- Southeast ISB
- Southeast ISB Extension
- Offsite ISB
- Extent of Perched Unit - 2021
- USDOE Property

Scale (ft)

0 2,500 5,000

N

Notes:

1. Normalized average Cr (VI) concentrations calculated using the average concentration 2017 - 2021 divided by the GWPS.
2. First Moments are the center of mass for Cr (VI) using quarterly consolidated data.
3. Mann Kendall trends were determined for Cr (VI) 2017 - 2021.

Cr (VI) - Hexavalent Chromium
GWPS - Groundwater Protection Standard
P&T - Pump and Treat
ISB - In Situ Bioremediation
USDOE - United States Department of Energy

HGL HydroGeoLogic, Inc

PANTEX SOUTHEAST SECTOR PERCHED
Cr (VI) AVERAGE CONCENTRATIONS, FIRST MOMENTS AND MANN-KENDALL TRENDS

Carson County, Texas

GIS Job No.	GS401D	Issued	30 June, 2022
Drawn By:	JM	Revised	6 September, 2022
Checked By:	MV	Map ID	--
Approved By:	MV		FIGURE 5

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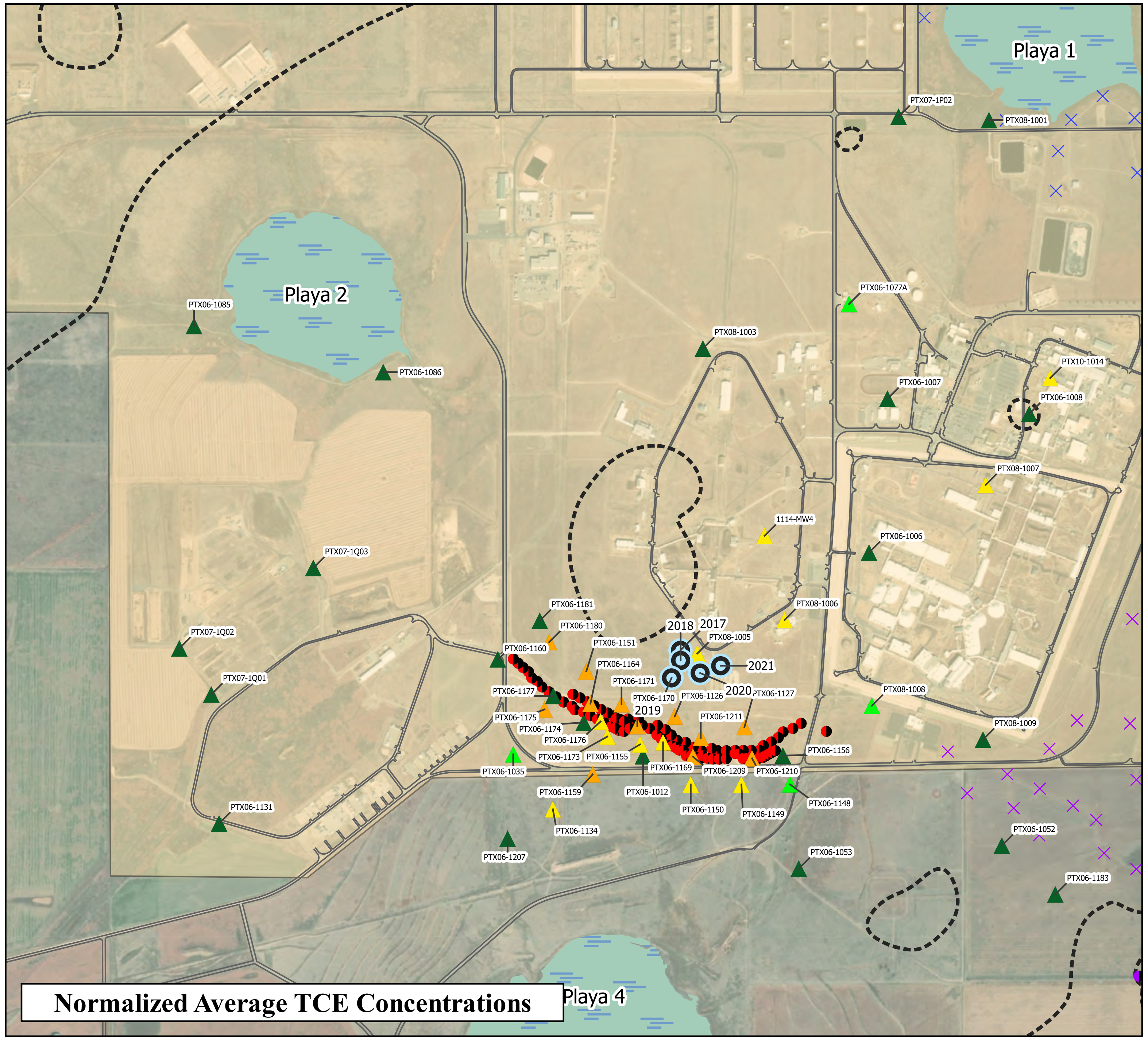
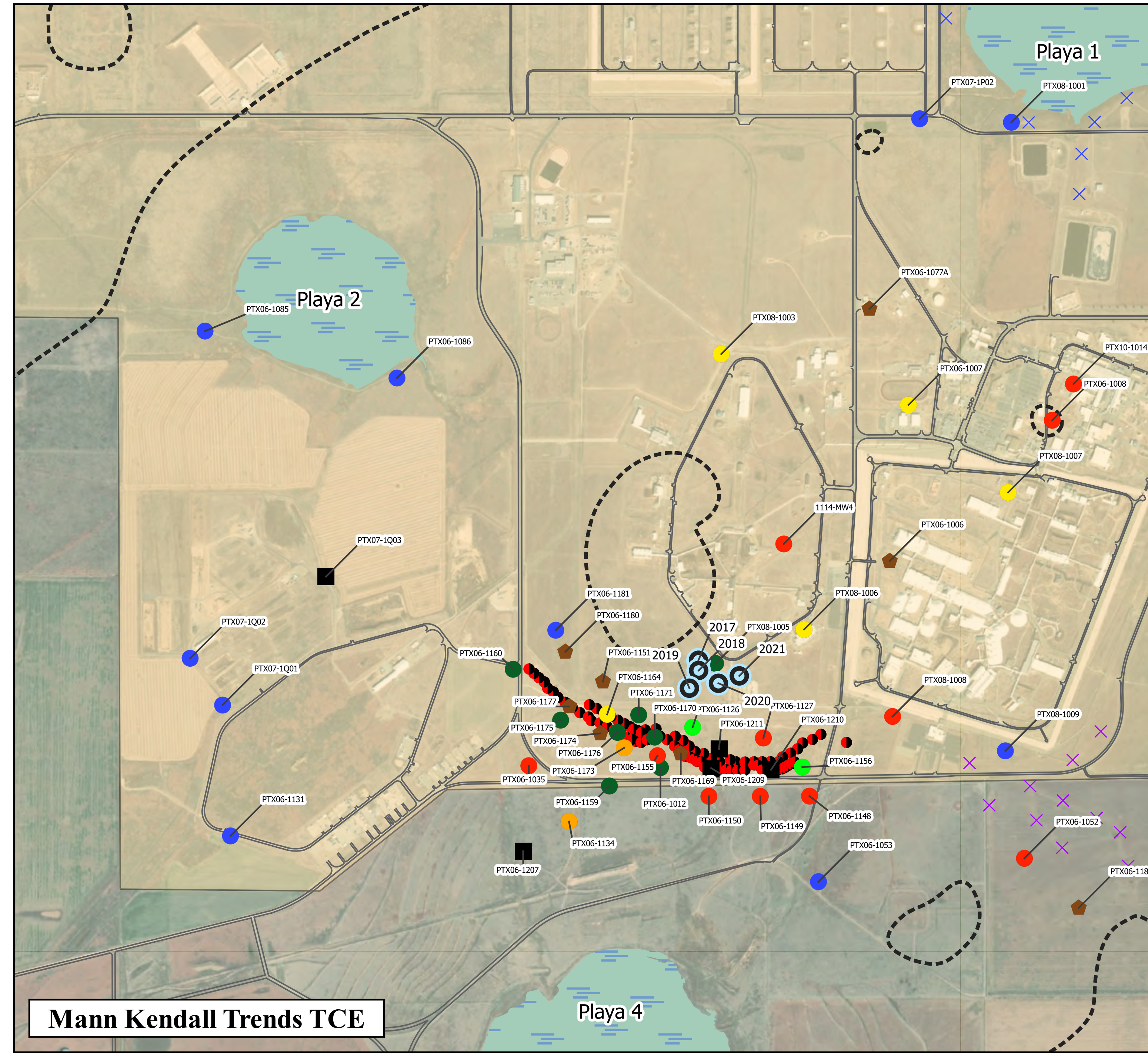




Legend

Normalized TCE Concentration GWPS TCE = 5 ug/L
- < 0.5
- 0.5 - 1
- 1 -10
- 10 - 100
- 100 - 1000
- >1000

Mann Kendal Trend TCE
- Decreasing
- Probably Decreasing
- Stable
- Probably Increasing
- Increasing
- Non Detect (2017 - 2021)
- No Trend
- Insufficient Data

TCE First Moments
- First Moments

Remedies
- Southeast P&T Extraction Well
- Playa 1 P&T Extraction Well
- Zone 11 ISB
- Southeast ISB
- Southeast ISB Extension
- Offsite ISB
- Extent of Perched Unit - 2021
- USDOE Property

Scale (ft)

0 2,500 5,000

N

Notes:
1. Normalized average TCE concentrations calculated using the average concentration 2017 - 2021 divided by the GWPS.
2. First Moments are the center of mass for TCE using quarterly consolidated data.
3. Mann Kendall trends were determined for TCE 2017 - 2021.

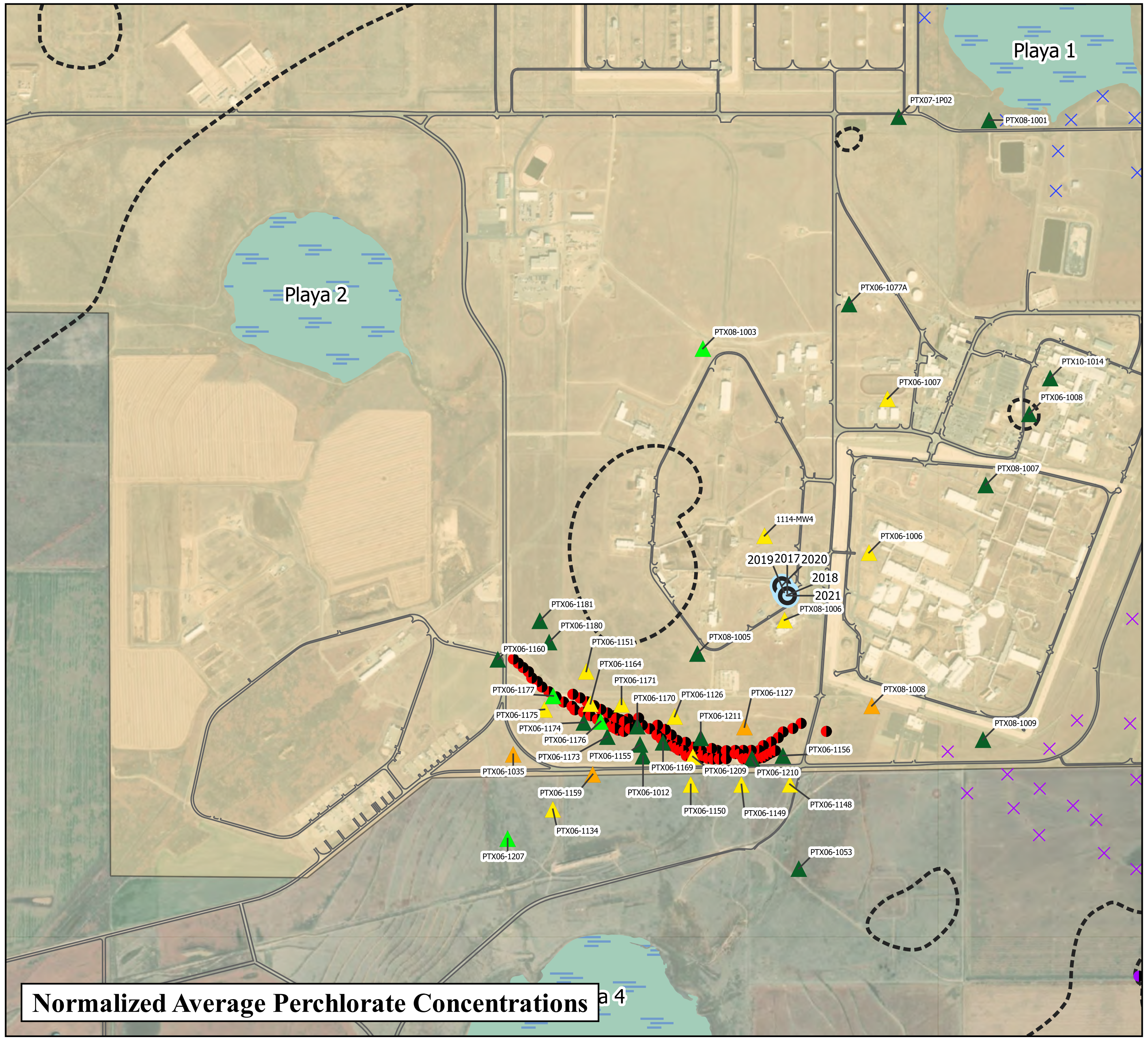
TCE - Trichloroethene
GWPS - Groundwater Protection Standard
P&T - Pump and Treat
ISB - In Situ Bioremediation
USDOE - United States Department of Energy

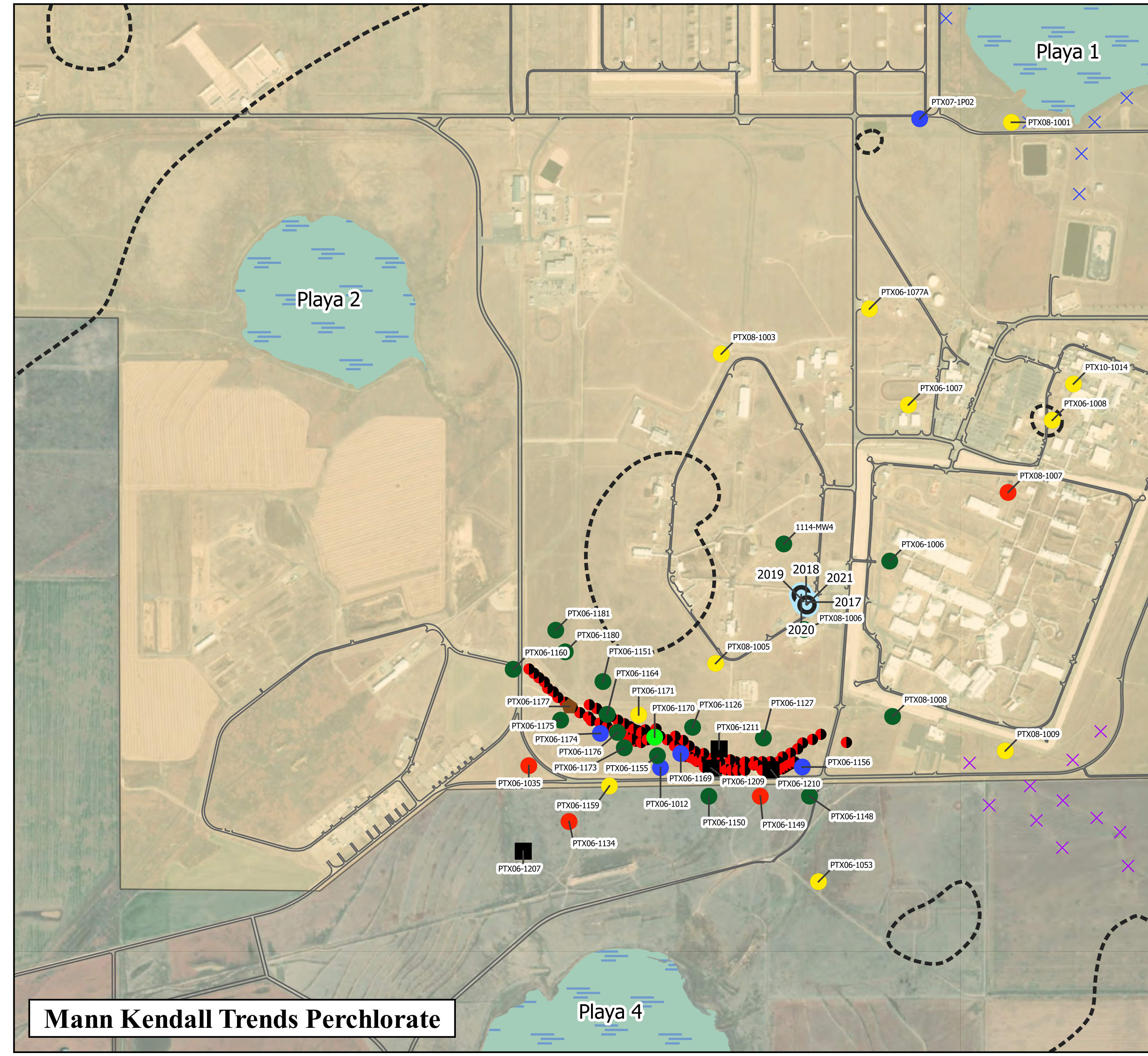
HGL HydroGeoLogic, Inc

PANTEX SOUTHWEST SECTOR PERCHED
TCE AVERAGE CONCENTRATIONS, FIRST MOMENTS AND MANN-KENDALL TRENDS

Carson County, Texas

GIS Job No.	GS401D	Issued	24 May, 2022
Drawn By:	JM	Revised	6 September, 2022
Checked By:	MV	Map ID	--
Approved By:	MV		FIGURE 6





Legend

Normalized Perchlorate Concentration
GWPS Perchlorate = 15 ug/L

- < 0.5
- 0.5 - 1
- 1 -10
- 10 - 100
- 100 - 1000
- >1000
- Extent of Perched Unit - 2021
- USDOE Property

Mann Kendal Trend Perchlorate

- Decreasing
- Probably Decreasing
- Stable
- Probably Increasing
- Increasing
- Non Detect (2017 - 2021)
- No Trend
- Insufficient Data

Perchlorate First Moments

- First Moments

Remedies

- Southeast P&T Extraction Well
- Playa 1 P&T Extraction Well
- Zone 11 ISB
- Southeast ISB
- Southeast ISB Extension
- Offsite ISB

Scale (ft)
0 2,500 5,000
N

Notes:
1. Normalized average perchlorate concentrations calculated using the average concentration 2017 - 2021 divided by the GWPS.
2. First Moments are the center of mass for perchlorate using quarterly consolidated data.
3. Mann Kendall trends were determined for perchlorate 2017 - 2021.

GWPS - Groundwater Protection Standard
P&T - Pump and Treat
ISB - In Situ Bioremediation
USDOE - United States Department of Energy

HGL HydroGeoLogic, Inc

PANTEX SOUTHWEST SECTOR PERCHED
PERCHLORATE AVERAGE CONCENTRATIONS, FIRST MOMENTS AND MANN-KENDALL TRENDS

Carson County, Texas

GIS Job No.	GS401D	Issued	24 May, 2022
Drawn By:	JM	Revised	6 September, 2022
Checked By:	MV	Map ID	--
Approved By:	MV		FIGURE 7

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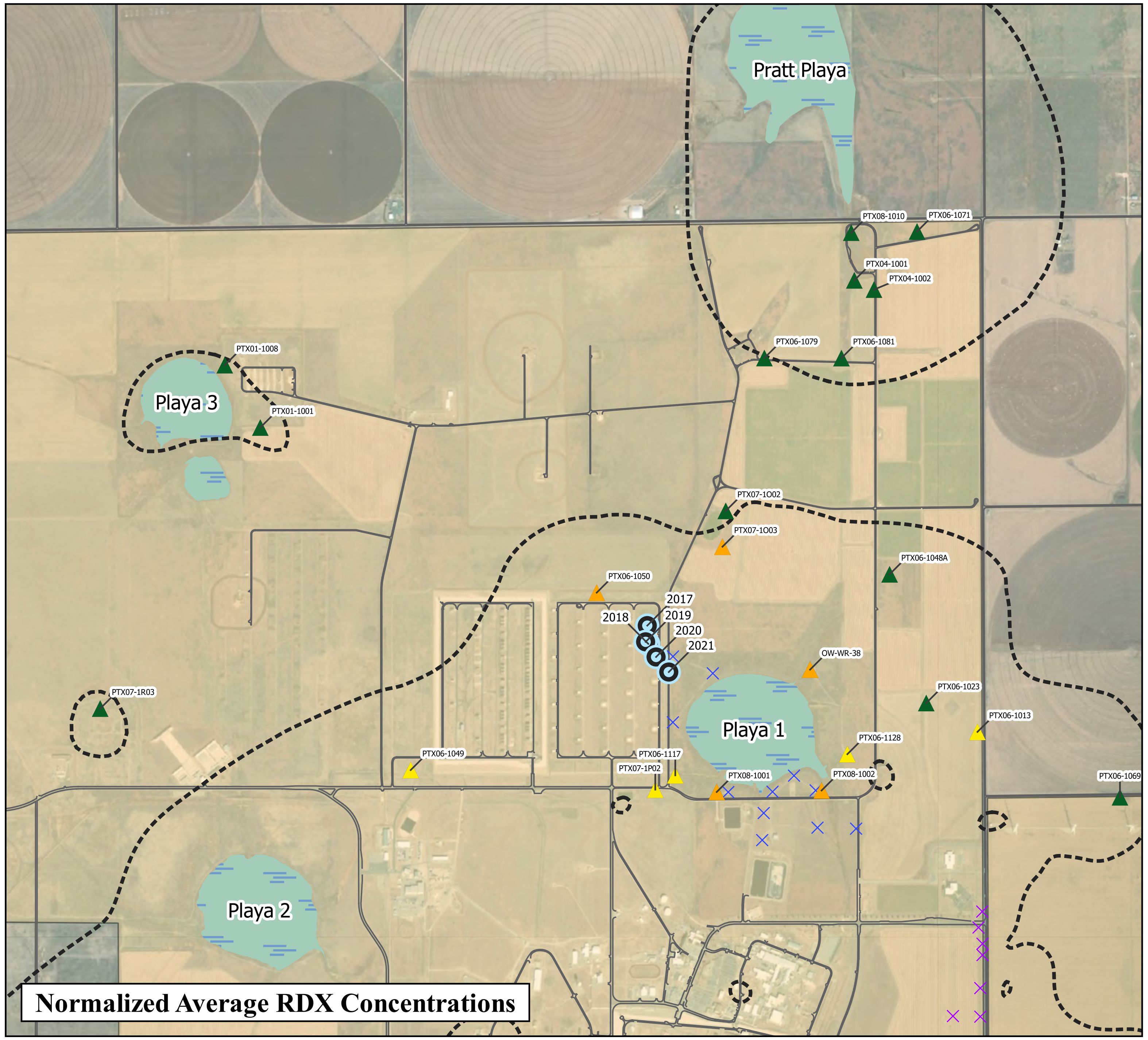
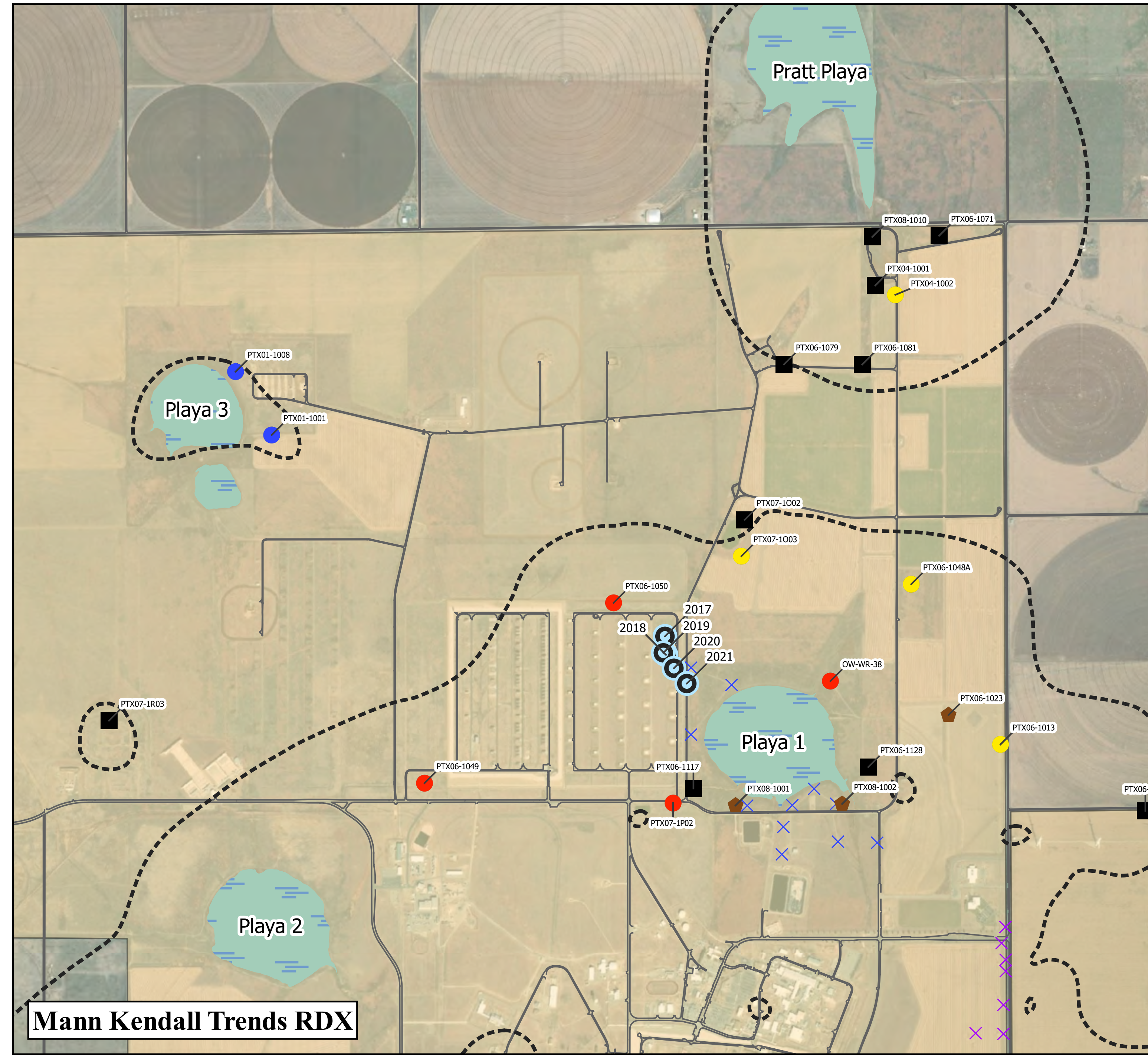




Legend

Normalized RDX Concentration GWPS RDX = 2 ug/L
- < 0.5
- 0.5 - 1
- 1 -10
- 10 - 100
- 100 - 1000
- >1000

Mann Kendal Trend RDX
- Decreasing
- Probably Decreasing
- Stable
- Probably Increasing
- Increasing
- Non Detect (2017 - 2021)
- No Trend
- Insufficient Data

RDX First Moments
- First Moments

Remedies
- Southeast P&T Extraction Well
- Playa 1 P&T Extraction Well
- Zone 11 ISB
- Southeast ISB
- Southeast ISB Extension
- Offsite ISB
- Extent of Perched Unit - 2021
- USDOE Property

Scale (ft)
0 2,500 5,000

N

Notes:
1. Normalized average RDX concentrations calculated using the average concentration 2017 - 2021 divided by the GWPS.
2. First Moments are the center of mass for RDX using quarterly consolidated data.
3. Mann Kendall trends were determined for RDX 2017 - 2021.

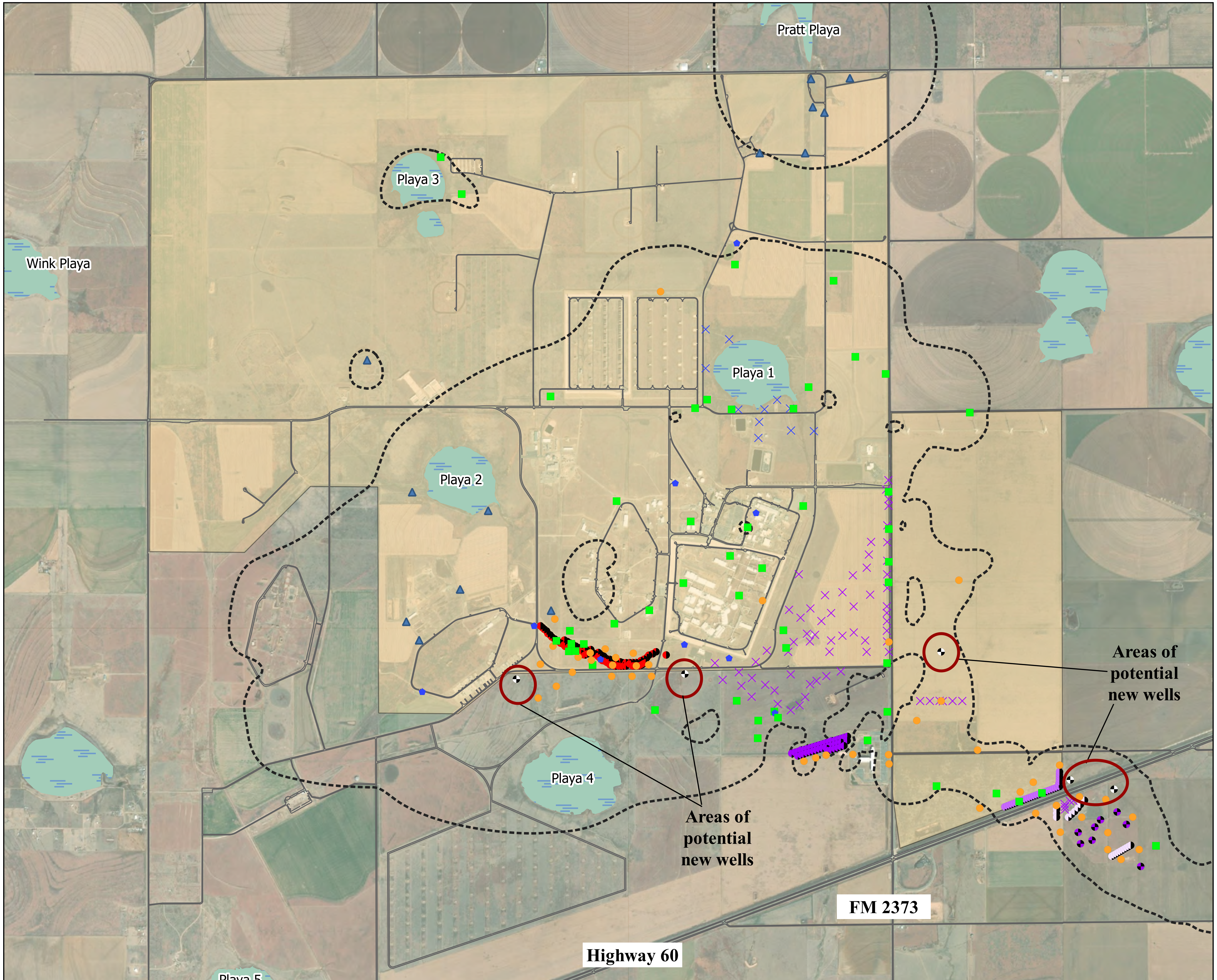
RDX - Hexahydro-1,3,5-trinitro-1,3,5-triazine
GWPS - Groundwater Protection Standard
P&T - Pump and Treat
ISB - In Situ Bioremediation
USDOE - United States Department of Energy

HGL HydroGeoLogic, Inc

PANTEX NORTH SECTOR PERCHED
RDX AVERAGE CONCENTRATIONS,
FIRST MOMENTS AND
MANN-KENDALL TRENDS

Carson County, Texas

GIS Job No.	GS401D	Issued	24 May, 2022
Drawn By:	JM	Revised	6 September, 2022
Checked By:	MV	Map ID	--
Approved By:	MV		FIGURE 8



N

Legend

Remedies
- Southeast P&T Extraction Well
- Playa 1 P&T Extraction Well
- Zone 11 ISB
- Southeast ISB
- Southeast ISB Extension
- Offsite ISB
- USDOE Property
- Extent of Perched Unit - 2021
- Playas

Recommended Sampling Frequency Investigation Wells
- 5 year
- Biennial
- Annual
- Semi-annual
- Potential New Well
- Planned New Well

Notes:
Spatial data received from Pantex Plant.
USDOE: United States Department of Energy

Scale (ft)
0 2,500 5,000

HGL HydroGeoLogic, Inc

PANTEX PERCHED GROUNDWATER
FINAL RECOMMENDED
MONITORING NETWORK
Carson County, Texas

GIS Job No.	GS401D	Issued	20 June, 2022
Drawn By:	JM	Revised	6 September, 2022
Checked By:	MV	Map ID	--
Approved By:	MV		FIGURE 9

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APPENDIX A

REFERENCES

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APPENDIX B

DATA AND RESULTS TABLES

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TABLE B-1
PANTEX PLANT INVESTIGATION MONITORING WELLS 2021: PERCHED GROUNDWATER

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Monitoring Sectors	Well Type	Current Sampling Frequency	Monitoring Objectives	Initial Saturated Thickness [FT]
1114-MW4	SWArea	IW	Annual	UM	14.11
OW-WR-38	NArea	IW	Annual	UM, RA	8.00
PTX01-1001	NArea	IW	Annual	UM/POC	0.36
PTX01-1008	NArea	IW	Annual	UM/POC	(dry)
PTX04-1001	NArea	IW		None	15.93
PTX04-1002	NArea	IW	5 Years	UM	14.71
PTX06-1002A	SEArea	IW	Annual	UM, RA	No Data
PTX06-1005	SEArea	IW	Semiannual	UM, RA	28.13
PTX06-1006	SWArea	IW	Annual	PS	No Data
PTX06-1007	SWArea	IW	Annual	UM	28.26
PTX06-1008	SWArea/SE	IW	Annual	UM	3.72
PTX06-1010	SEArea	IW	Annual	UM	7.00
PTX06-1011	SEArea	IW	Annual	UM	23.55
PTX06-1012	SWArea	ISPM	Semiannual	PS, RA	12.97
PTX06-1013	NArea/SE	IW	Annual	RA	6.59
PTX06-1014	SEArea	IW	Annual	RA	8.86
PTX06-1015	SEArea	IW	Annual	RA	7.47
PTX06-1023	NArea/SE	IW	Annual	RA, POC	11.96
PTX06-1031	SEArea	IW	Semiannual	RA, POC	7.70
PTX06-1034	SEArea	IW	Semiannual	PS, RA, POC	8.05
PTX06-1035	SWArea	IW	Semiannual	PS	6.67
PTX06-1037	SEArea	ISPM	Semiannual	RA	0.60
PTX06-1038	SEArea	IW	Annual	RA	21.20
PTX06-1039A	SEArea	IW	Annual	RA	12.02
PTX06-1040	SEArea	IW	Semiannual	RA	18.21
PTX06-1041	SEArea	IW	Semiannual	RA	35.00
PTX06-1042	SEArea	IW	Semiannual	RA/POC	17.00
PTX06-1045	SEArea	ISPM	Annual	RA/POC	1.20
PTX06-1046	SEArea	IW	Semiannual	RA/POC	11.50
PTX06-1047A	SEArea	IW	Semiannual	RA	4.60
PTX06-1048A	NArea	IW	Annual	PS, RA	8.15
PTX06-1049	NArea	IW	Annual	PS	10.00
PTX06-1050	NArea	IW	Annual	UM, RA/POC	34.00
PTX06-1052	SWArea/SE	IW	Semiannual	RA/POC	13.92
PTX06-1053	SWArea/SE	IW	Annual	UM, PS	5.75
PTX06-1069	NArea/SE	IW	Annual	PS	5.30
PTX06-1071	NArea	IW	5 Years	UM	28.00
PTX06-1077A	SWArea	IW	Annual	UM	6.50
PTX06-1079	NArea	IW		None	(dry)
PTX06-1081	NArea	IW		None	15.80
PTX06-1082	PantexLake	IW	5 Years	UM	9.48
PTX06-1083	PantexLake	IW	5 Years	UM	22.60
PTX06-1085	SWArea	IW	5 Years	UM	21.30
PTX06-1086	SWArea	IW	5 Years	UM	43.70
PTX06-1088	SEArea	IW	Semiannual	UM, RA	-2.00
PTX06-1095A	SEArea	IW	Semiannual	RA, UM	19.60
PTX06-1098	SEArea	ISPM	Annual	RA	No Data
PTX06-1100	SEArea	ISPM		None	5.09
PTX06-1101	SEArea	ISPM	Annual	RA,	No Data

See Notes End of Table

PTX06-1117	NArea	IW		None	33.35

TABLE B-1
PANTEX PLANT INVESTIGATION MONITORING WELLS 2021: PERCHED GROUNDWATER

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Monitoring Sectors	Well Type	Current Sampling Frequency	Monitoring Objectives	Initial Saturated Thickness [FT]
PTX06-1120	SEArea	IW	Annual	PS	7.58
PTX06-1126	SWArea	IW	Semiannual	PS/POC	18.47
PTX06-1127	SWArea	IW	Semiannual	PS/POC	22.38
PTX06-1128	NArea	IW		None	No Data
PTX06-1131	SWArea	IW	Annual	UM	6.62
PTX06-1133A	SEArea	IW	Semiannual	PS	31.00
PTX06-1134	SWArea	IW	Semiannual	PS	11.24
PTX06-1146	SEArea	IW	Semiannual	PS/POC	22.62
PTX06-1147	SEArea	IW	Semiannual	PS	16.58
PTX06-1148	SWArea/SE	ISPM	Semiannual	RA	No Data
PTX06-1149	SWArea	ISPM	Semiannual	RA	15.00
PTX06-1150	SWArea	ISPM	Semiannual	RA	No Data
PTX06-1151	SWArea	IW	Semiannual	PS	6.22
PTX06-1153	SEArea	ISPM	Semiannual	RA/POC	5.60
PTX06-1154	SEArea	ISPM	Semiannual	RA/POC	1.12
PTX06-1155	SWArea	ISPM	Semiannual	RA/POC	7.84
PTX06-1156	SWArea	ISPM	Semiannual	RA/POC	19.05
PTX06-1159	SWArea	IW	Semiannual	PS	17.00
PTX06-1160	SWArea	IW	Semiannual	PS	24.46
PTX06-1164	SWArea	TZM	Semiannual	TZM	19.00
PTX06-1166	SEArea	IW	Annual	PS	7.27
PTX06-1169	SWArea	TZM	Semiannual	TZM	16.85
PTX06-1170	SWArea	TZM	Semiannual	TZM	16.04
PTX06-1171	SWArea	IW	Annual	PS	14.92
PTX06-1173	SWArea	ISPM	Semiannual	RA	15.71
PTX06-1174	SWArea	ISPM	Semiannual	RA	14.57
PTX06-1175	SWArea	ISPM	Semiannual	RA	15.94
PTX06-1176	SWArea	TZM	Semiannual	TZM	16.40
PTX06-1177	SWArea	TZM	Semiannual	TZM	11.71
PTX06-1180	SWArea	IW	Semiannual	PS	18.00
PTX06-1181	SWArea	IW		None	21.80
PTX06-1182	SEArea	IW	Semiannual	PS	6.70
PTX06-1183	SWArea/SE	IW	Semiannual	PS	8.50
PTX06-1184	SEArea	IW	NA	PS	-1.19
PTX06-1185	SEArea	IW	Semiannual	PS	3.93
PTX06-1190	SEArea	IW	Semiannual	PS	6.32
PTX06-1191	SEArea	ISPM	Semiannual	PS, RA	11.83
PTX06-1192	SEArea	IW	Semiannual	PS	12.97
PTX06-1194	SEArea	ISPM	Semiannual	PS, RA	1.04
PTX06-1195	SEArea	IW	Annual	PS	7.03
PTX06-1196	SEArea	ISPM	Semiannual	PS, RA	9.83
PTX06-1197	SEArea	IW	Semiannual	PS	6.39
PTX06-1199	SEArea	IW	Semiannual	PS	9.90
PTX06-1200	SEArea	IW	Semiannual	PS	10.24
PTX06-1201	SEArea	IW	Semiannual	PS	11.18
PTX06-1202	SEArea	IW	Semiannual	PS	7.25
PTX06-1203	SEArea	IW	Semiannual	PS	10.64
PTX06-1204	SEArea	IW	Semiannual	PS	15.81
See Notes End of Table					
PTX06-1207	SWArea	IW	Semiannual	PS	11.90
PTX06-1208	SEArea	IW	Semiannual	PS	3.68

TABLE B-1
PANTEX PLANT INVESTIGATION MONITORING WELLS 2021: PERCHED GROUNDWATER

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Monitoring Sectors	Well Type	Current Sampling Frequency	Monitoring Objectives	Initial Saturated Thickness [FT]
PTX06-1209	SWArea	TZM	Semiannual	TZM	13.44
PTX06-1210	SWArea	TZM	Semiannual	TZM	15.70
PTX06-1211	SWArea	IW	Semiannual	PS	15.54
PTX06-1213	SEArea	TZM	Semiannual	TZM	7.30
PTX06-1214	SEArea	TZM	Semiannual	TZM	9.30
PTX07-1O02	NArea	IW	Annual	UM, PS, RA/POC	7.58
PTX07-1O03	NArea	IW	Annual	UM, PS, RA	10.68
PTX07-1P02	NArea/SW	IW	Annual	UM/POC	22.00
PTX07-1Q01	SWArea	IW	5 Years	UM	12.22
PTX07-1Q02	SWArea	IW	5 Years	UM	24.78
PTX07-1Q03	SWArea	IW		None	36.62
PTX07-1R03	NArea	IW	5 Years	UM	1.40
PTX08-1001	NArea/SW	IW	Annual	UM, RA	48.00
PTX08-1002	NArea/SE	IW	Annual	UM, RA	30.00
PTX08-1003	SWArea	IW	Annual	PS	20.19
PTX08-1005	SWArea	IW	Annual	UM	14.40
PTX08-1006	SWArea	IW	Semiannual	UM	32.10
PTX08-1007	SWArea/SE	IW	Annual	UM	33.30
PTX08-1008	SWArea/SE	IW	Semiannual	UM, RA	28.60
PTX08-1009	SWArea/SE	IW	Annual	UM, RA	19.35
PTX08-1010	NArea	IW	5 Years	UM	24.29
PTX10-1014	SWArea/SE	IW	Annual	UM	21.15

Notes

1. Wells listed are monitoring locations sampled at least once between 2017 and 2021.
   Extraction and in situ remedy wells are not included.
2. Monitoring Sectors SE = Southeast; SW = Southwest; N= North. Wells included in two
   Sector analyses are indicated.
3. Well Type, Sampling Frequency, Monitoring Objectives and Initial Saturated Thickness are from
   CNS Pantex well database (May 2022). Blank cells indicate no values were listed in the database.
   No Data -- no data on initial saturation was found in the well database.
   Negative numbers indicate that saturation was only in the sump or was below the level of the fine-grained zone.

IW = Investigation well; ISPM = in situ performance monitoring;
UM = Uncertainty Management; RA = Remedial Action monitoring; PS = Plume Stability;
POC = Point of Compliance, PRB = Permeable reactive barrier; TZM =Treatment zone monitoring.

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TABLE B-2
AQUIFER INPUT PARAMETERS

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Parameter	Units	Southeast	Southwest	North
Current Plume Length	ft	7000	8000	Various
Maximum Plume Length	ft	7000	8000	Various
Plume Width	ft	6400	6000	Various
Seepage Velocity (ft/yr)*	ft/yr	140	62	70
Distance to Receptors	ft	8000	10000	8000
Groundwater Fluctuations	--	No	No	No
Source Treatment	--	Pump and treat/ In situ bioremediation		
Plume Type	--	Explosives, VOCs		
NAPL Present		No	No	No
Number of investigation wells (2012 - 2016)	--	50	53	27
Parameter		**Value**		
Groundwater flow direction		S/SE	S/SW	Various (45)
Porosity	--	0.25	0.25	0.25
Source Location near Well	--	PTX06-1010	PTX08-1006	Playa 1 (various)
Source X-Coordinate	ft	639886.625	636400.4375	639580.323
Source Y-Coordinate	ft	3758067	3756761.75	3764100.313
Coordinate System		NAD 83 SP Texas North FT		
Average Saturated Thickness Perched Zone	ft	30		
Priority Constituents		**MSC**	**Basis**	**Sectors Affected**
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	µg/L	2	$GW\text{-}Res_c$	All
4-Amino-2,6-Dinitrotoluene (DNT4A)	µg/L	1.2	$GW\text{-}Res_{NCAdj}$	All
2-Amino-4,6-Dinitrotoluene (DNT2A)	µg/L	1.2	$GW\text{-}Res_{NCAdj}$	Southeast
2,4,6-Trinitrotoluene (TNT)	µg/L	3.6	$GW\text{-}Res_{NCAdj}$	Southeast
2,4-Dinitrotoluene (24DNT)	µg/L	1	PQL	Southeast
Chromium (VI)	µg/L	100	MCL	Southeast
Perchlorate	µg/L	15	$GW\text{-}Res_{NC}$	Southwest
Trichloroethene	µg/L	5	MCL	Southwest

Notes:

1. Aquifer data from CMS/FS (BWXT, 2007a) and Subsurface Modeling Report (BWXT, 2004).
2. Priority COCs defined by prevalence, toxicity and mobility.
3. Saturated thickness represents an estimated average for the perched unit, which ranges from 0 to 70 ft in saturated thickness.
4. * = a range of transmissivites are present in the aquifer, and groundwater velocity is estimated for each sector.
5. MSC = Medium Specific Concentration, from CMS/FS (BWXT, 2007b).
   GW-Resc = TCEQ Standard No. 2 Groundwater MSC for Residential Use; NC = Noncarcinogenic; C = Carcinogenic;
   Adj = Value adjusted for a cumulative hazard index of 1; PQL = Practical Quantitation Limit; MCL = EPA Maximum Contaminant Level.

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TABLE B-3
PERCHED GROUNDWATER INVESTIGATION WELLS SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Earliest Sample Date	Most Recent Sample Date	Number of Samples (2017-2021)	Primary COC at Well	Additional Objectives
Southeast Sector					
PTX06-1002A	2/23/2017	2/24/2021	8	RDX	Source
PTX06-1005	2/23/2017	8/4/2021	10	RDX	Source
PTX06-1008	5/23/2017	5/4/2021	5	1,2-DICHLOROETHANE	Source
PTX06-1010	5/24/2017	5/12/2021	8	CHROMIUM, TOTAL	Source
PTX06-1011	5/24/2017	5/12/2021	5	TCE	Source (SW)
PTX06-1013	4/25/2017	4/21/2021	5	RDX	SEPTS (N)
PTX06-1014	7/17/2017	8/4/2021	5	RDX	SEPTS
PTX06-1015	2/28/2017	8/21/2018	4	RDX	SEPTS
PTX06-1023	2/23/2017	2/8/2021	8	RDX	POC
PTX06-1031	5/15/2017	10/27/2021	11	RDX	East POC
PTX06-1034	2/21/2017	8/24/2021	10	RDX	East POC **
PTX06-1037	2/6/2017	8/3/2021	14	None	Dry/ISPM **
PTX06-1038	2/20/2017	2/8/2021	9	RDX	(SW)
PTX06-1039A	2/27/2017	2/24/2021	8	RDX	
PTX06-1040	2/27/2017	11/3/2021	10	RDX	SEPTS
PTX06-1041	2/27/2017	11/3/2021	10	RDX	SEPTS
PTX06-1042	2/20/2017	10/25/2021	10	RDX	SEPTS/POC
PTX06-1045	8/14/2019	5/26/2021	4	RDX	Dry/POC /ISPM **
PTX06-1046	3/1/2017	10/26/2021	10	RDX	SEPTS/POC/ **
PTX06-1047A	3/1/2017	10/26/2021	9	RDX	**
PTX06-1052	2/28/2017	8/18/2021	10	CHROMIUM, TOTAL	POC
PTX06-1053	5/8/2017	2/8/2021	8	None	**
PTX06-1069	7/28/2021	7/28/2021	1	None	(SW)
PTX06-1088	5/24/2017	11/9/2021	10	RDX	Delineation (N)
PTX06-1095A	2/27/2017	11/3/2021	10	RDX	Source
PTX06-1098	4/25/2017	6/23/2021	8	None	ISPM
PTX06-1100	9/6/2017	6/23/2021	5	None	ISPM
PTX06-1101	9/6/2017	6/23/2021	5	RDX	ISPM
PTX06-1120	6/1/2017	10/26/2021	4	RDX	Dry **
PTX06-1133A	5/15/2017	5/5/2021	9	CHROMIUM, TOTAL	**
PTX06-1146	2/21/2017	8/24/2021	10	RDX	
PTX06-1147	5/15/2017	10/27/2021	10	RDX	
PTX06-1148	2/9/2017	11/8/2021	17	PERCHLORATE	ISPM
PTX06-1153	2/6/2017	8/3/2021	23	RDX	East (POC)/ISPM **
PTX06-1154	2/6/2017	8/3/2021	16	TNX	East (POC)/ISPM **
PTX06-1166	2/21/2017	7/21/2021	8	RDX	
PTX06-1182	4/25/2017	11/1/2021	11	RDX	East
PTX06-1183	5/1/2017	11/1/2021	10	CHROMIUM, TOTAL	
PTX06-1184	7/10/2017	7/10/2017	1	RDX	East
PTX06-1185	7/10/2017	11/1/2021	10	RDX	(SW)

See Notes end of Table

TABLE B-3
PERCHED GROUNDWATER INVESTIGATION WELLS SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Earliest Sample Date	Most Recent Sample Date	Number of Samples (2017-2021)	Primary COC at Well	Additional Objectives
Southeast Sector					
PTX06-1190	1/24/2018	10/27/2021	10	RDX	
PTX06-1191	2/13/2018	8/16/2021	8	RDX	ISPM *
PTX06-1192	2/14/2018	8/16/2021	8	CHROMIUM, HEXAVALENT	*
PTX06-1194	2/13/2018	8/16/2021	8	RDX	ISPM *
PTX06-1195	2/14/2018	10/26/2021	6	RDX	
PTX06-1196	8/20/2018	8/16/2021	7	RDX	ISPM *
PTX06-1197	8/20/2018	8/16/2021	7	RDX	*
PTX06-1199	8/20/2018	8/16/2021	7	RDX	*
PTX06-1200	2/20/2019	8/23/2021	6	BORON	*
PTX06-1201	1/14/2019	8/23/2021	7	RDX	*
PTX06-1202	1/15/2019	8/16/2021	7	RDX	*
PTX06-1203	2/21/2019	8/23/2021	6	RDX	*
PTX06-1204	2/20/2019	8/23/2021	7	RDX	*
PTX06-1208	3/2/2021	8/23/2021	2	CHROMIUM, TOTAL	*
PTX06-1213	11/15/2021	11/15/2021	1	CHROMIUM, TOTAL	
PTX06-1214	11/15/2021	11/15/2021	1	None	
PTX08-1002	5/17/2017	11/8/2021	8	RDX	
PTX08-1007	5/24/2017	5/12/2021	5	1,2-DICHLOROETHANE	Source
PTX08-1008	5/18/2017	11/10/2021	10	PERCHLORATE	Source
PTX08-1009	5/18/2017	3/1/2021	8	RDX	
PTX10-1014	5/23/2017	8/18/2021	10	TCE	

Notes:
1. Wells listed are investigation wells in current monitoring program. Wells that are intermittently dry are indicated (Dry).
   ISPM = In situ remedy performance monitoring; East = Location east of FM2373; Source = Designated source area well.
   SEPTS = Extraction picket in SE Sector; SE ISB = Southeast In Situ Bioremediation
   (SW) = well also included in Southwest Sector analysis; (N) = well also included in North Sector analysis.
   POC = point of compliance well
   * = downgradient of SE Extension/Off-site ISB; ** = downgradient of Southeast ISB for trend aggregate analysis.
2. Sampling dates for wells range from January 2017 (earliest sample dates) to December 2021 (most recent sample dates).
3. The priority chemical of concern (COC) at each well is the constituent detected at the highest level normalized by the MSC or appropriate RRS. The priorty constituent does not necessarily exceed the MSC.
4. Number of samples is the number of individual sample dates in the database for the priority COC, results from duplicate samples from the same date are averaged.
5. RDX = Hexahydro, 1,3,5-trinitro, 1,3,5-triazine; TCE = trichloroethene.
6. MAROS Goup is the goup assigned for an aggregate trend determination:
7. Wells with stainless steel construction can show false positive metal (Cr, Fe, Ni, etc.) detections.
   ISPM wells can have transient high metals cocentration due to redox changes.

TABLE B-4
MONITORING WELL TREND SUMMARY RESULTS SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

WellName	Number of Samples	Number of Detects	Percent Detection	Maximum Concentration [µg/L]	Maximum Above MSC?	Average Concentration [µg/L]	Average Above MSC?	Mann-Kendall Trend (2012 - 2016)	Mann-Kendall Trend (2017 - 2021)
RDX Southeast Sector									
PTX06-1002A	10	10	100%	**41**	Yes	**26.09**	Yes	D	PI
PTX06-1005	11	11	100%	**34**	Yes	**13.13**	Yes	PD	S
PTX06-1008	5	0	0%	DL	No	DL	No	ND	ND
PTX06-1010	8	8	100%	**2**	Yes	1.61	No	D	NT
PTX06-1011	5	5	100%	1.10	No	0.63	No	NT	S
PTX06-1013	5	5	100%	**6**	Yes	**5.30**	Yes	PD	S
PTX06-1014	5	5	100%	**706**	Yes	**594.20**	Yes	S	S
PTX06-1015	4	4	100%	**969**	Yes	**893.25**	Yes	D	S
PTX06-1023	10	4	40%	0.65	No	0.20	No	D	NT
PTX06-1031	12	12	100%	**848**	Yes	**650.82**	Yes	PI	NT
PTX06-1034	10	10	100%	**1,250**	Yes	**996.80**	Yes	I	NT
PTX06-1037	14	2	14%	0.21	No	0.14	No	D	D
PTX06-1038	10	10	100%	**117**	Yes	**92.62**	Yes	D	D
PTX06-1039A	9	9	100%	**1,140**	Yes	**743.44**	Yes	S	S
PTX06-1040	10	10	100%	**1,190**	Yes	**886.30**	Yes	NT	S
PTX06-1041	10	10	100%	**1,680**	Yes	**1,092.40**	Yes	S	NT
PTX06-1042	10	10	100%	**475**	Yes	**367.50**	Yes	D	S
PTX06-1045	5	5	100%	**58**	Yes	**23.00**	Yes	N/A	D
PTX06-1046	10	10	100%	**1,470**	Yes	**780.20**	Yes	PI	D
PTX06-1047A	10	10	100%	**92**	Yes	**44.97**	Yes	D	PD
PTX06-1052	11	3	27%	0.14	No	0.13	No	D	NT
PTX06-1053	8	5	62%	0.14	No	0.13	No	I	NT
PTX06-1069	1	0	0%	0.13	No	0.13	No	NT	N/A
PTX06-1088	10	10	100%	**141**	Yes	**35.80**	Yes	D	I
PTX06-1095A	10	10	100%	**618**	Yes	**100.41**	Yes	NT	D
PTX06-1098	8	1	12%	0.13	No	0.13	No	NT	S
PTX06-1100	5	0	0%	DL	No	DL	No	ND	ND
PTX06-1101	5	5	100%	**59**	Yes	**39.20**	Yes	I	NT
PTX06-1120	4	4	100%	**2,850**	Yes	**1,435.00**	Yes	S	D
PTX06-1133A	10	1	10%	0.34	No	0.15	No	S	S
PTX06-1146	10	10	100%	**2,100**	Yes	**1,263.30**	Yes	S	PI
PTX06-1147	11	11	100%	**952**	Yes	**678.75**	Yes	S	S
PTX06-1148	17	2	12%	0.21	No	0.13	No	S	PD
PTX06-1153	30	30	100%	**838**	Yes	**337.75**	Yes	NT	I
PTX06-1154	16	3	19%	0.86	No	0.18	No	D	PD
PTX06-1166	8	8	100%	**18**	Yes	**13.81**	Yes	S	S
PTX06-1182	12	11	92%	**23**	Yes	**4.99**	Yes	N/A	D
PTX06-1183	10	0	0%	0.13	No	0.13	No	ND	ND
PTX06-1184	1	1	100%	0.11	No	0.11	No	S	N/A
PTX06-1185	11	11	100%	**724**	Yes	**464.33**	Yes	PI	D
PTX06-1190	11	11	100%	**1,700**	Yes	**948.61**	Yes	D	I
PTX06-1191	8	8	100%	**164**	Yes	**129.44**	Yes	S	PI
PTX06-1192	8	1	12%	0.14	No	0.13	No	N/A	S
PTX06-1194	12	2	17%	0.15	No	0.13	No	N/A	S
PTX06-1195	6	2	33%	0.14	No	0.13	No	N/A	S
PTX06-1196	7	7	100%	**34**	Yes	**25.84**	Yes	N/A	I
PTX06-1197	8	8	100%	**279**	Yes	**193.36**	Yes	N/A	I
PTX06-1199	7	7	100%	**9**	Yes	**6.90**	Yes	N/A	I
PTX06-1200	8	0	0%	DL	No	DL	No	N/A	ND
PTX06-1201	7	7	100%	**10**	Yes	**5**	Yes	N/A	I
PTX06-1202	7	6	86%	**0.22**	No	**0.17**	No	N/A	PI

See Notes end of Table

TABLE B-4
MONITORING WELL TREND SUMMARY RESULTS SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

WellName	Number of Samples	Number of Detects	Percent Detection	Maximum Concentration [µg/L]	Maximum Above MSC?	Average Concentration [µg/L]	Average Above MSC?	Mann-Kendall Trend (2012 - 2016)	Mann-Kendall Trend (2017 - 2021)
PTX06-1203	6	6	100%	**244**	Yes	**159.77**	Yes	N/A	I
PTX06-1204	7	5	71%	1.09	No	0.35	No	N/A	PI
PTX06-1208	3	0	0%	0.13	No	0.13	No	N/A	N/A
PTX06-1213	1	0	0%	0.63	No	0.63	No	N/A	N/A
PTX06-1214	1	0	0%	0.13	No	0.13	No	N/A	N/A
PTX08-1002	9	9	100%	**142**	Yes	**26.95**	Yes	S	NT
PTX08-1007	5	5	100%	**3**	Yes	**2.84**	Yes	S	S
PTX08-1008	10	2	20%	2.15	Yes	0.33	No	NT	NT
PTX08-1009	9	6	67%	0.35	No	0.14	No	D	NT
PTX10-1014	6	6	100%	**3**	Yes	**1.66**	No	S	NT

Notes

1. Trends were evaluated for data collected between January 2017 and December 2020. Trends from 2012- 2016 indicated. Data were not consolidated by time.
2. Number of Samples is the number of samples evaluated for the compound at this location during 2017 - 2021
   Number of Detects is the number of samples where the compound was detected at this location.
3. The maximum concentration for the COC is the maximum analytical result analyzed between 2017 and 2021. Results above MSCs are indicated in **Bold**.
4. MSCs = Medium Specific Concentration from Corrective Measure Study. RDX = 2 µg/L;
5. D = Decreasing; PD = Probably Decreasing; S = Stable; PI = Probably Increasing; I = Increasing; N/A = Insufficient Data to determine trend;
   NT = No Trend; ND = well has all non-detect results for COC; ND* = one detection for compound, may be unaffected.
6. Recent Mann-Kendall trend results are illustrated on Figures 3 and 4.

TABLE B-5
SUMMARY STATISTICS RESULTS RDX SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

WellName	Recent Above MSC	RDX Concentration µg/L Mean	Median	SD	COV	95% UCL RDX [µg/L]	Distribution	Outlier
RDX Southeast Sector								
PTX06-1002A	TRUE	24.4	27.4	14.4	0.59	**38.56**	Normal	FALSE
PTX06-1005	TRUE	12.7	8.1	9.7	0.77	**20.38**	Lognormal	TRUE
PTX06-1008	FALSE	0.1	0.0	0.0	0.00	**DL**	Normal	FALSE
PTX06-1010	FALSE	1.6	1.5	0.5	0.31	**2.03**	Normal	FALSE
PTX06-1011	FALSE	0.6	0.8	0.4	0.59	**1.09**	Normal	FALSE
PTX06-1013	TRUE	5.3	5.5	1.0	0.19	**6.54**	Normal	FALSE
PTX06-1014	TRUE	594.2	549.0	96.7	0.16	**714.32**	Normal	FALSE
PTX06-1015	TRUE	893.3	889.0	80.4	0.09	**1021.25**	Normal	FALSE
PTX06-1023	FALSE	0.2	0.0	0.2	1.12	**0.35**	No distribution	TRUE
PTX06-1031	TRUE	650.2	659.0	122.1	0.19	**736.81**	Normal	FALSE
PTX06-1034	TRUE	996.8	928.0	183.1	0.18	**1127.76**	Normal	FALSE
PTX06-1037	FALSE	0.2	0.0	0.0	0.00	**0.16**	No distribution	FALSE
PTX06-1038	TRUE	89.2	83.1	16.2	0.18	**106.36**	Normal	FALSE
PTX06-1039A	TRUE	722.3	632.0	230.9	0.32	**941.90**	Normal	FALSE
PTX06-1040	TRUE	886.3	817.0	178.2	0.20	**1013.76**	Normal	FALSE
PTX06-1041	TRUE	1092.4	1000.0	312.6	0.29	**1315.99**	Normal	FALSE
PTX06-1042	TRUE	367.5	351.0	62.9	0.17	**412.49**	Normal	FALSE
PTX06-1045	TRUE	22.8	22.0	21.4	0.94	**62.30**	Normal	FALSE
PTX06-1046	TRUE	780.2	588.0	469.3	0.60	**1115.93**	Normal	FALSE
PTX06-1047A	TRUE	47.0	43.3	25.6	0.54	**65.18**	Normal	FALSE
PTX06-1052	FALSE	0.1	0.0	0.0	0.00	**0.13**	Normal	FALSE
PTX06-1053	FALSE	0.1	0.0	0.0	0.00	**0.14**	Normal	FALSE
PTX06-1069	FALSE	0.1	0.0	0.0	0.00	**N/A**	No distribution	FALSE
PTX06-1088	TRUE	35.8	13.9	43.4	1.21	**66.82**	Lognormal	TRUE
PTX06-1095A	TRUE	100.4	23.9	187.2	1.86	**234.32**	Lognormal	TRUE
PTX06-1098	FALSE	0.1	0.0	0.0	0.00	**0.14**	No distribution	TRUE
PTX06-1100	FALSE	0.1	0.0	0.0	0.00	**DL**	Normal	FALSE
PTX06-1101	TRUE	39.2	43.1	14.8	0.38	**57.61**	Normal	FALSE
PTX06-1120	TRUE	1435.0	886.0	960.1	0.67	**2962.67**	Normal	TRUE
PTX06-1133A	FALSE	0.0	0.0	0.0	0.00	**0.20**	No distribution	TRUE
PTX06-1146	TRUE	1263.3	1120.0	352.3	0.28	**1515.31**	Lognormal	TRUE
PTX06-1147	TRUE	676.5	653.5	155.2	0.23	**795.66**	Normal	FALSE
PTX06-1148	FALSE	0.0	0.0	0.1	1.76	**0.15**	No distribution	FALSE
PTX06-1153	TRUE	359.1	280.5	154.5	0.43	**430.60**	No distribution	TRUE
PTX06-1154	FALSE	0.2	0.0	0.2	1.41	**0.28**	No distribution	TRUE
PTX06-1166	TRUE	13.8	13.7	2.3	0.17	**15.72**	Normal	FALSE
PTX06-1182	FALSE	4.6	0.3	8.8	1.93	**11.10**	No distribution	TRUE
PTX06-1183	FALSE	0.1	0.0	0.0	0.00	**0.13**	Normal	FALSE
PTX06-1184	FALSE	0.1	0.0	0.0	0.00	**N/A**	No distribution	FALSE
PTX06-1185	TRUE	472.7	469.0	196.5	0.42	**609.75**	Normal	FALSE
PTX06-1190	TRUE	931.3	955.0	473.4	0.51	**1305.30**	Normal	FALSE
PTX06-1191	TRUE	129.4	126.0	22.7	0.18	**148.39**	Normal	FALSE
PTX06-1192	FALSE	0.1	0.0	0.0	0.00	**0.14**	Normal	FALSE
PTX06-1194	FALSE	0.0	0.0	0.1	3.17	**0.14**	No distribution	TRUE
PTX06-1195	FALSE	0.1	0.0	0.0	0.00	**0.14**	No distribution	FALSE
PTX06-1196	TRUE	25.8	24.7	5.2	0.20	**30.62**	Normal	FALSE
PTX06-1197	TRUE	195.9	176.0	47.5	0.24	**240.31**	Normal	FALSE
PTX06-1199	TRUE	6.9	7.0	1.7	0.25	**8.48**	Normal	FALSE

TABLE B-5
SUMMARY STATISTICS RESULTS RDX SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

WellName	Recent Above MSC	RDX Concentration µg/L				95% UCL RDX [µg/L]	Distribution	Outlier
		Mean	Median	SD	COV			
PTX06-1200	FALSE	0.2	0.0	0.0	0.00	**DL**	No distribution	FALSE
See Notes End of Table								
PTX06-1201	TRUE	4.4	3.1	3.7	0.83	**8.81**	No distribution	FALSE
PTX06-1202	FALSE	0.2	0.2	0.0	0.22	**0.21**	Normal	FALSE
PTX06-1203	TRUE	159.8	139.0	56.8	0.36	**219.41**	No distribution	FALSE
PTX06-1204	FALSE	0.3	0.1	0.4	1.23	**0.75**	No distribution	TRUE
PTX06-1208	FALSE	0.1	0.0	0.0	0.00	**0.13**	Normal	FALSE
PTX06-1213	FALSE	0.6	0.0	0.0	0.00	**N/A**	No distribution	FALSE
PTX06-1214	FALSE	0.1	0.0	0.0	0.00	**N/A**	No distribution	FALSE
PTX08-1002	TRUE	25.2	11.3	44.1	1.75	**66.05**	No distribution	TRUE
PTX08-1007	TRUE	2.8	2.9	0.4	0.13	**3.28**	Normal	FALSE
PTX08-1008	TRUE	0.3	0.0	0.9	2.61	**0.79**	No distribution	TRUE
PTX08-1009	FALSE	0.1	0.1	0.1	0.87	**0.22**	No distribution	TRUE
PTX10-1014	TRUE	2.0	1.8	1.0	0.51	**2.84**	Normal	FALSE

Notes:
1. Summary statistics calculated using Kaplan Meier method.
2. Distribution determined by Shapiro Wilk method. Normal = normal distribution, Lognormal = log normal distribution;
   No distribution = neither normal nor lognormal or insufficient data; other distributions not tested.
3. Outlier in dataset determined by Dixon's method. Outliers are usually high values.
4. N/A = insufficient data. ND = Non-Detect, DL =detection limit.

TABLE B-6
SPATIAL ANALYSIS SUMMARY RESULTS SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	RDX Average Slope Factor	RDX Slope Factor COV	Area of Influence [FT^2]	DNT4A Average Slope Factor	DNT4A Slope Factor COV	Recommendation After Qualitative Review
PTX06-1002A	*0.17*	**1.10**	5.90E+06	0.75	0.85	Retain for northern source
PTX06-1005	*0.11*	0.47	2.78E+06	0.32	0.24	Retain, source
PTX06-1008	**0.84**	0.05	9.54E+05	*0.22*	0.22	Retain for 1,2-DCA
PTX06-1010	*0.23*	0.24	2.70E+06	0.65	0.07	Retain (Cr source)
PTX06-1011	0.51	0.76	2.17E+06	0.54	0.03	Retain (TCE)
PTX06-1013	*0.15*	0.33	3.63E+06	0.72	0.13	Retain (DNT4A north)
PTX06-1014	*0.18*	0.00	1.09E+06	*0.17*	0.21	Retain, source
PTX06-1015	*0.30*	0.00	1.32E+06	*0.29*	0.25	May be redundant with PTX06-1031
PTX06-1023	**0.81**	0.49	9.59E+05	0.76	0.13	Retain (DNT4A)
PTX06-1031	*0.24*	0.00	1.67E+06	*0.20*	0.26	May be redundant with PTX06-1015
PTX06-1034	*0.25*	0.00	4.71E+06	*0.20*	0.11	Retain
PTX06-1037	**0.85**	0.17	5.28E+05	0.65	0.17	Retain
PTX06-1038	*0.05*	0.02	5.72E+06	*0.10*	0.27	Reduced monitoring schedule
PTX06-1039A	*0.13*	0.00	1.99E+06	*0.23*	0.08	Retain
PTX06-1040	*0.07*	0.00	2.44E+06	*0.17*	0.06	Retain
PTX06-1041	*0.11*	0.00	3.63E+06	*0.15*	0.04	Retain
PTX06-1042	*0.05*	0.00	2.98E+06	*0.10*	0.22	Retain
PTX06-1045	*0.19*	0.74	1.06E+06	0.56	0.28	Retain
PTX06-1046	0.36	0.02	5.90E+05	0.38	0.74	Retain
PTX06-1047A	*0.18*	0.22	1.53E+06	*0.30*	**1.09**	Retain
PTX06-1052	0.78	0.04	1.33E+06	0.53	0.29	Retain
PTX06-1053	0.65	0.05	4.67E+05	0.38	0.41	Retain [Cr (VI)]
PTX06-1069	**0.95**	0.00	4.59E+06	**0.91**	0.00	Retain
PTX06-1088	0.44	0.29	1.60E+06	0.45	0.45	Retain
PTX06-1095A	*0.26*	0.34	2.65E+06	0.27	0.48	Retain
PTX06-1098	0.78	0.11	1.14E+06	0.51	0.02	Retain
PTX06-1100	0.78	0.02	7.13E+04	0.27	0.02	Retain
PTX06-1101	0.70	0.19	9.53E+05	0.44	0.18	Retain
PTX06-1120	0.37	0.00	7.66E+05	0.45	0.48	Retain
PTX06-1133A	**0.92**	0.70	2.40E+06	**0.83**	0.15	Retain (delineation)
PTX06-1146	*0.22*	0.00	1.38E+07	*0.29*	0.02	Retain
PTX06-1147	0.32	0.00	5.17E+06	*0.29*	0.03	Retain
PTX06-1148	0.60	0.15	5.14E+05	0.59	0.17	Retain (SW)
PTX06-1153	**0.83**	0.01	8.81E+05	0.74	0.52	Retain
PTX06-1154	0.74	0.31	3.88E+05	0.54	0.22	Retain
PTX06-1166	*0.30*	0.02	1.14E+06	*0.28*	0.09	Retain (groundwater divide)
PTX06-1182	0.56	**1.65**	1.02E+06	0.52	**1.02**	Retain
PTX06-1184	**0.98**	0.00	1.14E+06	**0.90**	0.00	Retain (near edge of saturated zone PTX06-9906)
PTX06-1185	*0.19*	0.02	4.45E+05	*0.16*	0.66	Retain
PTX06-1190	0.35	0.00	1.05E+06	0.40	0.19	Retain
PTX06-1191	0.53	0.01	5.31E+05	*0.28*	0.38	Retain
PTX06-1192	**0.81**	0.21	7.44E+05	0.67	0.15	Retain
PTX06-1194	**0.82**	0.67	7.55E+05	0.65	0.51	Retain (delineation)
PTX06-1195	**0.92**	0.33	7.59E+06	0.74	0.20	Retain (delineation)
PTX06-1196	*0.11*	0.03	8.71E+05	*0.18*	0.12	Retain

See Notes End of Table

TABLE B-6
SPATIAL ANALYSIS SUMMARY RESULTS SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	RDX Average Slope Factor	RDX Slope Factor COV	Area of Influence [FT^2]	DNT4A Average Slope Factor	DNT4A Slope Factor COV	Recommendation After Qualitative Review
PTX06-1197	0.31	0.01	6.91E+05	*0.15*	0.08	Retain
PTX06-1199	*0.17*	0.06	1.75E+06	*0.11*	0.06	Retain
PTX06-1200	0.77	0.16	3.78E+05	0.79	0.20	Retain
PTX06-1201	*0.11*	0.53	4.27E+05	*0.10*	0.44	Retain
PTX06-1202	0.79	0.04	8.01E+05	0.50	0.02	Retain
PTX06-1203	0.51	0.02	6.98E+05	0.47	0.06	Retain
PTX06-1204	0.53	0.62	9.93E+04	*0.21*	0.48	Retain
PTX06-1208	0.37	0.01	1.24E+05	0.66	0.03	Retain
PTX06-1213	0.59	0.00	5.92E+05	*0.01*	0.00	Retain
PTX06-1214	**0.96**	0.00	4.15E+05	**0.92**	0.00	Retain
PTX08-1002	0.41	0.12	3.53E+06	0.56	**1.22**	Retain
PTX08-1007	0.54	0.09	1.20E+06	0.39	0.02	Retain
PTX08-1008	0.67	0.45	2.26E+06	0.62	0.96	Retain
PTX08-1009	0.64	0.37	2.53E+06	0.47	0.02	Retain
PTX10-1014	0.38	0.45	1.74E+06	0.35	0.04	Retain

Notes:

1. Slope Factor (SF) is the difference between the actual concentration and the concentration estimated from nearby wells normalized by the actual concentration. Slope factors close to 1 show the concentrations cannot be estimated from the adjacent wells, and the well is important in the network.
2. Slope factors were calculated using data collected between January 2017 and November 2021.
3. Well locations with slope factors below 0.3 and area ratios below 0.8 were considered for elimination.
   Average slope factors below 0.3 are shown in *italic* and those above 0.8 are shown in **Bold**.
   SF COV above 1 are shown in **Bold**, indicating locations with fluctuating concentrations.
5. Locations identified for future elimination should be reviewed, and possibly removed from the program after 5 years of data collection.
6. PTX10-1013 not evaluated for RDX. Evaluated in SW Sector for TCE.

TABLE B-7
SAMPLING FREQUENCY ANALYSIS RESULTS SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Recent Concentration Rate of Change [mg/yr]	Recent MK Trend (2017-2021)	Sampling Frequency Based on Recent Data (2017-2021)	Overall Concentration Rate of Change [mg/yr]	Overall MK Trend (2012 - 2021)	Sampling Frequency Based on Overall Data (2012 - 2021)	MAROS Recommended Sampling Frequency	LTM Plan Sampling Frequency
RDX Southeast Sector								
PTX06-1002A	2.12E-05	PI	Quarterly	1.49E-05	NT	Quarterly	Quarterly	Annual
PTX06-1005	-1.30E-05	S	Biennial	-1.34E-05	S	Biennial	Biennial	Semiannual
PTX06-1008	-7.04E-09	S	Biennial	-7.25E-09	ND	Biennial	Biennial	Annual
PTX06-1010	3.02E-07	NT	Biennial	1.74E-07	NT	Biennial	Biennial	Annual
PTX06-1011	-3.98E-07	S	Biennial	-4.31E-07	S	Biennial	Biennial	Annual
PTX06-1013	-1.12E-06	S	Biennial	-1.12E-06	S	Biennial	Biennial	Annual
PTX06-1014	-3.01E-05	S	Biennial	-3.01E-05	S	Biennial	Biennial	Annual
PTX06-1015	-2.14E-04	S	Quarterly	0.00E+00	N/A	Quarterly	Quarterly	Annual
PTX06-1023	1.31E-07	NT	Biennial	1.40E-07	S	Biennial	Biennial	Annual
PTX06-1031	3.46E-05	NT	Quarterly	3.94E-05	NT	Quarterly	Quarterly	Semiannual
PTX06-1034	5.91E-05	NT	Quarterly	2.13E-05	S	Quarterly	Quarterly	Semiannual
PTX06-1037	-1.13E-08	D	Biennial	-1.20E-08	S	Biennial	Biennial	Semiannual
PTX06-1038	-2.45E-05	D	Biennial	-2.13E-05	D	Biennial	Biennial	Annual
PTX06-1039A	-9.34E-05	S	Biennial	-5.95E-05	S	Biennial	Biennial	Annual
PTX06-1040	-1.30E-04	S	Biennial	-1.31E-04	S	Biennial	Biennial	Semiannual
PTX06-1041	1.95E-04	NT	Quarterly	2.29E-04	NT	Quarterly	Quarterly	Semiannual
PTX06-1042	-3.35E-05	S	Biennial	-3.85E-05	D	Biennial	Biennial	Semiannual
PTX06-1045	-6.39E-05	D	Quarterly	0.00E+00	N/A	Quarterly	Quarterly	Annual
PTX06-1046	-8.08E-04	D	Biennial	-8.19E-04	D	Biennial	Biennial	Semiannual
PTX06-1047A	-1.48E-05	PD	Biennial	-8.21E-06	S	Biennial	Biennial	Semiannual
PTX06-1052	3.78E-09	NT	Biennial	2.94E-09	NT	Biennial	Biennial	Semiannual
PTX06-1053	7.79E-09	NT	Biennial	1.43E-09	S	Biennial	Biennial	Annual
PTX06-1069	0.00E+00	N/A	Annual	0.00E+00	N/A	Annual	Annual	Annual
PTX06-1088	3.66E-05	I	Quarterly	3.86E-05	NT	Quarterly	Quarterly	Semiannual
PTX06-1095A	-2.06E-04	D	Biennial	-2.17E-04	D	Biennial	Biennial	Semiannual
PTX06-1098	-6.93E-09	S	Biennial	-7.88E-09	S	Biennial	Biennial	Annual
PTX06-1100	-3.17E-09	S	Biennial	-3.01E-09	ND	Biennial	Biennial	
PTX06-1101	2.05E-05	NT	Quarterly	1.99E-05	NT	Quarterly	Quarterly	Annual
PTX06-1120	-1.31E-03	D	Biennial	-1.46E-03	D	Biennial	Biennial	Annual
PTX06-1133A	3.17E-08	S	Biennial	2.59E-08	S	Biennial	Biennial	Semiannual
PTX06-1146	4.16E-04	PI	Quarterly	3.91E-04	NT	Quarterly	Quarterly	Semiannual
PTX06-1147	-1.11E-04	S	Biennial	-1.05E-04	S	Biennial	Biennial	Semiannual
PTX06-1148	8.61E-09	PD	Biennial	3.18E-09	S	Biennial	Biennial	Semiannual
PTX06-1153	6.68E-05	I	Quarterly	4.02E-06	NT	Annual	Quarterly	Semiannual
PTX06-1154	4.50E-08	PD	Biennial	-5.18E-09	S	Biennial	Biennial	Semiannual
PTX06-1166	-5.51E-07	S	Biennial	-1.42E-06	S	Biennial	Biennial	Annual
PTX06-1182	-1.29E-05	D	Biennial	-1.35E-05	D	Biennial	Biennial	Semiannual
PTX06-1184	0.00E+00	N/A	FYR	0.00E+00	N/A	Annual	Annual	FYR
PTX06-1185	-3.30E-04	D	Biennial	-3.22E-04	D	Biennial	Biennial	Semiannual
PTX06-1190	9.02E-04	I	Quarterly	9.71E-04	I	Quarterly	Quarterly	Semiannual
PTX06-1191	2.26E-05	PI	Quarterly	1.14E-05	NT	Quarterly	Quarterly	Semiannual
PTX06-1192	-6.33E-09	S	Biennial	-7.12E-09	S	Biennial	Biennial	Semiannual
PTX06-1194	-1.16E-08	S	Biennial	-1.30E-08	S	Biennial	Biennial	Semiannual
PTX06-1195	-8.54E-09	S	Biennial	-4.92E-09	S	Biennial	Biennial	Annual
PTX06-1196	9.73E-06	I	Quarterly	7.47E-06	NT	SemiAnnual	Quarterly	Semiannual
PTX06-1197	1.31E-04	I	Quarterly	1.14E-04	I	Quarterly	Quarterly	Semiannual
PTX06-1199	4.28E-06	I	SemiAnnual	4.32E-06	I	SemiAnnual	SemiAnnual	Semiannual
PTX06-1200	-2.12E-08	S	Annual	0.00E+00	N/A	Annual	Annual	Semiannual
PTX06-1201	9.94E-06	I	Quarterly	0.00E+00	N/A	Quarterly	Quarterly	Semiannual
PTX06-1202	7.15E-08	PI	Annual	0.00E+00	N/A	Annual	Annual	Semiannual

See Notes End of Table

TABLE B-7
SAMPLING FREQUENCY ANALYSIS RESULTS SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Recent Concentration Rate of Change [mg/yr]	Recent MK Trend (2017-2021)	Sampling Frequency Based on Recent Data (2017-2021)	Overall Concentration Rate of Change [mg/yr]	Overall MK Trend (2012 - 2021)	Sampling Frequency Based on Overall Data (2012 - 2021)	MAROS Recommended Sampling Frequency	LTM Plan Sampling Frequency
RDX Southeast Sector								
PTX06-1203	1.65E-04	I	Quarterly	0.00E+00	N/A	Quarterly	Quarterly	Semiannual
PTX06-1204	9.48E-07	PI	SemiAnnual	0.00E+00	N/A	SemiAnnual	SemiAnnual	Semiannual
PTX06-1208	0.00E+00	N/A	Annual	0.00E+00	N/A	Annual	Annual	Semiannual
PTX06-1213	0.00E+00	N/A	Annual	0.00E+00	N/A	Annual	Annual	Semiannual
PTX06-1214	0.00E+00	N/A	Annual	0.00E+00	N/A	Annual	Annual	Semiannual
PTX08-1002	3.17E-05	NT	Quarterly	3.37E-05	NT	Quarterly	Quarterly	Annual
PTX08-1007	-4.11E-07	S	Biennial	-4.35E-07	S	Biennial	Biennial	Annual
PTX08-1008	5.78E-07	NT	Biennial	5.47E-07	NT	Biennial	Biennial	Semiannual
PTX08-1009	5.54E-08	NT	Biennial	5.44E-08	S	Biennial	Biennial	Annual
PTX10-1014	7.67E-07	NT	Biennial	8.58E-07	NT	Biennial	Biennial	Annual

Notes:

1. 'Recent' concentration rate of change and MK trends are calculated from data collected 2017 - 2021.
2. MK = Mann Kendall Trend; D = Decreasing, PD = Probably Decreasing, S = Stable, NT = No Trend, PI = Probably Increasing, I = Increasing, ND = Non-detect, N/A = insufficient data, less than 4 sample events for time interval indicated.
3. Overall rate of change and MK trend are for the full data set (2012-2021) for each well.
4. MAROS Recommended Sampling Frequency is the sampling frequency from MAROS based on both recent and overall trends.
5. LTM Plan (CNS, Database) is the sampling frequency currently implemented.
6. The final recommended sampling frequency is listed on Table 8, and is based on a combination of qualitative and statistical evaluations.

TABLE B-8
FINAL RECOMMENDED MONITORING NETWORK SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	RDX			DNT4A			Sampling Recommendation	Rationale
	Percent Detection	Mann Kendall Trend	Average SF	Percent Detection	Mann Kendall Trend	Average SF		
Southeast Sector								
PTX06-1002A	100	PI	0.17	60	I	0.75	Annual	UM, RA, North source monitoring for RDX - Observe trends while P&T remedy/discharge is modified
PTX06-1005	100	S	0.11	100	D	0.32	Annual	UM, RA, Downgradient from source, spatially important to track reduction in concentrations.
PTX06-1008	0	ND	0.84	60	S	0.22	Annual	UM, Zone 11, delineate plumes for Cr, TCE, perchlorate, 1,2-dichloroethane
PTX06-1010	100	NT	0.23	62	S	0.65	Annual	UM, Monitors diminishing source discharge, historical total Cr
PTX06-1011	100	S	0.51	0	S	0.54	Annual	UM, Historical source of TCE, decreasing trends.
PTX06-1013	100	S	0.15	0	NT	0.72	Annual	RA, Edge of perched unit east of Playa 1. Monitor for boron and RDX.
PTX06-1014	100	S	0.18	100	S	0.17	Annual	RA, Monitors SEPTS near periodically dry area along FM 2373.
PTX06-1015	100	S	0.30	100	NT	0.29	Annual	RA, Monitors decreasing trends downgradient of SEPTS
PTX06-1023	40	NT	0.81	0	S	0.76	Annual	RA, POC, Edge of perched unit east of Playa 1. Monitor for boron and RDX.
PTX06-1031	100	NT	0.24	100	NT	0.20	Semiannual	RA, POC, Monitors RDX plume east of SEPTS, limited saturation and increasing trends
PTX06-1034	100	NT	0.25	100	NT	0.20	Semiannual	POC, Monitors migration path to southeast edge of unit.
PTX06-1037	14	D	0.85	0	D	0.65	Semiannual	RA, POC, Monitors southeastern edge of perched unit, increasing RDX trend,
PTX06-1038	100	D	0.05	100	D	0.10	Annual	RA, Monitores eastern extent of plume and SEPTS efficacy
PTX06-1039A	100	S	0.13	100	NT	0.23	Annual	RA, Monitores eastern extent of plume and SEPTS efficacy
PTX06-1040	100	S	0.07	100	S	0.17	Annual	RA, Monitors north of SEPTS along FM 2373, Stable trends
PTX06-1041	100	NT	0.11	100	PD	0.15	Annual	RA, Monitors variable high mass area along FM2373, monitor response action, stable trends
PTX06-1042	100	S	0.05	100	PD	0.10	Semiannual	RA, POC, Monitors variable high mass area along FM2373, monitor response action
PTX06-1045	100	D	0.19	60	S	0.56	Semiannual	RA, POC, Monitors variable high mass area along FM2373, monitor response action
PTX06-1046	100	D	0.36	100	D	0.38	Semiannual	RA, POC, Monitors variable high mass area along FM2373, monitor response action
PTX06-1047A	100	PD	0.18	100	PD	0.30	Semiannual	RA, Monitors flow path to the Southeast
PTX06-1052	27	NT	0.78	18	NT	0.53	Annual	RA, POC, Monitors decreasing trends downgradient of SEPTS
PTX06-1053	62	NT	0.65	100	PD	0.38	Annual	UM, Cr(VI) and TCE monitoring
PTX06-1069	0	N/A	0.95	0	N/A	0.91	Annual	PS, larger uncertainty between wells, delineates perched unit to the Northeast

See Notes End of Table

TABLE B-8
FINAL RECOMMENDED MONITORING NETWORK SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

	RDX			DNT4A				
Well Name	**Percent Detection**	**Mann Kendall Trend**	**Average SF**	**Percent Detection**	**Mann Kendall Trend**	**Average SF**	**Sampling Recommendation**	**Rationale**
Southeast Sector								
PTX06-1088	100	I	0.44	100	I	0.45	Semiannual	UM, Near source, increasing RDX trends
PTX06-1095A	100	D	0.26	100	D	0.27	Annual	UM, monitors plume migration from sources
PTX06-1098	12	S	0.78	0	S	0.51	Annual	Monitors plume migration upgradient of SE ISB
PTX06-1100	0	ND	0.78	0	S	0.27	Biennial	May be redundant with PTX06-1098 and PTX06-1101. Consider elimination.
PTX06-1101	100	NT	0.70	40	PD	0.44	Annual	Monitors plume migration upgradient of SE ISB
PTX06-1120	100	D	0.37	100	D	0.45	Annual	PS, Cross-gradient of SE ISB
PTX06-1133A	10	S	0.92	0	PD	0.83	Annual	PS, Monitors edge of plume upgradient of SE Off-site area
PTX06-1146	100	PI	0.22	100	NT	0.29	Semiannual	RA, Monitors area near SEPTS along limited saturation zone. High concentration area of potential plume migration.
PTX06-1147	100	S	0.32	100	I	0.29	Semiannual	PS, Monitors highest concentration of RDX in perched unit, cross-gradient from ISB.
PTX06-1148	12	PD	0.60	12	PD	0.59	Semiannual	PS, RA, Downgradient from SW ISB, remedy, very high perchlorate, decreasing trends.
PTX06-1153	100	I	0.83	97	NT	0.74	Semiannual	ISPM, RA, POC, Downgradient of SE ISB, monitors anomalous conditions near ISB remedy.
PTX06-1154	19	PD	0.74	0	D	0.54	Semiannual	ISPM, RA, POC, Downgradient of SE ISB, remedy performance monitoring.
PTX06-1166	100	S	0.30	100	PI	0.28	Annual	PS, Monitors southern edge of groundwater divide, stable trends with exceedances for boron and RDX, cross-gradient from SE ISB may monitor intermittently saturated hydraulic connection around edge of ISB.
PTX06-1182	92	D	0.56	92	D	0.52	Annual	PS, Monitors the edge of the southeastern perched unit, upgradient of SE Offsite RDX plume.
PTX06-1184	100	N/A	0.98	0	N/A	0.90	Semiannual	PS, Delineates edge of SE plume near the SE Off-site ISB, decreasing concentration.
PTX06-1185	100	D	0.19	100	D	0.16	Semiannual	PS, Monitors groundwater entering the SE Off-site ISB
PTX06-1190	100	I	0.35	100	S	0.40	Semiannual	PS, Monitors groundwater entering the SE Off-site ISB. High and increasing concentration.
PTX06-1191	100	PI	0.53	100	D	0.28	Semiannual	RA, Monitors downgradinet of SE Off-site ISB.
PTX06-1192	12	S	0.81	0	S	0.67	Semiannual	RA, Monitors edge of SE Off-site plume. Limited detections.

See Notes End of Table

TABLE B-8
FINAL RECOMMENDED MONITORING NETWORK SOUTHEAST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	RDX			DNT4A			Sampling Recommendation	Rationale
	Percent Detection	Mann Kendall Trend	Average SF	Percent Detection	Mann Kendall Trend	Average SF		
Southeast Sector								
PTX06-1194	17	S	0.82	0	S	0.65	Semiannual	RA, Monitors edge of SE Off-site plume. Limited detections.
PTX06-1195	33	S	0.92	0	D	0.74	Semiannual	RA, Monitors edge of SE Off-site plume. Limited detections.
PTX06-1196	100	I	0.11	100	S	0.18	Semiannual	RA, Monitors area downgradient of SE Off-site ISB.
PTX06-1197	100	I	0.31	100	S	0.15	Semiannual	RA, Monitors area downgradient of SE Off-site ISB.
PTX06-1199	100	I	0.17	100	I	0.11	Semiannual	RA, Monitors edge of SE Off-site plume. Increasing trends.
PTX06-1200	0	ND	0.77	12	S	0.79	Semiannual	Downgradient delineation of the SE Off-site plume.
PTX06-1201	100	I	0.11	100	I	0.10	Semiannual	RA, PS, Monitors plume downgradient of the SE Off-site plume.
PTX06-1202	86	PI	0.79	100	I	0.50	Semiannual	RA, UM, Monitors area south of Zone 11, Cr (VI) and perchlorate plumes.
PTX06-1203	100	I	0.51	100	NT	0.47	Semiannual	Downgradient monitoring north edge of SE Off-site plume. High and increasing trends.
PTX06-1204	71	PI	0.53	100	I	0.21	Semiannual	Downgradient delineation of the SE Off-site plume.
PTX06-1208	0	N/A	0.37	0	N/A	0.66	Annual	Downgradient delineation of the SE Off-site plume.
PTX06-1213	0	N/A	0.59	0	N/A	0.01	Annual	Monitors area within SE Off-site ISB remedy.
PTX06-1214	0	N/A	0.96	0	N/A	0.92	Annual	Monitors area within SE Off-site ISB remedy.
PTX08-1002	100	NT	0.41	89	PD	0.56	Annual	UM, RA, Monitors high concentrations south of Playa 1.
PTX08-1007	100	S	0.54	0	S	0.39	Annual	UM, Monitors Zone 11 source area.
PTX08-1008	20	NT	0.67	80	I	0.62	Biennial	RA, UM, Monitors area south of Zone 11, Cr (VI) and perchlorate plumes.
PTX08-1009	67	NT	0.64	0	PD	0.47	Biennial	RA, UM, Monitors area south of Zone 11/12, limited detections of COCs.
PTX10-1014	100	NT	0.38	0	D	0.35	Biennial	UM, Source area, north of Zone 11/12.

Notes:

1. D = Decreasing; PD = Probably Decreasing; S = Stable; PI = Probably Increasing; I = Increasing; N/A = Insufficient Data to determine result; NT = No Trend; ND = well has all non-detect results for COC indicated.
2. Mann-Kendall trends for 2017 - 2021 are shown.
3. SF = Slope Factor. SF close to 1 indicates well provides unique information in network. SF near 0 indicates well may be redundant.
4. Percent detection is the ratio of the number of detections to the number of samples for the compound indicated multiplied by 100.
5. Some wells are evaluated for other COCs in results from Southwest and North Sectors.
6. PS = Plume Stability, UM = Uncertainty Management, RA = Remedial Action, POC = Point of Compliance

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TABLE B-9
PERCHED GROUNDWATER INVESTIGATION WELLS SOUTHWEST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Earliest Sample Date[3]	Most Recent Sample Date	Number of Samples (2017-2021)	Primary COC at Well	Additional Objectives
Southwest Sector					
1114-MW4	5/1/2017	8/1/2021	9	PERCHLORATE	Source
PTX06-1006	5/1/2017	11/1/2021	5	RDX	Source
PTX06-1007	5/1/2017	11/1/2021	5	DNT4A	Source
PTX06-1008	5/1/2017	5/1/2021	5	1,2-DICHLOROETHANE	Source (SE)
PTX06-1012	2/1/2017	11/1/2021	17	TCE	ISPM
PTX06-1035	2/1/2017	8/1/2021	10	PERCHLORATE	
PTX06-1052	2/1/2017	8/1/2021	11	CHROMIUM, TOTAL	(SE)
PTX06-1053	5/1/2017	2/1/2021	8	None	(SE)
PTX06-1077A	8/1/2017	8/1/2021	5	TCE	
PTX06-1085	5/1/2017	8/1/2021	4	None	
PTX06-1086	5/1/2017	8/1/2021	4	None	
PTX06-1126	5/1/2017	11/1/2021	14	TCE	Upgradient ISB
PTX06-1127	5/1/2017	11/1/2021	14	RDX	
PTX06-1131	5/1/2017	5/1/2021	5	BORON	
PTX06-1134	5/1/2017	11/1/2021	12	TCE	
PTX06-1148	2/1/2017	11/1/2021	19	PERCHLORATE	ISPM (SE)
PTX06-1149	2/1/2017	11/1/2021	16	PERCHLORATE	ISPM
PTX06-1150	2/1/2017	11/1/2021	16	PERCHLORATE	ISPM
PTX06-1151	2/1/2017	8/1/2021	11	TCE	
PTX06-1155	2/1/2017	11/1/2021	18	TCE	ISPM
PTX06-1156	2/1/2017	11/1/2021	16	None	ISPM
PTX06-1159	2/1/2017	8/1/2021	13	TCE	
PTX06-1160	2/1/2017	8/1/2021	12	PERCHLORATE	
PTX06-1164	2/1/2017	11/1/2021	16	TCE	ISTZ
PTX06-1169	5/1/2017	11/1/2021	6	TCE	
PTX06-1170	2/1/2017	11/1/2021	19	TCE	ISTZ
PTX06-1171	8/1/2017	8/1/2021	5	TCE	
PTX06-1173	2/1/2017	11/1/2021	16	TCE	ISPM
PTX06-1174	2/1/2017	11/1/2021	16	TCE	ISPM
PTX06-1175	2/1/2017	11/1/2021	17	TCE	ISPM
PTX06-1176	2/1/2017	11/1/2021	16	TCE	ISTZ
PTX06-1177	2/1/2017	11/1/2021	17	TCE	ISTZ
PTX06-1180	2/1/2017	8/1/2021	10	TCE	
PTX06-1181	8/1/2017	8/1/2021	9	None	
PTX06-1183	5/1/2017	11/1/2021	10	CHROMIUM, TOTAL	
PTX06-1207	8/1/2020	11/1/2021	3	DNT4A	
PTX06-1209	11/1/2021	11/1/2021	1	TCE	ISTZ
PTX06-1210	11/1/2021	11/1/2021	1	TCE	ISTZ
PTX06-1211	11/1/2021	11/1/2021	1	TCE	Upgradient ISB

See Notes End of Table

TABLE B-9
PERCHED GROUNDWATER INVESTIGATION WELLS SOUTHWEST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Earliest Sample Date[3]	Most Recent Sample Date	Number of Samples (2017-2021)	Primary COC at Well	Additional Objectives
Southwest Sector					
PTX07-1P02	5/10/2012	11/2/2016	11	None	(N)
PTX07-1Q01	8/1/2017	8/1/2021	4	None	
PTX07-1Q02	8/1/2017	8/1/2021	4	None	
PTX07-1Q03	8/1/2017	8/1/2019	3	None	
PTX08-1001	5/1/2017	5/1/2021	5	RDX	(N)
PTX08-1003	5/1/2017	2/1/2021	6	None	
PTX08-1005	2/1/2017	2/1/2021	9	TCE	Source
PTX08-1006	2/1/2017	8/1/2021	10	RDX	Source
PTX08-1007	5/1/2017	5/1/2021	5	1,2-DICHLOROETHANE	Source (SE)
PTX08-1008	5/1/2017	11/1/2021	12	CHROMIUM, HEXAVALENT	Source (SE)
PTX08-1009	5/1/2017	2/1/2021	8	None	Source (SE)
PTX10-1014	5/1/2017	8/1/2021	9	TCE	Source (SE)

Notes:

1. Wells listed are investigation wells in current monitoring program. Wells that are intermittently dry are indicated (Dry). ISPM = In situ remedy performance monitoring; ISTZ = In situ treatment zone monitoring
2. Sampling dates for wells range from February 2017 (earliest sample dates) to November 2021 (most recent sample dates).
3. The priority chemical of concern (COC) at each well is the constituent detected at the highest level normalized by the MSC or appropriate RRS.
4. Number of samples is the number of individual sample dates in the database for the priority COC, results from duplicate samples from the same date are averaged.
5. RDX = Hexahydro, 1,3,5-trinitro, 1,3,5-triazine; TCE = trichloroethene; DNT4A = 4-Amino, 2,6-dinitrotoluene; DNT2A = 2-Amino, 4,6-dinitrotoluene.
6. Additional monitoring objectives are used to group wells for aggregate trends: SE = well included in southeast sector analysis; N= well included in north sector; Source = wells in Zone 12 near primary sources.
7. * = Wells with stainless steel construction can show false positive metal (Cr, Fe, Ni, etc.) detections.
   ** = ISPM wells can have transient high metals cocentration due to redox changes.

TABLE B-10
MONITORING WELL TREND SUMMARY RESULTS SOUTHWEST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Number of Samples (2017 - 2021)	Number of Detects	Percent Detection	Maximum Concentration [µg/L]	Maximum Above MSC?	Average Concentration [µg/L]	Average Above MSC?	Mann-Kendall Trend 2012 - 2016	Mann-Kendall Trend 2017 - 2021
TCE Southwest Sector									
1114-MW4	9	9	100%	**17.7**	Yes	**13.16**	Yes	D	I
PTX06-1006	5	5	100%	1.1	No	0.99	No	S	NT
PTX06-1007	5	3	60%	0.5	No	0.45	No	S	S
PTX06-1008	5	5	100%	3.2	No	2.06	No	D	I
PTX06-1012	17	17	100%	2.1	No	1.07	No	D	D
PTX06-1035	10	10	100%	**8.5**	Yes	4.26	No	I	I
PTX06-1052	11	5	45%	**5.3**	Yes	1.71	No	S	I
PTX06-1053	8	0	0%	ND	No	ND	No	ND	ND
PTX06-1077A	4	4	100%	**6.3**	Yes	4.79	No	D	NT
PTX06-1085	4	0	0%	ND	No	ND	No	ND	ND
PTX06-1086	4	0	0%	ND	No	ND	No	ND	ND
PTX06-1126	12	12	100%	**1500.0**	Yes	**476.1**	Yes	S	PD
PTX06-1127	10	10	100%	**198.0**	Yes	**139.94**	Yes	PI	I
PTX06-1131	5	0	0%	ND	No	ND	No	ND	ND
PTX06-1134	10	10	100%	**75.8**	Yes	**35.2**	Yes	PI	PI
PTX06-1148	17	17	100%	**9.9**	Yes	3.15	No	D	I
PTX06-1149	16	12	75%	**53.2**	Yes	**7.5**	Yes	I* (ND)	I
PTX06-1150	16	16	100%	**20.7**	Yes	**8.72**	Yes	I	I
PTX06-1151	10	10	100%	**162.0**	Yes	**120.17**	Yes	PD	NT
PTX06-1155	18	11	61%	**40.5**	Yes	**6.17**	Yes	D	I
PTX06-1156	16	6	38%	3.8	No	1.4	No	NT	PD
PTX06-1159	11	11	100%	**356.5**	Yes	**231.69**	Yes	I	D
PTX06-1160	10	3	30%	0.6	No	0.52	No	NT	D
PTX06-1164	16	16	100%	**230.0**	Yes	**123.92**	Yes	NT	S
PTX06-1169	6	6	100%	**63.0**	Yes	**16.87**	Yes	N/A	NT
PTX06-1170	19	19	100%	**400.0**	Yes	**189.49**	Yes	S	D
PTX06-1171	5	5	100%	**347.0**	Yes	**326.6**	Yes	N/A	D
PTX06-1173	16	14	88%	**140.0**	Yes	**32.08**	Yes	N/A	PI
PTX06-1174	16	12	75%	**10.0**	Yes	1.74	No	N/A	NT
PTX06-1175	16	16	100%	**150.0**	Yes	**108.33**	Yes	N/A	D
PTX06-1176	16	13	81%	**74.0**	Yes	**17.14**	Yes	S	D
PTX06-1177	17	13	76%	**7.0**	Yes	2	No	S	NT
PTX06-1180	10	10	100%	**541.0**	Yes	**403.9**	Yes	--	NT
PTX06-1181	9	0	0%	ND	No	ND	No	N/A	ND
PTX06-1183	10	3	30%	1.2	No	0.55	No	N/A	NT
PTX06-1207	3	3	100%	1.3	No	0.91	No	--	N/A
PTX06-1209	1	1	100%	**329.0**	Yes	**329**	Yes	--	N/A
PTX06-1210	1	1	100%	**230.0**	Yes	**230**	Yes	--	N/A
PTX06-1211	1	1	100%	**336.0**	Yes	**336**	Yes	--	N/A
PTX07-1P02	10	0	0%	ND	No	ND	No	ND	ND
PTX07-1Q01	4	0	0%	**ND**	No	ND	No	ND	ND
PTX07-1Q02	4	0	0%	**ND**	No	ND	No	ND	ND
PTX07-1Q03	3	0	0%	**ND**	No	ND	No	ND	N/A
PTX08-1001	5	0	0%	**ND**	No	ND	No	ND	ND
PTX08-1003	6	5	83%	0.8	No	0.56	No	D	S
PTX08-1005	9	9	100%	**30.7**	Yes	**19.97**	Yes	PD	D
PTX08-1006	10	10	100%	**73.7**	Yes	**32.19**	Yes	I	S
PTX08-1007	5	5	100%	**15.5**	Yes	**14.32**	Yes	D	S
PTX08-1008	10	8	80%	**13.5**	Yes	2.69	No	ND	I
PTX08-1009	8	0	0%	ND	No	ND	Yes	NT	ND
PTX10-1014	6	6	100%	**35.2**	Yes	**16.73**	Yes	S	I

See Notes End of Table

TABLE B-10
MONITORING WELL TREND SUMMARY RESULTS SOUTHWEST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Number of Samples (2017 - 2021)	Number of Detects	Percent Detection	Maximum Concentration [µg/L]	Maximum Above MSC?	Average Concentration [µg/L]	Average Above MSC?	Mann-Kendall Trend 2012 - 2016	Mann-Kendall Trend 2017 - 2021
Perchlorate Southwest Sector									
1114-MW4	9	9	100%	**132.0**	Yes	**94.13**	Yes	NT	D
PTX06-1006	5	5	100%	**156.0**	Yes	**139.4**	Yes	NT	D
PTX06-1007	5	5	100%	**135.0**	Yes	**102.62**	Yes	S	S
PTX06-1008	5	4	80%	12.3	No	4.92	No	ND	S
PTX06-1012	17	0	0%	ND	No	ND	Yes	ND*	ND
PTX06-1035	10	10	100%	**293.0**	Yes	**212.81**	Yes	I	I
PTX06-1053	8	2	25%	6.0	No	4.79	No	ND	S
PTX06-1077A	5	4	80%	6.0	No	4.67	No	NT	S
PTX06-1126	14	14	100%	**139.5**	Yes	**30.9**	Yes	S	D
PTX06-1127	14	14	100%	**488.0**	Yes	**304.8**	Yes	S	D
PTX06-1134	12	12	100%	**239.0**	Yes	**111.84**	Yes	I	I
PTX06-1148	19	17	89%	**410.0**	Yes	**130.34**	Yes	D	D
PTX06-1149	16	7	44%	**95.7**	Yes	**20.22**	Yes	PD	I
PTX06-1150	16	16	100%	**41.0**	Yes	**20.16**	Yes	D	D
PTX06-1151	11	11	100%	**97.5**	Yes	**74.6**	Yes	S	D
PTX06-1155	18	1	6%	6.0	No	4.57	No	ND	D
PTX06-1156	16	0	0%	ND	No	ND	Yes	ND	ND
PTX06-1159	13	13	100%	**724.0**	Yes	**502.65**	Yes	I	S
PTX06-1160	12	9	75%	44.1	Yes	6.75	No	ND	D
PTX06-1164	16	13	81%	**110.0**	Yes	**47.44**	Yes	S	D
PTX06-1169	6	0	0%	ND	No	ND	Yes	N/A	ND
PTX06-1170	17	1	6%	30.0	Yes	6.12	No	ND	PD
PTX06-1171	5	5	100%	**63.8**	Yes	**47.12**	Yes	N/A	S
PTX06-1173	16	1	6%	6.0	No	4.58	No	N/A	D
PTX06-1174	16	0	0%	ND	No	ND	Yes	N/A	ND
PTX06-1175	17	14	82%	**300.0**	Yes	**112.82**	Yes	N/A	D
PTX06-1176	16	5	31%	38.0	Yes	13.33	No	S	D
PTX06-1177	17	1	6%	50.0	Yes	10.47	No	D	NT
PTX06-1180	10	4	40%	6.0	No	4.91	No	--	D
PTX06-1181	9	4	44%	6.0	No	3.9	No	N/A	D
PTX06-1207	3	3	100%	15.1	No	10.37	No	--	N/A
PTX06-1209	1	1	100%	**51.8**	Yes	**51.8**	Yes	--	N/A
PTX06-1210	1	0	0%	ND	No	ND	Yes	--	N/A
PTX06-1211	1	1	100%	2.3	No	2.3	No	--	N/A
PTX07-1P02	10	0	0%	ND	No	ND	Yes	ND	ND
PTX08-1001	5	1	20%	6.0	No	3.64	No	S	S
PTX08-1003	6	6	100%	10.7	No	10.01	No	D	S
PTX08-1005	9	3	33%	6.0	No	4.86	No	S	S
PTX08-1006	10	10	100%	**261.0**	Yes	**71.46**	Yes	D	D
PTX08-1007	5	5	100%	8.8	No	7.49	No	S	I
PTX08-1008	12	12	100%	**382.0**	Yes	**312.53**	Yes	I	D
PTX08-1009	8	4	50%	6.0	No	4.64	No	--	S
PTX10-1014	6	6	100%	7.1	No	6.31	No	S	S

Notes

1. Trends were evaluated for data collected between January 2017 and December 2021. Trends from 2012 - 2016 from 2017 LTMO Report.
2. Number of Samples is the number of samples for the compound at this location.
   Number of Detects is the number of samples where the compound was detected at this location.
3. Maximum Result is the maximum concentration for the COC analyzed between 2017 and 2021. Results above MSCs are indicated in **Bold**.
4. Screening level from Corrective Measure Study. TCE = 5 µg/L; Perchlorate = 15 µg/L.
5. Maximum and average concentrations for wells with no detections are representative of the detection limits for the analyses.
6. D = Decreasing; PD = Probably Decreasing; S = Stable; PI = Probably Increasing; I = Increasing; N/A = Insufficient Data to determine trend;
   NT = No Trend; ND = well has all non-detect results for COC, ND* = one detection for compound, may be unaffected.
7. * = Single detection with changing detection limit, results in false trend or detection limits above remedial goals.

TABLE B-11
SUMMARY STATISTICS RESULTS SOUTHWEST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

WellName	Recent Above MSC	TCE Concentration µg/L Mean	Median	SD	COV	95% UCL TCE µg/L	Distribution	Outlier
TCE Southwest Sector								
1114-MW4	Yes	12.5	14.1	4.6	0.37	**16.85**	Normal	No
PTX06-1006	No	1.0	1.1	0.1	0.14	1.16	Normal	No
PTX06-1007	No	0.5	0.0	0.0	0.00	0.52	Normal	No
PTX06-1008	No	2.1	2.1	0.8	0.40	3.09	Normal	No
PTX06-1012	No	1.1	0.9	0.5	0.45	**1.32**	Normal	No
PTX06-1035	Yes	4.3	4.3	1.9	0.44	**5.61**	Normal	Yes
PTX06-1052	Yes	1.2	0.0	1.6	1.35	2.97	No distribution	No
PTX06-1053	No	0.5	0.0	0.0	0.00	0.50	No distribution	No
PTX06-1077A	Yes	4.8	4.8	1.3	0.28	6.90	Normal	No
PTX06-1085	No	ND	--	--	--	--	--	--
PTX06-1086	No	ND	--	--	--	--	--	--
PTX06-1126	Yes	431.5	214.0	408.4	0.95	788.41	Lognormal	Yes
PTX06-1127	Yes	139.9	133.0	55.0	0.39	179.29	Normal	No
PTX06-1131	No	ND	0.0	0.0	0.00	0.50	No distribution	No
PTX06-1134	Yes	35.2	33.0	24.0	0.68	52.39	Normal	No
PTX06-1148	Yes	3.6	2.3	2.8	0.78	4.40	Lognormal	No
PTX06-1149	Yes	7.4	2.3	13.3	1.80	14.49	Lognormal	Yes
PTX06-1150	Yes	8.7	6.4	5.0	0.58	11.39	No distribution	No
PTX06-1151	Yes	120.2	112.0	22.2	0.18	136.06	Normal	No
PTX06-1155	Yes	7.5	1.0	15.0	2.00	12.92	No distribution	No
PTX06-1156	No	0.8	0.4	1.2	1.54	1.90	No distribution	No
PTX06-1159	Yes	245.6	252.0	87.1	0.35	292.74	Normal	No
PTX06-1160	No	0.2	0.0	0.3	1.87	0.55	No distribution	Yes
PTX06-1164	Yes	123.9	130.0	59.7	0.48	155.72	Normal	No
PTX06-1169	Yes	16.9	8.7	22.9	1.36	40.91	No distribution	Yes
PTX06-1170	No	192.0	140.0	126.3	0.66	263.56	Normal	No
PTX06-1171	Yes	326.6	339.0	25.5	0.08	358.32	Normal	No
PTX06-1173	No	33.0	1.6	54.7	1.66	61.05	No distribution	No
PTX06-1174	No	1.6	0.8	2.5	1.58	3.04	No distribution	Yes
PTX06-1175	Yes	108.7	120.0	32.4	0.30	126.01	Normal	No
PTX06-1176	Yes	17.1	1.1	24.6	1.44	30.12	No distribution	No
PTX06-1177	No	1.6	1.2	1.5	0.94	3.04	No distribution	No
PTX06-1180	Yes	403.9	382.0	69.6	0.17	453.66	Normal	No
PTX06-1181	No	ND	--	--	--	--	--	--
PTX06-1183	No	0.5	0.4	0.3	0.62	0.71	No distribution	Yes
PTX06-1207	No	0.9	0.8	0.3	0.38	1.77	Normal	No
PTX06-1209	Yes	329.0	N/A	N/A	N/A	N/A	No distribution	No
PTX06-1210	Yes	230.0	N/A	N/A	N/A	N/A	No distribution	No
PTX06-1211	Yes	336.0	N/A	N/A	N/A	N/A	No distribution	No
PTX07-1P02	No	ND	--	--	--	--	--	--
PTX07-1Q01	No	ND	--	--	--	--	--	--
PTX07-1Q02	No	ND	--	--	--	--	--	--
PTX07-1Q03	No	ND	--	--	--	--	--	--
PTX08-1001	No	ND	--	--	--	--	--	--
PTX08-1003	No	0.5	0.5	0.1	0.27	0.74	Normal	Yes
PTX08-1005	No	18.1	22.2	10.6	0.59	27.92	Normal	No
PTX08-1006	Yes	32.2	24.3	18.5	0.57	45.41	Lognormal	No
PTX08-1007	Yes	14.3	14.1	0.7	0.05	15.20	Normal	No
PTX08-1008	No	2.6	1.3	4.1	1.57	5.50	Lognormal	Yes
PTX08-1009	No	ND	--	--	--	--	--	--
PTX10-1014	Yes	21.3	15.0	12.5	0.58	29.77	Lognormal	Yes

Notes:
1. Summary statistics calculated using Kaplan Meier method. -- = Insufficient data to calculate a result.
2. Distribution determined by Shapiro Wilk method. Normal = normal distribution, Lognormal = log normal distribution; No distribution = neither normal nor lognormal, other distributions not tested.
3. Outlier in dataset determined by Dixon's method. Outliers are usually high values.
4. N/A = insufficient data. ND = Non-Detect.

TABLE B-12
SPATIAL ANALYSIS SUMMARY RESULTS SOUTHWEST SECTOR
LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Perchlorate Average Slope Factor	SF COV	Area of Influence [ft2]	TCE Average Slope Factor	SF COV	Area of Influence [ft2]	Recommendation After Qualitative Review
1114-MW4	*0.14*	0.24	2.19E+06	*0.11*	0.56	2.19E+06	Retain Source Area
PTX06-1006	*0.15*	0.06	2.44E+06	0.35	0.27	2.44E+06	Retain
PTX06-1007	0.32	0.10	2.98E+06	0.55	0.23	2.98E+06	Retain
PTX06-1008	*0.24*	0.90	1.01E+06	0.31	0.62	1.01E+06	Retain
PTX06-1012	*0.25*	**1.18**	3.04E+05	0.39	0.28	3.04E+05	Retain
PTX06-1035	*0.25*	0.04	2.01E+06	*0.29*	0.40	2.01E+06	Retain
PTX06-1052	--	--	--	0.45	0.70	2.19E+06	Retain (sample for 1,4-dioxane)
PTX06-1053	0.40	0.95	3.02E+06	0.47	0.11	3.02E+06	Retain
PTX06-1077A	0.30	0.39	4.05E+06	*0.10*	0.27	4.05E+06	Retain
PTX06-1085	--	--	--	*0.00*	0.16	2.19E+06	May be redudant with PTX06-1086
PTX06-1086	--	--	--	*0.16*	0.15	8.53E+06	Retain
PTX06-1126	*0.19*	0.79	3.24E+05	0.35	0.11	3.24E+05	Retain
PTX06-1127	0.47	0.08	6.57E+05	0.37	0.05	6.57E+05	Retain
PTX06-1131	--	--	--	0.56	0.33	2.15E+06	Retain (sample for perchlorate)
PTX06-1134	0.49	0.02	1.26E+06	0.37	0.36	1.26E+06	Retain (Delineates TCE SW)
PTX06-1148	0.44	**1.10**	9.86E+05	*0.18*	0.62	9.86E+05	Retain
PTX06-1149	0.39	0.25	5.88E+05	*0.16*	0.77	5.88E+05	Retain
PTX06-1150	*0.20*	0.37	1.45E+06	*0.07*	0.38	1.45E+06	Retain
PTX06-1151	0.38	0.19	6.14E+05	*0.22*	0.01	6.14E+05	Retain
PTX06-1155	*0.07*	**1.17**	7.16E+04	0.46	0.99	7.16E+04	Retain
PTX06-1156	0.52	**1.18**	5.54E+05	0.37	0.55	5.54E+05	Retain
PTX06-1159	0.62	0.03	6.96E+05	0.51	0.04	6.96E+05	Retain
PTX06-1160	0.50	**1.05**	2.62E+06	0.65	0.07	2.62E+06	Retain (SE)
PTX06-1164	0.32	**1.21**	8.15E+04	0.42	0.06	8.15E+04	Retain
PTX06-1169	*0.28*	**1.02**	1.33E+05	*0.21*	0.99	1.33E+05	Retain
PTX06-1170	*0.25*	**1.18**	1.28E+05	0.37	0.55	1.28E+05	Retain
PTX06-1171	*0.21*	0.09	2.84E+05	*0.23*	0.01	2.84E+05	Retain
PTX06-1173	*0.23*	**1.15**	1.48E+05	0.45	0.84	1.48E+05	Retain
PTX06-1174	0.40	**1.14**	1.97E+05	0.49	0.44	1.97E+05	Retain
PTX06-1175	0.40	0.34	3.35E+05	0.57	0.04	3.35E+05	Retain
PTX06-1176	*0.21*	**1.22**	6.50E+04	0.39	0.77	6.50E+04	Retain
PTX06-1177	0.40	**1.61**	2.16E+05	0.53	0.34	2.16E+05	Retain
PTX06-1180	*0.19*	0.32	3.65E+05	0.58	0.00	3.65E+05	Retain
PTX06-1181	*0.22*	0.64	2.84E+06	0.76	0.11	2.84E+06	Retain
PTX06-1183	--	--	--	*0.29*	0.22	3.79E+05	Retain (sample for 1,4-dioxane)
PTX06-1207	0.33	0.10	2.09E+06	0.59	0.32	2.09E+06	Retain
PTX06-1209	0.45	--	1.60E+05	*0.20*	--	1.60E+05	Retain
PTX06-1210	0.70	--	1.86E+05	*0.20*	--	1.86E+05	Retain
PTX06-1211	0.32	--	2.26E+05	*0.13*	--	2.26E+05	Retain
PTX07-1P02	0.39	0.68	6.17E+05	0.33	0.09	6.17E+05	Retain
PTX07-1Q01	--	--	--	0.50	0.08	2.38E+06	Retain
PTX07-1Q02	--	--	--	*0.00*	0.09	2.78E+05	Retain (Delineates TCE SW)
PTX07-1Q03	--	--	--	*0.07*	0.00	6.22E+06	Retain (Delineates TCE SW)
PTX08-1001	*0.23*	0.70	1.25E+06	*0.11*	0.06	1.25E+06	Retain (N)
PTX08-1003	0.30	0.01	8.00E+06	0.39	0.11	8.00E+06	Retain
PTX08-1005	0.34	0.42	8.52E+05	*0.09*	0.17	8.52E+05	Retain
PTX08-1006	0.41	0.05	1.56E+06	0.31	0.05	1.56E+06	Retain
PTX08-1007	*0.27*	0.02	1.83E+06	0.47	0.00	1.83E+06	Retain
PTX08-1008	0.36	0.00	2.44E+06	0.32	0.64	2.44E+06	Retain
PTX08-1009	0.41	0.02	2.63E+06	0.33	0.10	2.63E+06	Retain (sample for 1,4-dioxane)
PTX10-1014	*0.12*	0.08	1.31E+06	0.43	0.08	1.31E+06	Retain

Notes:
1. Slope Factor (SF) is the difference between the actual concentration and the concentration estimated from nearby wells normalized by the actual concentration. Slope factors close to 1 show the concentrations cannot be estimated from the nearby wells, and the well is important in the network.
2. Slope factors were calculated using data collected between February 2017 and 2021.
3. Well locations with slope factors below 0.3 and area ratios below 0.8 were considered for elimination.
   Average slope factors below 0.3 are shown in *italic* and those above 0.8 are shown in **Bold**.
   SF COV above 1 are shown in **Bold**, indicating locations with fluctuating concentrations.
   Not all wells were sampled for perchlorate.
4. N/A = Locations with insufficient data between 2017 - 2021 to calculate a slope factor.
5. Wells recommended for elimination are not recommended for plugging and abandonment, but should be retained for hydrogeologic monitoring.
6. * = Well included in Southeast network, recommendation based on COCs from Southeast Sector.

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TABLE B-13
SAMPLING FREQUENCY ANALYSIS RESULTS SOUTHWEST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Recent Concentration Rate of Change [mg/yr]	Recent MK Trend (2017-2021)	Sampling Frequency Based on Recent Data (2017-2021)	Overall Concentration Rate of Change [mg/yr]	Overall MK Trend (2012 - 2021)	Sampling Frequency Based on Overall Data (2012 - 2021)	MAROS Recommended Sampling Frequency	LTM Plan Sampling Frequency
TCE Southwest Sector								
1114-MW4	7.25E-06	I	Semiannual	7.14E-06	I	Semiannual	Semiannual	Annual
PTX06-1006	1.74E-07	NT	Biennial	2.05E-07	NT	Biennial	Biennial	Annual
PTX06-1007	1.82E-08	S	Biennial	2.19E-08	S	Biennial	Biennial	Annual
PTX06-1008	1.11E-06	I	Biennial	1.10E-06	I	Biennial	Biennial	Annual
PTX06-1012	-8.42E-07	D	Biennial	-7.78E-07	D	Biennial	Biennial	Semiannual
PTX06-1035	2.93E-06	I	Biennial	2.87E-06	I	Biennial	Biennial	Semiannual
PTX06-1052	2.76E-06	I	Biennial	2.76E-06	NT	Biennial	Biennial	Semiannual
PTX06-1053	0.00E+00	S	Biennial	0.00E+00	ND	Biennial	Biennial	Annual
PTX06-1077A	2.40E-07	NT	Biennial	2.40E-07	NT	Biennial	Biennial	Annual
PTX06-1085	0.00E+00	S	Biennial	0.00E+00	ND	Biennial	Biennial	5 Years
PTX06-1086	0.00E+00	S	Biennial	0.00E+00	ND	Biennial	Biennial	5 Years
PTX06-1126	-3.25E-04	PD	Biennial	-3.69E-04	S	Biennial	Biennial	Semiannual
PTX06-1127	8.92E-05	I	Quarterly	9.27E-05	I	Quarterly	Quarterly	Semiannual
PTX06-1131	0.00E+00	S	Biennial	0.00E+00	ND	Biennial	Biennial	Annual
PTX06-1134	2.50E-05	PI	Semiannual	2.54E-05	NT	Quarterly	Quarterly	Semiannual
PTX06-1148	4.03E-06	I	Biennial	4.38E-06	I	Biennial	Biennial	Semiannual
PTX06-1149	1.88E-05	I	Quarterly	2.12E-05	I	Quarterly	Quarterly	Semiannual
PTX06-1150	8.53E-06	I	Semiannual	9.67E-06	I	Semiannual	Semiannual	Semiannual
PTX06-1151	6.61E-06	NT	Biennial	7.43E-06	NT	Annual	Biennial	Semiannual
PTX06-1155	1.73E-05	I	Quarterly	2.08E-05	I	Quarterly	Quarterly	Semiannual
PTX06-1156	5.60E-07	PD	Biennial	8.74E-07	S	Biennial	Biennial	Semiannual
PTX06-1159	-1.46E-04	D	Biennial	-1.51E-04	D	Biennial	Biennial	Semiannual
PTX06-1160	-5.11E-08	D	Biennial	-4.93E-08	PD	Biennial	Biennial	Semiannual
PTX06-1164	-2.25E-05	S	Biennial	-1.26E-05	S	Biennial	Biennial	Semiannual
PTX06-1169	7.16E-06	NT	Annual	1.37E-05	NT	Semiannual	Semiannual	Semiannual
PTX06-1170	-1.58E-04	D	Biennial	-1.83E-04	D	Biennial	Biennial	Semiannual
PTX06-1171	-3.94E-05	D	Biennial	-3.94E-05	D	Biennial	Biennial	Annual
PTX06-1173	2.96E-05	PI	Quarterly	2.01E-05	NT	Semiannual	Quarterly	Semiannual
PTX06-1174	2.77E-07	NT	Biennial	-9.89E-08	S	Biennial	Biennial	Semiannual
PTX06-1175	-4.88E-05	D	Biennial	-4.30E-05	D	Biennial	Biennial	Semiannual
PTX06-1176	-3.68E-05	D	Biennial	-3.09E-05	NT	Biennial	Biennial	Semiannual
PTX06-1177	-5.21E-07	NT	Biennial	-8.49E-07	NT	Biennial	Biennial	Semiannual
PTX06-1180	3.45E-06	NT	Biennial	7.82E-06	NT	Annual	Biennial	Semiannual
PTX06-1181	0.00E+00	S	Biennial	0.00E+00	ND	Biennial	Biennial	--
PTX06-1183	2.22E-07	NT	Biennial	2.05E-07	PI	Biennial	Biennial	Semiannual
PTX06-1207	0.00E+00	N/A	Annual	0.00E+00	N/A	Annual	Annual	Semiannual
PTX06-1209	0.00E+00	N/A	Quarterly	0.00E+00	N/A	Quarterly	Quarterly	Semiannual
PTX06-1210	0.00E+00	N/A	Quarterly	0.00E+00	N/A	Quarterly	Quarterly	Semiannual
PTX06-1211	0.00E+00	N/A	Quarterly	0.00E+00	N/A	Quarterly	Quarterly	Semiannual
PTX07-1P02	0.00E+00	S	Biennial	0.00E+00	ND	Biennial	Biennial	Annual
PTX07-1Q01	0.00E+00	S	Biennial	0.00E+00	ND	Biennial	Biennial	5 Years
PTX07-1Q02	0.00E+00	S	Biennial	0.00E+00	ND	Biennial	Biennial	5 Years
PTX07-1Q03	0.00E+00	N/A	Annual	0.00E+00	N/A	Annual	Annual	--
PTX08-1001	0.00E+00	S	Biennial	0.00E+00	ND	Biennial	Biennial	Annual
PTX08-1003	-2.17E-07	S	Biennial	-1.97E-07	S	Biennial	Biennial	Annual
PTX08-1005	-1.81E-05	D	Biennial	-1.76E-05	D	Biennial	Biennial	Annual
PTX08-1006	1.49E-05	S	Semiannual	1.59E-05	S	Semiannual	Semiannual	Semiannual
PTX08-1007	-9.74E-07	S	Biennial	-9.85E-07	S	Biennial	Biennial	Annual
PTX08-1008	4.25E-06	I	Biennial	4.84E-06	I	Biennial	Biennial	Semiannual
PTX08-1009	0.00E+00	S	Biennial	0.00E+00	ND	Biennial	Biennial	Annual
PTX10-1014	1.34E-05	I	Semiannual	1.43E-05	I	Quarterly	Quarterly	Annual

See Notes End of Table

TABLE B-13
SAMPLING FREQUENCY ANALYSIS RESULTS SOUTHWEST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Recent Concentration Rate of Change [mg/yr]	Recent MK Trend (2017-2021)	Sampling Frequency Based on Recent Data (2017-2021)	Overall Concentration Rate of Change [mg/yr]	Overall MK Trend (2012 - 2021)	Sampling Frequency Based on Overall Data (2012 - 2021)	MAROS Recommended Sampling Frequency	LTM Plan Sampling Frequency
Perchlorate Southwest Sector								
1114-MW4	-4.78E-05	D	Biennial	-4.78E-05	D	Biennial	Biennial	Annual
PTX06-1006	-1.52E-05	D	Biennial	-1.83E-05	D	Biennial	Biennial	Annual
PTX06-1007	-1.59E-05	S	Biennial	-1.92E-05	S	Biennial	Biennial	Annual
PTX06-1008	-3.26E-06	S	Biennial	-3.17E-06	S	Biennial	Biennial	Annual
PTX06-1012	-3.86E-06	D	Biennial	-4.52E-06	ND	Biennial	Biennial	Semiannual
PTX06-1035	1.08E-04	I	Quarterly	1.06E-04	NT	Semiannual	Quarterly	Semiannual
PTX06-1053	-3.58E-06	S	Biennial	-3.90E-06	S	Biennial	Biennial	Annual
PTX06-1077A	-2.32E-06	S	Biennial	-2.30E-06	S	Biennial	Biennial	Annual
PTX06-1126	-5.73E-05	D	Biennial	-5.65E-05	D	Biennial	Biennial	Semiannual
PTX06-1127	-2.33E-04	D	Biennial	-2.33E-04	D	Biennial	Biennial	Semiannual
PTX06-1134	9.44E-05	I	Quarterly	1.02E-04	I	Quarterly	Quarterly	Semiannual
PTX06-1148	-2.32E-04	D	Biennial	-2.15E-04	NT	Biennial	Biennial	Semiannual
PTX06-1149	4.13E-05	I	Semiannual	4.61E-05	I	Semiannual	Semiannual	Semiannual
PTX06-1150	-1.87E-05	D	Biennial	-1.77E-05	D	Biennial	Biennial	Semiannual
PTX06-1151	-4.60E-05	D	Biennial	-4.62E-05	D	Biennial	Biennial	Semiannual
PTX06-1155	-3.76E-06	D	Biennial	-4.39E-06	S	Biennial	Biennial	Semiannual
PTX06-1156	-3.86E-06	D	Biennial	-4.52E-06	ND	Biennial	Biennial	Semiannual
PTX06-1159	-1.86E-04	S	Biennial	-1.98E-04	S	Biennial	Biennial	Semiannual
PTX06-1160	-2.74E-06	D	Biennial	-4.04E-06	NT	Biennial	Biennial	Semiannual
PTX06-1164	-6.54E-05	D	Biennial	-5.87E-05	D	Biennial	Biennial	Semiannual
PTX06-1169	-4.20E-06	NT	Biennial	-4.52E-06	ND	Biennial	Biennial	Semiannual
PTX06-1170	-2.75E-06	PD	Biennial	-4.53E-06	S	Biennial	Biennial	Semiannual
PTX06-1171	-1.34E-05	S	Biennial	-1.34E-05	S	Biennial	Biennial	Annual
PTX06-1173	-3.73E-06	D	Biennial	-4.41E-06	S	Biennial	Biennial	Semiannual
PTX06-1174	-3.82E-06	D	Biennial	-4.52E-06	ND	Biennial	Biennial	Semiannual
PTX06-1175	-1.39E-04	D	Biennial	-1.21E-04	S	Biennial	Biennial	Semiannual
PTX06-1176	-2.00E-05	D	Biennial	-1.87E-05	PD	Biennial	Biennial	Semiannual
PTX06-1177	4.90E-06	NT	Biennial	8.92E-07	NT	Biennial	Biennial	Semiannual
PTX06-1180	-2.04E-06	D	Biennial	-2.18E-06	S	Biennial	Biennial	Semiannual
PTX06-1181	-4.37E-06	D	Biennial	-3.90E-06	PD	Biennial	Biennial	--
PTX06-1207	0.00E+00	N/A	Semiannual	0.00E+00	N/A	Semiannual	Semiannual	Semiannual
PTX06-1209	0.00E+00	N/A	Quarterly	0.00E+00	N/A	Quarterly	Quarterly	Semiannual
PTX06-1210	0.00E+00	N/A	Annual	0.00E+00	N/A	Annual	Annual	Semiannual
PTX06-1211	0.00E+00	N/A	Annual	0.00E+00	N/A	Annual	Annual	Semiannual
PTX07-1P02	-3.83E-06	PD	Biennial	-4.52E-06	ND	Biennial	Biennial	Annual
PTX08-1001	-4.08E-06	S	Biennial	-4.08E-06	S	Biennial	Biennial	Annual
PTX08-1003	-3.74E-07	S	Biennial	-3.50E-07	S	Biennial	Biennial	Annual
PTX08-1005	-3.29E-06	S	Biennial	-3.63E-06	S	Biennial	Biennial	Annual
PTX08-1006	-1.23E-04	D	Biennial	-1.23E-04	NT	Biennial	Biennial	Semiannual
PTX08-1007	1.50E-06	I	Biennial	1.57E-06	I	Biennial	Biennial	Annual
PTX08-1008	-6.86E-05	D	Biennial	-6.20E-05	S	Biennial	Biennial	Semiannual
PTX08-1009	-2.62E-06	S	Biennial	-2.72E-06	S	Biennial	Biennial	Annual
PTX10-1014	-5.36E-07	S	Biennial	-5.61E-07	S	Biennial	Biennial	Annual

Notes:
1. 'Recent' concentration rate of change and MK trends are calculated from data collected 2017 - 2021.
2. MK = Mann Kendall Trend; D = Decreasing, PD = Probably Decreasing, S = Stable, NT = No Trend, PI = Probably Increasing, I = Increasing, ND = Non-detect, N/A = insufficient data, less than 4 sample events for time interval indicated.
3. Overall rate of change and MK trend are for the full data set (2012-2021) for each well.
4. MAROS Recommended Sampling Frequency is the sampling frequency from MAROS based on both recent and overall trends.
5. LTM Plan (CNS, Database) is the sampling frequency currently implemented.
6. The final recommended sampling frequency is listed on Table 8, and is based on a combination of qualitative and statistical evaluations.

TABLE B-14
FINAL RECOMMENDED MONITORING NETWORK SOUTHWEST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	TCE			Perchlorate			Sampling Recommendation	Rationale
	Percent Detection	Mann Kendall Trend	Average SF	Percent Detection	Mann Kendall Trend	Average SF		
Southwest Sector								
1114-MW4	100%	I	0.11	100%	D	0.14	Annual	UM, Monitors perchlorate source, decreasing trend of perchlorate, increasing trend of TCE
PTX06-1006	100%	NT	0.35	100%	D	0.15	Annual	PS, Monitors perchlorate source, decreasing trend.
PTX06-1007	60%	S	0.55	100%	S	0.32	Annual	UM, Monitors perchlorate, RDX and DNT4A sources.
PTX06-1008	100%	I	0.31	80%	S	0.24	Annual	UM, Zone 11, delineate northern plumes, increasing TCE trend.
PTX06-1012	100%	D	0.39	0%	ND	0.25	Annual	ISPM, RA, PS, TCE remedy monitoring.
PTX06-1035	100%	I	0.29	100%	I	0.25	Semiannual	PS, Delineates southern edge of plumes, increasing trends.
PTX06-1052	45%	I	0.45				Semiannual	RA, POC, Monitors near groundwater flow divide; Total Cr and Cr (VI); early warning for movement of COCs to south/southeastern extent of perched groundwater.
PTX06-1053	0%	ND	0.47	25%	S	0.40	Annual	PS, UM, Upgradient of groundwater divide and downgradient from SW ISB, low to ND concentrations.
PTX06-1077A	100%	NT	0.10	80%	S	0.30	Biennial	UM, Delineates Southwest Sector to the north, low concentrations for all COCs.
PTX06-1085	0%	ND	0.00				5 yrs	UM, Delineates western edge of plume near Playa 2, largely non-detect.
PTX06-1086	0%	ND	0.16				5 yrs	UM, Delineates western edge of plumes near Playa 2, largely non-detect.
PTX06-1126	100%	PD	0.35	100%	D	0.19	Semiannual	PS, UM, POC, Upgradient of ISB, core of perchlorate and 1,4-dioxane plumes.
PTX06-1127	100%	I	0.37	100%	D	0.47	Semiannual	PS, UM, POC, Upgradient of ISB, core of perchlorate and 1,4-dioxane plumes.
PTX06-1131	0%	ND	0.56				Biennial	UM, Delineates Southwest Sector to the southwest.
PTX06-1134	100%	PI	0.37	100%	I	0.49	Semiannual	PS, Downgradient from ISB remedy, potentially increasing and increasing concentration trends.

See notes end of table.

TABLE B-14
FINAL RECOMMENDED MONITORING NETWORK SOUTHWEST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	TCE			Perchlorate			Sampling Recommendation	Rationale
	Percent Detection	Mann Kendall Trend	Average SF	Percent Detection	Mann Kendall Trend	Average SF		
Southwest Sector								
PTX06-1148	100%	I	0.18	89%	D	0.44	Semiannual	PS, RA, Downgradient from ISB remedy, high perchlorate concentrations confirm decreasing trends, tacks 1,4-dioxane to the SW.
PTX06-1149	75%	I	0.16	44%	I	0.39	Semiannual	PS, Downgradient from ISB remedy, increasing trends of TCE, perchlorate, and 1,4-dioxane.
PTX06-1150	100%	I	0.07	100%	D	0.20	Semiannual	PS, RA, Downgradient from ISB, low but increasing TCE and 1,4-dioxane and decreasing perchlorate concentrations.
PTX06-1151	100%	NT	0.22	100%	D	0.38	Annual	PS, RA, Upgradient western edge of ISB, monitors edge of TCE and perchlorate plume.
PTX06-1155	61%	I	0.46	6%	D	0.07	Semiannual	Downgradient from ISB, ISPM well, required for TCE remedy performance monitoring; RA, POC
PTX06-1156	38%	PD	0.37	0%	ND	0.52	Semiannual	Downgradient from ISB on east side, below remedial goals, increasing 1,4-dioxane trends; UM
PTX06-1159	100%	D	0.51	100%	S	0.62	Semiannual	PS, RA, Downgradient from ISB, high TCE and perchlorate concentrations.
PTX06-1160	30%	D	0.65	75%	D	0.50	Biennial	PS, RA, Western edge of TCE plume, low concentrations; (recommended as UM well).
PTX06-1164	100%	S	0.42	81%	D	0.32	Annual	RA, Monitors area within the western ISB remedy with stable to decreasing trends, in situ treatment zone.
PTX06-1169	100%	NT	0.21	0%	ND	0.28	Annual	RA, Monitors central ISB in an area of low TCE concentrations, low uncertainty.
PTX06-1170	100%	D	0.37	6%	PD	0.25	Semiannual	RA, Monitors in situ treatment zone of the central ISB, high, decreasing TCE concentrations.
PTX06-1171	100%	D	0.23	100%	S	0.21	Annual	RA, Upgradient of western ISB, high, decreasing TCE concentrations, stable perchlorate trends.
PTX06-1173	88%	PI	0.45	6%	D	0.23	Semiannual	RA, Downgradient of western ISB, possibly increasing TCE trends and high concentrations of cis-1,2-DCE.

See Notes End of Table

TABLE B-14
FINAL RECOMMENDED MONITORING NETWORK SOUTHWEST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	TCE			Perchlorate			Sampling Recommendation	Rationale
	Percent Detection	Mann Kendall Trend	Average SF	Percent Detection	Mann Kendall Trend	Average SF		
Southwest Sector								
PTX06-1174	75%	NT	0.49	0%	ND	0.40	Annual	RA, Downgradient of western ISB, ISPM, high concentrations of cis-1,2-DCE, low concentrations of TCE.
PTX06-1175	100%	D	0.57	82%	D	0.40	Semiannual	RA, Downgradient of western ISB, ISPM, high TCE and perchlorate concentrations, decreasing trends.
PTX06-1176	81%	D	0.39	31%	D	0.21	Annual	RA, Monitors in situ treatment zone of the western ISB, decreasing concentration trends.
PTX06-1177	76%	NT	0.53	6%	NT	0.40	Annual	RA, Monitors in situ treatment zone of the western ISB, low TCE and perchlorate concentrations.
PTX06-1180	100%	NT	0.58	40%	D	0.19	Semiannual	PS, Monitors western edge of TCE plume upgradient from western edge of ISB.
PTX06-1181	0%	ND	0.76	44%	D	0.22	5 yrs	RA, Delineates TCE plume to the west, low detections.
PTX06-1183	30%	NT	0.29				Annual	PS, RA, SE Sector RDX/Cr (VI) monitoring downgradient from groundwater divide. Begin sampling for perchlorate and 1,4-dioxane.
PTX06-1207	100%	N/A	0.59	100%	N/A	0.33	Semiannual	PS, Downgradient of ISB monitors TCE and perchlorate plumes leading edge, aditional sampling required for trend analysis.
PTX06-1209	100%	N/A	0.20	100%	N/A	0.45	Semiannual	RA, Monitors in situ treatment zone of the eastern ISB, high TCE and perchlorate concentrations, additional sampling required for trend analysis.
PTX06-1210	100%	N/A	0.20	0%	N/A	0.70	Semiannual	RA, Monitors in situ treatment zone of the eastern ISB, high TCE and perchlorate concentrations, additional sampling required for trend analysis.
PTX06-1211	100%	N/A	0.13	100%	N/A	0.32	Semiannual	PS, Upgradient off the estern ISB, high TCE and 1,4-dioxane concentrations, additional sampling required for trend analysis.
PTX07-1P02	0%	ND	0.33	0%	ND	0.39	Annual	UM, POC, Monitor RDX increasing trend and boron plume west of Playa 1.
PTX07-1Q01	0%	ND	0.50	20%	S	0.23	5 yrs	UM, Delineates Southwest Sector to the southwest.

TABLE B-14
FINAL RECOMMENDED MONITORING NETWORK SOUTHWEST SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	TCE			Perchlorate			Sampling Recommendation	Rationale
	Percent Detection	Mann Kendall Trend	Average SF	Percent Detection	Mann Kendall Trend	Average SF		
Southwest Sector								
PTX07-1Q02	0%	ND	0.00				5 yrs	UM, Delineates Southwest Sector to the southwest.
See Notes End of Table								
PTX07-1Q03	0%	N/A	0.07				5 yrs	UM, Delineates Southwest Sector to the southwest.
PTX08-1001	0%	ND	0.11				Annual	UM, RA, Monitor RDX and boron plumes south of Playa 1.
PTX08-1003	83%	S	0.39	100%	S	0.30	Annual	PS, Delineates TCE northwest of Zone 11, concentrations below remedial goals.
PTX08-1005	100%	D	0.09	33%	S	0.34	Annual	UM, Monitors area between TCE sources and ISB.
PTX08-1006	100%	S	0.31	100%	D	0.41	Annual	UM, Monitors upgradient area of high perchlorate, TCE, 1,4-dioxane, potential source.
PTX08-1007	100%	S	0.47	100%	I	0.27	Annual	UM, Monitors Zone 11 source area, stable to increasing concentrations.
PTX08-1008	80%	I	0.32	100%	D	0.36	Semiannual	RA, UM, Monitors area south of Zone 11, Cr (VI) and perchlorate plumes.
PTX08-1009	0%	ND	0.33	50%	S	0.41	Biennial	RA, UM, Monitors area south of Zone 11/12, limited detections of COCs.
PTX10-1014	100%	I	0.43	100%	S	0.12	Annual	UM, Source area, north of Zone 11/12, increasing TCE trends.

Notes:
1. D = Decreasing; PD = Probably Decreasing; S = Stable; PI = Probably Increasing; I = Increasing; N/A = Insufficient Data to determine trend; NT = No Trend; ND = well has all non-detect results for COC indicated. NA = Not applicable, no longer in active.
2. Mann-Kendall trends for 2017 - 2021 are shown.
3. SF = Slope Factor. SF close to 1 indicates well provides unique information in network. SF near 0 indicates well may be redundant.
4. * = Well also evaluated for other Sectors.

TABLE B-15
PERCHED GROUNDWATER INVESTIGATION WELLS NORTH SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Earliest Sample Date[3]	Most Recent Sample Date	Number of Samples (2017-2021)	Primary COC at Well	Area
North Sector					
OW-WR-38	4/25/2017	5/20/2021	8	RDX	Playa 1
PTX01-1001	4/25/2017	11/8/2021	9	Perchlorate	Burning Ground
PTX01-1008	4/25/2017	11/8/2021	8	RDX	Burning Ground
PTX04-1001	8/29/2017	8/1/2019	3	TCE	North
PTX04-1002	8/29/2017	8/1/2021	4	1,4-Dioxane	North
PTX06-1013	4/25/2017	5/20/2021	5	RDX	(SE)
PTX06-1023	2/23/2017	2/28/2020	10	RDX	(SE)
PTX06-1048A	4/25/2017	5/20/2021	4	TCE	Playa 1
PTX06-1049	4/25/2017	8/1/2021	11	RDX	Playa 1
PTX06-1050	4/25/2017	2/28/2020	8	RDX	Source/Playa 1
PTX06-1069	8/1/2021	8/1/2021	1	Cr (tot)	Playa 1 (SE)
PTX06-1071	8/1/2021	8/1/2021	1	None	North
PTX06-1079	1/23/2019	1/23/2019	1	Boron	North
PTX06-1081	8/29/2017	8/1/2019	3	RDX	North
PTX06-1117	10/23/2018	10/29/2019	3	RDX	Playa 1
PTX06-1128	10/23/2018	8/20/2020	4	RDX	Playa 1
PTX07-1O02	11/8/2021	11/8/2021	1	TCE	Playa 1
PTX07-1O03	8/29/2017	8/1/2021	5	RDX	Playa 1
PTX07-1P02	4/25/2017	11/8/2021	12	RDX	Playa 1 (SW)
PTX07-1R03	8/1/2021	8/1/2021	1	None	West
PTX08-1001	4/25/2017	5/20/2021	5	RDX	Playa 1 (SW)
PTX08-1002	4/25/2017	11/8/2021	9	RDX	Source/Playa 1 (SE)
PTX08-1010	8/1/2021	8/1/2021	1	None	North

Notes:

1. Wells listed are investigation wells in current monitoring program. Wells that were dry during the recent five years are not listed. Some wells included in more than one Sector for spatial analysis. N = North; SE = Southeast; SW = Southwest;
2. Data from CNS database received April, 2022.
3. Sampling dates for wells range from February 2017 (earliest sample dates) to November 2021 (most recent sample dates).
4. The priority chemical of concern (COC) at each well is the constituent detected at the highest level normalized by the MSC or appropriate remedial goal.
5. Number of samples is the number of individual sample dates in the database for the priority COC, results from duplicate samples from the same date are averaged.
6. RDX = Hexahydro, 1,3,5-trinitro, 1,3,5-triazine; TCE = trichloroethene; DNT4A = 4-Amino, 2,6-dinitrotoluene; Cr(VI) = Hexavalent Chromium.
7. MAROS Goup is the goup assigned for an aggregate trend determination:
   SEPTS = Extraction picket in SE Sector; SE ISB = Southeast In Situ Bioremediation
   ISB Zone 11 = In Situ Bioremediation Zone 11; Playa 1 = Perched unit beneath Playa 1.

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TABLE B-16
MONITORING WELL TREND SUMMARY RESULTS NORTH SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

WellName	Number of Samples (2017 - 2021)	Number of Detects	Percent Detection	Maximum Concentration [µg/L]	Maximum Above MSC?	Average Concentration [µg/L]	Average Above MSC?	Mann-Kendall Trend 2012 - 2016	Mann-Kendall Trend 2017 - 2021
RDX North Sector									
OW-WR-38	8	8	100%	**52.3**	Yes	**26.8**	Yes	I	I
PTX01-1001	9	0	0%	ND	No	ND	No	ND	ND
PTX01-1008	8	0	0%	ND	No	ND	No	D	ND
PTX04-1001	3	2	67%	0.13	No	0.1	No	ND	N/A
PTX04-1002	4	4	100%	0.22	No	0.2	No	NT	S
PTX06-1013	5	5	100%	**6.48**	Yes	**5.3**	Yes	PD	S
PTX06-1023	10	4	40%	0.65	No	0.2	No	D	NT
PTX06-1048A	4	1	25%	0.14	No	0.1	No	ND	S
PTX06-1049	11	11	100%	**6.49**	Yes	**2.7**	Yes	NT	I
PTX06-1050	8	8	100%	**421**	Yes	**199.3**	Yes	PD	I
PTX06-1069	1	0	0%	ND	No	ND	No	NT	N/A
PTX06-1071	1	0	0%	ND	No	ND	No	N/A	N/A
PTX06-1079	1	0	0%	ND	No	ND	No	--	N/A
PTX06-1081	3	0	0%	ND	No	ND	No	NT	N/A
PTX06-1117	3	3	100%	**13.4**	Yes	**10.9**	Yes	--	N/A
PTX06-1128	4	4	100%	**9.59**	Yes	**8.0**	Yes	--	N/A
PTX07-1O02	1	1	100%	0.1	No	0.1	No	PI	N/A
PTX07-1O03	5	5	100%	**45.9**	Yes	**39.9**	Yes	I	S
PTX07-1P02	12	12	100%	**13**	Yes	**5.7**	Yes	I	I
PTX07-1R03	1	0	0%	ND	No	ND	No	N/A	N/A
PTX08-1001	5	5	100%	**123**	Yes	**34.7**	Yes	S	NT
PTX08-1002	9	9	100%	**142**	Yes	**27.0**	Yes	S	NT
PTX08-1010	1	0	0%	ND	No	ND	No	N/A	N/A
DNT4A North Sector									
OW-WR-38	8	4	50%	0.14	No	0.1	No	--	S
PTX01-1001	9	0	0%	ND	No	ND	No	S	ND
PTX01-1008	8	0	0%	ND	No	ND	No	--	ND
PTX04-1001	3	0	0%	ND	No	ND	No	--	N/A
PTX04-1002	4	0	0%	ND	No	ND	No	--	ND
PTX06-1013	5	0	0%	ND	No	ND	No	--	ND
PTX06-1023	10	0	0%	ND	No	ND	No	--	ND
PTX06-1048A	4	3	75%	0.13	No	0.1	No	D	S
PTX06-1049	11	11	100%	**1.84**	Yes	**1.2**	Yes	D	S
PTX06-1050	8	8	100%	**6.59**	Yes	**4.5**	Yes	D	D
PTX06-1069	1	0	0%	ND	No	ND	No	--	N/A
PTX06-1071	1	0	0%	ND	No	ND	No	--	N/A
PTX06-1079	1	0	0%	ND	No	ND	No	--	N/A
PTX06-1081	3	0	0%	ND	No	ND	No	--	N/A
PTX06-1117	3	0	0%	ND	No	ND	No	--	N/A
PTX06-1128	4	0	0%	ND	No	ND	No	--	N/A
PTX07-1O02	1	0	0%	ND	No	ND	No	--	N/A
PTX07-1O03	5	0	0%	ND	No	ND	No	--	ND
PTX07-1P02	12	0	0%	ND	No	ND	No	--	ND
PTX07-1R03	1	0	0%	ND	No	ND	No	--	N/A
PTX08-1001	5	1	20%	0.18	No	0.1	No	S	PD
PTX08-1002	9	8	89%	**2.82**	Yes	**1.2**	Yes	PD	PD
PTX08-1010	1	0	0%	ND	No	ND	No	--	N/A

See Notes End of Table

TABLE B-16
MONITORING WELL TREND SUMMARY RESULTS NORTH SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

WellName	Number of Samples (2017 - 2021)	Number of Detects	Percent Detection	Maximum Concentration [µg/L]	Maximum Above MSC?	Average Concentration [µg/L]	Average Above MSC?	Mann-Kendall Trend 2012 - 2016	Mann-Kendall Trend 2017 - 2021
Boron North Sector									
OW-WR-38	6	6	100%	**706**	Yes	461.1	No	NT	I
PTX01-1001	9	9	100%	70.2	No	62.2	No	S	I
PTX01-1008	8	8	100%	58.3	No	51.7	No	S	I
PTX04-1001	3	3	100%	155	No	134.3	No	N/A	N/A
PTX04-1002	4	4	100%	150	No	128.5	No	NT	S
PTX06-1013	5	5	100%	485	No	471.0	No	PD	S
PTX06-1023	10	10	100%	106	No	95.9	No	S	S
PTX06-1048A	4	4	100%	80.5	No	76.7	No	S	D
PTX06-1049	9	9	100%	132	No	119.1	No	PI	PI
PTX06-1050	8	8	100%	**1140**	Yes	**894.9**	Yes	D	I
PTX06-1069	1	1	100%	125	No	125.0	No	S	N/A
PTX06-1071	1	1	100%	97.9	No	97.9	No	N/A	N/A
PTX06-1079	1	1	100%	67.2	No	67.2	No	--	N/A
PTX06-1081	3	3	100%	82.2	No	79.9	No	NT	N/A
PTX06-1117	3	3	100%	**954**	Yes	**925.8**	Yes	--	N/A
PTX06-1128	4	4	100%	**605**	Yes	490.2	No	--	N/A
PTX07-1O02	1	1	100%	83	No	83.0	No	S	N/A
PTX07-1O03	5	5	100%	449	No	419.8	No	NT	S
PTX07-1P02	10	10	100%	**1310**	Yes	**947.1**	Yes	NT	I
PTX07-1R03	1	1	100%	131	No	131.0	No	N/A	N/A
PTX08-1001	5	5	100%	**1330**	Yes	**943.4**	Yes	S	S
PTX08-1002	9	9	100%	**831**	Yes	**529.6**	Yes	PD	NT
PTX08-1010	1	1	100%	134	No	134.0	No	N/A	N/A
Chromium North Sector									
No exceedances for Cr (VI) and single exceedance for Total Cr 2017 - 2021									
PTX06-1128	4	4	100%	**126**	Yes	66.8	No	--	N/A
TCE North Sector									
No exceedances for TCE 2017 - 2021									

Notes

1. Only wells where the COC indicated was detected are shown. Trends were evaluated for data collected between January 2017 and December 2021.
2. Number of Samples is the number of samples for the compound at this location during 2017 - 2021.
   Number of Detects is the number of samples where the compound was detected at this location.
3. The maximum concentration for the COC is the maximum analytical result analyzed between 2017 and 2021. Results above MSCs/remedial goals are indicated in **Bold**.
4. MSCs = Medium Specific Concentration from Corrective Measure Study. RDX = 2 µg/L; DNT4A = 1.2 µg/L; TCE = 5 µg/L; Cr (VI) = 100 µg/L;
   Perchlorate = 15 µg/L; Boron = 500 µg/L.
5. No exceedances of Cr(VI) were found in North Sector wells.
6. D = Decreasing; PD = Probably Decreasing; S = Stable; PI = Probably Increasing; I = Increasing; N/A = Insufficient Data to determine trend;
   NT = No Trend; ND = well has all non-detect results for COC; ND* = one detection for compound, may be unaffected.

TABLE B-17
FINAL RECOMMENDED GROUNDWATER MONITORING NETWORK NORTH SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Priority COPC	Maximum Above MSC?	MK Trend	Sampling Frequency Recommendation	Rationale
North Sector					
OW-WR-38	RDX	Yes	I	Annual	UM, RA, Monitors source area in north adjacent to Playa 1
PTX01-1001	None	--	--	Annual	UM and POC in Burning Ground, limited saturated thickness, low concentrations of COCs
PTX01-1008	None	--	--	Annual	UM and POC in Burning Ground, limited saturated thickness
PTX04-1001	None	--	--	5 yrs	UM in NE corner of DOE property.
PTX04-1002	None	--	--	5 yrs	UM in NE corner of DOE property.
PTX06-1013	RDX	Yes	S	Annual	RA, Edge of perched unit east of Playa 1. Monitor for boron and RDX.
PTX06-1023	RDX	No	NT	Biennial	RA, POC, Edge of perched unit east of Playa 1. Monitor for boron and RDX.
PTX06-1048A	TCE	No	S	Annual	PS, RA, TCE detections slightly below remedial goals and stable trend; Delineates north/northeast of perched unit.
PTX06-1049	RDX	Yes	I	Annual	PS, UM, Low concentrations of COCs with increasing RDX trend, delineates northwest of Zone 11
PTX06-1050	RDX	Yes	I	Semiannual	UM, RA, POC, Monitors area northwest of Playa 1, area of highest RDX concentration in North Sector.
PTX06-1069	Cr (tot)	No	N/A	5 yrs	PS, Monitors eastern extent of perched unit. Continue to monitor for plume staiblity.
PTX06-1071	None	--	--	5 yrs	UM, Non-detect for most COCs, Monitors SWMU 140, NE corner of DOE property.
PTX06-1079	None	--	--	5 yrs	UM, Non-detect for COCs, NE corner of DOE property.

See Notes End of Table

TABLE B-17
FINAL RECOMMENDED GROUNDWATER MONITORING NETWORK NORTH SECTOR

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	Priority COPC	Maximum Above MSC?	MK Trend	Sampling Frequency Recommendation	Rationale
North Sector					
PTX06-1081	None	--	--	5 yrs	UM, Non-detect for most COCs, NE corner of DOE property.
PTX06-1117	RDX	Yes	N/A	Annual	PS, RA, Monitor RDX and boron plumes south of Playa 1.
PTX06-1128	RDX	Yes	N/A	Annual	PS, RA, Monitor RDX and boron plumes east of Playa 1.
PTX07-1O02	None	--	--	Biennial	PS, UM, RA, POC, Monitors SWMU 68b.
PTX07-1O03	RDX	Yes	S	Annual	PS, UM, RA, Monitors SWMU 68b, stable RDX concentration trend.
PTX07-1P02	RDX	Yes	I	Annual	UM, POC, Monitors increasing RDX trend and boron plume west of Playa 1.
PTX07-1R03	None	--	--	5 yrs	UM, Monitors isolated area of groundwater northwest of Playa 2.
PTX08-1001	RDX	Yes	NT	Annual	UM, RA, Monitor RDX and boron plumes south of Playa 1.
PTX08-1002	RDX	Yes	--	Annual	UM, RA, Monitor RDX plume south of Playa 1.
PTX08-1010	None	--	--	5 yrs	UM, RA, limited detections of COPCs below remedial goals, NE corner of DOE property.

Notes:
1. MSC = Medium Specific Concentration.
2. D = Decreasing; PD = Probably Decreasing; S = Stable; PI = Probably Increasing; I = Increasing; N/A = Insufficient Data to determine trend; NT = No Trend; ND = well has all non-detect results for COC indicated; N/C not calculated.
3. Mann-Kendall trends for 2017 - 2021 are shown.
4. PS = Plume Stability, RA = Remedial Action, UM = Uncertainty Management, POC = Point of Compliance.

TABLE B-18
SUMMARY MONITORING NETWORK RECOMMENDATIONS

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	MAROS Analysis Sector	Indicator Area/Secondary Objectives	Priority COC at Well	LTM Objectives	Frequency Analysis Result
1114-MW4	Southwest	Source	PERCHLORATE	UM	Annual
OW-WR-38	North	Playa 1	RDX	UM, RA	Annual
PTX01-1001	North	Burning Ground	None	UM, POC	Annual
PTX01-1008	North	Burning Ground	None	UM, POC	Annual
PTX04-1001	North	North	None	None	5 yrs
PTX04-1002	North	North	None	UM	5 yrs
PTX06-1002A	Southeast	Source	RDX	UM, RA	Annual
PTX06-1005	Southeast	Source	RDX	UM, RA	Annual
PTX06-1006	Southwest	Source	RDX	PS	Annual
PTX06-1007	Southwest	Source	RDX	UM	Annual
PTX06-1008	Southwest/Southeast	Source	1,2-DICHLOROETHANE	UM	Annual
PTX06-1010	Southeast	Source	CHROMIUM, TOTAL	UM	Annual
PTX06-1011	Southeast	Source	TCE	UM	Annual
PTX06-1012	Southwest	ISPM	TCE	PS, RA	Annual
PTX06-1013	North/Southeast	P1PTS	RDX	RA	Annual
PTX06-1014	Southeast	SEPTS	RDX	RA	Annual
PTX06-1015	Southeast	SEPTS	RDX	RA	Annual
PTX06-1023	North/Southeast	P1PTS	RDX	RA, POC	Annual
PTX06-1031	Southeast	East edge	RDX	RA, POC	Semiannual
PTX06-1034	Southeast	East edge	RDX	PS, RA, POC	Semiannual
PTX06-1035	Southwest	ISPM	PERCHLORATE	PS	Semiannual
PTX06-1037	Southeast	ISPM (Dry)	None	RA	Semiannual
PTX06-1038	Southeast	SEPTS	RDX	RA	Annual
PTX06-1039A	Southeast	SEPTS	RDX	RA	Annual
PTX06-1040	Southeast	SEPTS	RDX	RA	Annual
PTX06-1041	Southeast	SEPTS	RDX	RA	Annual
PTX06-1042	Southeast	SEPTS	RDX	RA, POC	Semiannual
PTX06-1045	Southeast	ISPM (Dry)		RA, POC	Semiannual
PTX06-1046	Southeast	SEPTS	RDX	RA, POC	Semiannual
PTX06-1047A	Southeast	SE Migration	RDX	RA	Semiannual
PTX06-1048A	North	Playa 1	TCE	PS, RA	Annual
PTX06-1049	North	Playa 1	RDX	PS	Annual
PTX06-1050	North	Source/Playa 1	RDX	UM, RA, POC	Semiannual
PTX06-1052	Southwest/Southeast	ISPM	CHROMIUM, TOTAL	RA, POC	Annual
PTX06-1053	Southwest/Southeast	ISPM	None	PS, UM	Annual
PTX06-1069	North/Southeast	East edge	None	PS	Annual
PTX06-1071	North	North	None	UM	5 yrs
PTX06-1077A	Southwest	Zone 11	TCE	UM	Biennial
PTX06-1079	North	North	None	None	5 yrs
PTX06-1081	North	North	None	None	5 yrs
PTX06-1082	PantexLake	PantexLake	None	UM	5 yrs
PTX06-1083	PantexLake	PantexLake	None	UM	5 yrs
PTX06-1085	Southwest	Playa 2	None	UM	5 yrs
PTX06-1086	Southwest	Playa 2	None	UM	5 yrs
PTX06-1088	Southeast	Source	RDX	UM, RA	Semiannual
PTX06-1095A	Southeast	Source	RDX	RA, UM	Annual
PTX06-1098	Southeast	ISPM	None	RA	Annual

See Notes End of Table

TABLE B-18
SUMMARY MONITORING NETWORK RECOMMENDATIONS

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	MAROS Analysis Sector	Indicator Area/Secondary Objectives	Priority COC at Well	LTM Objectives	Frequency Analysis Result
PTX06-1100	Southeast	ISPM	None	None	Biennial
PTX06-1101	Southeast	ISPM	RDX	RA	Annual
PTX06-1117	North	Playa 1	RDX	None	Annual
PTX06-1120	Southeast	SE Migration	RDX	PS	Annual
PTX06-1126	Southwest	Upgradient ISB	TCE	PS, POC	Semiannual
PTX06-1127	Southwest	Upgradient ISB	RDX	PS, POC	Semiannual
PTX06-1128	North	Playa 1	RDX	None	Annual
PTX06-1131	Southwest	Zone 10	Boron	UM	Biennial
PTX06-1133A	Southeast	SE Migration	CHROMIUM, TOTAL	PS	Annual
PTX06-1134	Southwest	SW Migration	TCE	PS	Semiannual
PTX06-1146	Southeast	East edge	RDX	PS, POC	Semiannual
PTX06-1147	Southeast	East edge	RDX	PS	Semiannual
PTX06-1148	Southwest/Southeast	ISPM	PERCHLORATE	RA	Semiannual
PTX06-1149	Southwest	ISPM	PERCHLORATE	RA	Semiannual
PTX06-1150	Southwest	ISPM	PERCHLORATE	RA	Semiannual
PTX06-1151	Southwest	Upgradient ISB	TCE	PS	Annual
PTX06-1153	Southeast	ISPM	RDX	RA, POC	Semiannual
PTX06-1154	Southeast	ISPM	TNX	RA, POC	Semiannual
PTX06-1155	Southwest	ISPM	TCE	RA, POC	Semiannual
PTX06-1156	Southwest	ISPM	None	RA, POC	Semiannual
PTX06-1159	Southwest	SW Migration	TCE	PS	Semiannual
PTX06-1160	Southwest	SW Migration	PERCHLORATE	PS	Biennial
PTX06-1164	Southwest	ISTZ	TCE	TZM	Annual
PTX06-1166	Southeast	GW Divide	RDX	PS	Annual
PTX06-1169	Southwest	ISTZ	TCE	TZM	Biennial
PTX06-1170	Southwest	ISTZ	TCE	TZM	Semiannual
PTX06-1171	Southwest	ISPM	TCE	PS	Annual
PTX06-1173	Southwest	ISPM	TCE	RA	Semiannual
PTX06-1174	Southwest	ISPM	TCE	RA	Annual
PTX06-1175	Southwest	ISPM	TCE	RA	Semiannual
PTX06-1176	Southwest	ISTZ	TCE	TZM	Annual
PTX06-1177	Southwest	ISTZ	TCE	TZM	Annual
PTX06-1180	Southwest	ISB	TCE	PS	Semiannual
PTX06-1181	Southwest	ISB	None	None	5 yrs
PTX06-1182	Southeast	SE Migration	RDX	PS	Annual
PTX06-1183	Southwest	GW Divide	CHROMIUM, TOTAL	PS	Annual
PTX06-1184	Southeast	SE Edge	RDX	PS	Semiannual
PTX06-1185	Southeast	Upgradient ISB	RDX	PS	Semiannual
PTX06-1190	Southeast	Upgradient ISB	RDX	PS	Semiannual
PTX06-1191	Southeast	ISPM	RDX	PS, RA	Semiannual
PTX06-1192	Southeast	Offsite	CHROMIUM, HEXAVALENT	PS	Semiannual
PTX06-1194	Southeast	ISPM	RDX	PS, RA	Semiannual
PTX06-1195	Southeast	Offsite	RDX	PS	Semiannual
PTX06-1196	Southeast	ISPM	RDX	PS, RA	Semiannual
PTX06-1197	Southeast	Downgradient of Offsite ISB	RDX	PS	Semiannual
PTX06-1199	Southeast	Downgradient of Offsite ISB	RDX	PS	Semiannual

TABLE B-18
SUMMARY MONITORING NETWORK RECOMMENDATIONS

LONG-TERM MONITORING OPTIMIZATION
PANTEX PLANT
Carson County, Texas

Well Name	MAROS Analysis Sector	Indicator Area/Secondary Objectives	Priority COC at Well	LTM Objectives	Frequency Analysis Result
See Notes End of Table					
PTX06-1200	Southeast	Downgradient of Offsite ISB	BORON	PS	Semiannual
PTX06-1201	Southeast	Downgradient of Offsite ISB	RDX	PS	Semiannual
PTX06-1202	Southeast	Downgradient of Offsite ISB	RDX	PS	Semiannual
PTX06-1203	Southeast	Downgradient of Offsite ISB	RDX	PS	Semiannual
PTX06-1204	Southeast	Downgradient of Offsite ISB	RDX	PS	Semiannual
PTX06-1207	Southwest	SW Migration	4ADNT	PS	Semiannual
PTX06-1208	Southeast	Downgradient of Offsite ISB	CHROMIUM, TOTAL	PS	Annual
PTX06-1209	Southwest	ISTZ	TCE	TZM	Semiannual
PTX06-1210	Southwest	ISTZ	TCE	TZM	Semiannual
PTX06-1211	Southwest	Upgradient ISB	TCE	PS	Semiannual
PTX06-1213	Southeast	ISTZ	CHROMIUM, TOTAL	TZM	Annual
PTX06-1214	Southeast	ISTZ	None	TZM	Annual
PTX07-1O02	North	Playa 1	None	PS, UM, RA, POC	Biennial
PTX07-1O03	North	Playa 1	RDX	PS, UM, RA	Annual
PTX07-1P02	North/Southwest	Playa 1	RDX	UM, POC	Annual
PTX07-1Q01	Southwest	Zone 10	None	UM	5 yrs
PTX07-1Q02	Southwest	Zone 10	None	UM	5 yrs
PTX07-1Q03	Southwest	Zone 10	None	None	5 yrs
PTX07-1R03	North	West perched	None	UM	5 yrs
PTX08-1001	North/Southwest	Playa 1	RDX	UM, RA	Annual
PTX08-1002	North/Southeast	Source/Playa 1	RDX	UM, RA	Annual
PTX08-1003	Southwest	Zone 11	None	PS	Annual
PTX08-1005	Southwest	Source	TCE	UM	Annual
PTX08-1006	Southwest	Source	RDX	UM	Annual
PTX08-1007	Southwest/Southeast	Source	1,2-DICHLOROETHANE	UM	Annual
PTX08-1008	Southwest/Southeast	Source	CHROMIUM, HEXAVALENT	UM/RA	Biennial
PTX08-1009	Southwest/Southeast	Source	RDX	UM, RA	Biennial
PTX08-1010	North	North edge	None	UM	5 yrs
PTX10-1014	Southwest/Southeast	Source	TCE	UM	Biennial
Four Potential New Wells					
Southeast	Between PTX06-1195 and PTX06-1196		Southeast	UM, RA	Semiannual
Southeast	Northeast of PTX-06-1199		Southeast	UM	Semiannual
Southeast	East of PTX06-1042 and north of PTX06-1147		Southeast	PS, RA	Semiannual
Southwest	South of PTX08-1008		Southwest	UM	Semiannual
Southwest	Downgradient of PTX06-1035		Southwest	PS, UM	Semiannual

Notes:

1. SW = Southwest, N = North, SE = Southeast, ISPM = In situ performance monitoring, ISTZ = In situ treatment zone, SEPTS = Southeast Pump and Treat System; P1PTS = Playa 1 Pump and Treat System; ISB = In situ bioremediation, GW = groundwater, Dry = well intermittently dry.
2. Priority COCs represent the highest ratio of average concentration to remedial goal.
3. LTM Monitoring Objectives: PS = Plume Stability; UM = Uncertainty Management; RA = Response Action Effectiveness.

M = Treatment zone monitoring

4. Monitoring frequency recommendation from MAROS analysis and qualitative review.

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APPENDIX C

MAROS REPORTS

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SOUTHEAST SECTOR MAROS REPORTS

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MAROS COC Assessment

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Toxicity:

Contaminant of Concern	Representative Concentration (mg/L)	PRG (mg/L)	Percent Above PRG
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	2.7E-01	2.0E-03	13459.5%
TNX	1.3E-02	2.0E-03	560.1%
PERCHLORATE	7.7E-02	1.5E-02	411.8%
MNX	2.6E-03	2.0E-03	31.0%
CHROMIUM, TOTAL	1.1E-01	1.0E-01	5.0%
ARSENIC	1.2E-02	1.2E-02	0.2%

Note: Top COCs by toxicity were determined by examining a representative concentration for each compound over the entire site. The compound representative concentrations are then compared with the chosen PRG for that compound, with the percentage exceedance from the PRG determining the compound's toxicity. All compounds above exceed the PRG.

Prevalence:

Contaminant of Concern	Class	Total Wells	Total Exceedance	Percent Exceedances	Total Detects
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ORG	69	39	56.5%	63
TNX	ORG	69	29	42.0%	46
PERCHLORATE	INO	8	2	25.0%	8
ARSENIC	MET	18	3	16.7%	17
CHROMIUM, TOTAL	MET	68	9	13.2%	62
MNX	ORG	69	4	5.8%	33

Note: Top COCs by prevalence were determined by examining a representative concentration for each well location at the site. The total exceedances (values above the chosen PRGs) are compared to the total number of wells to determine the prevalence of the compound.

Mobility:

Contaminant of Concern	Kd/Koc
TNX	
PERCHLORATE	
MNX	
CHROMIUM, TOTAL	
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	0.00741
ARSENIC	25

MAROS COC Assessment

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Note: Top COCs by mobility were determined by examining each detected compound in the dataset and comparing their mobilities (Koc's for organics, assuming foc = 0.001, and Kd's for metals).

Priority Constituents by Well:

Well Name	Average	Max
PTX06-1002A	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1005	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1008	1,2-DICHLOROETHANE	1,2-DICHLOROETHANE
PTX06-1010	CHROMIUM, TOTAL	CHROMIUM, TOTAL
PTX06-1011	CHROMIUM, TOTAL	TRICHLOROETHYLENE (TCE
PTX06-1013	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1014	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1015	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1023	MOLYBDENUM	HEXAHYDRO-1,3,5-TRINITR
PTX06-1030	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1031	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1034	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1036	BORON	HEXAHYDRO-1,3,5-TRINITR
PTX06-1037	ARSENIC	ARSENIC
PTX06-1038	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1039A	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1040	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1041	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1042	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1045	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1046	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1047A	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1052	CHROMIUM, TOTAL	CHROMIUM, TOTAL
PTX06-1053	2,6-DINITROTOLUENE	2-AMINO-4,6-DINITROTOL
PTX06-1069	MANGANESE	CHROMIUM, TOTAL
PTX06-1088	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1095A	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1098	BARIUM	BARIUM
PTX06-1100	BARIUM	BARIUM
PTX06-1101	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1102	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR

PTX06-1120	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1121	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1123	TNX	TNX
PTX06-1130	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1133A	1,2-DICHLOROETHANE	CHROMIUM, TOTAL
PTX06-1135	TETRACHLOROETHYLENE(P	CHROMIUM, TOTAL
PTX06-1146	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1147	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1148	PERCHLORATE	PERCHLORATE
PTX06-1153	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1154	BARIUM	TNX
PTX06-1166	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1182	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1183	CHROMIUM, TOTAL	CHROMIUM, TOTAL
PTX06-1184	2,4,6-TRINITROTOLUENE	HEXAHYDRO-1,3,5-TRINITR
PTX06-1185	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1190	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1191	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1192	HEXAHYDRO-1,3,5-TRINITR	CHROMIUM, HEXAVALENT
PTX06-1194	2,4-DINITROTOLUENE	HEXAHYDRO-1,3,5-TRINITR
PTX06-1195	CHROMIUM, HEXAVALENT	HEXAHYDRO-1,3,5-TRINITR
PTX06-1196	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1197	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1199	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1200	1,1-DICHLOROETHENE	BORON
PTX06-1201	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1202	2,6-DINITROTOLUENE	HEXAHYDRO-1,3,5-TRINITR
PTX06-1203	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX06-1204	2,4-DINITROTOLUENE	HEXAHYDRO-1,3,5-TRINITR
PTX06-1208	TRICHLOROETHYLENE (TCE)	CHROMIUM, TOTAL
PTX06-1213	CHROMIUM, TOTAL	CHROMIUM, TOTAL
PTX06-1214	1,3,5-TRINITROBENZENE	BORON
PTX06-PRB16	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX08-1002	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINITR
PTX08-1007	TRICHLOROETHYLENE (TCE)	1,2-DICHLOROETHANE

PTX08-1008	PERCHLORATE	PERCHLORATE
PTX08-1009	4-AMINO-2,6-DINITROTOL	HEXAHYDRO-1,3,5-TRINITR
PTX10-1014	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE

MAROS Individual Well Summary Report

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
PTX06-1002A										
A4DNT26	NO	60 %	NO	I	0.91	0.0002	NO	Normal	YES	NO
CR6	NO	100 %	NO	PI	0.92	0.0015	NO	Normal	YES	NO
RDX	YES	100 %	YES	PI	0.59	0.0386	NO	Normal	NO	NO
TNX	NO	100 %	YES	PI	0.50	0.0067	NO	Normal	NO	NO
PTX06-1005										
A4DNT26	NO	100 %	NO	D	0.35	0.0004	NO	Normal	YES	YES
CR6	NO	100 %	NO	NT	0.14	0.0460	NO	Normal	YES	YES
RDX	YES	100 %	YES	S	0.77	0.0204	NO	Lognormal	NO	NO
TNX	NO	100 %	NO	PI	0.40	0.0011	NO	Normal	YES	YES
PTX06-1008										
A4DNT26	NO	60 %	NO	S	0.33	0.0002	NO	Normal	YES	YES
CR6	NO	100 %	NO	D	0.93	0.0059	YES	No distribution	YES	NO
RDX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PCATE	NO	80 %	NO	S	1.22	0.0107	NO	Normal	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PTX06-1010										
A4DNT26	NO	62 %	NO	S	0.00	0.0001	NO	No distribution	YES	YES
CR6	NO	100 %	YES	D	0.34	1.8828	NO	Normal	NO	NO
RDX	NO	100 %	NO	NT	0.31	0.0020	NO	Normal	NO	NO
TNX	NO	62 %	NO	S	0.33	0.0002	NO	Normal	YES	YES
PTX06-1011										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
CR6	NO	100 %	NO	S	0.24	0.0675	NO	Normal	YES	NO
RDX	NO	100 %	NO	S	0.59	0.0011	NO	Normal	YES	NO
PCATE	NO	86 %	NO	D	0.18	0.0051	NO	Normal	YES	YES
TNX	NO	80 %	NO	S	0.65	0.0004	NO	Normal	YES	NO
PTX06-1013										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES

MAROS Individual Well Summary Report

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
CR6	NO	80 %	NO	NT	0.00	0.0058	YES	No distribution	YES	NO
RDX	YES	100 %	YES	S	0.19	0.0065	NO	Normal	NO	NO
TNX	NO	100 %	NO	S	0.21	0.0006	NO	Normal	YES	YES
PTX06-1014										
A4DNT26	NO	100 %	NO	S	0.14	0.0032	YES	Normal	YES	YES
CR6	NO	100 %	NO	S	0.05	0.0020	NO	Normal	YES	YES
RDX	YES	100 %	YES	S	0.16	0.7143	NO	Normal	NO	NO
TNX	NO	100 %	YES	NT	0.11	0.0294	NO	Normal	NO	NO
PTX06-1015										
A4DNT26	NO	100 %	NO	NT	0.04	0.0035	NO	Normal	YES	YES
CR6	NO	100 %	NO	N/A	0.14	0.0188	NO	Normal	NO	NO
RDX	YES	100 %	YES	S	0.09	1.0213	NO	Normal	NO	NO
TNX	NO	100 %	YES	S	0.18	0.0641	NO	Normal	NO	NO
PTX06-1023										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
CR6	NO	100 %	NO	NT	0.20	0.0013	NO	Normal	YES	YES
RDX	YES	40 %	NO	NT	1.12	0.0004	YES	No distribution	YES	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PTX06-1031										
A4DNT26	NO	100 %	NO	NT	0.21	0.0033	NO	Normal	YES	YES
CR6	NO	100 %	NO	I	0.46	0.0141	YES	Lognormal	YES	NO
RDX	YES	100 %	YES	NT	0.19	0.7368	NO	Normal	NO	NO
TNX	NO	100 %	YES	I	0.35	0.0316	NO	Normal	NO	NO
PTX06-1034										
A4DNT26	NO	100 %	NO	NT	0.12	0.0054	NO	Normal	YES	YES
CR6	NO	100 %	NO	S	0.07	0.0030	NO	No distribution	YES	YES
RDX	YES	100 %	YES	NT	0.18	1.1278	NO	Normal	NO	NO
TNX	NO	100 %	YES	PD	0.32	0.0575	YES	Lognormal	NO	NO
PTX06-1037										

MAROS Individual Well Summary Report

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
A4DNT26	NO	0 %	NO	ND	0.00	0.0002	NO	No distribution	YES	YES
CR6	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	YES	NO
RDX	NO	14 %	NO	D	0.00	0.0002	NO	No distribution	YES	YES
TNX	NO	7 %	NO	D	0.00	0.0002	NO	No distribution	YES	YES
PTX06-1038										
A4DNT26	NO	100 %	NO	D	0.29	0.0075	NO	Normal	NO	NO
CR6	NO	100 %	NO	NT	0.11	0.0016	NO	Normal	YES	YES
RDX	YES	100 %	YES	D	0.18	0.1064	NO	Normal	NO	NO
TNX	NO	100 %	YES	PD	0.23	0.0056	NO	Normal	NO	NO
PTX06-1039A										
A4DNT26	NO	100 %	YES	NT	0.20	0.0242	NO	Normal	NO	NO
CR6	NO	100 %	NO	I	0.18	0.0015	NO	Normal	YES	NO
RDX	YES	100 %	YES	S	0.32	0.9419	NO	Normal	NO	NO
TNX	NO	100 %	YES	NT	0.26	0.0855	NO	Normal	NO	NO
PTX06-1040										
A4DNT26	NO	100 %	YES	S	0.18	0.0239	NO	Normal	NO	NO
CR6	NO	100 %	NO	D	2.31	0.0211	YES	No distribution	YES	NO
RDX	YES	100 %	YES	S	0.20	1.0138	NO	Normal	NO	NO
TNX	NO	100 %	YES	D	0.29	0.0754	NO	Normal	NO	NO
PTX06-1041										
A4DNT26	NO	100 %	YES	PD	0.11	0.0161	NO	Normal	NO	NO
CR6	NO	100 %	NO	I	1.03	0.0086	YES	No distribution	YES	NO
RDX	YES	100 %	YES	NT	0.29	1.3160	NO	Normal	NO	NO
TNX	NO	100 %	YES	D	0.34	0.0293	NO	Normal	NO	NO
PTX06-1042										
A4DNT26	NO	100 %	NO	PD	0.29	0.0056	NO	Normal	YES	YES
CR6	NO	100 %	NO	NT	0.32	0.0024	YES	Lognormal	YES	YES
RDX	YES	100 %	YES	S	0.17	0.4125	NO	Normal	NO	NO
TNX	NO	100 %	YES	S	0.28	0.0074	NO	Normal	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
PTX06-1045										
A4DNT26	NO	60 %	NO	S	1.04	0.0003	NO	Normal	YES	NO
CR6	NO	100 %	NO	S	0.31	0.0023	NO	Normal	YES	NO
RDX	YES	100 %	YES	D	0.94	0.0623	NO	Normal	NO	NO
TNX	NO	100 %	NO	D	0.78	0.0038	NO	Normal	NO	NO
PTX06-1046										
A4DNT26	NO	100 %	NO	D	0.37	0.0047	NO	Normal	YES	NO
CR6	NO	100 %	NO	S	0.75	0.0096	NO	Normal	YES	NO
RDX	YES	100 %	YES	D	0.60	1.1159	NO	Normal	NO	NO
TNX	NO	100 %	YES	D	0.81	0.0726	NO	Normal	NO	NO
PTX06-1047A										
A4DNT26	NO	100 %	NO	PD	0.68	0.0022	NO	Normal	YES	NO
CR6	NO	100 %	NO	NT	0.96	0.0131	NO	Lognormal	YES	NO
RDX	YES	100 %	YES	PD	0.54	0.0652	NO	Normal	NO	NO
TNX	NO	100 %	NO	D	0.66	0.0033	NO	Normal	NO	NO
PTX06-1052										
A4DNT26	NO	18 %	NO	NT	4.00	0.0002	YES	No distribution	YES	YES
CR6	NO	100 %	NO	D	0.62	0.4653	NO	Normal	NO	NO
RDX	NO	27 %	NO	NT	0.00	0.0001	YES	Normal	YES	YES
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PTX06-1053										
A4DNT26	NO	100 %	NO	PD	0.45	0.0003	NO	Normal	YES	NO
CR6	NO	88 %	NO	NT	0.00	0.0044	NO	No distribution	YES	NO
RDX	NO	62 %	NO	NT	0.00	0.0001	NO	Normal	YES	YES
PCATE	NO	25 %	NO	S	0.00	0.0067	NO	No distribution	YES	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PTX06-1069										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
RDX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
TNX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX06-1088										
A4DNT26	NO	100 %	NO	I	0.40	0.0006	NO	Normal	YES	NO
CR6	NO	100 %	NO	I	0.67	0.0617	NO	Lognormal	NO	NO
RDX	YES	100 %	YES	I	1.21	0.0668	NO	Lognormal	NO	NO
TNX	NO	100 %	NO	PI	0.55	0.0009	NO	Normal	YES	NO
PTX06-1095A										
A4DNT26	NO	100 %	NO	D	0.83	0.0009	NO	No distribution	YES	NO
CR6	NO	100 %	NO	NT	0.26	0.0163	NO	Normal	YES	YES
RDX	YES	100 %	YES	D	1.86	0.2343	YES	Lognormal	NO	NO
TNX	NO	80 %	NO	D	1.19	0.0008	NO	No distribution	YES	NO
PTX06-1098										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
CR6	NO	0 %	NO	ND	0.00	0.0000	NO	No distribution	YES	YES
RDX	NO	12 %	NO	S	0.00	0.0001	YES	No distribution	YES	YES
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PTX06-1100										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
CR6	NO	0 %	NO	ND	0.00	0.0076	YES	No distribution	YES	NO
RDX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PTX06-1101										
A4DNT26	NO	40 %	NO	PD	0.00	0.0001	YES	Normal	YES	YES
CR6	NO	40 %	NO	NT	0.00	0.0076	YES	Lognormal	YES	NO
RDX	YES	100 %	YES	NT	0.38	0.0576	NO	Normal	NO	NO
TNX	NO	20 %	NO	S	0.00	0.0001	NO	Normal	YES	YES
PTX06-1120										
A4DNT26	NO	100 %	NO	D	0.72	0.0086	NO	Normal	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
CR6	NO	100 %	NO	D	1.28	0.0187	YES	Normal	YES	NO
RDX	YES	100 %	YES	D	0.67	2.9627	YES	Normal	NO	NO
TNX	NO	100 %	YES	S	0.69	0.2268	NO	Normal	NO	NO
PTX06-1133A										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
CR6	NO	90 %	NO	D	0.00	0.0037	YES	No distribution	YES	YES
RDX	NO	10 %	NO	S	0.00	0.0002	YES	No distribution	YES	YES
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PTX06-1146										
A4DNT26	NO	100 %	YES	NT	0.12	0.0227	NO	Normal	NO	NO
CR6	NO	100 %	NO	I	0.16	0.0166	NO	Normal	YES	NO
RDX	YES	100 %	YES	PI	0.28	1.5153	NO	Lognormal	NO	NO
TNX	NO	100 %	YES	I	0.12	0.0224	NO	Normal	NO	NO
PTX06-1147										
A4DNT26	NO	100 %	NO	I	0.16	0.0041	NO	Normal	NO	NO
CR6	NO	91 %	NO	NT	0.00	0.0049	YES	Lognormal	YES	YES
RDX	YES	100 %	YES	S	0.23	0.7957	NO	Normal	NO	NO
TNX	NO	100 %	YES	S	0.33	0.0433	YES	Normal	NO	NO
PTX06-1148										
A4DNT26	NO	12 %	NO	PD	3.74	0.0001	NO	No distribution	YES	YES
RDX	NO	12 %	NO	PD	1.76	0.0001	YES	No distribution	YES	YES
PCATE	YES	89 %	YES	D	1.30	0.2139	NO	Lognormal	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	YES	YES
PTX06-1153										
A4DNT26	NO	97 %	NO	NT	0.00	0.0031	YES	No distribution	YES	YES
CR6	NO	100 %	NO	D	0.64	0.0176	NO	Normal	YES	YES
RDX	YES	100 %	YES	I	0.43	0.4306	NO	No distribution	NO	NO
TNX	NO	100 %	YES	I	0.40	0.0193	NO	Normal	NO	NO
PTX06-1154										

MAROS Individual Well Summary Report

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	YES	YES
CR6	NO	7 %	NO	NT	0.00	0.0000	YES	No distribution	YES	YES
RDX	NO	19 %	NO	PD	1.41	0.0003	YES	No distribution	YES	YES
TNX	YES	0 %	NO	ND	0.00	0.0001	YES	No distribution	YES	YES
PTX06-1166										
A4DNT26	NO	100 %	NO	PI	0.12	0.0004	NO	Normal	YES	YES
CR6	NO	100 %	NO	I	0.42	0.0960	NO	Normal	NO	NO
RDX	YES	100 %	YES	S	0.17	0.0157	NO	Normal	NO	NO
TNX	NO	12 %	NO	S	0.00	0.0001	YES	No distribution	YES	YES
PTX06-1182										
A4DNT26	NO	92 %	NO	D	1.88	0.0034	NO	No distribution	YES	NO
CR6	NO	90 %	NO	S	0.00	0.0037	YES	No distribution	YES	NO
RDX	YES	92 %	NO	D	1.93	0.0111	NO	No distribution	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	YES	YES
PTX06-1183										
A4DNT26	NO	10 %	NO	PD	0.00	0.0001	YES	No distribution	YES	YES
CR6	NO	100 %	YES	D	0.47	1.0148	NO	Normal	NO	NO
RDX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PTX06-1184										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	YES	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
TNX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX06-1185										
A4DNT26	NO	100 %	NO	D	0.26	0.0036	NO	Normal	YES	YES
CR6	NO	100 %	NO	PD	0.20	0.0039	NO	Normal	YES	YES
RDX	YES	100 %	YES	D	0.42	0.6097	NO	Normal	NO	NO
TNX	NO	100 %	NO	D	0.51	0.0033	NO	No distribution	NO	NO
PTX06-1190										

MAROS Individual Well Summary Report

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
A4DNT26	NO	100 %	YES	S	0.13	0.0084	NO	Normal	NO	NO
CR6	NO	100 %	NO	I	0.12	0.0035	NO	Normal	YES	NO
RDX	YES	100 %	YES	I	0.51	1.3053	NO	Normal	NO	NO
TNX	NO	100 %	YES	I	0.28	0.0249	NO	Normal	NO	NO
PTX06-1191										
A4DNT26	NO	100 %	NO	D	0.22	0.0018	NO	Normal	YES	YES
CR6	NO	100 %	NO	S	0.09	0.0026	NO	Normal	YES	YES
RDX	YES	100 %	YES	PI	0.18	0.1484	NO	Normal	NO	NO
TNX	NO	100 %	NO	I	0.23	0.0004	NO	Normal	YES	NO
PTX06-1192										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	YES	YES
CR6	YES	100 %	NO	NT	1.34	0.0069	YES	Lognormal	YES	NO
RDX	YES	12 %	NO	S	0.00	0.0001	NO	Normal	YES	YES
TNX	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	YES	YES
PTX06-1194										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	YES	YES
CR6	NO	100 %	NO	S	0.60	0.0023	YES	Normal	YES	NO
RDX	YES	17 %	NO	S	3.17	0.0001	YES	No distribution	YES	YES
TNX	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	YES	YES
PTX06-1195										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	No distribution	YES	YES
CR6	YES	100 %	NO	NT	0.52	0.0011	NO	No distribution	YES	NO
RDX	YES	33 %	NO	S	0.00	0.0001	YES	No distribution	YES	YES
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	No distribution	YES	YES
PTX06-1196										
A4DNT26	NO	100 %	NO	S	0.25	0.0053	NO	Normal	YES	NO
CR6	NO	100 %	NO	N/A	0.23	0.0030	NO	Normal	NO	NO
RDX	YES	100 %	YES	I	0.20	0.0306	NO	Normal	NO	NO
TNX	NO	100 %	NO	I	0.62	0.0017	NO	Normal	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
PTX06-1197										
A4DNT26	NO	100 %	NO	S	0.12	0.0035	NO	Normal	YES	YES
CR6	NO	100 %	NO	NT	0.23	0.0042	NO	Normal	YES	YES
RDX	YES	100 %	YES	I	0.24	0.2403	NO	Normal	NO	NO
TNX	NO	100 %	NO	NT	0.19	0.0018	YES	Normal	YES	NO
PTX06-1199										
A4DNT26	NO	100 %	NO	I	0.20	0.0020	YES	Normal	NO	NO
CR6	NO	100 %	NO	I	0.72	0.0040	YES	Lognormal	YES	NO
RDX	YES	100 %	YES	I	0.25	0.0085	NO	Normal	NO	NO
TNX	NO	14 %	NO	PD	0.00	0.0001	YES	No distribution	YES	YES
PTX06-1200										
A4DNT26	NO	12 %	NO	S	0.00	0.0002	YES	No distribution	YES	YES
CR6	NO	100 %	NO	NT	0.06	0.0013	YES	No distribution	YES	YES
RDX	NO	0 %	NO	ND	0.00	0.0002	YES	No distribution	YES	YES
TNX	NO	0 %	NO	ND	0.00	0.0002	YES	No distribution	YES	YES
PTX06-1201										
A4DNT26	NO	100 %	NO	I	0.50	0.0014	NO	No distribution	NO	NO
CR6	NO	100 %	NO	NT	0.16	0.0029	YES	No distribution	YES	YES
RDX	YES	100 %	YES	I	0.83	0.0088	NO	No distribution	NO	NO
TNX	NO	14 %	NO	PD	0.00	0.0001	YES	No distribution	YES	YES
PTX06-1202										
A4DNT26	NO	100 %	NO	I	0.17	0.0004	NO	No distribution	YES	NO
CR6	NO	100 %	NO	I	0.20	0.0016	YES	No distribution	YES	NO
RDX	YES	86 %	NO	PI	0.22	0.0002	NO	Normal	YES	YES
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PTX06-1203										
A4DNT26	NO	100 %	YES	NT	0.09	0.0068	YES	No distribution	NO	NO
CR6	NO	100 %	NO	S	0.03	0.0045	NO	Normal	YES	YES
RDX	YES	100 %	YES	I	0.36	0.2194	NO	No distribution	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
TNX	NO	100 %	YES	PI	0.29	0.0030	NO	No distribution	NO	NO
PTX06-1204										
A4DNT26	NO	100 %	NO	I	0.68	0.0009	NO	Lognormal	NO	NO
CR6	NO	100 %	NO	NT	0.18	0.0032	YES	No distribution	YES	YES
RDX	YES	71 %	NO	PI	1.23	0.0008	YES	No distribution	YES	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	No distribution	YES	YES
PTX06-1208										
A4DNT26	NO	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
CR6	NO	100 %	NO	N/A	1.34	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
TNX	NO	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
PTX06-1213										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
TNX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX06-1214										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
TNX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX08-1002										
A4DNT26	NO	89 %	NO	PD	0.79	0.0020	NO	Normal	YES	NO
CR6	NO	89 %	NO	NT	0.00	0.0032	YES	No distribution	YES	NO
RDX	YES	100 %	YES	NT	1.75	0.0660	YES	No distribution	NO	NO
TNX	NO	100 %	NO	S	0.99	0.0023	YES	Lognormal	NO	NO
PTX08-1007										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
CR6	NO	100 %	NO	D	1.01	0.0081	YES	No distribution	YES	NO
RDX	NO	100 %	YES	S	0.13	0.0033	NO	Normal	NO	NO
PCATE	NO	100 %	NO	I	0.13	0.0087	NO	Normal	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
TNX	NO	100 %	NO	S	0.28	0.0009	NO	Normal	YES	NO
PTX08-1008										
A4DNT26	NO	80 %	NO	I	1.11	0.0021	NO	Lognormal	NO	NO
CR6	NO	100 %	NO	D	0.69	0.0992	NO	Normal	NO	NO
RDX	NO	20 %	YES	NT	2.61	0.0008	YES	No distribution	YES	NO
PCATE	YES	100 %	YES	D	0.19	0.3575	NO	Normal	NO	NO
TNX	NO	10 %	NO	S	0.00	0.0002	YES	No distribution	YES	YES
PTX08-1009										
A4DNT26	YES	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
CR6	NO	100 %	NO	D	0.69	0.0284	NO	Normal	YES	NO
RDX	YES	67 %	NO	NT	0.87	0.0002	YES	No distribution	YES	YES
PCATE	NO	50 %	NO	S	0.00	0.0064	NO	No distribution	YES	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PTX10-1014										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
CR6	NO	100 %	NO	S	0.74	0.0250	NO	Normal	YES	NO
RDX	NO	100 %	YES	NT	0.51	0.0028	NO	Normal	NO	NO
PCATE	NO	100 %	NO	S	0.11	0.0073	NO	Normal	YES	YES
TNX	NO	100 %	NO	NT	0.35	0.0005	NO	Normal	YES	NO

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Time Period: 1/1/2017 **to** 1/1/2022
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
4-AMINO-2,6-DINITROTOLUENE							
PTX06-1002A	8	5	0.18	20	99.3%	No	I
PTX06-1005	10	10	0.34	-31	99.8%	No	D
PTX06-1008	5	3	0.21	-6	88.3%	No	S
PTX06-1010	8	5	0.08	-4	64.0%	No	S
PTX06-1011	5	0	0.02	-5	82.1%	Yes	ND
PTX06-1013	5	0	0.02	3	67.5%	Yes	ND
PTX06-1014	5	5	0.14	-4	75.8%	No	S
PTX06-1015	4	4	0.04	4	83.3%	No	NT
PTX06-1023	8	0	0.04	-2	54.8%	Yes	ND
PTX06-1031	11	11	0.18	11	77.7%	No	NT
PTX06-1034	10	10	0.12	1	50.0%	No	NT
PTX06-1037	14	0	0.19	-46	99.4%	Yes	ND
PTX06-1038	8	8	0.24	-25	100.0%	No	D
PTX06-1039A	8	8	0.21	8	80.1%	No	NT
PTX06-1040	10	10	0.18	-1	50.0%	No	S
PTX06-1041	10	10	0.11	-18	93.4%	No	PD
PTX06-1042	10	10	0.29	-19	94.6%	No	PD
PTX06-1045	4	2	0.32	-4	83.3%	No	S
PTX06-1046	10	10	0.37	-25	98.6%	No	D
PTX06-1047A	9	9	0.76	-16	94.0%	No	PD
PTX06-1052	10	2	0.65	13	85.4%	No	NT
PTX06-1053	8	8	0.45	-14	94.6%	No	PD
PTX06-1069	1	0	0.00	0	0.0%	Yes	ND
PTX06-1088	10	10	0.40	27	99.2%	No	I
PTX06-1095A	10	10	0.83	-35	100.0%	No	D
PTX06-1098	8	0	0.02	-10	86.2%	Yes	ND

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

4-AMINO-2,6-DINITROTOLUENE

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PTX06-1100	5	0	0.02	-6	88.3%	Yes	ND
PTX06-1101	5	2	0.15	-7	92.1%	No	PD
PTX06-1120	4	4	0.72	-6	95.8%	No	D
PTX06-1133A	10	0	0.02	-16	90.7%	Yes	ND
PTX06-1146	10	10	0.12	3	56.9%	No	NT
PTX06-1147	10	10	0.16	25	98.6%	No	I
PTX06-1148	16	1	0.22	-30	90.3%	No	PD
PTX06-1153	16	15	1.28	-29	89.5%	No	NT
PTX06-1154	16	0	0.14	-68	99.9%	Yes	ND
PTX06-1166	8	8	0.12	14	94.6%	No	PI
PTX06-1182	11	10	1.78	-44	100.0%	No	D
PTX06-1183	10	1	0.05	-16	90.7%	No	PD
PTX06-1184	1	0	0.00	0	0.0%	Yes	ND
PTX06-1185	9	9	0.26	-28	99.9%	No	D
PTX06-1190	9	9	0.13	-12	87.0%	No	S
PTX06-1191	8	8	0.22	-16	96.9%	No	D
PTX06-1192	8	0	0.04	-3	59.4%	Yes	ND
PTX06-1194	8	0	0.04	-11	88.7%	Yes	ND
PTX06-1195	6	0	0.03	-10	95.2%	Yes	ND
PTX06-1196	7	7	0.25	-1	50.0%	No	S
PTX06-1197	7	7	0.11	-9	88.1%	No	S
PTX06-1199	7	7	0.20	15	98.5%	No	I
PTX06-1200	6	1	0.18	-5	76.5%	No	S
PTX06-1201	6	6	0.40	11	97.2%	No	I
PTX06-1202	6	6	0.15	11	97.2%	No	I
PTX06-1203	6	6	0.09	6	81.5%	No	NT
PTX06-1204	6	6	0.61	15	99.9%	No	I
PTX06-1208	3	0	0.00	0	0.0%	Yes	ND
PTX06-1213	1	0	0.00	0	0.0%	Yes	ND
PTX06-1214	1	0	0.00	0	0.0%	Yes	ND
PTX08-1002	8	7	0.72	-12	91.1%	No	PD
PTX08-1007	5	0	0.03	-3	67.5%	Yes	ND
PTX08-1008	10	8	1.05	43	100.0%	No	I

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
4-AMINO-2,6-DINITROTOLUENE							
PTX08-1009	8	0	0.04	-13	92.9%	Yes	ND
PTX10-1014	5	0	0.04	-8	95.8%	Yes	ND
CHROMIUM, HEXAVALENT							
PTX06-1002A	8	8	0.81	14	94.6%	No	PI
PTX06-1005	10	10	0.14	9	75.8%	No	NT
PTX06-1008	5	5	0.93	-10	99.2%	No	D
PTX06-1010	8	8	0.34	-20	99.3%	No	D
PTX06-1011	5	5	0.24	-6	88.3%	No	S
PTX06-1013	5	4	1.72	0	40.8%	No	NT
PTX06-1014	5	5	0.05	0	40.8%	No	S
PTX06-1015	3	3	0.00	0	0.0%	No	N/A
PTX06-1023	8	8	0.21	2	54.8%	No	NT
PTX06-1031	10	10	0.46	21	96.4%	No	I
PTX06-1034	10	10	0.07	-13	85.4%	No	S
PTX06-1037	10	0	2.07	-9	75.8%	Yes	ND
PTX06-1038	8	8	0.11	2	54.8%	No	NT
PTX06-1039A	8	8	0.18	18	98.4%	No	I
PTX06-1040	10	10	2.31	-27	99.2%	No	D
PTX06-1041	10	10	1.03	27	99.2%	No	I
PTX06-1042	10	10	0.32	11	81.0%	No	NT
PTX06-1045	4	4	0.43	-4	83.3%	No	S
PTX06-1046	10	10	0.75	-7	70.0%	No	S
PTX06-1047A	9	9	1.06	-8	76.2%	No	NT
PTX06-1052	10	10	0.65	-39	100.0%	No	D
PTX06-1053	8	7	1.66	-8	80.1%	No	NT
PTX06-1069	1	1	0.00	0	0.0%	No	N/A
PTX06-1088	10	10	0.67	33	99.9%	No	I
PTX06-1095A	10	10	0.26	7	70.0%	No	NT
PTX06-1098	7	0	0.00	0	43.7%	Yes	ND
PTX06-1100	5	0	2.20	-1	50.0%	Yes	ND
PTX06-1101	5	2	2.17	2	59.2%	No	NT
PTX06-1120	4	4	1.28	-6	95.8%	No	D
PTX06-1133A	10	9	0.75	-31	99.8%	No	D

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
CHROMIUM, HEXAVALENT							
PTX06-1146	10	10	0.16	31	99.8%	No	I
PTX06-1147	10	9	0.37	15	89.2%	No	NT
PTX06-1153	16	16	0.58	-70	99.9%	No	D
PTX06-1154	14	1	1.83	-13	74.1%	No	NT
PTX06-1166	8	8	0.42	18	98.4%	No	I
PTX06-1182	10	9	0.89	-13	85.4%	No	S
PTX06-1183	10	10	0.47	-33	99.9%	No	D
PTX06-1185	9	9	0.21	-16	94.0%	No	PD
PTX06-1190	8	8	0.11	20	99.3%	No	I
PTX06-1191	4	4	0.09	0	37.5%	No	S
PTX06-1192	8	8	1.34	8	80.1%	No	NT
PTX06-1194	4	4	0.60	0	37.5%	No	S
PTX06-1195	6	6	0.52	5	76.5%	No	NT
PTX06-1196	3	3	0.00	0	0.0%	No	N/A
PTX06-1197	7	7	0.25	5	71.9%	No	NT
PTX06-1199	7	7	0.72	13	96.5%	No	I
PTX06-1200	6	6	0.06	7	86.4%	No	NT
PTX06-1201	6	6	0.16	5	76.5%	No	NT
PTX06-1202	6	6	0.20	11	97.2%	No	I
PTX06-1203	6	6	0.03	-3	64.0%	No	S
PTX06-1204	6	6	0.18	7	86.4%	No	NT
PTX06-1208	2	2	0.00	0	0.0%	No	N/A
PTX08-1002	8	7	2.43	-2	54.8%	No	NT
PTX08-1007	5	5	1.01	-10	99.2%	No	D
PTX08-1008	10	10	0.69	-39	100.0%	No	D
PTX08-1009	8	8	0.69	-24	99.9%	No	D
PTX10-1014	5	5	0.84	-6	88.3%	No	S
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZIN							
PTX06-1002A	8	8	0.57	14	94.6%	No	PI
PTX06-1005	10	10	0.77	-15	89.2%	No	S
PTX06-1008	5	0	0.04	-6	88.3%	Yes	ND
PTX06-1010	8	8	0.31	8	80.1%	No	NT
PTX06-1011	5	5	0.59	-4	75.8%	No	S

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZIN

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PTX06-1013	5	5	0.19	-6	88.3%	No	S
PTX06-1014	5	5	0.16	-2	59.2%	No	S
PTX06-1015	4	4	0.09	-4	83.3%	No	S
PTX06-1023	8	3	0.93	1	50.0%	No	NT
PTX06-1031	11	11	0.20	11	77.7%	No	NT
PTX06-1034	10	10	0.18	5	63.6%	No	NT
PTX06-1037	14	2	0.19	-44	99.2%	No	D
PTX06-1038	8	8	0.18	-16	96.9%	No	D
PTX06-1039A	8	8	0.32	0	45.2%	No	S
PTX06-1040	10	10	0.20	-11	81.0%	No	S
PTX06-1041	10	10	0.29	15	89.2%	No	NT
PTX06-1042	10	10	0.17	-9	75.8%	No	S
PTX06-1045	4	4	1.07	-6	95.8%	No	D
PTX06-1046	10	10	0.60	-43	100.0%	No	D
PTX06-1047A	9	9	0.58	-14	91.0%	No	PD
PTX06-1052	10	3	0.05	11	81.0%	No	NT
PTX06-1053	8	5	0.09	2	54.8%	No	NT
PTX06-1069	1	0	0.00	0	0.0%	Yes	ND
PTX06-1088	10	10	1.21	21	96.4%	No	I
PTX06-1095A	10	10	1.86	-39	100.0%	No	D
PTX06-1098	8	1	0.08	-10	86.2%	No	S
PTX06-1100	5	0	0.02	-6	88.3%	Yes	ND
PTX06-1101	5	5	0.38	6	88.3%	No	NT
PTX06-1120	4	4	0.67	-6	95.8%	No	D
PTX06-1133A	10	1	0.43	-9	75.8%	No	S
PTX06-1146	10	10	0.28	18	93.4%	No	PI
PTX06-1147	10	10	0.24	-5	63.6%	No	S
PTX06-1148	16	2	0.26	-37	94.7%	No	PD
PTX06-1153	16	16	0.52	38	95.2%	No	I
PTX06-1154	16	3	1.00	-36	94.2%	No	PD
PTX06-1166	8	8	0.17	0	45.2%	No	S
PTX06-1182	11	11	1.83	-47	100.0%	No	D
PTX06-1183	10	0	0.03	-16	90.7%	Yes	ND

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZIN							
PTX06-1184	1	1	0.00	0	0.0%	No	N/A
PTX06-1185	9	9	0.41	-32	100.0%	No	D
PTX06-1190	9	9	0.49	31	100.0%	No	I
PTX06-1191	8	8	0.18	12	91.1%	No	PI
PTX06-1192	8	1	0.05	-7	76.4%	No	S
PTX06-1194	8	2	0.07	-11	88.7%	No	S
PTX06-1195	6	2	0.11	-5	76.5%	No	S
PTX06-1196	7	7	0.20	13	96.5%	No	I
PTX06-1197	7	7	0.26	19	99.9%	No	I
PTX06-1199	7	7	0.25	19	99.9%	No	I
PTX06-1200	6	0	0.17	-3	64.0%	Yes	ND
PTX06-1201	6	6	0.73	11	97.2%	No	I
PTX06-1202	6	6	0.20	9	93.2%	No	PI
PTX06-1203	6	6	0.36	15	99.9%	No	I
PTX06-1204	6	5	1.11	9	93.2%	No	PI
PTX06-1208	3	0	0.00	0	0.0%	Yes	ND
PTX06-1213	1	0	0.00	0	0.0%	Yes	ND
PTX06-1214	1	0	0.00	0	0.0%	Yes	ND
PTX08-1002	8	8	1.74	0	45.2%	No	NT
PTX08-1007	5	5	0.13	-6	88.3%	No	S
PTX08-1008	10	2	1.91	-13	85.4%	No	NT
PTX08-1009	8	6	0.60	6	72.6%	No	NT
PTX10-1014	5	5	0.57	2	59.2%	No	NT
PERCHLORATE							
PTX06-1008	5	4	0.95	-2	59.2%	No	S
PTX06-1011	5	5	0.19	-10	99.2%	No	D
PTX06-1053	8	2	0.47	-11	88.7%	No	S
PTX06-1148	16	14	1.20	-88	100.0%	No	D
PTX08-1007	5	5	0.13	8	95.8%	No	I
PTX08-1008	10	10	0.20	-21	96.4%	No	D
PTX08-1009	6	4	0.35	-2	57.0%	No	S
PTX10-1014	5	5	0.12	-2	59.2%	No	S

MAROS Mann-Kendall Statistics Summary

Project: Pantex | **User Name:** JM
Location: Southeast | **State:** Texas

TNX

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
TNX							
PTX06-1002A	8	8	0.49	14	94.6%	No	PI
PTX06-1005	10	10	0.42	17	92.2%	No	PI
PTX06-1008	5	0	0.04	-6	88.3%	Yes	ND
PTX06-1010	8	5	0.24	-6	72.6%	No	S
PTX06-1011	5	4	0.57	-6	88.3%	No	S
PTX06-1013	5	5	0.21	-6	88.3%	No	S
PTX06-1014	5	5	0.11	2	59.2%	No	NT
PTX06-1015	4	4	0.18	0	37.5%	No	S
PTX06-1023	8	0	0.04	-2	54.8%	Yes	ND
PTX06-1031	11	11	0.37	35	99.7%	No	I
PTX06-1034	10	10	0.32	-17	92.2%	No	PD
PTX06-1037	14	1	0.20	-36	97.3%	No	D
PTX06-1038	8	8	0.20	-14	94.6%	No	PD
PTX06-1039A	8	8	0.28	8	80.1%	No	NT
PTX06-1040	10	10	0.29	-20	95.5%	No	D
PTX06-1041	10	10	0.34	-23	97.7%	No	D
PTX06-1042	10	10	0.28	-7	70.0%	No	S
PTX06-1045	4	4	0.93	-6	95.8%	No	D
PTX06-1046	10	10	0.81	-43	100.0%	No	D
PTX06-1047A	9	9	0.72	-22	98.8%	No	D
PTX06-1052	10	0	0.03	-11	81.0%	Yes	ND
PTX06-1053	8	0	0.04	-7	76.4%	Yes	ND
PTX06-1069	1	0	0.00	0	0.0%	Yes	ND
PTX06-1088	10	10	0.55	17	92.2%	No	PI
PTX06-1095A	10	8	1.06	-41	100.0%	No	D
PTX06-1098	8	0	0.02	-10	86.2%	Yes	ND
PTX06-1100	5	0	0.02	-6	88.3%	Yes	ND
PTX06-1101	5	1	0.06	-3	67.5%	No	S
PTX06-1120	4	4	0.69	-4	83.3%	No	S
PTX06-1133A	10	0	0.02	-16	90.7%	Yes	ND
PTX06-1146	10	10	0.12	23	97.7%	No	I
PTX06-1147	10	10	0.31	-15	89.2%	No	S

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

TNX

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PTX06-1148	16	0	0.16	-51	98.9%	Yes	ND
PTX06-1153	16	16	0.46	50	98.7%	No	I
PTX06-1154	16	0	0.14	-68	99.9%	Yes	ND
PTX06-1166	8	1	0.11	-8	80.1%	No	S
PTX06-1182	11	0	0.09	-26	97.5%	Yes	ND
PTX06-1183	10	0	0.03	-16	90.7%	Yes	ND
PTX06-1184	1	0	0.00	0	0.0%	Yes	ND
PTX06-1185	8	8	0.53	-23	99.9%	No	D
PTX06-1190	9	9	0.29	24	99.4%	No	I
PTX06-1191	8	8	0.23	20	99.3%	No	I
PTX06-1192	8	0	0.04	-3	59.4%	Yes	ND
PTX06-1194	8	0	0.04	-11	88.7%	Yes	ND
PTX06-1195	6	0	0.03	-10	95.2%	Yes	ND
PTX06-1196	7	7	0.62	17	99.5%	No	I
PTX06-1197	7	7	0.20	3	61.4%	No	NT
PTX06-1199	7	1	0.12	-12	94.9%	No	PD
PTX06-1200	6	0	0.17	-3	64.0%	Yes	ND
PTX06-1201	6	1	0.12	-9	93.2%	No	PD
PTX06-1202	6	0	0.02	-9	93.2%	Yes	ND
PTX06-1203	6	6	0.29	9	93.2%	No	PI
PTX06-1204	6	0	0.02	-2	57.0%	Yes	ND
PTX06-1208	3	0	0.00	0	0.0%	Yes	ND
PTX06-1213	1	0	0.00	0	0.0%	Yes	ND
PTX06-1214	1	0	0.00	0	0.0%	Yes	ND
PTX08-1002	8	8	0.99	0	45.2%	No	S
PTX08-1007	5	5	0.28	-2	59.2%	No	S
PTX08-1008	10	1	0.20	-13	85.4%	No	S
PTX08-1009	8	0	0.04	-13	92.9%	Yes	ND
PTX10-1014	5	5	0.40	4	75.8%	No	NT

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

TNX

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events).

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Spatial Moment Analysis Summary

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Effective Date	0th Moment Estimated Mass (Kg)	1st Moment (Center of Mass) Xc (ft)	Yc (ft)	Source Distance	2nd Moment (Spread) Sigma XX (sq ft)	Sigma YY (sq ft)	Number of Wells
4-AMINO-2,6-DINITROTOLUENE							
7/1/2017	5.1E+01	644,342	3,756,611	4,687	2,587,255	6,507,284	43
7/1/2018	4.8E+01	644,515	3,756,872	4,780	3,181,330	6,615,842	49
7/1/2019	4.9E+01	644,721	3,756,583	5,057	3,992,504	7,368,661	55
7/1/2020	5.0E+01	644,722	3,756,667	5,033	4,216,930	7,350,045	56
7/1/2021	4.9E+01	644,991	3,756,686	5,288	4,603,449	6,528,502	59
CHROMIUM, HEXAVALENT							
7/1/2017	3.1E+02	640,180	3,756,131	1,958	4,498,128	4,204,942	41
7/1/2018	2.8E+02	640,597	3,756,206	1,992	5,197,814	3,785,964	48
7/1/2019	2.3E+02	641,284	3,756,031	2,469	6,953,226	4,654,786	54
7/1/2020	1.9E+02	641,509	3,756,152	2,510	7,750,799	4,709,518	51
7/1/2021	2.3E+02	641,942	3,756,628	2,509	7,787,342	3,924,527	53
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZIN							
7/1/2017	4.3E+03	644,516	3,755,441	5,322	2,334,009	4,152,667	43
7/1/2018	2.9E+03	644,433	3,755,963	5,009	1,800,644	4,959,651	49
7/1/2019	3.1E+03	644,253	3,755,846	4,898	1,958,086	5,560,669	55
7/1/2020	2.9E+03	644,229	3,756,057	4,785	2,124,646	6,319,475	56
7/1/2021	3.0E+03	644,438	3,755,952	5,018	2,001,596	4,956,342	59
PERCHLORATE							
7/1/2017	3.8E+01	637,587	3,755,905	3,157	375,748	934,385	7
7/1/2018	3.7E+01	637,820	3,755,856	3,027	413,606	956,905	8
7/1/2019	2.8E+01	637,978	3,755,943	2,856	389,401	1,057,132	8
7/1/2020	1.5E+01	638,127	3,756,235	2,541	320,415	884,418	8
7/1/2021	2.5E+01	637,932	3,756,073	2,793	369,167	860,015	8
TNX							
7/1/2017	1.5E+02	644,324	3,755,776	4,994	2,056,628	6,060,321	43
7/1/2018	1.2E+02	644,383	3,756,079	4,916	2,381,058	6,966,288	49
7/1/2019	1.4E+02	644,288	3,756,015	4,856	2,380,266	7,200,377	55
7/1/2020	1.2E+02	644,201	3,756,323	4,653	2,581,113	7,828,957	56
7/1/2021	1.1E+02	644,392	3,756,134	4,902	2,555,546	7,071,084	59

MAROS Spatial Moment Analysis Summary

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Spatial Moment Analysis Summary:

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
0th Moment	4-AMINO-2,6-DINITROTOLU	0.03	0	40.8%	S
0th Moment	CHROMIUM, HEXAVALENT	0.19	-6	88.3%	S
0th Moment	HEXAHYDRO-1,3,5-TRINITR	0.18	-4	75.8%	S
0th Moment	PERCHLORATE	0.33	-8	95.8%	D
0th Moment	TNX	0.11	-6	88.3%	S
First Moment	4-AMINO-2,6-DINITROTOLU	0.05	8	95.8%	I
First Moment	CHROMIUM, HEXAVALENT	0.12	8	95.8%	I
First Moment	HEXAHYDRO-1,3,5-TRINITR	0.04	-4	75.8%	S
First Moment	PERCHLORATE	0.08	-8	95.8%	D
First Moment	TNX	0.03	-6	88.3%	S
Second Moment X	4-AMINO-2,6-DINITROTOLU	0.22	10	99.2%	I
Second Moment X	CHROMIUM, HEXAVALENT	0.23	10	99.2%	I
Second Moment X	HEXAHYDRO-1,3,5-TRINITR	0.10	0	40.8%	S
Second Moment X	PERCHLORATE	0.09	-4	75.8%	S
Second Moment X	TNX	0.09	6	88.3%	NT
Second Moment Y	4-AMINO-2,6-DINITROTOLU	0.06	2	59.2%	NT
Second Moment Y	CHROMIUM, HEXAVALENT	0.10	2	59.2%	NT
Second Moment Y	HEXAHYDRO-1,3,5-TRINITR	0.16	4	75.8%	NT
Second Moment Y	PERCHLORATE	0.08	-4	75.8%	S
Second Moment Y	TNX	0.09	6	88.3%	NT

Note: The following assumptions were applied for the calculation of the Zeroth Moment:

Porosity: 0.25 **Saturated Thickness:** Uniform: 30 ft

Mann-Kendall Trend test performed on all sample events for each constituent. Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events); (ND) Non Detect.

Note: The Sigma XX and Sigma YY components are estimated using the given field coordinate system and then rotated to align with the estimated groundwater flow direction. Moments are not calculated for sample events with less than 6 wells.

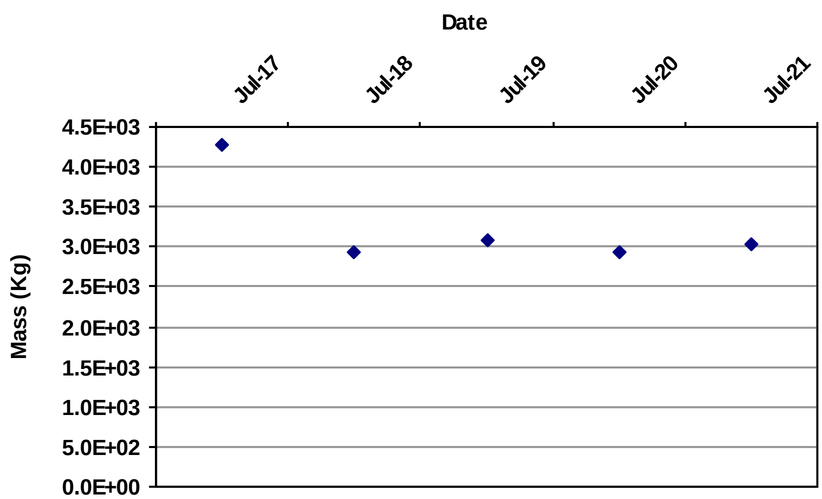
MAROS Zeroth Moment Analysis

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Change in Dissolved Mass Over Time

COC: HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE



Porosity: 0.25

Saturated Thickness:

Uniform: 30 ft

Mann-Kendall S Statistic:

-4

Confidence in Trend:

75.8%

Coefficient of Variation:

0.18

Zeroth Moment Trend:

S

Data Table:

Effective Date	Constituent	Estimated Mass (Kg)	Number of Wells
7/1/2017	HEXAHYDRO-1,3,5-TRINITRO-1,3,	4.3E+03	43
7/1/2018	HEXAHYDRO-1,3,5-TRINITRO-1,3,	2.9E+03	49
7/1/2019	HEXAHYDRO-1,3,5-TRINITRO-1,3,	3.1E+03	55
7/1/2020	HEXAHYDRO-1,3,5-TRINITRO-1,3,	2.9E+03	56
7/1/2021	HEXAHYDRO-1,3,5-TRINITRO-1,3,	3.0E+03	59

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect. Moments are not calculated for sample events with less than 6 wells.

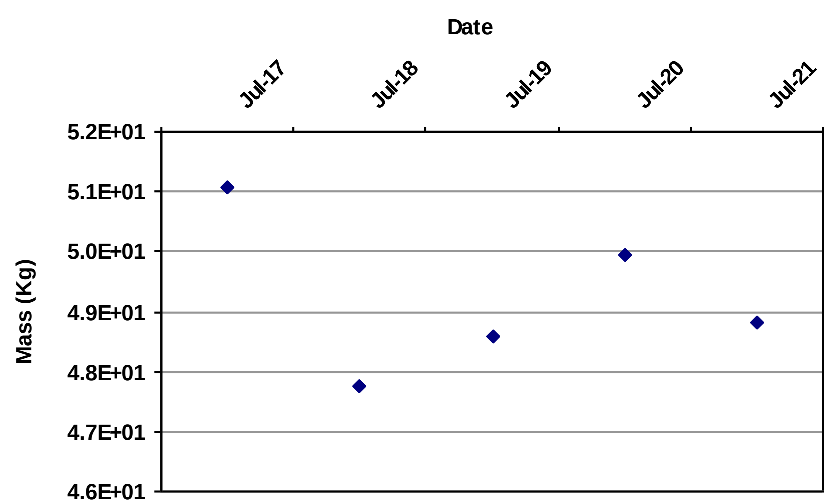
MAROS Zeroth Moment Analysis

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Change in Dissolved Mass Over Time

COC: 4-AMINO-2,6-DINITROTOLUENE



Porosity: 0.25

Saturated Thickness:

Uniform: 30 ft

Mann-Kendall S Statistic:

0

Confidence in Trend:

40.8%

Coefficient of Variation:

0.03

Zeroth Moment Trend:

S

Data Table:

Effective Date	Constituent	Estimated Mass (Kg)	Number of Wells
7/1/2017	4-AMINO-2,6-DINITROTOLUENE	5.1E+01	43
7/1/2018	4-AMINO-2,6-DINITROTOLUENE	4.8E+01	49
7/1/2019	4-AMINO-2,6-DINITROTOLUENE	4.9E+01	55
7/1/2020	4-AMINO-2,6-DINITROTOLUENE	5.0E+01	56
7/1/2021	4-AMINO-2,6-DINITROTOLUENE	4.9E+01	59

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect. Moments are not calculated for sample events with less than 6 wells.

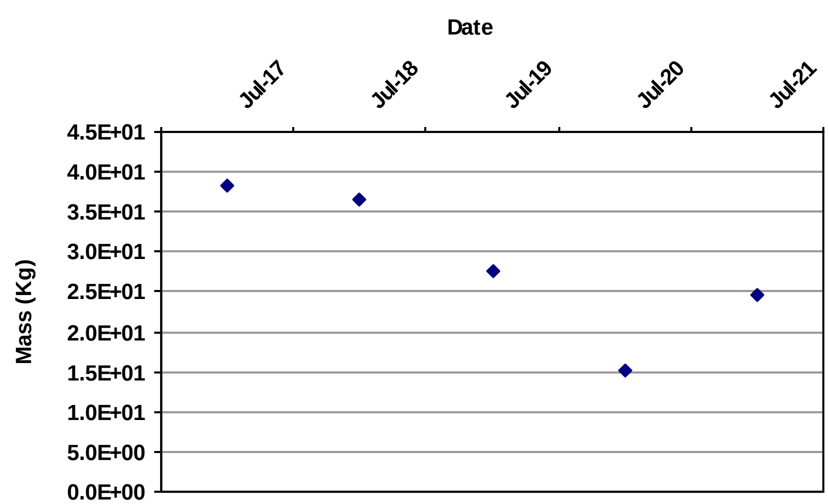
MAROS Zeroth Moment Analysis

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Change in Dissolved Mass Over Time

COC: PERCHLORATE



Porosity: 0.25

Saturated Thickness:

Uniform: 30 ft

Mann-Kendall S Statistic:

-8

Confidence in Trend:

95.8%

Coefficient of Variation:

0.33

Zeroth Moment Trend:

D

Data Table:

Effective Date	Constituent	Estimated Mass (Kg)	Number of Wells
7/1/2017	PERCHLORATE	3.8E+01	7
7/1/2018	PERCHLORATE	3.7E+01	8
7/1/2019	PERCHLORATE	2.8E+01	8
7/1/2020	PERCHLORATE	1.5E+01	8
7/1/2021	PERCHLORATE	2.5E+01	8

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect. Moments are not calculated for sample events with less than 6 wells.

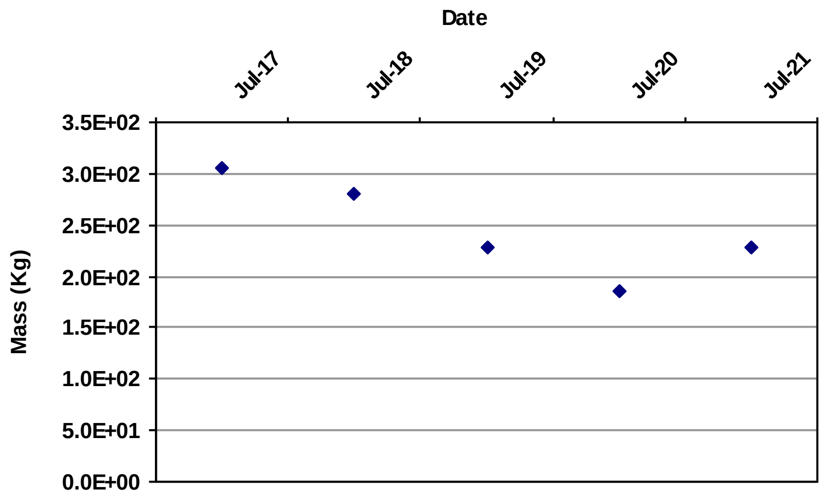
MAROS Zeroth Moment Analysis

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

Change in Dissolved Mass Over Time

COC: CHROMIUM, HEXAVALENT



Porosity: 0.25

Saturated Thickness:

Uniform: 30 ft

Mann-Kendall S Statistic:

-6

Confidence in Trend:

88.3%

Coefficient of Variation:

0.19

Zeroth Moment Trend:

S

Data Table:

Effective Date	Constituent	Estimated Mass (Kg)	Number of Wells
7/1/2017	CHROMIUM, HEXAVALENT	3.1E+02	41
7/1/2018	CHROMIUM, HEXAVALENT	2.8E+02	48
7/1/2019	CHROMIUM, HEXAVALENT	2.3E+02	54
7/1/2020	CHROMIUM, HEXAVALENT	1.9E+02	51
7/1/2021	CHROMIUM, HEXAVALENT	2.3E+02	53

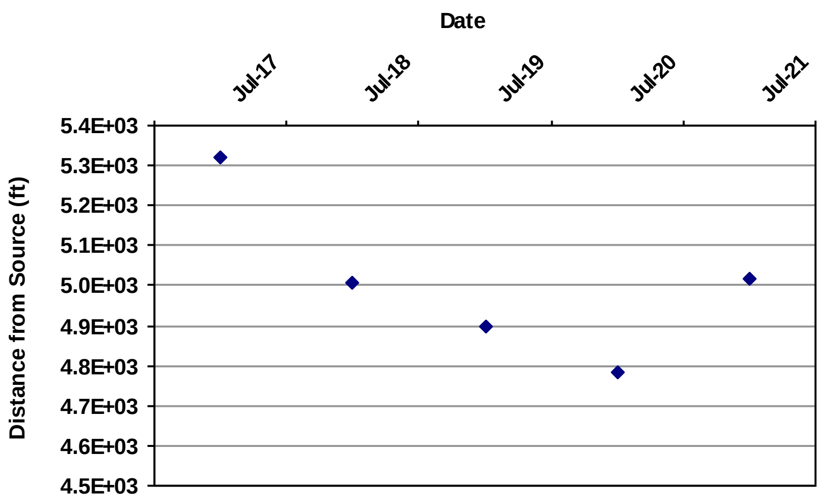
Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect. Moments are not calculated for sample events with less than 6 wells.

MAROS First Moment Analysis

Project: Pantex | **User Name:** JM
Location: Southeast | **State:** Texas

COC: HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE

Distance from Source to Center of Mass



Mann-Kendall S Statistic:
-4

Confidence in Trend:
75.8%

Coefficient of Variation:
0.04

First Moment Trend:
S

DATA TABLE

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source	Number of Wells
7/1/2017	HEXAHYDRO-1,3,5-TRINITRO-	644,516	3,755,441	5,322	43
7/1/2018	HEXAHYDRO-1,3,5-TRINITRO-	644,433	3,755,963	5,009	49
7/1/2019	HEXAHYDRO-1,3,5-TRINITRO-	644,253	3,755,846	4,898	55
7/1/2020	HEXAHYDRO-1,3,5-TRINITRO-	644,229	3,756,057	4,785	56
7/1/2021	HEXAHYDRO-1,3,5-TRINITRO-	644,438	3,755,952	5,018	59

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

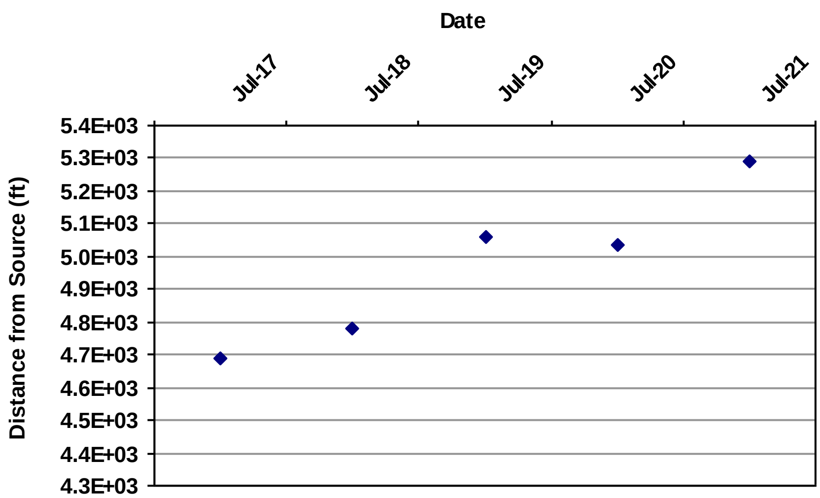
MAROS First Moment Analysis

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC: 4-AMINO-2,6-DINITROTOLUENE

Distance from Source to Center of Mass



Mann-Kendall S Statistic:

8

Confidence in Trend:

95.8%

Coefficient of Variation:

0.05

First Moment Trend:

I

DATA TABLE

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source	Number of Wells
7/1/2017	4-AMINO-2,6-DINITROTOLUE	644,342	3,756,611	4,687	43
7/1/2018	4-AMINO-2,6-DINITROTOLUE	644,515	3,756,872	4,780	49
7/1/2019	4-AMINO-2,6-DINITROTOLUE	644,721	3,756,583	5,057	55
7/1/2020	4-AMINO-2,6-DINITROTOLUE	644,722	3,756,667	5,033	56
7/1/2021	4-AMINO-2,6-DINITROTOLUE	644,991	3,756,686	5,288	59

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

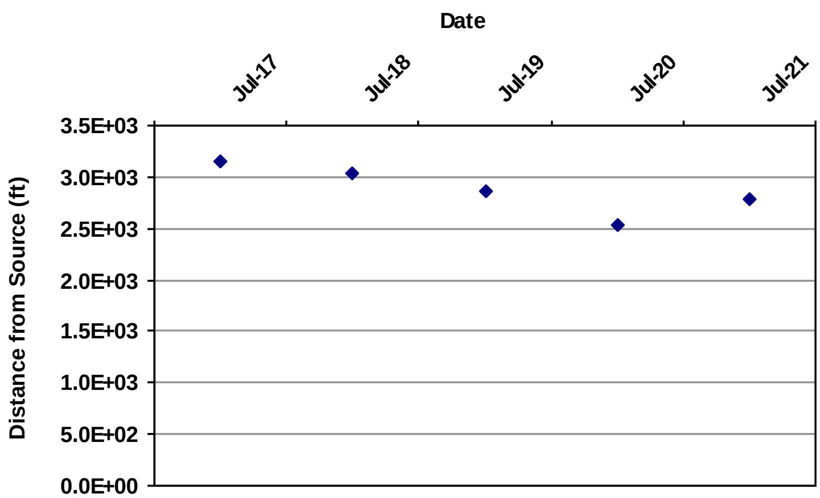
MAROS First Moment Analysis

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC: PERCHLORATE

Distance from Source to Center of Mass



Mann-Kendall S Statistic:

-8

Confidence in Trend:

95.8%

Coefficient of Variation:

0.08

First Moment Trend:

D

DATA TABLE

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source	Number of Wells
7/1/2017	PERCHLORATE	637,587	3,755,905	3,157	7
7/1/2018	PERCHLORATE	637,820	3,755,856	3,027	8
7/1/2019	PERCHLORATE	637,978	3,755,943	2,856	8
7/1/2020	PERCHLORATE	638,127	3,756,235	2,541	8
7/1/2021	PERCHLORATE	637,932	3,756,073	2,793	8

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

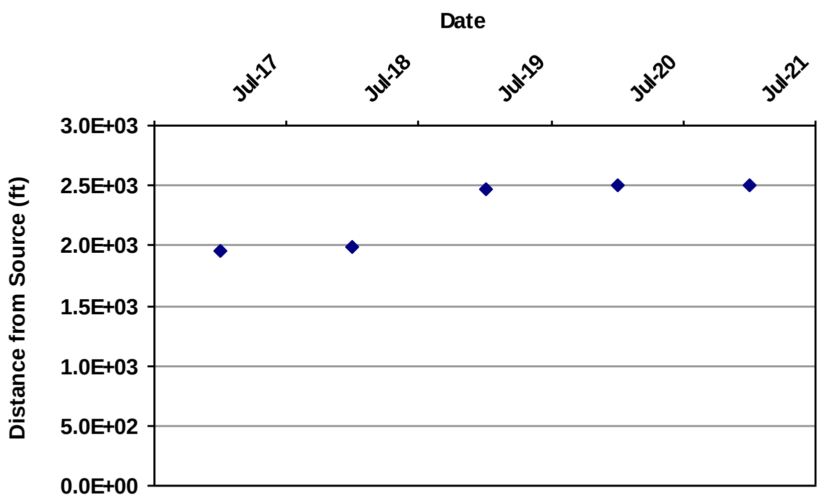
MAROS First Moment Analysis

Project: Pantex **User Name:** JM

Location: Southeast **State:** Texas

COC: CHROMIUM, HEXAVALENT

Distance from Source to Center of Mass



Mann-Kendall S Statistic:
8

Confidence in Trend:
95.8%

Coefficient of Variation:
0.12

First Moment Trend:
I

DATA TABLE

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source	Number of Wells
7/1/2017	CHROMIUM, HEXAVALENT	640,180	3,756,131	1,958	41
7/1/2018	CHROMIUM, HEXAVALENT	640,597	3,756,206	1,992	48
7/1/2019	CHROMIUM, HEXAVALENT	641,284	3,756,031	2,469	54
7/1/2020	CHROMIUM, HEXAVALENT	641,509	3,756,152	2,510	51
7/1/2021	CHROMIUM, HEXAVALENT	641,942	3,756,628	2,509	53

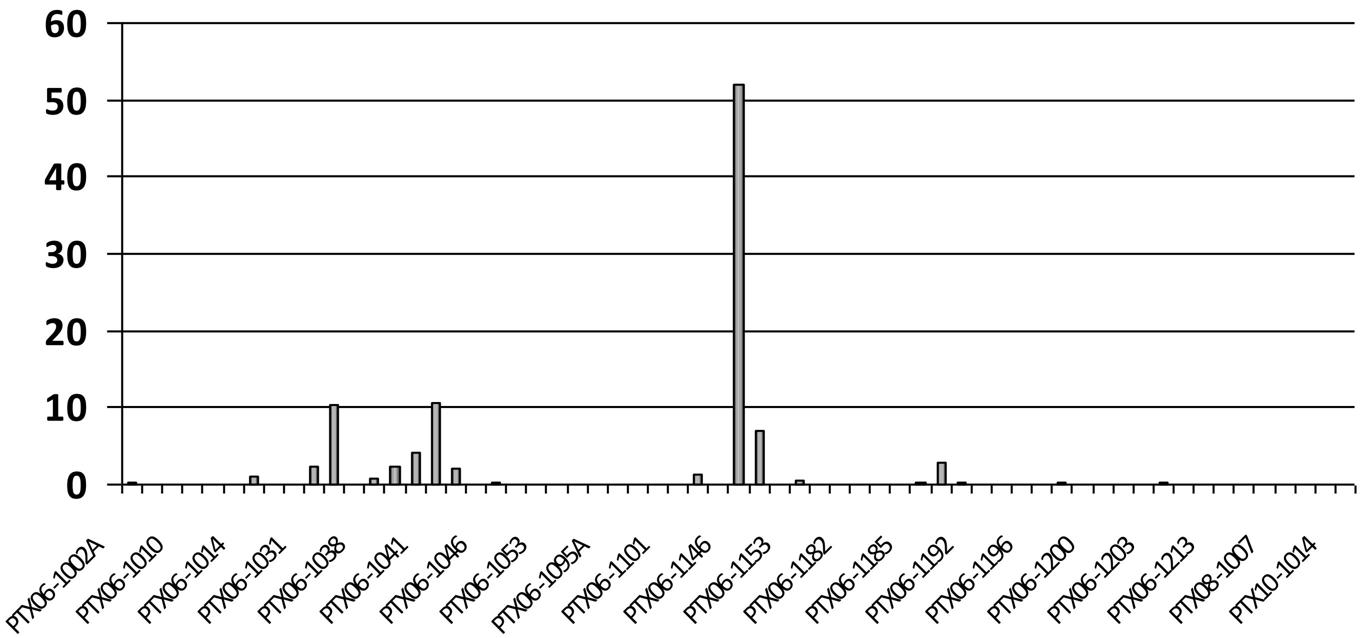
Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

MAROS Percent of Mass by Well

Project: Pantex **User Name:**

Location: Southeast **State:** Texas

HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE 7/1/2021



Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1002A	5,898,553.56	42,347.93	0.33	4.42
PTX06-1005	2,780,965.17	6,595.58	0.05	2.08
PTX06-1008	954,160.68	31.81	0.00	0.71
PTX06-1010	2,700,073.87	1,375.01	0.01	2.02
PTX06-1011	2,169,869.21	177.14	0.00	1.63
PTX06-1013	3,626,944.53	3,551.23	0.03	2.72
PTX06-1014	1,093,970.16	138,988.92	1.10	0.82
PTX06-1015	1,324,787.40	347.76	0.00	0.99
PTX06-1023	959,172.23	32.73	0.00	0.72
PTX06-1031	1,670,955.38	304,406.31	2.40	1.25
PTX06-1034	4,709,730.68	1,315,427.84	10.37	3.53
PTX06-1037	528,128.48	17.88	0.00	0.40
PTX06-1038	5,720,024.85	113,563.95	0.90	4.29
PTX06-1039A	1,994,280.36	289,756.49	2.28	1.49

MAROS Percent of Mass by Well

Project: Pantex **User Name:**

Location: Southeast **State:** Texas

Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1040	2,435,227.30	539,205.01	4.25	1.82
PTX06-1041	3,629,713.53	1,338,683.78	10.55	2.72
PTX06-1042	2,977,062.19	260,232.46	2.05	2.23
PTX06-1045	1,058,899.97	856.12	0.01	0.79
PTX06-1046	590,347.66	36,881.97	0.29	0.44
PTX06-1047A	1,529,031.93	5,860.02	0.05	1.15
PTX06-1052	1,327,447.84	45.04	0.00	0.99
PTX06-1053	466,526.33	14.82	0.00	0.35
PTX06-1069	4,592,861.63	157.94	0.00	3.44
PTX06-1088	1,598,085.73	13,193.20	0.10	1.20
PTX06-1095A	2,651,449.16	6,016.97	0.05	1.99
PTX06-1098	1,144,173.42	39.35	0.00	0.86
PTX06-1100	71,341.35	2.45	0.00	0.05
PTX06-1101	952,746.22	11,179.29	0.09	0.71
PTX06-1120	765,782.07	159,608.14	1.26	0.57
PTX06-1133A	2,404,511.91	82.53	0.00	1.80
PTX06-1146	13,794,283.21	6,608,324.12	52.09	10.34
PTX06-1147	5,166,374.70	896,091.59	7.06	3.87
PTX06-1148	514,389.34	17.35	0.00	0.39
PTX06-1153	880,912.92	58,619.25	0.46	0.66
PTX06-1154	387,810.68	13.23	0.00	0.29
PTX06-1166	1,136,055.53	3,071.61	0.02	0.85
PTX06-1182	1,024,988.71	30.94	0.00	0.77
PTX06-1183	580,191.68	19.72	0.00	0.43
PTX06-1184	1,138,391.32	298.83	0.00	0.85
PTX06-1185	445,465.15	28,327.41	0.22	0.33
PTX06-1190	1,047,244.92	372,491.95	2.94	0.78
PTX06-1191	530,805.27	19,367.76	0.15	0.40
PTX06-1192	744,017.53	25.54	0.00	0.56
PTX06-1194	755,474.36	25.85	0.00	0.57
PTX06-1195	7,594,975.12	258.18	0.00	5.69

MAROS Percent of Mass by Well

Project: Pantex **User Name:**

Location: Southeast **State:** Texas

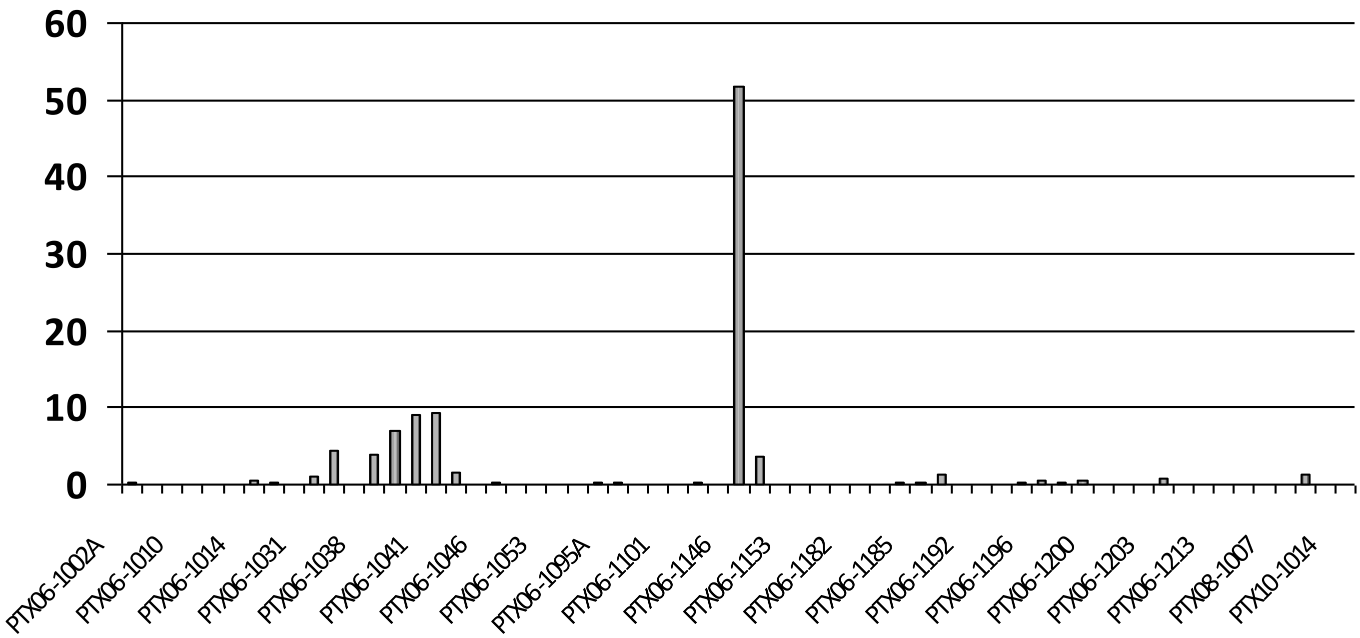
Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1196	871,157.87	6,986.14	0.06	0.65
PTX06-1197	690,996.12	45,890.78	0.36	0.52
PTX06-1199	1,754,597.26	3,967.91	0.03	1.31
PTX06-1200	378,473.50	12.87	0.00	0.28
PTX06-1201	427,409.23	1,060.24	0.01	0.32
PTX06-1202	800,789.99	41.10	0.00	0.60
PTX06-1203	698,212.41	39,588.65	0.31	0.52
PTX06-1204	99,313.42	19.88	0.00	0.07
PTX06-1208	123,744.76	4.08	0.00	0.09
PTX06-1213	592,053.73	97.13	0.00	0.44
PTX06-1214	414,597.73	14.04	0.00	0.31
PTX08-1002	3,530,174.71	9,637.38	0.08	2.65
PTX08-1007	1,202,127.31	823.61	0.01	0.90
PTX08-1008	2,258,743.43	674.74	0.01	1.69
PTX08-1009	2,528,484.34	60.73	0.00	1.89
PTX10-1014	1,735,116.57	1,421.06	0.01	1.30
	118,174,197.6	12,685,963.3	100	88.5522965593

MAROS Percent of Mass by Well

Project: Pantex **User Name:**

Location: Southeast **State:** Texas

4-AMINO-2,6-DINITROTOLUENE 7/1/2021



Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1002A	5,898,553.56	297.29	0.20	4.42
PTX06-1005	2,780,965.17	185.42	0.12	2.08
PTX06-1008	954,160.68	31.81	0.02	0.71
PTX06-1010	2,700,073.87	91.43	0.06	2.02
PTX06-1011	2,169,869.21	74.05	0.05	1.63
PTX06-1013	3,626,944.53	129.96	0.09	2.72
PTX06-1014	1,093,970.16	720.79	0.48	0.82
PTX06-1015	1,324,787.40	347.76	0.23	0.99
PTX06-1023	959,172.23	32.73	0.02	0.72
PTX06-1031	1,670,955.38	1,359.74	0.91	1.25
PTX06-1034	4,709,730.68	6,682.23	4.45	3.53
PTX06-1037	528,128.48	17.88	0.01	0.40
PTX06-1038	5,720,024.85	5,870.89	3.91	4.29
PTX06-1039A	1,994,280.36	10,469.97	6.98	1.49

MAROS Percent of Mass by Well

Project: Pantex **User Name:**

Location: Southeast **State:** Texas

Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1040	2,435,227.30	13,488.12	8.99	1.82
PTX06-1041	3,629,713.53	13,958.52	9.30	2.72
PTX06-1042	2,977,062.19	2,379.60	1.59	2.23
PTX06-1045	1,058,899.97	36.55	0.02	0.79
PTX06-1046	590,347.66	227.03	0.15	0.44
PTX06-1047A	1,529,031.93	107.17	0.07	1.15
PTX06-1052	1,327,447.84	109.76	0.07	0.99
PTX06-1053	466,526.33	33.92	0.02	0.35
PTX06-1069	4,592,861.63	157.94	0.11	3.44
PTX06-1088	1,598,085.73	259.67	0.17	1.20
PTX06-1095A	2,651,449.16	202.19	0.13	1.99
PTX06-1098	1,144,173.42	39.35	0.03	0.86
PTX06-1100	71,341.35	2.45	0.00	0.05
PTX06-1101	952,746.22	31.76	0.02	0.71
PTX06-1120	765,782.07	325.65	0.22	0.57
PTX06-1133A	2,404,511.91	82.53	0.05	1.80
PTX06-1146	13,794,283.21	77,489.39	51.64	10.34
PTX06-1147	5,166,374.70	5,434.86	3.62	3.87
PTX06-1148	514,389.34	22.82	0.02	0.39
PTX06-1153	880,912.92	192.56	0.13	0.66
PTX06-1154	387,810.68	13.23	0.01	0.29
PTX06-1166	1,136,055.53	130.32	0.09	0.85
PTX06-1182	1,024,988.71	34.71	0.02	0.77
PTX06-1183	580,191.68	19.72	0.01	0.43
PTX06-1184	1,138,391.32	298.83	0.20	0.85
PTX06-1185	445,465.15	263.98	0.18	0.33
PTX06-1190	1,047,244.92	1,905.07	1.27	0.78
PTX06-1191	530,805.27	145.89	0.10	0.40
PTX06-1192	744,017.53	25.54	0.02	0.56
PTX06-1194	755,474.36	25.85	0.02	0.57
PTX06-1195	7,594,975.12	258.18	0.17	5.69

MAROS Percent of Mass by Well

Project: Pantex **User Name:**

Location: Southeast **State:** Texas

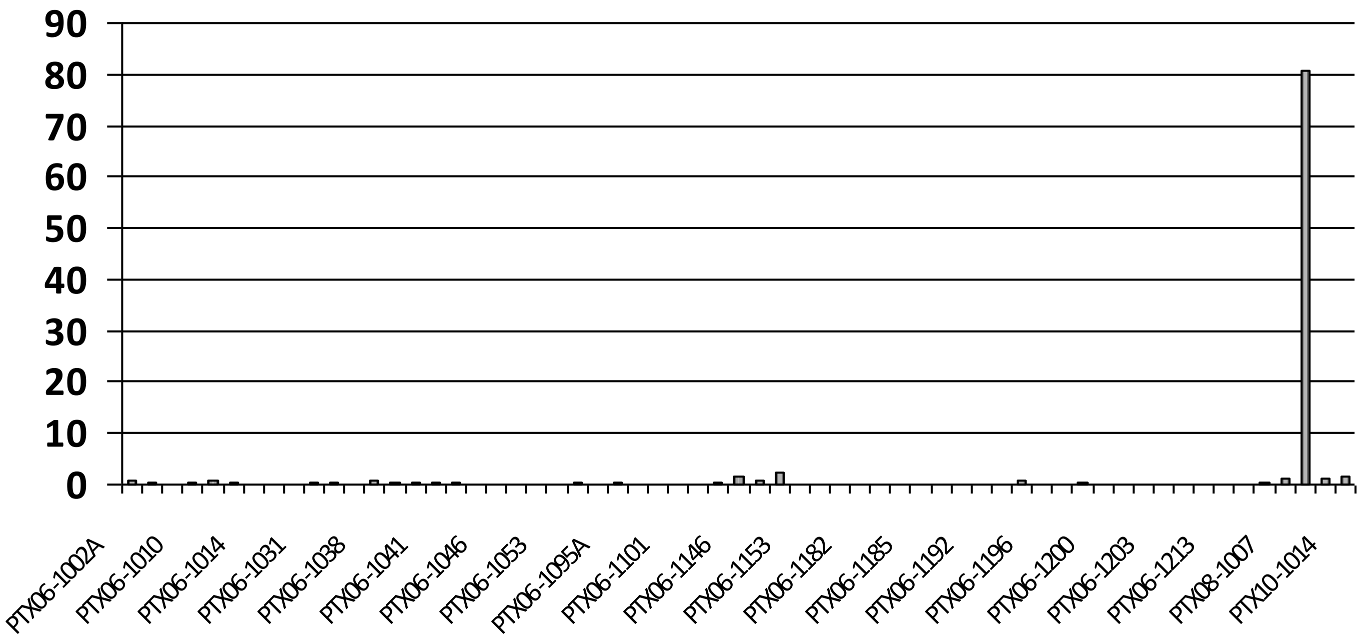
Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1196	871,157.87	822.10	0.55	0.65
PTX06-1197	690,996.12	529.65	0.35	0.52
PTX06-1199	1,754,597.26	916.56	0.61	1.31
PTX06-1200	378,473.50	12.37	0.01	0.28
PTX06-1201	427,409.23	155.95	0.10	0.32
PTX06-1202	800,789.99	84.08	0.06	0.60
PTX06-1203	698,212.41	1,194.99	0.80	0.52
PTX06-1204	99,313.42	23.76	0.02	0.07
PTX06-1208	123,744.76	4.08	0.00	0.09
PTX06-1213	592,053.73	97.13	0.06	0.44
PTX06-1214	414,597.73	14.04	0.01	0.31
PTX08-1002	3,530,174.71	121.86	0.08	2.65
PTX08-1007	1,202,127.31	41.18	0.03	0.90
PTX08-1008	2,258,743.43	1,882.52	1.25	1.69
PTX08-1009	2,528,484.34	84.63	0.06	1.89
PTX10-1014	1,735,116.57	58.87	0.04	1.30
	118,174,197.6	150,058.9	100	88.5522965593

MAROS Percent of Mass by Well

Project: Pantex **User Name:**

Location: Southeast **State:** Texas

PERCHLORATE 7/1/2021



Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1002A	5,898,553.56	1,548.37	0.70	4.42
PTX06-1005	2,780,965.17	730.00	0.33	2.08
PTX06-1008	954,160.68	257.98	0.12	0.71
PTX06-1010	2,700,073.87	708.77	0.32	2.02
PTX06-1011	2,169,869.21	1,873.95	0.84	1.63
PTX06-1013	3,626,944.53	952.07	0.43	2.72
PTX06-1014	1,093,970.16	287.17	0.13	0.82
PTX06-1015	1,324,787.40	347.76	0.16	0.99
PTX06-1023	959,172.23	251.78	0.11	0.72
PTX06-1031	1,670,955.38	438.63	0.20	1.25
PTX06-1034	4,709,730.68	1,236.30	0.56	3.53
PTX06-1037	528,128.48	138.63	0.06	0.40
PTX06-1038	5,720,024.85	1,501.51	0.68	4.29
PTX06-1039A	1,994,280.36	523.50	0.24	1.49

MAROS Percent of Mass by Well

Project: Pantex | **User Name:**
Location: Southeast | **State:** Texas

Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1040	2,435,227.30	639.25	0.29	1.82
PTX06-1041	3,629,713.53	952.80	0.43	2.72
PTX06-1042	2,977,062.19	781.48	0.35	2.23
PTX06-1045	1,058,899.97	277.96	0.13	0.79
PTX06-1046	590,347.66	154.97	0.07	0.44
PTX06-1047A	1,529,031.93	401.37	0.18	1.15
PTX06-1052	1,327,447.84	348.46	0.16	0.99
PTX06-1053	466,526.33	176.35	0.08	0.35
PTX06-1069	4,592,861.63	1,205.63	0.54	3.44
PTX06-1088	1,598,085.73	419.50	0.19	1.20
PTX06-1095A	2,651,449.16	696.01	0.31	1.99
PTX06-1098	1,144,173.42	300.35	0.14	0.86
PTX06-1100	71,341.35	18.73	0.01	0.05
PTX06-1101	952,746.22	250.10	0.11	0.71
PTX06-1120	765,782.07	201.02	0.09	0.57
PTX06-1133A	2,404,511.91	631.18	0.28	1.80
PTX06-1146	13,794,283.21	3,621.00	1.63	10.34
PTX06-1147	5,166,374.70	1,356.17	0.61	3.87
PTX06-1148	514,389.34	4,830.60	2.17	0.39
PTX06-1153	880,912.92	231.24	0.10	0.66
PTX06-1154	387,810.68	101.80	0.05	0.29
PTX06-1166	1,136,055.53	298.21	0.13	0.85
PTX06-1182	1,024,988.71	269.06	0.12	0.77
PTX06-1183	580,191.68	152.30	0.07	0.43
PTX06-1184	1,138,391.32	298.83	0.13	0.85
PTX06-1185	445,465.15	116.93	0.05	0.33
PTX06-1190	1,047,244.92	274.90	0.12	0.78
PTX06-1191	530,805.27	139.34	0.06	0.40
PTX06-1192	744,017.53	195.30	0.09	0.56
PTX06-1194	755,474.36	198.31	0.09	0.57
PTX06-1195	7,594,975.12	1,993.68	0.90	5.69

MAROS Percent of Mass by Well

Project: Pantex **User Name:**

Location: Southeast **State:** Texas

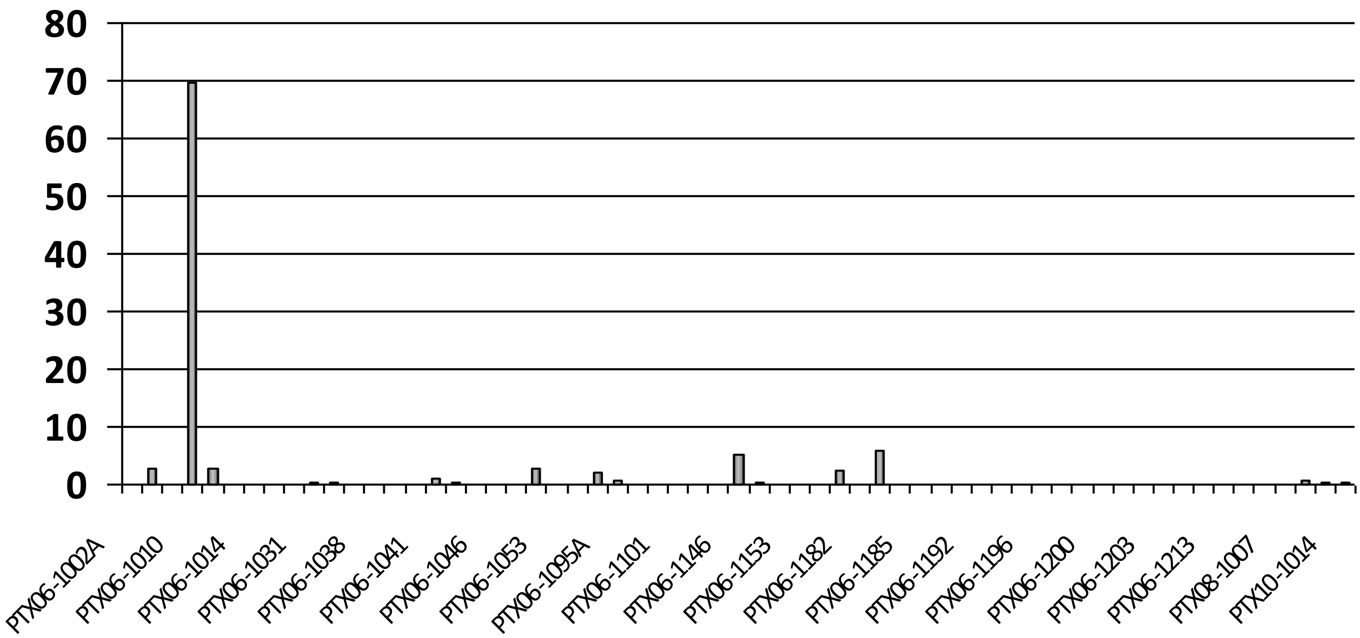
Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1196	871,157.87	228.68	0.10	0.65
PTX06-1197	690,996.12	181.39	0.08	0.52
PTX06-1199	1,754,597.26	460.58	0.21	1.31
PTX06-1200	378,473.50	99.35	0.04	0.28
PTX06-1201	427,409.23	112.19	0.05	0.32
PTX06-1202	800,789.99	210.21	0.09	0.60
PTX06-1203	698,212.41	183.28	0.08	0.52
PTX06-1204	99,313.42	26.07	0.01	0.07
PTX06-1208	123,744.76	32.48	0.01	0.09
PTX06-1213	592,053.73	155.41	0.07	0.44
PTX06-1214	414,597.73	108.83	0.05	0.31
PTX08-1002	3,530,174.71	926.67	0.42	2.65
PTX08-1007	1,202,127.31	2,780.07	1.25	0.90
PTX08-1008	2,258,743.43	179,061.89	80.60	1.69
PTX08-1009	2,528,484.34	2,210.21	0.99	1.89
PTX10-1014	1,735,116.57	3,060.75	1.38	1.30
	118,174,197.6	222,167.3	100	88.5522965593

MAROS Percent of Mass by Well

Project: Pantex **User Name:**

Location: Southeast **State:** Texas

CHROMIUM, HEXAVALENT 7/1/2021



Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1002A	5,898,553.56	1,947.85	0.17	4.42
PTX06-1005	2,780,965.17	32,454.86	2.80	2.08
PTX06-1008	954,160.68	363.18	0.03	0.71
PTX06-1010	2,700,073.87	807,157.25	69.52	2.02
PTX06-1011	2,169,869.21	31,113.89	2.68	1.63
PTX06-1013	3,626,944.53	535.07	0.05	2.72
PTX06-1014	1,093,970.16	501.97	0.04	0.82
PTX06-1015	1,324,787.40	347.76	0.03	0.99
PTX06-1023	959,172.23	355.89	0.03	0.72
PTX06-1031	1,670,955.38	4,796.15	0.41	1.25
PTX06-1034	4,709,730.68	3,187.19	0.27	3.53
PTX06-1037	528,128.48	1.39	0.00	0.40
PTX06-1038	5,720,024.85	1,959.47	0.17	4.29
PTX06-1039A	1,994,280.36	749.65	0.06	1.49

MAROS Percent of Mass by Well

Project: Pantex **User Name:**

Location: Southeast **State:** Texas

Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1040	2,435,227.30	1,183.25	0.10	1.82
PTX06-1041	3,629,713.53	11,357.85	0.98	2.72
PTX06-1042	2,977,062.19	2,036.14	0.18	2.23
PTX06-1045	1,058,899.97	139.54	0.01	0.79
PTX06-1046	590,347.66	437.47	0.04	0.44
PTX06-1047A	1,529,031.93	578.17	0.05	1.15
PTX06-1052	1,327,447.84	31,877.19	2.75	0.99
PTX06-1053	466,526.33	17.63	0.00	0.35
PTX06-1069	4,592,861.63	1,661.35	0.14	3.44
PTX06-1088	1,598,085.73	25,085.74	2.16	1.20
PTX06-1095A	2,651,449.16	9,080.09	0.78	1.99
PTX06-1098	1,144,173.42	3.00	0.00	0.86
PTX06-1100	71,341.35	0.19	0.00	0.05
PTX06-1101	952,746.22	30.51	0.00	0.71
PTX06-1120	765,782.07	331.28	0.03	0.57
PTX06-1133A	2,404,511.91	1,060.71	0.09	1.80
PTX06-1146	13,794,283.21	61,853.91	5.33	10.34
PTX06-1147	5,166,374.70	5,673.89	0.49	3.87
PTX06-1148	514,389.34	135.03	0.01	0.39
PTX06-1153	880,912.92	1,490.17	0.13	0.66
PTX06-1154	387,810.68	1.02	0.00	0.29
PTX06-1166	1,136,055.53	26,620.13	2.29	0.85
PTX06-1182	1,024,988.71	363.10	0.03	0.77
PTX06-1183	580,191.68	69,435.85	5.98	0.43
PTX06-1184	1,138,391.32	298.83	0.03	0.85
PTX06-1185	445,465.15	286.87	0.02	0.33
PTX06-1190	1,047,244.92	961.74	0.08	0.78
PTX06-1191	530,805.27	139.34	0.01	0.40
PTX06-1192	744,017.53	319.91	0.03	0.56
PTX06-1194	755,474.36	198.31	0.02	0.57
PTX06-1195	7,594,975.12	1,772.38	0.15	5.69

MAROS Percent of Mass by Well

Project: Pantex **User Name:**

Location: Southeast **State:** Texas

Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1196	871,157.87	228.68	0.02	0.65
PTX06-1197	690,996.12	605.65	0.05	0.52
PTX06-1199	1,754,597.26	977.12	0.08	1.31
PTX06-1200	378,473.50	125.53	0.01	0.28
PTX06-1201	427,409.23	301.58	0.03	0.32
PTX06-1202	800,789.99	325.61	0.03	0.60
PTX06-1203	698,212.41	784.53	0.07	0.52
PTX06-1204	99,313.42	75.04	0.01	0.07
PTX06-1208	123,744.76	623.46	0.05	0.09
PTX06-1213	592,053.73	155.41	0.01	0.44
PTX06-1214	414,597.73	108.83	0.01	0.31
PTX08-1002	3,530,174.71	212.21	0.02	2.65
PTX08-1007	1,202,127.31	589.15	0.05	0.90
PTX08-1008	2,258,743.43	8,460.97	0.73	1.69
PTX08-1009	2,528,484.34	4,176.17	0.36	1.89
PTX10-1014	1,735,116.57	3,315.58	0.29	1.30
	118,174,197.6	1,160,967.7	100	88.5522965593

SOUTHWEST SECTOR MAROS REPORTS

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MAROS COC Assessment

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Toxicity:

Contaminant of Concern	Representative Concentration (mg/L)	PRG (mg/L)	Percent Above PRG
TRICHLOROETHYLENE (TCE)	6.4E-02	5.0E-03	1187.8%
PERCHLORATE	6.7E-02	1.2E-02	458.3%
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	6.1E-03	2.0E-03	206.4%
4-AMINO-2,6-DINITROTOLUENE	2.0E-03	1.2E-03	68.0%
1,4-DIOXANE (P-DIOXANE)	8.8E-03	7.7E-03	13.9%
ARSENIC	1.0E-02	1.0E-02	3.8%
BORON	2.0E-01	1.9E-01	2.0%

Note: Top COCs by toxicity were determined by examining a representative concentration for each compound over the entire site. The compound representative concentrations are then compared with the chosen PRG for that compound, with the percentage exceedance from the PRG determining the compound's toxicity. All compounds above exceed the PRG.

Prevalence:

Contaminant of Concern	Class	Total Wells	Total Exceedance	Percent Exceedances	Total Detects
TRICHLOROETHYLENE (TCE)	ORG	57	29	50.9%	45
PERCHLORATE	INO	48	24	50.0%	41
1,4-DIOXANE (P-DIOXANE)	ORG	50	15	30.0%	41
BORON	MET	51	15	29.4%	51
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ORG	51	14	27.5%	37
4-AMINO-2,6-DINITROTOLUENE	ORG	51	12	23.5%	30
ARSENIC	MET	35	6	17.1%	31

Note: Top COCs by prevalence were determined by examining a representative concentration for each well location at the site. The total exceedances (values above the chosen PRGs) are compared to the total number of wells to determine the prevalence of the compound.

Mobility:

Contaminant of Concern	Kd/Koc
PERCHLORATE	
BORON	
1,4-DIOXANE (P-DIOXANE)	0.000479
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	0.00741
4-AMINO-2,6-DINITROTOLUENE	0.0985
TRICHLOROETHYLENE (TCE)	0.297
ARSENIC	25

MAROS COC Assessment

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Note: Top COCs by mobility were determined by examining each detected compound in the dataset and comparing their mobilities (Koc's for organics, assuming foc = 0.001, and Kd's for metals).

Priority Constituents by Well:

Well Name	Average	Max
1114-MW4	PERCHLORATE	PERCHLORATE
PTX06-1006	PERCHLORATE	PERCHLORATE
PTX06-1007	4-AMINO-2,6-DINITROTOL	4-AMINO-2,6-DINITROTOL
PTX06-1008	1,2-DICHLOROETHANE	1,2-DICHLOROETHANE
PTX06-1011	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1012	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1035	PERCHLORATE	PERCHLORATE
PTX06-1036	2,6-DINITROTOLUENE	HEXAHYDRO-1,3,5-TRINIT
PTX06-1052	CHROMIUM, TOTAL	CHROMIUM, TOTAL
PTX06-1053	1,1-DICHLOROETHENE	2-AMINO-4,6-DINITROTOL
PTX06-1073A	TNX	TRICHLOROETHYLENE (TCE
PTX06-1077A	2-AMINO-4,6-DINITROTOL	TRICHLOROETHYLENE (TCE
PTX06-1085	BARIUM	BARIUM
PTX06-1086	LEAD	BORON
PTX06-1126	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1127	PERCHLORATE	HEXAHYDRO-1,3,5-TRINIT
PTX06-1131	BORON	BORON
PTX06-1134	PERCHLORATE	PERCHLORATE
PTX06-1148	PERCHLORATE	PERCHLORATE
PTX06-1149	ARSENIC	PERCHLORATE
PTX06-1150	PERCHLORATE	PERCHLORATE
PTX06-1151	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1155	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1156	ARSENIC	ARSENIC
PTX06-1159	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1160	1,1-DICHLOROETHENE	PERCHLORATE
PTX06-1162	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1164	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1169	ARSENIC	TRICHLOROETHYLENE (TCE
PTX06-1170	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE

MAROS COC Assessment

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

PTX06-1171	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1172	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1173	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1174	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1175	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1176	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1177	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1180	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1181	2,4-DINITROTOLUENE	BORON
PTX06-1183	CHROMIUM, TOTAL	CHROMIUM, TOTAL
PTX06-1207	4-AMINO-2,6-DINITROTOL	4-AMINO-2,6-DINITROTOL
PTX06-1209	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1210	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX06-1211	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX07-1P02	BORON	BORON
PTX07-1P05	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX07-1Q01	1,3-DINITROBENZENE	BORON
PTX07-1Q02	HEXAHYDRO-1,3,5-TRINITR	BORON
PTX07-1Q03	OCTAHYDRO-1,3,5,7-TETRA	BORON
PTX08-1001	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX08-1003	OCTAHYDRO-1,3,5,7-TETRA	PERCHLORATE
PTX08-1005	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX08-1006	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX08-1007	TRICHLOROETHYLENE (TCE)	1,2-DICHLOROETHANE
PTX08-1008	PERCHLORATE	PERCHLORATE
PTX08-1009	2-AMINO-4,6-DINITROTOL	BORON
PTX10-1014	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
PTX06-1002A										
A4DNT26	NO	56 %	NO	PI	0.39	0.0002	NO	Normal	NO	NO
CR6	NO	61 %	NO	D	0.00	0.0047	NO	No distribution	NO	NO
RDX	YES	100 %	YES	NT	0.72	0.0281	NO	No distribution	NO	NO
TNX	NO	100 %	YES	NT	0.66	0.0056	NO	Lognormal	NO	NO
PTX06-1005										
A4DNT26	NO	100 %	NO	D	1.17	0.0024	NO	Lognormal	NO	NO
CR6	NO	100 %	NO	D	1.75	0.2682	NO	No distribution	NO	NO
RDX	YES	100 %	YES	D	1.10	0.2579	NO	No distribution	NO	NO
TNX	NO	100 %	NO	D	1.62	0.0092	NO	No distribution	NO	NO
PTX06-1008										
A4DNT26	NO	70 %	NO	S	0.30	0.0002	NO	Normal	NO	NO
CR6	NO	80 %	NO	D	1.22	0.0100	YES	Lognormal	NO	NO
RDX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
PCATE	NO	40 %	NO	S	1.48	0.0077	YES	No distribution	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
PTX06-1010										
A4DNT26	NO	50 %	NO	D	0.18	0.0001	NO	No distribution	NO	NO
CR6	NO	100 %	YES	D	0.45	2.0637	NO	Normal	NO	NO
RDX	NO	100 %	NO	PD	0.34	0.0021	NO	Normal	NO	NO
TNX	NO	56 %	NO	NT	0.25	0.0001	NO	No distribution	NO	NO
PTX06-1011										
A4DNT26	NO	10 %	NO	S	0.00	0.0001	YES	No distribution	NO	NO
CR6	NO	100 %	NO	NT	0.42	0.0587	NO	Normal	NO	NO
RDX	NO	80 %	NO	NT	1.43	0.0017	YES	Lognormal	NO	NO
PCATE	NO	60 %	NO	D	0.00	0.0058	NO	No distribution	NO	NO
TNX	NO	70 %	NO	NT	1.60	0.0009	YES	Lognormal	NO	NO
PTX06-1013										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
CR6	NO	33 %	NO	D	0.00	0.0063	NO	No distribution	NO	NO
RDX	YES	100 %	YES	D	0.17	0.0067	NO	Normal	NO	NO
TNX	NO	100 %	NO	D	0.20	0.0006	NO	Normal	NO	NO
PTX06-1014										
A4DNT26	NO	100 %	NO	PD	0.20	0.0033	NO	Normal	NO	NO
CR6	NO	80 %	NO	D	0.86	0.0058	NO	No distribution	NO	NO
RDX	YES	100 %	YES	NT	0.18	0.6106	NO	Normal	NO	NO
TNX	NO	100 %	YES	S	0.20	0.0296	NO	Normal	NO	NO
PTX06-1015										
A4DNT26	NO	100 %	NO	D	0.32	0.0052	NO	Normal	NO	NO
CR6	NO	93 %	NO	I	0.72	0.0193	NO	Lognormal	NO	NO
RDX	YES	100 %	YES	PD	0.18	0.9842	NO	Normal	NO	NO
TNX	NO	100 %	YES	D	0.18	0.0572	NO	Normal	NO	NO
PTX06-1023										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	No distribution	NO	NO
CR6	NO	50 %	NO	D	0.00	0.0048	NO	No distribution	NO	NO
RDX	YES	39 %	NO	NT	1.33	0.0005	NO	No distribution	NO	NO
TNX	YES	11 %	NO	NT	0.36	0.0001	YES	No distribution	NO	NO
PTX06-1030										
A4DNT26	NO	100 %	YES	I	0.18	0.0175	NO	Normal	NO	NO
CR6	NO	86 %	NO	S	0.45	0.0086	NO	Normal	NO	NO
RDX	YES	100 %	YES	PI	0.10	1.1325	NO	Normal	NO	NO
TNX	NO	100 %	YES	S	0.33	0.0213	NO	Normal	NO	NO
PTX06-1031										
A4DNT26	NO	100 %	NO	I	0.18	0.0029	NO	Lognormal	NO	NO
CR6	NO	85 %	NO	I	0.59	0.0101	YES	Lognormal	NO	NO
RDX	YES	100 %	YES	I	0.20	0.6539	NO	Normal	NO	NO
TNX	NO	100 %	YES	I	0.69	0.0219	NO	No distribution	NO	NO
PTX06-1034										

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
A4DNT26	NO	100 %	NO	D	0.35	0.0082	NO	Normal	NO	NO
CR6	NO	75 %	NO	D	0.61	0.0057	YES	No distribution	NO	NO
RDX	YES	100 %	YES	I	0.29	0.9853	NO	Normal	NO	NO
TNX	NO	100 %	YES	D	0.28	0.0612	NO	Normal	NO	NO
PTX06-1036										
A4DNT26	NO	0 %	NO	N/A	0.00	0.0001	YES	Normal	NO	NO
CR6	NO	100 %	NO	N/A	0.14	0.0143	NO	Normal	NO	NO
RDX	YES	100 %	NO	N/A	0.05	0.0016	NO	Normal	NO	NO
TNX	NO	0 %	NO	N/A	0.00	0.0001	YES	Normal	NO	NO
PTX06-1037										
A4DNT26	NO	0 %	NO	ND	0.00	0.0004	NO	No distribution	NO	NO
CR6	NO	13 %	NO	D	0.00	0.0050	NO	No distribution	NO	NO
RDX	NO	29 %	NO	D	0.00	0.0005	NO	No distribution	NO	NO
TNX	NO	59 %	NO	D	1.20	0.0005	NO	No distribution	NO	NO
PTX06-1038										
A4DNT26	NO	100 %	NO	D	0.42	0.0121	NO	Normal	NO	NO
CR6	NO	79 %	NO	D	0.85	0.0052	NO	No distribution	NO	NO
RDX	YES	100 %	YES	D	0.73	0.2360	NO	Lognormal	NO	NO
TNX	NO	100 %	YES	D	0.62	0.0117	NO	Lognormal	NO	NO
PTX06-1039A										
A4DNT26	NO	100 %	YES	I	0.38	0.0187	NO	Normal	NO	NO
CR6	NO	61 %	NO	D	1.25	0.0057	NO	No distribution	NO	NO
RDX	YES	100 %	YES	S	0.25	0.8069	NO	Normal	NO	NO
TNX	NO	100 %	YES	I	0.27	0.0704	NO	Normal	NO	NO
PTX06-1040										
A4DNT26	NO	100 %	YES	NT	0.20	0.0223	NO	Normal	NO	NO
CR6	NO	81 %	NO	D	1.96	0.0127	YES	No distribution	NO	NO
RDX	YES	100 %	YES	D	0.20	1.0759	NO	Normal	NO	NO
TNX	NO	100 %	YES	NT	0.29	0.0710	NO	Normal	NO	NO

MAROS Individual Well Summary Report

Project: Pantex | **User Name:** MV
Location: Southwest Sector | **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
PTX06-1041										
A4DNT26	NO	100 %	YES	D	0.13	0.0173	NO	Normal	NO	NO
CR6	NO	80 %	NO	D	0.80	0.0073	NO	Lognormal	NO	NO
RDX	YES	100 %	YES	NT	0.21	1.1907	NO	Normal	NO	NO
TNX	NO	100 %	YES	D	0.36	0.0363	NO	Normal	NO	NO
PTX06-1042										
A4DNT26	NO	100 %	NO	D	0.54	0.0107	NO	Normal	NO	NO
CR6	NO	62 %	NO	D	0.00	0.0072	YES	Lognormal	NO	NO
RDX	YES	100 %	YES	D	0.40	0.6345	NO	Normal	NO	NO
TNX	NO	100 %	YES	D	0.58	0.0126	NO	Lognormal	NO	NO
PTX06-1045										
A4DNT26	NO	50 %	NO	S	1.46	0.0003	NO	Normal	NO	NO
CR6	NO	100 %	NO	S	0.43	0.0023	NO	Normal	NO	NO
RDX	YES	100 %	YES	D	1.07	0.0623	NO	Normal	NO	NO
TNX	NO	100 %	NO	D	0.93	0.0038	NO	Normal	NO	NO
PTX06-1046										
A4DNT26	NO	100 %	NO	D	0.41	0.0064	NO	Normal	NO	NO
CR6	NO	90 %	NO	S	0.58	0.0086	NO	Normal	NO	NO
RDX	YES	100 %	YES	D	0.55	1.6078	NO	Normal	NO	NO
TNX	NO	100 %	YES	D	0.64	0.1166	NO	Normal	NO	NO
PTX06-1047A										
A4DNT26	NO	95 %	NO	D	1.00	0.0033	NO	Lognormal	NO	NO
CR6	NO	60 %	NO	D	1.18	0.0100	NO	Lognormal	NO	NO
RDX	YES	100 %	YES	D	1.47	0.2276	NO	Lognormal	NO	NO
TNX	NO	95 %	NO	D	1.61	0.0144	NO	Lognormal	NO	NO
PTX06-1052										
A4DNT26	NO	30 %	NO	NT	0.80	0.0002	YES	No distribution	NO	NO
CR6	NO	100 %	NO	D	1.22	2.0136	NO	Lognormal	NO	NO
RDX	NO	30 %	NO	S	0.38	0.0001	YES	No distribution	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
PTX06-1053										
A4DNT26	NO	100 %	NO	D	0.57	0.0006	NO	Normal	NO	NO
CR6	NO	50 %	NO	D	0.00	0.0053	NO	No distribution	NO	NO
RDX	NO	67 %	NO	S	0.35	0.0002	NO	Normal	NO	NO
PCATE	NO	12 %	NO	S	0.00	0.0063	NO	No distribution	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Lognormal	NO	NO
PTX06-1069										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
CR6	NO	40 %	NO	S	1.61	0.0101	NO	Normal	NO	NO
RDX	NO	40 %	NO	NT	0.00	0.0001	NO	Normal	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
PTX06-1088										
A4DNT26	NO	100 %	NO	S	0.66	0.0008	NO	Lognormal	NO	NO
CR6	NO	95 %	NO	I	0.81	0.0485	NO	Lognormal	NO	NO
RDX	YES	100 %	YES	NT	1.09	0.0543	NO	Lognormal	NO	NO
TNX	NO	100 %	NO	S	0.63	0.0009	NO	Lognormal	NO	NO
PTX06-1095A										
A4DNT26	NO	100 %	NO	D	0.81	0.0024	NO	No distribution	NO	NO
CR6	NO	90 %	NO	PI	1.59	0.0344	YES	No distribution	NO	NO
RDX	YES	100 %	YES	D	1.17	0.5371	NO	Lognormal	NO	NO
TNX	NO	90 %	NO	D	1.09	0.0066	NO	No distribution	NO	NO
PTX06-1098										
A4DNT26	NO	0 %	NO	ND	0.00	0.0003	YES	No distribution	NO	NO
CR6	NO	35 %	NO	D	1.92	0.0104	NO	No distribution	NO	NO
RDX	NO	11 %	NO	NT	0.00	0.0003	YES	No distribution	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0007	YES	No distribution	NO	NO
PTX06-1100										
A4DNT26	NO	0 %	NO	ND	0.00	0.0003	YES	No distribution	NO	NO

MAROS Individual Well Summary Report

Project: Pantex | **User Name:** MV
Location: Southwest Sector | **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
CR6	NO	30 %	NO	D	3.22	0.0289	YES	No distribution	NO	NO
RDX	NO	0 %	NO	ND	0.00	0.0003	YES	No distribution	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0006	YES	No distribution	NO	NO
PTX06-1101										
A4DNT26	NO	20 %	NO	S	0.00	0.0003	YES	No distribution	NO	NO
CR6	NO	40 %	NO	D	2.31	0.0079	NO	Normal	NO	NO
RDX	YES	80 %	YES	I	0.82	0.0384	NO	Normal	NO	NO
TNX	NO	20 %	NO	NT	0.00	0.0005	YES	No distribution	NO	NO
PTX06-1102										
A4DNT26	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	YES	100 %	YES	N/A	0.00	#Error	NO	No distribution	NO	NO
TNX	NO	100 %	YES	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX06-1120										
A4DNT26	NO	100 %	NO	D	0.40	0.0098	NO	No distribution	NO	NO
CR6	NO	100 %	NO	S	0.88	0.0145	NO	Lognormal	NO	NO
RDX	YES	100 %	YES	D	0.36	2.7696	NO	Normal	NO	NO
TNX	NO	100 %	YES	D	0.41	0.2351	NO	Normal	NO	NO
PTX06-1121										
A4DNT26	NO	100 %	NO	N/A	0.24	#Error	NO	No distribution	NO	NO
CR6	NO	100 %	NO	N/A	0.08	#Error	NO	No distribution	NO	NO
RDX	YES	100 %	YES	N/A	0.64	#Error	NO	No distribution	NO	NO
TNX	NO	100 %	YES	N/A	0.56	#Error	NO	No distribution	NO	NO
PTX06-1123										
A4DNT26	NO	0 %	NO	ND	0.00	0.0007	YES	No distribution	NO	NO
CR6	NO	7 %	NO	D	0.00	0.0072	NO	No distribution	NO	NO
RDX	NO	53 %	NO	D	2.11	0.0036	NO	No distribution	NO	NO
TNX	YES	100 %	NO	D	1.21	0.0171	NO	Lognormal	NO	NO
PTX06-1130										

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
A4DNT26	NO	100 %	NO	D	0.16	0.0094	YES	Normal	NO	NO
CR6	NO	43 %	NO	D	0.00	0.0072	NO	Normal	NO	NO
RDX	YES	100 %	YES	S	0.12	0.1213	NO	Normal	NO	NO
TNX	NO	100 %	YES	NT	0.10	0.0065	NO	Normal	NO	NO
PTX06-1133A										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
CR6	NO	67 %	NO	D	0.73	0.0053	NO	No distribution	NO	NO
RDX	NO	20 %	NO	D	2.95	0.0004	YES	No distribution	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
PTX06-1135										
A4DNT26	NO	78 %	NO	I	1.02	0.0004	YES	No distribution	NO	NO
CR6	NO	38 %	NO	S	0.63	0.0079	NO	Normal	NO	NO
RDX	NO	100 %	NO	I	0.58	0.0008	YES	Lognormal	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
PTX06-1146										
A4DNT26	NO	100 %	YES	D	0.16	0.0243	NO	Normal	NO	NO
CR6	NO	85 %	NO	I	0.38	0.0142	NO	No distribution	NO	NO
RDX	YES	100 %	YES	NT	0.23	1.3113	YES	No distribution	NO	NO
TNX	NO	100 %	YES	I	0.19	0.0207	NO	Normal	NO	NO
PTX06-1147										
A4DNT26	NO	100 %	NO	PD	0.22	0.0045	NO	Normal	NO	NO
CR6	NO	60 %	NO	D	0.00	0.0054	NO	Normal	NO	NO
RDX	YES	100 %	YES	D	0.31	0.9937	NO	Normal	NO	NO
TNX	NO	100 %	YES	D	0.32	0.0534	NO	Normal	NO	NO
PTX06-1148										
A4DNT26	NO	6 %	NO	S	0.00	0.0002	NO	No distribution	NO	NO
RDX	NO	19 %	NO	S	0.00	0.0002	NO	No distribution	NO	NO
PCATE	YES	94 %	YES	D	0.96	0.5226	NO	No distribution	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0004	NO	No distribution	NO	NO

MAROS Individual Well Summary Report

Project: Pantex | **User Name:** MV

Location: Southwest Sector | **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
PTX06-1153										
A4DNT26	NO	92 %	NO	D	0.00	0.0042	NO	No distribution	NO	NO
CR6	NO	100 %	NO	D	0.81	0.0876	NO	No distribution	NO	NO
RDX	YES	100 %	YES	PI	0.43	0.3447	NO	No distribution	NO	NO
TNX	NO	94 %	YES	I	0.00	0.0140	NO	No distribution	NO	NO
PTX06-1154										
A4DNT26	NO	0 %	NO	ND	0.00	0.0007	NO	No distribution	NO	NO
CR6	NO	41 %	NO	D	1.63	0.0085	NO	No distribution	NO	NO
RDX	NO	14 %	NO	NT	4.48	0.0016	NO	No distribution	NO	NO
TNX	YES	37 %	NO	D	2.45	0.0254	NO	No distribution	NO	NO
PTX06-1166										
A4DNT26	NO	100 %	NO	S	0.20	0.0004	NO	Lognormal	NO	NO
CR6	NO	94 %	NO	I	0.79	0.0644	NO	Normal	NO	NO
RDX	YES	100 %	YES	D	0.24	0.0188	NO	Normal	NO	NO
TNX	NO	19 %	NO	PI	0.00	0.0001	NO	No distribution	NO	NO
PTX06-1182										
A4DNT26	NO	92 %	NO	D	1.54	0.0039	NO	No distribution	NO	NO
CR6	NO	82 %	NO	PD	0.00	0.0039	NO	Lognormal	NO	NO
RDX	YES	100 %	NO	D	1.56	0.0119	NO	No distribution	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	NO	NO
PTX06-1183										
A4DNT26	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR6	NO	100 %	YES	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
TNX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX06-1184										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	YES	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
TNX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
PTX06-1185										
A4DNT26	NO	100 %	NO	D	0.26	0.0036	NO	Normal	NO	NO
CR6	NO	100 %	NO	PD	0.21	0.0039	NO	Normal	NO	NO
RDX	YES	100 %	YES	D	0.41	0.6097	NO	Normal	NO	NO
TNX	NO	100 %	NO	D	0.53	0.0033	NO	No distribution	NO	NO
PTX06-1190										
A4DNT26	NO	100 %	YES	S	0.13	0.0084	NO	Normal	NO	NO
CR6	NO	100 %	NO	I	0.11	0.0035	NO	Normal	NO	NO
RDX	YES	100 %	YES	I	0.49	1.3053	NO	Normal	NO	NO
TNX	NO	100 %	YES	I	0.29	0.0249	NO	Normal	NO	NO
PTX06-1191										
A4DNT26	NO	100 %	NO	D	0.22	0.0018	NO	Normal	NO	NO
CR6	NO	100 %	NO	S	0.09	0.0026	NO	Normal	NO	NO
RDX	YES	100 %	YES	PI	0.18	0.1484	NO	Normal	NO	NO
TNX	NO	100 %	NO	I	0.23	0.0004	NO	Normal	NO	NO
PTX06-1192										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	NO	NO
CR6	YES	100 %	NO	NT	1.34	0.0069	YES	Lognormal	NO	NO
RDX	NO	12 %	NO	S	0.00	0.0001	NO	Normal	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	NO	NO
PTX06-1194										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	NO	NO
CR6	NO	100 %	NO	S	0.60	0.0023	YES	Normal	NO	NO
RDX	YES	25 %	NO	S	2.46	0.0001	YES	No distribution	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	NO	NO
PTX06-1195										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	No distribution	NO	NO
CR6	NO	100 %	NO	NT	0.52	0.0011	NO	No distribution	NO	NO
RDX	YES	33 %	NO	S	0.00	0.0001	YES	No distribution	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	No distribution	NO	NO
PTX06-1196										
A4DNT26	NO	100 %	NO	S	0.25	0.0053	NO	Normal	NO	NO
CR6	NO	100 %	NO	N/A	0.23	0.0030	NO	Normal	NO	NO
RDX	YES	100 %	YES	I	0.20	0.0306	NO	Normal	NO	NO
TNX	NO	100 %	NO	I	0.62	0.0017	NO	Normal	NO	NO
PTX06-1197										
A4DNT26	NO	100 %	NO	S	0.12	0.0035	NO	Normal	NO	NO
CR6	NO	100 %	NO	NT	0.25	0.0042	NO	Normal	NO	NO
RDX	YES	100 %	YES	I	0.26	0.2403	NO	Normal	NO	NO
TNX	NO	100 %	NO	NT	0.20	0.0018	YES	Normal	NO	NO
PTX06-1199										
A4DNT26	NO	100 %	NO	I	0.20	0.0020	YES	Normal	NO	NO
CR6	NO	100 %	NO	I	0.72	0.0040	YES	Lognormal	NO	NO
RDX	YES	100 %	YES	I	0.25	0.0085	NO	Normal	NO	NO
TNX	NO	14 %	NO	PD	0.00	0.0001	YES	No distribution	NO	NO
PTX06-1200										
A4DNT26	NO	17 %	NO	S	0.00	0.0002	YES	No distribution	NO	NO
CR6	NO	100 %	NO	NT	0.06	0.0013	YES	No distribution	NO	NO
RDX	NO	0 %	NO	ND	0.00	0.0002	YES	No distribution	NO	NO
TNX	YES	0 %	NO	ND	0.00	0.0002	YES	No distribution	NO	NO
PTX06-1201										
A4DNT26	NO	100 %	NO	I	0.40	0.0014	NO	No distribution	NO	NO
CR6	NO	100 %	NO	NT	0.16	0.0029	YES	No distribution	NO	NO
RDX	YES	100 %	YES	I	0.73	0.0088	NO	No distribution	NO	NO
TNX	NO	17 %	NO	PD	0.00	0.0001	YES	No distribution	NO	NO
PTX06-1202										
A4DNT26	NO	100 %	NO	I	0.15	0.0004	NO	No distribution	NO	NO
CR6	NO	100 %	NO	I	0.20	0.0016	YES	No distribution	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
RDX	YES	100 %	NO	PI	0.20	0.0002	NO	Normal	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
PTX06-1203										
A4DNT26	NO	100 %	YES	NT	0.09	0.0068	YES	No distribution	NO	NO
CR6	NO	100 %	NO	S	0.03	0.0045	NO	Normal	NO	NO
RDX	YES	100 %	YES	I	0.36	0.2194	NO	No distribution	NO	NO
TNX	NO	100 %	YES	PI	0.29	0.0030	NO	No distribution	NO	NO
PTX06-1204										
A4DNT26	NO	100 %	NO	I	0.61	0.0009	NO	Lognormal	NO	NO
CR6	NO	100 %	NO	NT	0.18	0.0032	YES	No distribution	NO	NO
RDX	YES	83 %	NO	PI	1.16	0.0008	YES	No distribution	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	No distribution	NO	NO
PTX06-1207										
A4DNT26	YES	100 %	NO	N/A	0.22	0.0088	NO	Normal	NO	NO
RDX	YES	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
PCATE	NO	100 %	NO	N/A	0.50	0.0233	NO	Normal	NO	NO
TNX	NO	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
PTX06-1208										
A4DNT26	NO	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
CR6	NO	100 %	NO	N/A	1.34	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
TNX	NO	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
PTX06-1213										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
TNX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX06-1214										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
TNX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX06-PRB16										
A4DNT26	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	YES	100 %	YES	N/A	0.00	#Error	NO	No distribution	NO	NO
TNX	NO	100 %	YES	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX08-1002										
A4DNT26	NO	94 %	NO	D	0.81	0.0037	NO	Lognormal	NO	NO
CR6	NO	44 %	NO	D	0.00	0.0047	NO	No distribution	NO	NO
RDX	YES	100 %	YES	D	0.96	0.0704	NO	Lognormal	NO	NO
TNX	NO	100 %	NO	D	0.79	0.0041	NO	Lognormal	NO	NO
PTX08-1007										
A4DNT26	NO	30 %	NO	PI	0.00	0.0001	NO	No distribution	NO	NO
CR6	NO	60 %	NO	D	0.89	0.0068	NO	Normal	NO	NO
RDX	NO	100 %	YES	D	0.42	0.0059	NO	No distribution	NO	NO
PCATE	NO	80 %	NO	I	0.20	0.0074	NO	Normal	NO	NO
TNX	NO	100 %	NO	D	0.49	0.0017	NO	Normal	NO	NO
PTX08-1008										
A4DNT26	NO	40 %	NO	I	1.90	0.0011	NO	No distribution	NO	NO
CR6	YES	100 %	NO	D	1.72	0.3452	YES	Lognormal	NO	NO
RDX	NO	15 %	YES	NT	2.34	0.0004	YES	No distribution	NO	NO
PCATE	YES	95 %	YES	I	0.77	0.2612	NO	No distribution	NO	NO
TNX	NO	5 %	NO	NT	0.00	0.0001	YES	No distribution	NO	NO
PTX08-1009										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
CR6	NO	78 %	NO	S	0.76	0.0226	NO	No distribution	NO	NO
RDX	YES	83 %	NO	D	1.07	0.0005	YES	No distribution	NO	NO
PCATE	NO	67 %	NO	S	0.00	0.0064	NO	No distribution	NO	NO
TNX	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
PTX10-1014										

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	NO	NO
CR6	NO	80 %	NO	S	0.92	0.0146	NO	Lognormal	NO	NO
RDX	NO	100 %	YES	S	0.45	0.0023	NO	Normal	NO	NO
PCATE	NO	80 %	NO	S	0.17	0.0070	NO	Normal	NO	NO
TNX	NO	100 %	NO	S	0.42	0.0005	NO	Normal	NO	NO

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Time Period: 1/1/2017 **to** 12/1/2021
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
CHROMIUM, HEXAVALENT							
1114-MW4	1	1	0.00	0	0.0%	No	N/A
PTX06-1007	1	1	0.00	0	0.0%	No	N/A
PTX06-1008	5	5	0.93	-10	99.2%	No	D
PTX06-1052	10	10	0.65	-39	100.0%	No	D
PTX06-1053	8	7	1.66	-8	80.1%	No	NT
PTX06-1077A	1	1	0.00	0	0.0%	No	N/A
PTX06-1085	1	1	0.00	0	0.0%	No	N/A
PTX06-1086	1	1	0.00	0	0.0%	No	N/A
PTX06-1126	10	10	0.61	25	98.6%	No	I
PTX06-1127	10	9	0.70	-35	100.0%	No	D
PTX06-1131	1	1	0.00	0	0.0%	No	N/A
PTX06-1183	10	10	0.47	-33	99.9%	No	D
PTX07-1P02	1	1	0.00	0	0.0%	No	N/A
PTX07-1Q01	1	1	0.00	0	0.0%	No	N/A
PTX07-1Q02	1	1	0.00	0	0.0%	No	N/A
PTX08-1001	1	1	0.00	0	0.0%	No	N/A
PTX08-1005	8	8	0.14	14	94.6%	No	PI
PTX08-1006	1	1	0.00	0	0.0%	No	N/A
PTX08-1007	5	5	1.01	-10	99.2%	No	D
PTX08-1008	10	10	0.69	-39	100.0%	No	D
PTX08-1009	8	8	0.69	-24	99.9%	No	D
PTX10-1014	5	5	0.84	-6	88.3%	No	S
CHROMIUM, TOTAL							
1114-MW4	1	1	0.00	0	0.0%	No	N/A
PTX06-1007	1	1	0.00	0	0.0%	No	N/A
PTX06-1008	5	5	0.36	6	88.3%	No	NT

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
CHROMIUM, TOTAL							
PTX06-1012	14	0	0.36	-11	70.5%	Yes	ND
PTX06-1052	10	10	0.64	-37	100.0%	No	D
PTX06-1053	8	1	0.31	-1	50.0%	No	S
PTX06-1077A	1	0	0.00	0	0.0%	Yes	ND
PTX06-1085	1	0	0.00	0	0.0%	Yes	ND
PTX06-1086	1	0	0.00	0	0.0%	Yes	ND
PTX06-1126	10	10	0.48	19	94.6%	No	PI
PTX06-1127	10	10	1.46	21	96.4%	No	I
PTX06-1131	1	1	0.00	0	0.0%	No	N/A
PTX06-1148	14	13	1.56	-2	52.2%	No	NT
PTX06-1149	14	1	0.80	-11	70.5%	No	S
PTX06-1150	14	11	0.96	-6	60.6%	No	S
PTX06-1155	14	3	0.65	0	47.8%	No	S
PTX06-1156	14	0	0.45	-8	64.6%	Yes	ND
PTX06-1169	2	0	0.00	0	0.0%	Yes	ND
PTX06-1173	14	0	0.45	-8	64.6%	Yes	ND
PTX06-1174	14	0	0.48	-11	70.5%	Yes	ND
PTX06-1175	14	6	2.35	-17	80.6%	No	NT
PTX06-1183	10	10	0.43	-33	99.9%	No	D
PTX06-1211	1	0	0.00	0	0.0%	Yes	ND
PTX07-1P02	1	0	0.00	0	0.0%	Yes	ND
PTX07-1Q01	1	0	0.00	0	0.0%	Yes	ND
PTX07-1Q02	1	0	0.00	0	0.0%	Yes	ND
PTX08-1001	1	0	0.00	0	0.0%	Yes	ND
PTX08-1005	8	7	0.19	14	94.6%	No	PI
PTX08-1006	1	1	0.00	0	0.0%	No	N/A
PTX08-1007	5	2	0.23	-3	67.5%	No	S
PTX08-1008	10	10	0.71	-41	100.0%	No	D
PTX08-1009	8	8	0.63	-24	99.9%	No	D
PTX10-1014	5	5	0.40	-4	75.8%	No	S
cis-1,2-DICHLOROETHYLENE							
1114-MW4	8	0	0.00	0	45.2%	Yes	ND
PTX06-1006	5	0	0.00	0	40.8%	Yes	ND

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

cis-1,2-DICHLOROETHYLENE

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PTX06-1007	5	0	0.00	0	40.8%	Yes	ND
PTX06-1008	5	0	0.00	0	40.8%	Yes	ND
PTX06-1012	16	16	0.53	-47	98.2%	No	D
PTX06-1035	10	0	0.00	0	46.4%	Yes	ND
PTX06-1052	10	0	0.00	0	46.4%	Yes	ND
PTX06-1053	8	0	0.00	0	45.2%	Yes	ND
PTX06-1077A	4	4	1.03	2	62.5%	No	NT
PTX06-1085	4	0	0.00	0	37.5%	Yes	ND
PTX06-1086	4	0	0.00	0	37.5%	Yes	ND
PTX06-1126	10	10	0.68	-25	98.6%	No	D
PTX06-1127	10	10	0.49	29	99.5%	No	I
PTX06-1131	5	0	0.00	0	40.8%	Yes	ND
PTX06-1134	10	10	0.69	23	97.7%	No	I
PTX06-1148	16	7	0.58	-58	99.6%	No	D
PTX06-1149	16	7	0.41	-30	90.3%	No	PD
PTX06-1150	16	9	0.74	-33	92.4%	No	PD
PTX06-1151	10	10	0.30	16	90.7%	No	PI
PTX06-1155	16	16	0.42	39	95.7%	No	I
PTX06-1156	16	9	0.79	19	78.8%	No	NT
PTX06-1159	10	10	0.29	-33	99.9%	No	D
PTX06-1160	10	0	0.00	0	46.4%	Yes	ND
PTX06-1164	16	16	1.22	29	89.5%	No	NT
PTX06-1169	6	6	0.14	0	42.3%	No	S
PTX06-1170	16	16	0.48	-55	99.3%	No	D
PTX06-1171	5	5	0.11	-9	97.5%	No	D
PTX06-1173	16	16	0.43	9	63.9%	No	NT
PTX06-1174	16	16	1.24	-7	60.5%	No	NT
PTX06-1175	16	16	1.40	42	96.8%	No	I
PTX06-1176	16	16	0.84	-89	100.0%	No	D
PTX06-1177	16	15	0.68	-75	100.0%	No	D
PTX06-1180	10	10	0.17	-16	90.7%	No	PD
PTX06-1181	9	0	0.00	0	46.0%	Yes	ND
PTX06-1183	10	0	0.00	0	46.4%	Yes	ND

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

cis-1,2-DICHLOROETHYLENE

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PTX06-1207	3	0	0.00	0	0.0%	Yes	ND
PTX06-1209	1	1	0.00	0	0.0%	No	N/A
PTX06-1210	1	1	0.00	0	0.0%	No	N/A
PTX06-1211	1	1	0.00	0	0.0%	No	N/A
PTX07-1P02	8	0	0.00	0	45.2%	Yes	ND
PTX07-1Q01	4	0	0.00	0	37.5%	Yes	ND
PTX07-1Q02	4	0	0.00	0	37.5%	Yes	ND
PTX07-1Q03	3	0	0.00	0	0.0%	Yes	ND
PTX08-1001	5	0	0.00	0	40.8%	Yes	ND
PTX08-1003	5	0	0.00	0	40.8%	Yes	ND
PTX08-1005	8	5	0.19	7	76.4%	No	NT
PTX08-1006	10	3	0.14	8	72.9%	No	NT
PTX08-1007	5	0	0.00	0	40.8%	Yes	ND
PTX08-1008	10	0	0.73	7	70.0%	Yes	ND
PTX08-1009	8	0	0.00	0	45.2%	Yes	ND
PTX10-1014	5	0	0.00	0	40.8%	Yes	ND

PERCHLORATE

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
1114-MW4	8	8	0.30	-20	99.3%	No	D
PTX06-1006	5	5	0.09	-8	95.8%	No	D
PTX06-1007	5	5	0.21	-2	59.2%	No	S
PTX06-1008	5	4	0.95	-2	59.2%	No	S
PTX06-1012	16	0	0.53	-48	98.4%	Yes	ND
PTX06-1035	10	10	0.34	28	99.4%	No	I
PTX06-1053	8	2	0.47	-11	88.7%	No	S
PTX06-1077A	5	4	0.34	-4	75.8%	No	S
PTX06-1126	10	10	1.36	-37	100.0%	No	D
PTX06-1127	10	10	0.45	-37	100.0%	No	D
PTX06-1134	10	10	0.59	31	99.8%	No	I
PTX06-1148	16	14	1.20	-88	100.0%	No	D
PTX06-1149	16	7	1.28	62	99.8%	No	I
PTX06-1150	16	16	0.56	-101	100.0%	No	D
PTX06-1151	11	11	0.36	-55	100.0%	No	D
PTX06-1155	16	1	0.53	-43	97.1%	No	D

MAROS Mann-Kendall Statistics Summary

Project: Pantex　　**User Name:** MV

Location: Southwest Sector　　**State:** Texas

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PERCHLORATE							
PTX06-1156	16	0	0.53	-48	98.4%	Yes	ND
PTX06-1159	10	10	0.38	-11	81.0%	No	S
PTX06-1160	11	8	1.87	-24	96.4%	No	D
PTX06-1164	16	13	0.87	-80	100.0%	No	D
PTX06-1169	6	0	1.22	-8	89.8%	Yes	ND
PTX06-1170	16	1	1.11	-36	94.2%	No	PD
PTX06-1171	5	5	0.23	-4	75.8%	No	S
PTX06-1173	16	1	0.53	-43	97.1%	No	D
PTX06-1174	16	0	0.53	-48	98.4%	Yes	ND
PTX06-1175	16	13	0.92	-77	100.0%	No	D
PTX06-1176	16	5	1.07	-82	100.0%	No	D
PTX06-1177	16	1	1.28	-12	68.7%	No	NT
PTX06-1180	10	4	0.29	-20	95.5%	No	D
PTX06-1181	9	4	0.64	-24	99.4%	No	D
PTX06-1207	3	3	0.00	0	0.0%	No	N/A
PTX06-1209	1	1	0.00	0	0.0%	No	N/A
PTX06-1210	1	0	0.00	0	0.0%	Yes	ND
PTX06-1211	1	1	0.00	0	0.0%	No	N/A
PTX07-1P02	8	0	0.55	-12	91.1%	Yes	ND
PTX08-1001	5	1	0.79	-4	75.8%	No	S
PTX08-1003	5	5	0.07	-2	59.2%	No	S
PTX08-1005	8	2	0.43	-11	88.7%	No	S
PTX08-1006	10	10	1.17	-31	99.8%	No	D
PTX08-1007	5	5	0.13	8	95.8%	No	I
PTX08-1008	10	10	0.20	-21	96.4%	No	D
PTX08-1009	6	4	0.35	-2	57.0%	No	S
PTX10-1014	5	5	0.12	-2	59.2%	No	S
TRICHLOROETHYLENE (TCE)							
1114-MW4	8	8	0.34	22	99.8%	No	I
PTX06-1006	5	5	0.14	6	88.3%	No	NT
PTX06-1007	5	3	0.13	-1	50.0%	No	S
PTX06-1008	5	5	0.40	8	95.8%	No	I
PTX06-1012	16	16	0.45	-98	100.0%	No	D

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

TRICHLOROETHYLENE (TCE)

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PTX06-1035	10	10	0.44	31	99.8%	No	I
PTX06-1052	10	5	1.03	25	98.6%	No	I
PTX06-1053	8	0	0.00	0	45.2%	Yes	ND
PTX06-1077A	4	4	0.28	2	62.5%	No	NT
PTX06-1085	4	0	0.00	0	37.5%	Yes	ND
PTX06-1086	4	0	0.00	0	37.5%	Yes	ND
PTX06-1126	10	10	0.92	-19	94.6%	No	PD
PTX06-1127	10	10	0.39	31	99.8%	No	I
PTX06-1131	5	0	0.00	0	40.8%	Yes	ND
PTX06-1134	10	10	0.68	19	94.6%	No	PI
PTX06-1148	16	16	0.74	84	100.0%	No	I
PTX06-1149	16	12	1.75	89	100.0%	No	I
PTX06-1150	16	16	0.58	84	100.0%	No	I
PTX06-1151	10	10	0.18	3	56.9%	No	NT
PTX06-1155	16	9	2.06	68	99.9%	No	I
PTX06-1156	16	6	0.68	-32	91.7%	No	PD
PTX06-1159	10	10	0.37	-37	100.0%	No	D
PTX06-1160	10	3	0.07	-24	98.2%	No	D
PTX06-1164	16	16	0.48	-4	55.3%	No	S
PTX06-1169	6	6	1.36	7	86.4%	No	NT
PTX06-1170	16	16	0.73	-47	98.2%	No	D
PTX06-1171	5	5	0.08	-8	95.8%	No	D
PTX06-1173	16	14	1.69	33	92.4%	No	PI
PTX06-1174	16	12	1.39	4	55.3%	No	NT
PTX06-1175	16	16	0.31	-80	100.0%	No	D
PTX06-1176	16	13	1.42	-71	100.0%	No	D
PTX06-1177	16	12	0.97	11	67.1%	No	NT
PTX06-1180	10	10	0.17	2	53.5%	No	NT
PTX06-1181	9	0	0.00	0	46.0%	Yes	ND
PTX06-1183	10	3	0.41	10	78.4%	No	NT
PTX06-1207	3	3	0.00	0	0.0%	No	N/A
PTX06-1209	1	1	0.00	0	0.0%	No	N/A
PTX06-1210	1	1	0.00	0	0.0%	No	N/A

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

TRICHLOROETHYLENE (TCE)

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PTX06-1211	1	1	0.00	0	0.0%	No	N/A
PTX07-1P02	8	0	0.00	0	45.2%	Yes	ND
PTX07-1Q01	4	0	0.00	0	37.5%	Yes	ND
PTX07-1Q02	4	0	0.00	0	37.5%	Yes	ND
PTX07-1Q03	3	0	0.00	0	0.0%	Yes	ND
PTX08-1001	5	0	0.00	0	40.8%	Yes	ND
PTX08-1003	5	4	0.26	-4	75.8%	No	S
PTX08-1005	8	8	0.48	-20	99.3%	No	D
PTX08-1006	10	10	0.57	-1	50.0%	No	S
PTX08-1007	5	5	0.05	-6	88.3%	No	S
PTX08-1008	10	8	1.46	38	100.0%	No	I
PTX08-1009	8	0	0.00	0	45.2%	Yes	ND
PTX10-1014	5	5	0.63	8	95.8%	No	I

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events).

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Spatial Moment Analysis Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Effective Date	0th Moment Estimated Mass (Kg)	1st Moment (Center of Mass) Xc (ft)	Yc (ft)	Source Distance	2nd Moment (Spread) Sigma XX (sq ft)	Sigma YY (sq ft)	Number of Wells
CHROMIUM, HEXAVALENT							
7/1/2017	2.0E+02	638,502	3,755,271	2,576	664,965	1,460,591	11
7/1/2018	1.2E+02	638,400	3,755,043	2,637	639,312	1,287,607	11
7/1/2019	6.4E+01	638,456	3,755,347	2,496	757,425	1,374,075	11
7/1/2020	4.8E+01	638,502	3,755,382	2,514	823,434	1,514,124	11
7/1/2021	5.1E+01	637,147	3,756,143	970	7,221,966	3,454,996	22
CHROMIUM, TOTAL							
7/1/2017	2.4E+02	638,379	3,755,317	2,450	1,003,706	1,366,163	21
7/1/2018	2.5E+02	638,156	3,755,202	2,349	1,081,015	1,262,687	21
7/1/2019	1.7E+02	638,262	3,755,433	2,287	1,265,055	1,455,696	20
7/1/2020	1.5E+02	638,006	3,755,526	2,026	1,710,442	1,544,017	20
7/1/2021	2.1E+02	636,035	3,756,703	370	8,734,851	5,117,009	32
cis-1,2-DICHLOROETHYLENE							
7/1/2017	2.3E+01	634,590	3,756,334	1,860	3,628,253	3,740,479	47
7/1/2018	2.4E+01	634,563	3,756,253	1,907	3,531,930	3,583,374	47
7/1/2019	2.5E+01	634,432	3,756,235	2,037	3,354,264	3,471,405	45
7/1/2020	1.9E+01	634,939	3,755,889	1,702	2,650,196	2,478,162	43
7/1/2021	1.9E+01	634,854	3,756,726	1,547	4,728,345	4,741,790	50
PERCHLORATE							
7/1/2017	3.4E+02	636,434	3,757,097	337	1,567,603	2,618,704	38
7/1/2018	3.0E+02	636,426	3,757,069	308	1,959,096	2,935,121	39
7/1/2019	2.4E+02	636,395	3,757,107	345	2,398,655	3,266,896	38
7/1/2020	1.8E+02	636,366	3,757,187	427	2,335,960	2,921,188	40
7/1/2021	1.8E+02	636,436	3,757,065	305	2,417,182	3,074,378	43
TRICHLOROETHYLENE (TCE)							
7/1/2017	7.5E+01	635,106	3,756,385	1,347	2,396,526	2,449,452	47
7/1/2018	9.2E+01	635,109	3,756,260	1,385	2,236,134	2,255,352	47
7/1/2019	9.0E+01	634,995	3,756,043	1,578	2,149,165	1,678,341	45
7/1/2020	7.5E+01	635,351	3,756,103	1,239	2,204,240	2,238,066	43
7/1/2021	8.9E+01	635,606	3,756,193	976	2,833,342	3,076,529	50

MAROS Spatial Moment Analysis Summary

Project: Pantex | **User Name:** MV
Location: Southwest Sector | **State:** Texas

Spatial Moment Analysis Summary:

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
0th Moment	CHROMIUM, HEXAVALENT	0.66	-8	95.8%	D
0th Moment	CHROMIUM, TOTAL	0.20	-4	75.8%	S
0th Moment	cis-1,2-DICHLOROETHYLENE	0.13	-2	59.2%	S
0th Moment	PERCHLORATE	0.28	-8	95.8%	D
0th Moment	TRICHLOROETHYLENE (TCE)	0.10	0	40.8%	S
First Moment	CHROMIUM, HEXAVALENT	0.32	-6	88.3%	S
First Moment	CHROMIUM, TOTAL	0.46	-10	99.2%	D
First Moment	cis-1,2-DICHLOROETHYLENE	0.11	-4	75.8%	S
First Moment	PERCHLORATE	0.14	0	40.8%	S
First Moment	TRICHLOROETHYLENE (TCE)	0.17	-4	75.8%	S
Second Moment X	CHROMIUM, HEXAVALENT	1.44	8	95.8%	I
Second Moment X	CHROMIUM, TOTAL	1.21	10	99.2%	I
Second Moment X	cis-1,2-DICHLOROETHYLENE	0.21	-2	59.2%	S
Second Moment X	PERCHLORATE	0.17	8	95.8%	I
Second Moment X	TRICHLOROETHYLENE (TCE)	0.12	0	40.8%	S
Second Moment Y	CHROMIUM, HEXAVALENT	0.51	6	88.3%	NT
Second Moment Y	CHROMIUM, TOTAL	0.77	8	95.8%	I
Second Moment Y	cis-1,2-DICHLOROETHYLENE	0.22	-2	59.2%	S
Second Moment Y	PERCHLORATE	0.08	4	75.8%	NT
Second Moment Y	TRICHLOROETHYLENE (TCE)	0.21	0	40.8%	S

Note: The following assumptions were applied for the calculation of the Zeroth Moment:

Porosity: 0.25 **Saturated Thickness:** Uniform: 30 ft

Mann-Kendall Trend test performed on all sample events for each constituent. Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events); (ND) Non Detect.

Note: The Sigma XX and Sigma YY components are estimated using the given field coordinate system and then rotated to align with the estimated groundwater flow direction. Moments are not calculated for sample events with less than 6 wells.

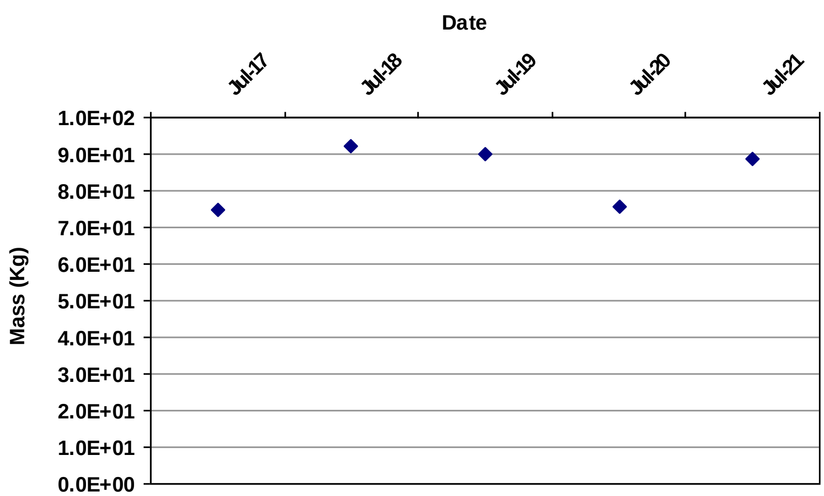
MAROS Zeroth Moment Analysis

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Change in Dissolved Mass Over Time

COC: TRICHLOROETHYLENE (TCE)



Porosity: 0.25

Saturated Thickness:

Uniform: 30 ft

Mann-Kendall S Statistic:

0

Confidence in Trend:

40.8%

Coefficient of Variation:

0.10

Zeroth Moment Trend:

S

Data Table:

Effective Date	Constituent	Estimated Mass (Kg)	Number of Wells
7/1/2017	TRICHLOROETHYLENE (TCE)	7.5E+01	47
7/1/2018	TRICHLOROETHYLENE (TCE)	9.2E+01	47
7/1/2019	TRICHLOROETHYLENE (TCE)	9.0E+01	45
7/1/2020	TRICHLOROETHYLENE (TCE)	7.5E+01	43
7/1/2021	TRICHLOROETHYLENE (TCE)	8.9E+01	50

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect. Moments are not calculated for sample events with less than 6 wells.

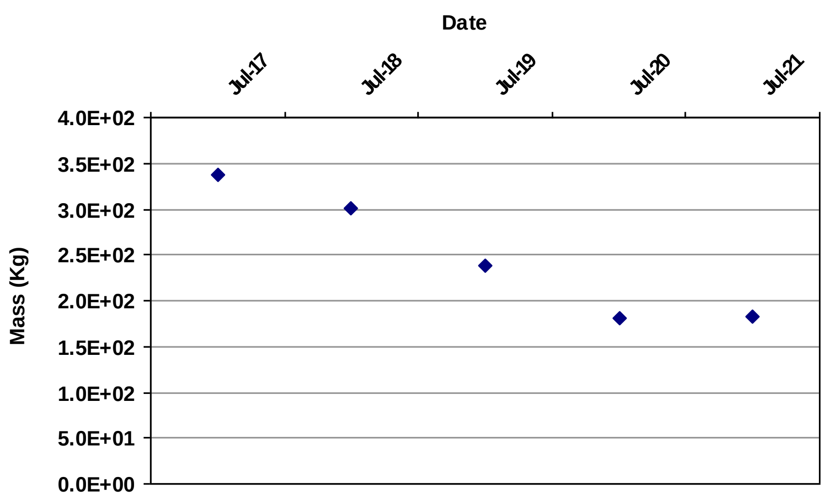
MAROS Zeroth Moment Analysis

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Change in Dissolved Mass Over Time

COC: PERCHLORATE



Porosity: 0.25

Saturated Thickness:

Uniform: 30 ft

Mann-Kendall S Statistic:

-8

Confidence in Trend:

95.8%

Coefficient of Variation:

0.28

Zeroth Moment Trend:

D

Data Table:

Effective Date	Constituent	Estimated Mass (Kg)	Number of Wells
7/1/2017	PERCHLORATE	3.4E+02	38
7/1/2018	PERCHLORATE	3.0E+02	39
7/1/2019	PERCHLORATE	2.4E+02	38
7/1/2020	PERCHLORATE	1.8E+02	40
7/1/2021	PERCHLORATE	1.8E+02	43

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect. Moments are not calculated for sample events with less than 6 wells.

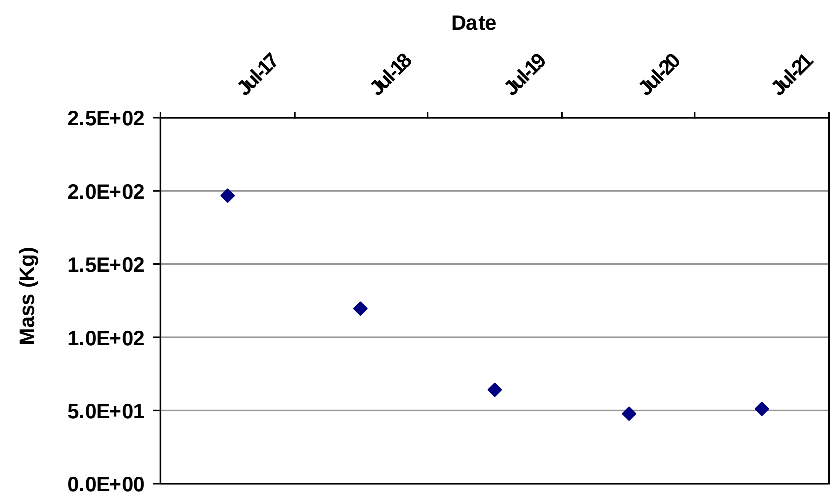
MAROS Zeroth Moment Analysis

Project: Pantex　　**User Name:** MV

Location: Southwest Sector　　**State:** Texas

Change in Dissolved Mass Over Time

COC: CHROMIUM, HEXAVALENT



Porosity: 0.25

Saturated Thickness:

Uniform: 30 ft

Mann-Kendall S Statistic:

-8

Confidence in Trend:

95.8%

Coefficient of Variation:

0.66

Zeroth Moment Trend:

D

Data Table:

Effective Date	Constituent	Estimated Mass (Kg)	Number of Wells
7/1/2017	CHROMIUM, HEXAVALENT	2.0E+02	11
7/1/2018	CHROMIUM, HEXAVALENT	1.2E+02	11
7/1/2019	CHROMIUM, HEXAVALENT	6.4E+01	11
7/1/2020	CHROMIUM, HEXAVALENT	4.8E+01	11
7/1/2021	CHROMIUM, HEXAVALENT	5.1E+01	22

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect. Moments are not calculated for sample events with less than 6 wells.

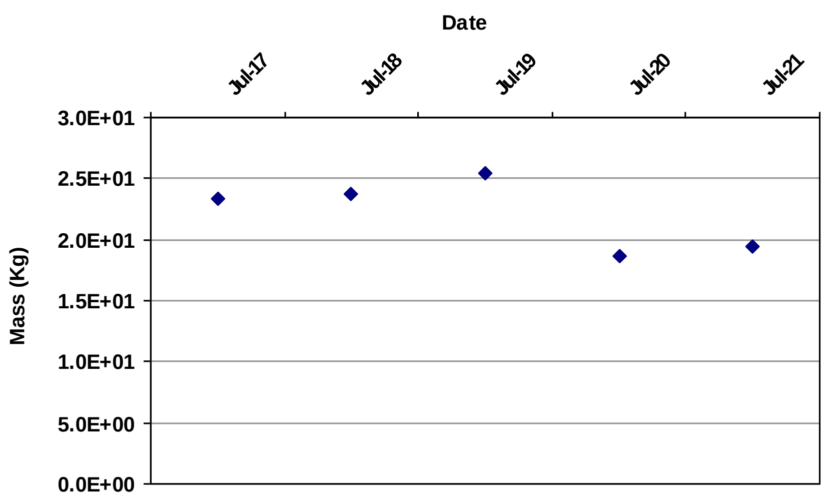
MAROS Zeroth Moment Analysis

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Change in Dissolved Mass Over Time

COC: cis-1,2-DICHLOROETHYLENE



Porosity: 0.25

Saturated Thickness:

Uniform: 30 ft

Mann-Kendall S Statistic:

-2

Confidence in Trend:

59.2%

Coefficient of Variation:

0.13

Zeroth Moment Trend:

S

Data Table:

Effective Date	Constituent	Estimated Mass (Kg)	Number of Wells
7/1/2017	cis-1,2-DICHLOROETHYLENE	2.3E+01	47
7/1/2018	cis-1,2-DICHLOROETHYLENE	2.4E+01	47
7/1/2019	cis-1,2-DICHLOROETHYLENE	2.5E+01	45
7/1/2020	cis-1,2-DICHLOROETHYLENE	1.9E+01	43
7/1/2021	cis-1,2-DICHLOROETHYLENE	1.9E+01	50

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect. Moments are not calculated for sample events with less than 6 wells.

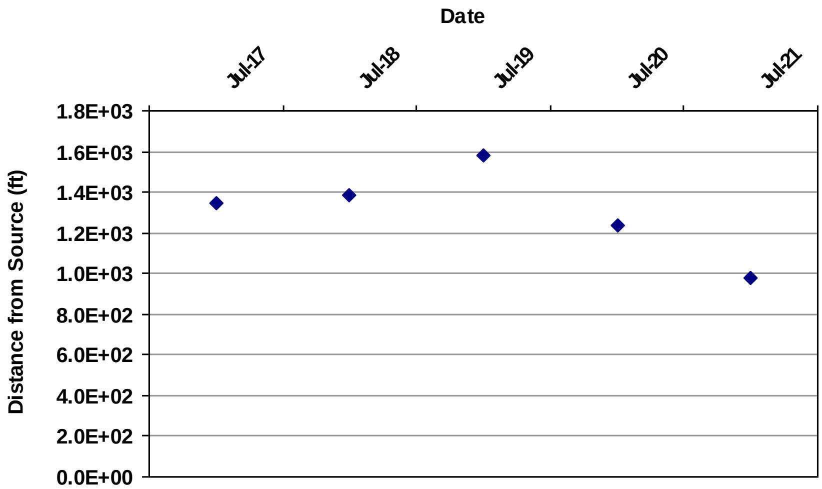
MAROS First Moment Analysis

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC: TRICHLOROETHYLENE (TCE)

Distance from Source to Center of Mass



Mann-Kendall S Statistic:
-4

Confidence in Trend:
75.8%

Coefficient of Variation:
0.17

First Moment Trend:
S

DATA TABLE

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source	Number of Wells
7/1/2017	TRICHLOROETHYLENE (TCE)	635,106	3,756,385	1,347	47
7/1/2018	TRICHLOROETHYLENE (TCE)	635,109	3,756,260	1,385	47
7/1/2019	TRICHLOROETHYLENE (TCE)	634,995	3,756,043	1,578	45
7/1/2020	TRICHLOROETHYLENE (TCE)	635,351	3,756,103	1,239	43
7/1/2021	TRICHLOROETHYLENE (TCE)	635,606	3,756,193	976	50

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

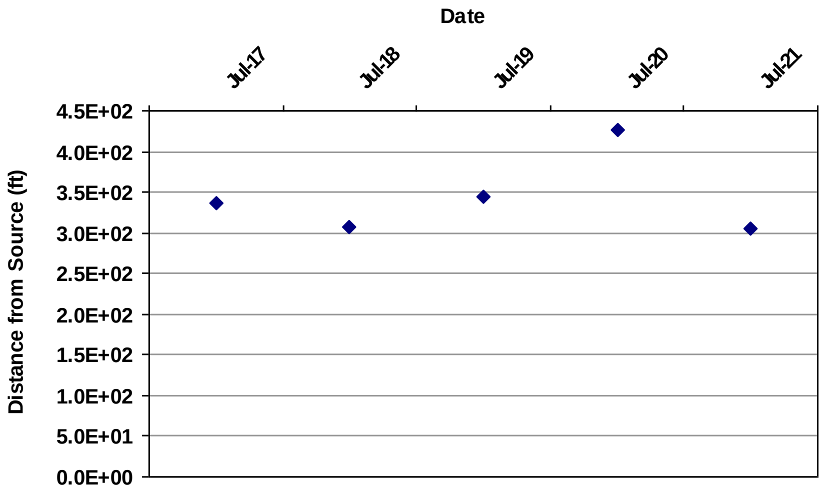
MAROS First Moment Analysis

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

COC: PERCHLORATE

Distance from Source to Center of Mass



Mann-Kendall S Statistic:
0

Confidence in Trend:
40.8%

Coefficient of Variation:
0.14

First Moment Trend:
S

DATA TABLE

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source	Number of Wells
7/1/2017	PERCHLORATE	636,434	3,757,097	337	38
7/1/2018	PERCHLORATE	636,426	3,757,069	308	39
7/1/2019	PERCHLORATE	636,395	3,757,107	345	38
7/1/2020	PERCHLORATE	636,366	3,757,187	427	40
7/1/2021	PERCHLORATE	636,436	3,757,065	305	43

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

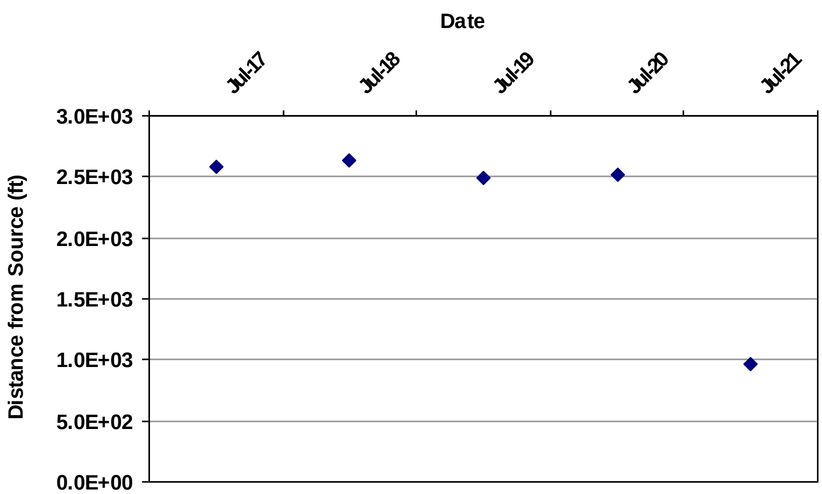
MAROS First Moment Analysis

Project: Pantex | **User Name:** MV

Location: Southwest Sector | **State:** Texas

COC: CHROMIUM, HEXAVALENT

Distance from Source to Center of Mass



Mann-Kendall S Statistic:
-6

Confidence in Trend:
88.3%

Coefficient of Variation:
0.32

First Moment Trend:
S

DATA TABLE

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source	Number of Wells
7/1/2017	CHROMIUM, HEXAVALENT	638,502	3,755,271	2,576	11
7/1/2018	CHROMIUM, HEXAVALENT	638,400	3,755,043	2,637	11
7/1/2019	CHROMIUM, HEXAVALENT	638,456	3,755,347	2,496	11
7/1/2020	CHROMIUM, HEXAVALENT	638,502	3,755,382	2,514	11
7/1/2021	CHROMIUM, HEXAVALENT	637,147	3,756,143	970	22

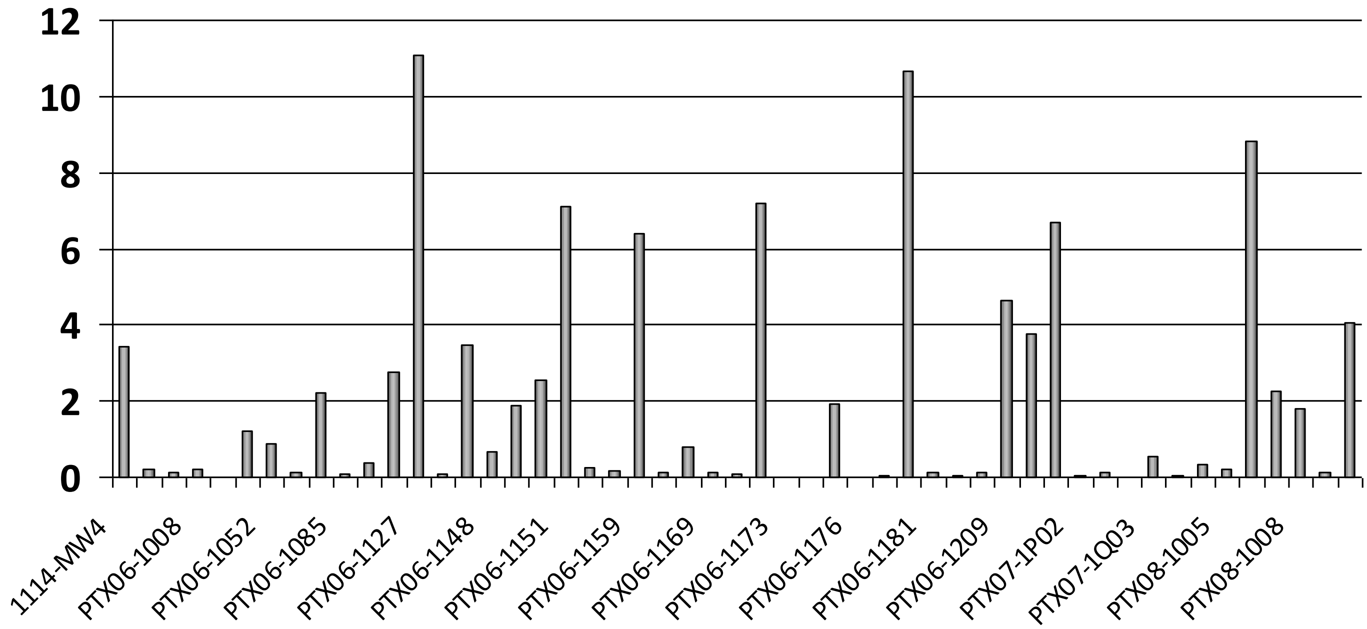
Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

TRICHLOROETHYLENE (TCE) 7/1/2021



Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
1114-MW4	2,187,942.97	10,165.73	3.41	2.43
PTX06-1006	2,435,332.46	671.24	0.23	2.70
PTX06-1007	2,977,699.96	328.29	0.11	3.30
PTX06-1008	1,006,773.04	586.70	0.20	1.12
PTX06-1012	304,319.09	41.78	0.01	0.34
PTX06-1035	2,007,659.81	3,552.05	1.19	2.23
PTX06-1052	2,194,563.85	2,595.21	0.87	2.43
PTX06-1053	3,022,608.92	396.72	0.13	3.35
PTX06-1077A	4,049,820.15	6,654.87	2.23	4.49
PTX06-1085	2,190,843.49	287.55	0.10	2.43
PTX06-1086	8,529,727.81	1,119.53	0.38	9.45
PTX06-1126	323,501.29	8,173.46	2.74	0.36
PTX06-1127	656,811.65	33,017.10	11.09	0.73
PTX06-1131	2,154,780.95	282.82	0.09	2.39

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1134	1,262,268.35	10,321.41	3.47	1.40
PTX06-1148	985,797.67	2,044.94	0.69	1.09
PTX06-1149	587,540.68	5,644.80	1.90	0.65
PTX06-1150	1,451,098.96	7,561.13	2.54	1.61
PTX06-1151	614,409.91	21,208.66	7.12	0.68
PTX06-1155	71,583.99	720.63	0.24	0.08
PTX06-1156	553,535.70	510.01	0.17	0.61
PTX06-1159	696,054.30	19,038.83	6.39	0.77
PTX06-1160	2,621,764.59	344.11	0.12	2.91
PTX06-1164	81,488.74	2,395.77	0.80	0.09
PTX06-1169	132,582.55	393.27	0.13	0.15
PTX06-1170	128,479.15	250.41	0.08	0.14
PTX06-1171	283,817.67	21,382.11	7.18	0.31
PTX06-1173	147,623.99	43.75	0.01	0.16
PTX06-1174	196,538.36	44.24	0.01	0.22
PTX06-1175	334,505.12	5,720.67	1.92	0.37
PTX06-1176	64,962.02	21.32	0.01	0.07
PTX06-1177	215,571.53	71.02	0.02	0.24
PTX06-1180	364,995.60	31,761.46	10.67	0.40
PTX06-1181	2,839,455.80	372.68	0.13	3.15
PTX06-1183	378,842.93	80.55	0.03	0.42
PTX06-1207	2,093,489.12	392.92	0.13	2.32
PTX06-1209	160,275.59	13,841.80	4.65	0.18
PTX06-1210	185,841.11	11,220.16	3.77	0.21
PTX06-1211	226,040.91	19,936.81	6.69	0.25
PTX07-1P02	616,645.36	80.93	0.03	0.68
PTX07-1Q01	2,383,680.14	312.86	0.11	2.64
PTX07-1Q02	277,970.92	36.48	0.01	0.31
PTX07-1Q03	6,220,267.64	1,632.82	0.55	6.89
PTX08-1001	1,251,956.44	164.32	0.06	1.39
PTX08-1003	8,003,427.39	1,050.45	0.35	8.87

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

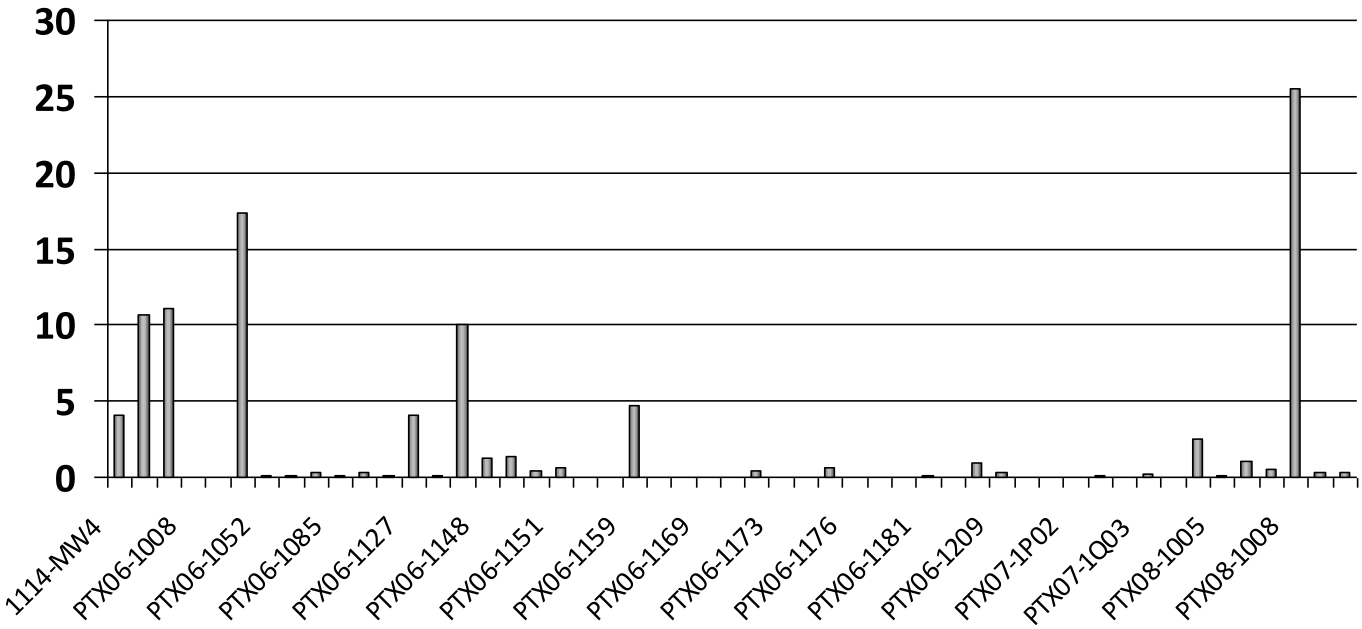
Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX08-1005	852,230.18	636.46	0.21	0.94
PTX08-1006	1,563,013.25	26,238.11	8.81	1.73
PTX08-1007	1,829,804.09	6,676.50	2.24	2.03
PTX08-1008	2,443,406.26	5,362.06	1.80	2.71
PTX08-1009	2,628,961.80	345.05	0.12	2.91
PTX10-1014	1,308,496.52	12,073.33	4.05	1.45
	80,100,809.7	297,805.9	100	88.7798524601

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

PERCHLORATE 7/1/2021



Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
1114-MW4	2,187,942.97	30,669.49	4.04	2.43
PTX06-1006	2,435,332.46	80,548.62	10.62	2.70
PTX06-1007	2,977,699.96	84,417.80	11.13	3.30
PTX06-1008	1,006,773.04	272.21	0.04	1.12
PTX06-1012	304,319.09	39.94	0.01	0.34
PTX06-1035	2,007,659.81	131,489.18	17.33	2.23
PTX06-1052	2,194,563.85	576.07	0.08	2.43
PTX06-1053	3,022,608.92	1,142.55	0.15	3.35
PTX06-1077A	4,049,820.15	2,636.43	0.35	4.49
PTX06-1085	2,190,843.49	575.10	0.08	2.43
PTX06-1086	8,529,727.81	2,239.05	0.30	9.45
PTX06-1126	323,501.29	589.76	0.08	0.36
PTX06-1127	656,811.65	31,034.35	4.09	0.73
PTX06-1131	2,154,780.95	565.63	0.07	2.39

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1134	1,262,268.35	76,043.78	10.02	1.40
PTX06-1148	985,797.67	9,257.56	1.22	1.09
PTX06-1149	587,540.68	10,541.58	1.39	0.65
PTX06-1150	1,451,098.96	3,479.64	0.46	1.61
PTX06-1151	614,409.91	4,911.06	0.65	0.68
PTX06-1155	71,583.99	9.40	0.00	0.08
PTX06-1156	553,535.70	72.65	0.01	0.61
PTX06-1159	696,054.30	35,537.92	4.68	0.77
PTX06-1160	2,621,764.59	363.38	0.05	2.91
PTX06-1164	81,488.74	56.26	0.01	0.09
PTX06-1169	132,582.55	17.40	0.00	0.15
PTX06-1170	128,479.15	16.86	0.00	0.14
PTX06-1171	283,817.67	3,360.05	0.44	0.31
PTX06-1173	147,623.99	19.38	0.00	0.16
PTX06-1174	196,538.36	25.80	0.00	0.22
PTX06-1175	334,505.12	4,860.15	0.64	0.37
PTX06-1176	64,962.02	8.53	0.00	0.07
PTX06-1177	215,571.53	28.29	0.00	0.24
PTX06-1180	364,995.60	333.90	0.04	0.40
PTX06-1181	2,839,455.80	883.25	0.12	3.15
PTX06-1183	378,842.93	99.45	0.01	0.42
PTX06-1207	2,093,489.12	7,226.46	0.95	2.32
PTX06-1209	160,275.59	2,179.35	0.29	0.18
PTX06-1210	185,841.11	24.39	0.00	0.21
PTX06-1211	226,040.91	136.47	0.02	0.25
PTX07-1P02	616,645.36	80.93	0.01	0.68
PTX07-1Q01	2,383,680.14	625.72	0.08	2.64
PTX07-1Q02	277,970.92	72.97	0.01	0.31
PTX07-1Q03	6,220,267.64	1,632.82	0.22	6.89
PTX08-1001	1,251,956.44	164.32	0.02	1.39
PTX08-1003	8,003,427.39	18,866.08	2.49	8.87

MAROS Percent of Mass by Well

Project: Pantex　　**User Name:** MV

Location: Southwest Sector　　**State:** Texas

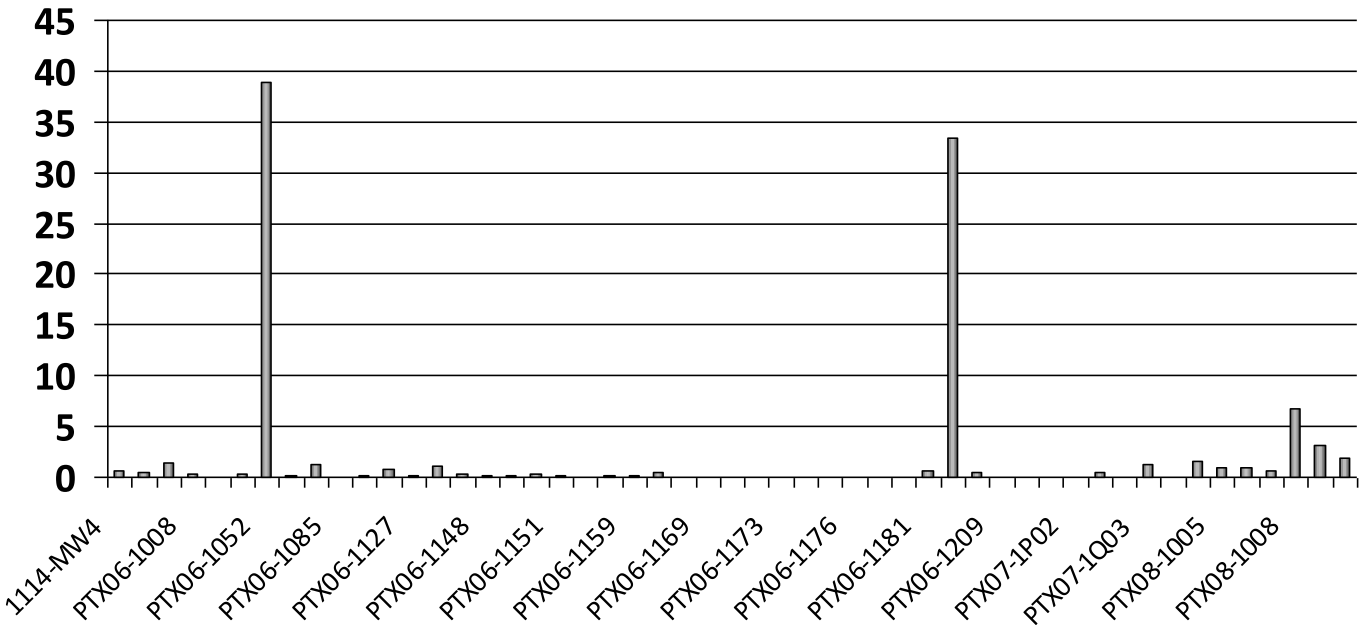
Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX08-1005	852,230.18	407.15	0.05	0.94
PTX08-1006	1,563,013.25	8,021.19	1.06	1.73
PTX08-1007	1,829,804.09	4,231.65	0.56	2.03
PTX08-1008	2,443,406.26	193,701.04	25.53	2.71
PTX08-1009	2,628,961.80	2,298.04	0.30	2.91
PTX10-1014	1,308,496.52	2,308.19	0.30	1.45
	80,100,809.7	758,699.2	100	88.7798524601

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

CHROMIUM, HEXAVALENT 7/1/2021



Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
1114-MW4	2,187,942.97	887.35	0.65	2.43
PTX06-1006	2,435,332.46	639.27	0.47	2.70
PTX06-1007	2,977,699.96	2,009.61	1.48	3.30
PTX06-1008	1,006,773.04	383.20	0.28	1.12
PTX06-1012	304,319.09	79.88	0.06	0.34
PTX06-1035	2,007,659.81	527.01	0.39	2.23
PTX06-1052	2,194,563.85	52,700.03	38.84	2.43
PTX06-1053	3,022,608.92	114.25	0.08	3.35
PTX06-1077A	4,049,820.15	1,796.60	1.32	4.49
PTX06-1085	2,190,843.49	83.96	0.06	2.43
PTX06-1086	8,529,727.81	248.53	0.18	9.45
PTX06-1126	323,501.29	1,100.21	0.81	0.36
PTX06-1127	656,811.65	270.52	0.20	0.73
PTX06-1131	2,154,780.95	1,419.73	1.05	2.39

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1134	1,262,268.35	331.35	0.24	1.40
PTX06-1148	985,797.67	258.77	0.19	1.09
PTX06-1149	587,540.68	154.23	0.11	0.65
PTX06-1150	1,451,098.96	380.91	0.28	1.61
PTX06-1151	614,409.91	161.28	0.12	0.68
PTX06-1155	71,583.99	18.79	0.01	0.08
PTX06-1156	553,535.70	145.30	0.11	0.61
PTX06-1159	696,054.30	182.71	0.13	0.77
PTX06-1160	2,621,764.59	688.21	0.51	2.91
PTX06-1164	81,488.74	21.39	0.02	0.09
PTX06-1169	132,582.55	34.80	0.03	0.15
PTX06-1170	128,479.15	33.73	0.02	0.14
PTX06-1171	283,817.67	74.50	0.05	0.31
PTX06-1173	147,623.99	38.75	0.03	0.16
PTX06-1174	196,538.36	51.59	0.04	0.22
PTX06-1175	334,505.12	87.81	0.06	0.37
PTX06-1176	64,962.02	17.05	0.01	0.07
PTX06-1177	215,571.53	56.59	0.04	0.24
PTX06-1180	364,995.60	95.81	0.07	0.40
PTX06-1181	2,839,455.80	745.36	0.55	3.15
PTX06-1183	378,842.93	45,338.95	33.42	0.42
PTX06-1207	2,093,489.12	549.54	0.41	2.32
PTX06-1209	160,275.59	42.07	0.03	0.18
PTX06-1210	185,841.11	48.78	0.04	0.21
PTX06-1211	226,040.91	59.34	0.04	0.25
PTX07-1P02	616,645.36	62.32	0.05	0.68
PTX07-1Q01	2,383,680.14	567.52	0.42	2.64
PTX07-1Q02	277,970.92	37.80	0.03	0.31
PTX07-1Q03	6,220,267.64	1,632.82	1.20	6.89
PTX08-1001	1,251,956.44	68.69	0.05	1.39
PTX08-1003	8,003,427.39	2,100.90	1.55	8.87

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

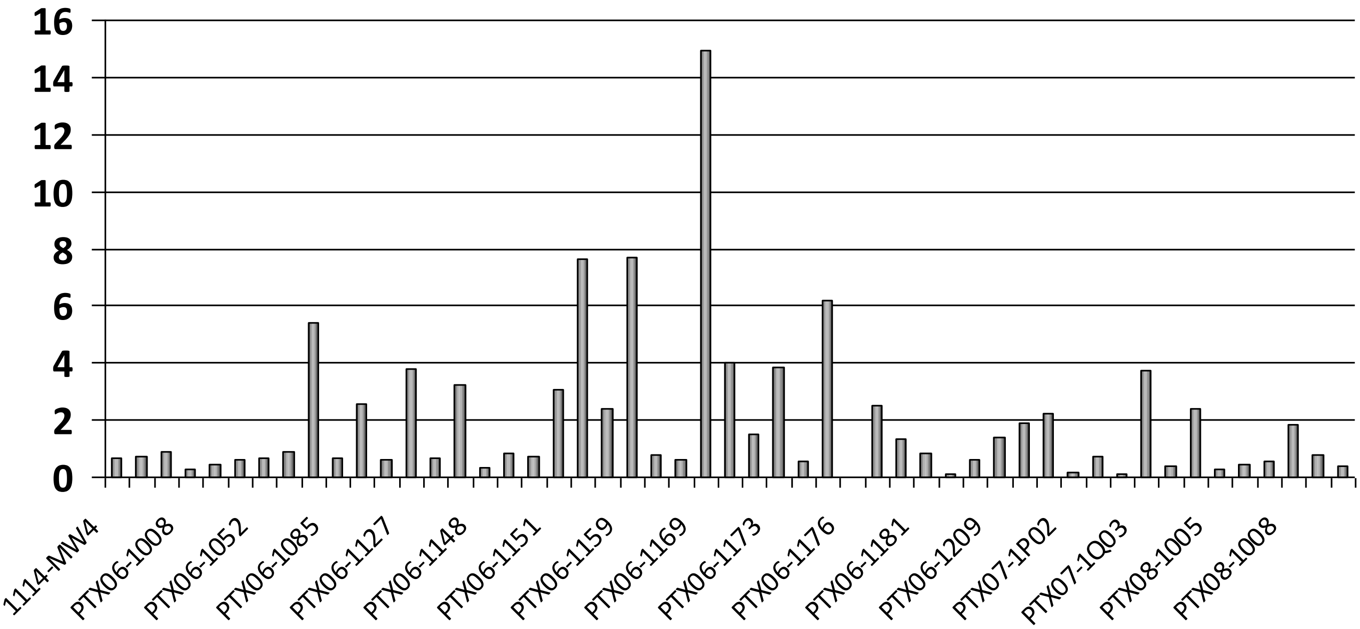
Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX08-1005	852,230.18	1,231.30	0.91	0.94
PTX08-1006	1,563,013.25	1,206.26	0.89	1.73
PTX08-1007	1,829,804.09	896.76	0.66	2.03
PTX08-1008	2,443,406.26	9,152.69	6.75	2.71
PTX08-1009	2,628,961.80	4,342.12	3.20	2.91
PTX10-1014	1,308,496.52	2,500.37	1.84	1.45
	80,100,809.7	135,677.4	100	88.7798524601

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

cis-1,2-DICHLOROETHYLENE 7/1/2021



Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
1114-MW4	2,187,942.97	287.17	0.66	2.43
PTX06-1006	2,435,332.46	319.64	0.73	2.70
PTX06-1007	2,977,699.96	390.82	0.90	3.30
PTX06-1008	1,006,773.04	132.14	0.30	1.12
PTX06-1012	304,319.09	185.61	0.43	0.34
PTX06-1035	2,007,659.81	263.51	0.60	2.23
PTX06-1052	2,194,563.85	288.04	0.66	2.43
PTX06-1053	3,022,608.92	396.72	0.91	3.35
PTX06-1077A	4,049,820.15	2,370.66	5.44	4.49
PTX06-1085	2,190,843.49	287.55	0.66	2.43
PTX06-1086	8,529,727.81	1,119.53	2.57	9.45
PTX06-1126	323,501.29	270.89	0.62	0.36
PTX06-1127	656,811.65	1,654.30	3.79	0.73
PTX06-1131	2,154,780.95	282.82	0.65	2.39

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1134	1,262,268.35	1,421.47	3.26	1.40
PTX06-1148	985,797.67	154.10	0.35	1.09
PTX06-1149	587,540.68	358.58	0.82	0.65
PTX06-1150	1,451,098.96	311.78	0.71	1.61
PTX06-1151	614,409.91	1,336.23	3.06	0.68
PTX06-1155	71,583.99	3,330.67	7.64	0.08
PTX06-1156	553,535.70	1,038.19	2.38	0.61
PTX06-1159	696,054.30	3,361.94	7.71	0.77
PTX06-1160	2,621,764.59	344.11	0.79	2.91
PTX06-1164	81,488.74	267.38	0.61	0.09
PTX06-1169	132,582.55	6,508.15	14.92	0.15
PTX06-1170	128,479.15	1,752.05	4.02	0.14
PTX06-1171	283,817.67	652.64	1.50	0.31
PTX06-1173	147,623.99	1,675.99	3.84	0.16
PTX06-1174	196,538.36	242.22	0.56	0.22
PTX06-1175	334,505.12	2,691.30	6.17	0.37
PTX06-1176	64,962.02	10.56	0.02	0.07
PTX06-1177	215,571.53	1,089.31	2.50	0.24
PTX06-1180	364,995.60	590.20	1.35	0.40
PTX06-1181	2,839,455.80	372.68	0.85	3.15
PTX06-1183	378,842.93	49.72	0.11	0.42
PTX06-1207	2,093,489.12	274.77	0.63	2.32
PTX06-1209	160,275.59	610.05	1.40	0.18
PTX06-1210	185,841.11	824.44	1.89	0.21
PTX06-1211	226,040.91	961.24	2.20	0.25
PTX07-1P02	616,645.36	80.93	0.19	0.68
PTX07-1Q01	2,383,680.14	312.86	0.72	2.64
PTX07-1Q02	277,970.92	36.48	0.08	0.31
PTX07-1Q03	6,220,267.64	1,632.82	3.74	6.89
PTX08-1001	1,251,956.44	164.32	0.38	1.39
PTX08-1003	8,003,427.39	1,050.45	2.41	8.87

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX08-1005	852,230.18	111.86	0.26	0.94
PTX08-1006	1,563,013.25	188.73	0.43	1.73
PTX08-1007	1,829,804.09	240.16	0.55	2.03
PTX08-1008	2,443,406.26	801.74	1.84	2.71
PTX08-1009	2,628,961.80	345.05	0.79	2.91
PTX10-1014	1,308,496.52	171.74	0.39	1.45
	80,100,809.7	43,616.3	100	88.7798524601

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well: PTX06-1035 **Time Period:** 1/1/2017 **to** 12/30/2021

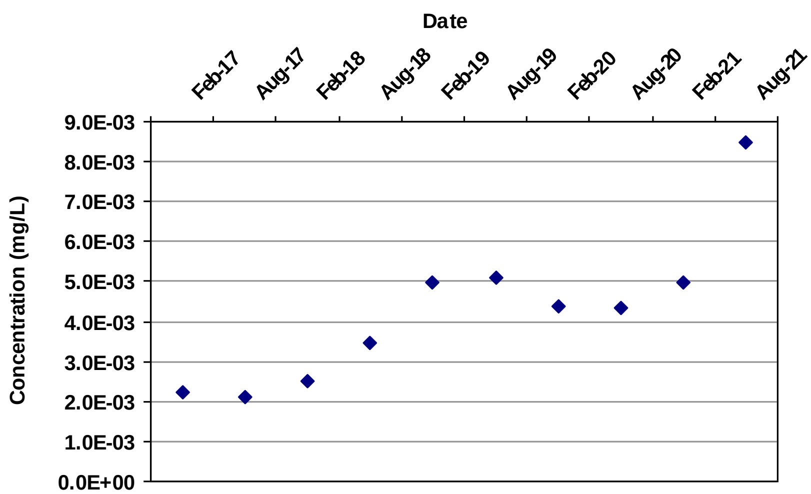
Well Type: RA **Consolidation Period:** No Time Consolidation

COC: TRICHLOROETHYLENE (TCE) **Duplicate Consolidation:** Median

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

31

Confidence in Trend:

99.8%

Coefficient of Variation:

0.44

Mann Kendall Concentration Trend: (See Note)

I

Data Table:

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1035	2/1/2017	TRICHLOROETHYLENE (TCE)	2.2E-03		1	1
PTX06-1035	8/1/2017	TRICHLOROETHYLENE (TCE)	2.1E-03		1	1
PTX06-1035	2/1/2018	TRICHLOROETHYLENE (TCE)	2.5E-03		1	1
PTX06-1035	8/1/2018	TRICHLOROETHYLENE (TCE)	3.5E-03		1	1
PTX06-1035	2/1/2019	TRICHLOROETHYLENE (TCE)	5.0E-03		1	1
PTX06-1035	8/1/2019	TRICHLOROETHYLENE (TCE)	5.1E-03		1	1
PTX06-1035	2/1/2020	TRICHLOROETHYLENE (TCE)	4.4E-03		1	1
PTX06-1035	8/1/2020	TRICHLOROETHYLENE (TCE)	4.3E-03		1	1
PTX06-1035	2/1/2021	TRICHLOROETHYLENE (TCE)	5.0E-03		1	1

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1035	8/1/2021	TRICHLOROETHYLENE (TCE)	8.5E-03		1	1

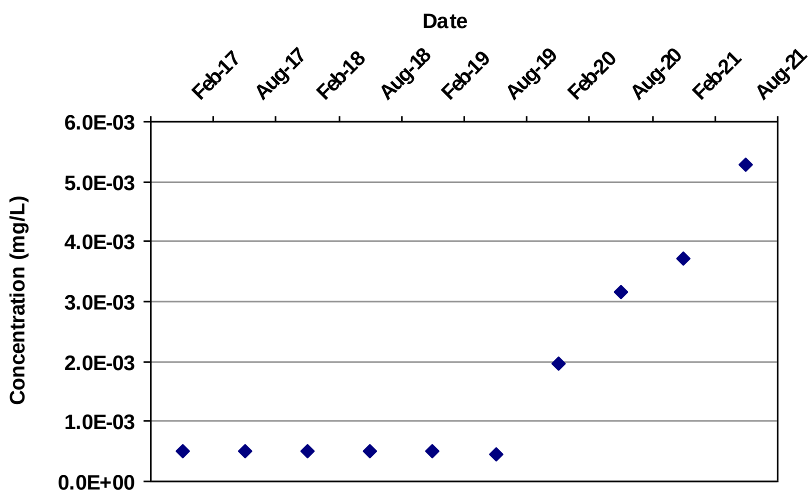
Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well:	PTX06-1052	**Time Period:**	1/1/2017 **to** 12/30/2021
Well Type:	SE/SW divide	**Consolidation Period:**	No Time Consolidation
COC:	TRICHLOROETHYLENE (TCE)	**Duplicate Consolidation:**	Median
		Consolidation Type:	Average
		ND Values:	1/2 Detection Limit
		J Flag Values :	Actual Value



Mann Kendall S Statistic:

25

Confidence in Trend:

98.6%

Coefficient of Variation:

1.03

Mann Kendall Concentration Trend: (See Note)

I

Data Table:

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1052	2/1/2017	TRICHLOROETHYLENE (TCE)	5.0E-04	ND	1	0
PTX06-1052	8/1/2017	TRICHLOROETHYLENE (TCE)	5.0E-04	ND	1	0
PTX06-1052	2/1/2018	TRICHLOROETHYLENE (TCE)	5.0E-04	ND	1	0
PTX06-1052	8/1/2018	TRICHLOROETHYLENE (TCE)	5.0E-04	ND	1	0
PTX06-1052	2/1/2019	TRICHLOROETHYLENE (TCE)	5.0E-04	ND	2	0
PTX06-1052	8/1/2019	TRICHLOROETHYLENE (TCE)	4.6E-04		1	1
PTX06-1052	2/1/2020	TRICHLOROETHYLENE (TCE)	2.0E-03		1	1
PTX06-1052	8/1/2020	TRICHLOROETHYLENE (TCE)	3.2E-03		1	1
PTX06-1052	2/1/2021	TRICHLOROETHYLENE (TCE)	3.7E-03		1	1

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1052	8/1/2021	TRICHLOROETHYLENE (TCE)	5.3E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

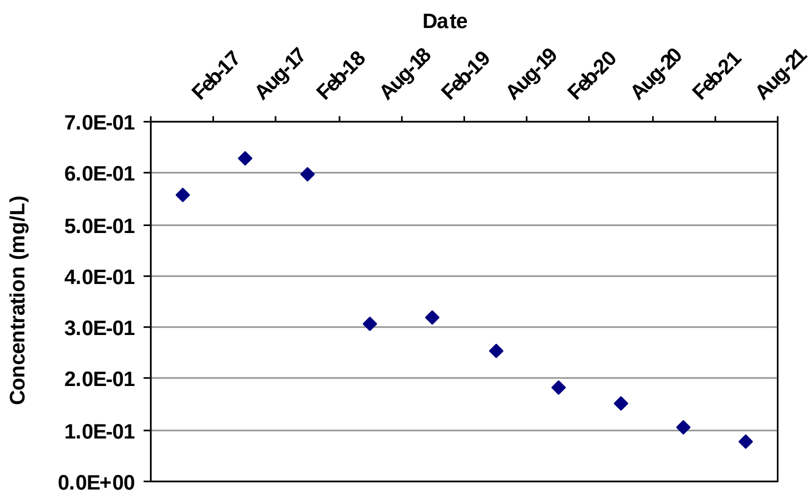
Project: Pantex

User Name: MV

Location: Southwest Sector

State: Texas

Well:	PTX06-1052	**Time Period:**	1/1/2017 **to** 12/30/2021
Well Type:	T	**Consolidation Period:**	No Time Consolidation
COC:	CHROMIUM, HEXAVALENT	**Duplicate Consolidation:**	Median
		Consolidation Type:	Average
		ND Values:	1/2 Detection Limit
		J Flag Values :	Actual Value



Mann Kendall S Statistic:

-39

Confidence in Trend:

100.0%

Coefficient of Variation:

0.65

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1052	2/1/2017	CHROMIUM, HEXAVALENT	5.6E-01		1	1
PTX06-1052	8/1/2017	CHROMIUM, HEXAVALENT	6.3E-01		1	1
PTX06-1052	2/1/2018	CHROMIUM, HEXAVALENT	6.0E-01		1	1
PTX06-1052	8/1/2018	CHROMIUM, HEXAVALENT	3.1E-01		1	1
PTX06-1052	2/1/2019	CHROMIUM, HEXAVALENT	3.2E-01		2	2
PTX06-1052	8/1/2019	CHROMIUM, HEXAVALENT	2.5E-01		1	1
PTX06-1052	2/1/2020	CHROMIUM, HEXAVALENT	1.8E-01		1	1
PTX06-1052	8/1/2020	CHROMIUM, HEXAVALENT	1.5E-01		1	1
PTX06-1052	2/1/2021	CHROMIUM, HEXAVALENT	1.1E-01		1	1

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1052	8/1/2021	CHROMIUM, HEXAVALENT	7.8E-02		1	1

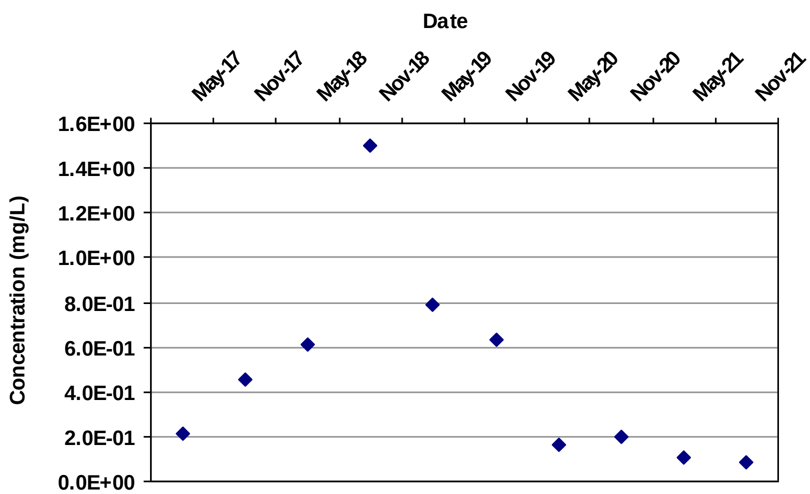
Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: Pantex | **User Name:** MV

Location: Southwest Sector | **State:** Texas

Well:	PTX06-1126	**Time Period:**	1/1/2017 **to** 12/30/2021
Well Type:	S	**Consolidation Period:**	No Time Consolidation
COC:	TRICHLOROETHYLENE (TCE)	**Duplicate Consolidation:**	Median
		Consolidation Type:	Average
		ND Values:	1/2 Detection Limit
		J Flag Values :	Actual Value



Mann Kendall S Statistic:

-19

Confidence in Trend:

94.6%

Coefficient of Variation:

0.92

Mann Kendall Concentration Trend: (See Note)

PD

Data Table:

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1126	5/1/2017	TRICHLOROETHYLENE (TCE)	2.1E-01		2	2
PTX06-1126	11/1/2017	TRICHLOROETHYLENE (TCE)	4.6E-01		1	1
PTX06-1126	5/1/2018	TRICHLOROETHYLENE (TCE)	6.1E-01		1	1
PTX06-1126	11/1/2018	TRICHLOROETHYLENE (TCE)	1.5E+00		1	1
PTX06-1126	5/1/2019	TRICHLOROETHYLENE (TCE)	7.9E-01		1	1
PTX06-1126	11/1/2019	TRICHLOROETHYLENE (TCE)	6.3E-01		1	1
PTX06-1126	5/1/2020	TRICHLOROETHYLENE (TCE)	1.7E-01		1	1
PTX06-1126	11/1/2020	TRICHLOROETHYLENE (TCE)	2.0E-01		2	2
PTX06-1126	5/1/2021	TRICHLOROETHYLENE (TCE)	1.1E-01		1	1

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1126	11/1/2021	TRICHLOROETHYLENE (TCE)	8.8E-02		1	1

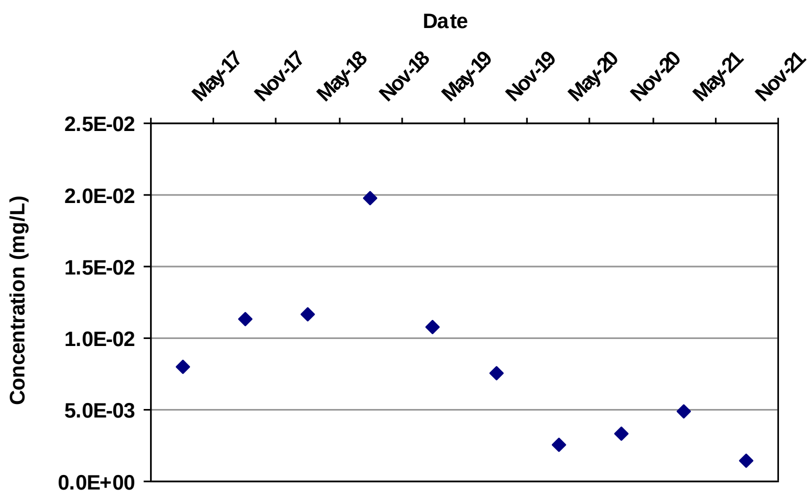
Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: Pantex | **User Name:** MV
Location: Southwest Sector | **State:** Texas

Well: PTX06-1126
Well Type: S
COC: cis-1,2-DICHLOROETHYLENE

Time Period: 1/1/2017 **to** 12/30/2021
Consolidation Period: No Time Consolidation
Duplicate Consolidation: Median
Consolidation Type: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

-25

Confidence in Trend:

98.6%

Coefficient of Variation:

0.68

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1126	5/1/2017	cis-1,2-DICHLOROETHYLENE	8.0E-03		2	2
PTX06-1126	11/1/2017	cis-1,2-DICHLOROETHYLENE	1.1E-02		1	1
PTX06-1126	5/1/2018	cis-1,2-DICHLOROETHYLENE	1.2E-02		1	1
PTX06-1126	11/1/2018	cis-1,2-DICHLOROETHYLENE	2.0E-02		1	1
PTX06-1126	5/1/2019	cis-1,2-DICHLOROETHYLENE	1.1E-02		1	1
PTX06-1126	11/1/2019	cis-1,2-DICHLOROETHYLENE	7.5E-03		1	1
PTX06-1126	5/1/2020	cis-1,2-DICHLOROETHYLENE	2.6E-03		1	1
PTX06-1126	11/1/2020	cis-1,2-DICHLOROETHYLENE	3.3E-03		2	2
PTX06-1126	5/1/2021	cis-1,2-DICHLOROETHYLENE	4.9E-03		1	1

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1126	11/1/2021	cis-1,2-DICHLOROETHYLENE	1.5E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

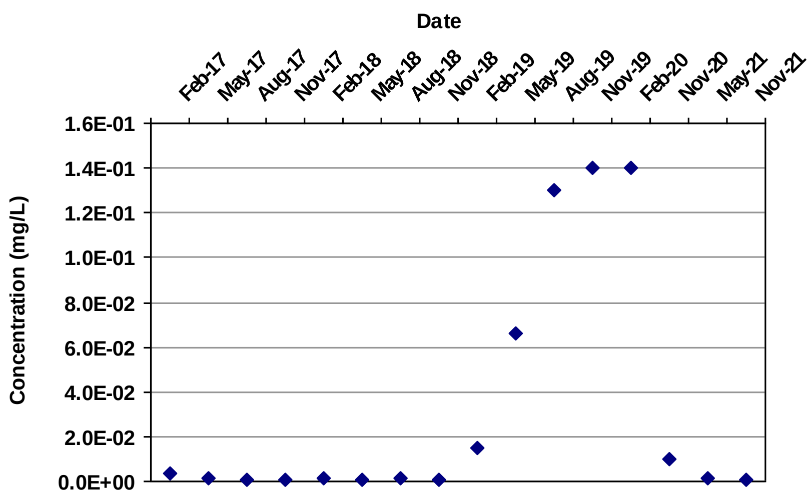
Project: Pantex

User Name: MV

Location: Southwest Sector

State: Texas

Well:	PTX06-1173	**Time Period:**	1/1/2017 **to** 12/1/2021
Well Type:	ISPM	**Consolidation Period:**	No Time Consolidation
COC:	TRICHLOROETHYLENE (TCE)	**Duplicate Consolidation:**	Median
		Consolidation Type:	Average
		ND Values:	1/2 Detection Limit
		J Flag Values :	Actual Value



Mann Kendall S Statistic:

33

Confidence in Trend:

92.4%

Coefficient of Variation:

1.69

Mann Kendall Concentration Trend: (See Note)

PI

Data Table:

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1173	2/1/2017	TRICHLOROETHYLENE (TCE)	3.3E-03		1	1
PTX06-1173	5/1/2017	TRICHLOROETHYLENE (TCE)	1.1E-03		1	1
PTX06-1173	8/1/2017	TRICHLOROETHYLENE (TCE)	8.5E-04		1	1
PTX06-1173	11/1/2017	TRICHLOROETHYLENE (TCE)	6.1E-04		1	1
PTX06-1173	2/1/2018	TRICHLOROETHYLENE (TCE)	1.5E-03	ND	1	0
PTX06-1173	5/1/2018	TRICHLOROETHYLENE (TCE)	6.5E-04		1	1
PTX06-1173	8/1/2018	TRICHLOROETHYLENE (TCE)	1.3E-03	ND	1	0
PTX06-1173	11/1/2018	TRICHLOROETHYLENE (TCE)	7.4E-04		1	1
PTX06-1173	2/1/2019	TRICHLOROETHYLENE (TCE)	1.5E-02		1	1

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: Southwest Sector **State:** Texas

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1173	5/1/2019	TRICHLOROETHYLENE (TCE)	6.6E-02		1	1
PTX06-1173	8/1/2019	TRICHLOROETHYLENE (TCE)	1.3E-01		1	1
PTX06-1173	11/1/2019	TRICHLOROETHYLENE (TCE)	1.4E-01		1	1
PTX06-1173	2/1/2020	TRICHLOROETHYLENE (TCE)	1.4E-01		1	1
PTX06-1173	11/1/2020	TRICHLOROETHYLENE (TCE)	1.0E-02		1	1
PTX06-1173	5/1/2021	TRICHLOROETHYLENE (TCE)	1.6E-03		1	1
PTX06-1173	11/1/2021	TRICHLOROETHYLENE (TCE)	6.6E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

NORTH SECTOR MAROS REPORTS

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MAROS COC Assessment

Project: Pantex | **User Name:** MV
Location: North | **State:** Texas

Toxicity:

Contaminant of Concern	Representative Concentration (mg/L)	PRG (mg/L)	Percent Above PRG
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	1.5E-02	2.0E-03	665.9%

Note: Top COCs by toxicity were determined by examining a representative concentration for each compound over the entire site. The compound representative concentrations are then compared with the chosen PRG for that compound, with the percentage exceedance from the PRG determining the compound's toxicity. All compounds above exceed the PRG.

Prevalence:

Contaminant of Concern	Class	Total Wells	Total Exceedance	Percent Exceedances	Total Detects
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	ORG	23	10	43.5%	20

Note: Top COCs by prevalence were determined by examining a representative concentration for each well location at the site. The total exceedances (values above the chosen PRGs) are compared to the total number of wells to determine the prevalence of the compound.

Mobility:

Contaminant of Concern	Kd/Koc
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	0.00741

Note: Top COCs by mobility were determined by examining each detected compound in the dataset and comparing their mobilities (Koc's for organics, assuming foc = 0.001, and Kd's for metals).

Priority Constituents by Well:

Well Name	Average	Max
OW-WR-38	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX01-1001	TRICHLOROETHYLENE (TCE)	PERCHLORATE
PTX01-1002	1,2-DICHLOROETHANE	ARSENIC
PTX01-1008	2-AMINO-4,6-DINITROTOL	HEXAHYDRO-1,3,5-TRINIT
PTX04-1001	TNX	TRICHLOROETHYLENE (TCE
PTX04-1002	4-AMINO-2,6-DINITROTOL	1,4-DIOXANE (P-DIOXANE)
PTX06-1013	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX06-1023	2,4,6-TRINITROTOLUENE	HEXAHYDRO-1,3,5-TRINIT
PTX06-1048A	MNX	TRICHLOROETHYLENE (TCE
PTX06-1049	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX06-1050	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX06-1069	1,2-DICHLOROETHANE	CHROMIUM, TOTAL

PTX06-1071	OCTAHYDRO-1,3,5,7-TETRA	MANGANESE
PTX06-1079	2,4,6-TRINITROTOLUENE	BORON
PTX06-1080	HEXAHYDRO-1,3,5-TRINITR	BARIUM
PTX06-1081	2,6-DINITROTOLUENE	HEXAHYDRO-1,3,5-TRINIT
PTX06-1117	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX06-1128	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX06-1136	1,2-DICHLOROETHANE	BORON
PTX07-1O01	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX07-1O02	TRICHLOROETHYLENE (TCE)	TRICHLOROETHYLENE (TCE
PTX07-1O03	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX07-1O06	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX07-1P02	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX07-1P05	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX07-1R03	1,3-DINITROBENZENE	ARSENIC
PTX08-1001	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX08-1002	HEXAHYDRO-1,3,5-TRINITR	HEXAHYDRO-1,3,5-TRINIT
PTX08-1010	2,4,6-TRINITROTOLUENE	ARSENIC
PTX-BEG3	CHROMIUM, TOTAL	CHROMIUM, HEXAVALENT

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: North **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
OW-WR-38										
A4DNT26	NO	50 %	NO	S	0.00	0.0001	NO	No distribution	YES	YES
B	NO	100 %	NO	I	0.37	0.6976	NO	Normal	YES	NO
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	YES	100 %	YES	I	0.69	0.0515	NO	No distribution	NO	NO
PTX01-1001										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	YES	Normal	YES	YES
B	NO	100 %	NO	I	0.08	0.0669	NO	Normal	YES	NO
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	ND	0.00	0.0001	YES	Normal	YES	YES
PTX01-1008										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
B	NO	100 %	NO	I	0.11	0.0564	NO	Normal	YES	NO
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	YES	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
PTX04-1001										
A4DNT26	NO	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
B	NO	100 %	NO	N/A	0.14	0.1812	NO	Normal	NO	NO
RDX	NO	67 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
PTX04-1002										
A4DNT26	YES	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
B	NO	100 %	NO	S	0.12	0.1539	NO	Normal	YES	YES
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	100 %	NO	S	0.25	0.0002	NO	Normal	YES	NO
PTX06-1013										

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: North **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
B	NO	100 %	NO	S	0.03	0.4864	NO	Normal	YES	YES
CR6	NO	80 %	NO	NT	0.00	0.0058	YES	No distribution	YES	NO
CR	NO	20 %	NO	NT	0.00	0.0094	YES	No distribution	YES	NO
RDX	YES	100 %	YES	S	0.19	0.0065	NO	Normal	NO	NO
PTX06-1023										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
B	NO	100 %	NO	S	0.05	0.1002	NO	Normal	YES	YES
CR6	NO	100 %	NO	NT	0.00	0.0013	NO	Normal	YES	NO
CR	NO	0 %	NO	ND	0.00	0.0050	NO	No distribution	YES	YES
RDX	YES	40 %	NO	NT	1.12	0.0004	YES	No distribution	YES	NO
PTX06-1048A										
A4DNT26	NO	75 %	NO	S	0.00	0.0001	YES	Normal	YES	YES
B	NO	100 %	NO	D	0.04	0.0819	NO	Normal	YES	YES
RDX	NO	25 %	NO	S	0.00	0.0002	YES	Normal	YES	YES
PTX06-1049										
A4DNT26	NO	100 %	NO	S	0.23	0.0014	YES	No distribution	NO	NO
B	NO	100 %	NO	PI	0.09	0.1286	NO	No distribution	YES	YES
RDX	YES	100 %	YES	I	0.63	0.0040	NO	Lognormal	NO	NO
PTX06-1050										
A4DNT26	NO	100 %	YES	D	0.30	0.0057	NO	Normal	NO	NO
B	NO	100 %	NO	I	0.17	1.0228	NO	Normal	YES	NO
RDX	YES	100 %	YES	I	0.47	0.2769	YES	No distribution	NO	NO
PTX06-1069										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
B	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	YES	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: North **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
PTX06-1071										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
B	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX06-1079										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
B	YES	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX06-1081										
A4DNT26	NO	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
B	NO	100 %	NO	N/A	0.03	0.0857	NO	Normal	NO	NO
RDX	YES	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
PTX06-1117										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
B	NO	100 %	NO	N/A	0.04	#Error	NO	No distribution	NO	NO
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	67 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	YES	100 %	YES	N/A	0.29	#Error	NO	No distribution	NO	NO
PTX06-1128										
A4DNT26	NO	0 %	NO	N/A	0.00	0.0001	NO	Normal	NO	NO
B	NO	100 %	NO	N/A	0.18	0.7389	NO	Normal	NO	NO
CR6	NO	100 %	NO	N/A	0.00	0.0022	NO	Normal	NO	NO
CR	NO	100 %	NO	N/A	0.00	0.1944	NO	Normal	NO	NO
RDX	YES	100 %	YES	N/A	0.17	0.0116	NO	Normal	NO	NO
PTX07-1O02										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
B	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: North **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX07-1O03										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	NO	Normal	YES	YES
B	NO	100 %	NO	S	0.05	0.4475	NO	Normal	YES	YES
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	YES	100 %	YES	S	0.14	0.0467	NO	Normal	NO	NO
PTX07-1P02										
A4DNT26	NO	0 %	NO	ND	0.00	0.0001	YES	No distribution	YES	YES
B	NO	100 %	NO	I	0.19	1.1078	NO	Normal	YES	NO
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	YES	100 %	YES	I	0.65	0.0089	NO	Normal	NO	NO
PTX07-1R03										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
B	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
PTX08-1001										
A4DNT26	NO	20 %	NO	PD	0.00	0.0002	YES	No distribution	YES	YES
B	NO	100 %	NO	S	0.25	1.2376	NO	Normal	YES	YES
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	YES	100 %	YES	NT	1.45	0.0973	YES	Lognormal	NO	NO
PTX08-1002										
A4DNT26	NO	89 %	NO	PD	0.79	0.0020	NO	Normal	NO	NO

MAROS Individual Well Summary Report

Project: Pantex **User Name:** MV

Location: North **State:** Texas

COC	Priority COC for Well?	Detection Frequency	Recent Sample Above Goal?	MK Trend	COV	95% UCL	Outlier	Distribution Assumption	Attained Cleanup?	
									Normal	Lognormal
B	NO	100 %	NO	NT	0.27	0.6512	NO	Normal	YES	NO
CR6	NO	89 %	NO	NT	0.00	0.0032	YES	No distribution	YES	NO
CR	NO	0 %	NO	ND	0.00	0.0050	NO	No distribution	YES	YES
RDX	YES	100 %	YES	NT	1.75	0.0660	YES	No distribution	NO	NO
PTX08-1010										
A4DNT26	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
B	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR6	NO	100 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
CR	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO
RDX	NO	0 %	NO	N/A	0.00	#Error	NO	No distribution	NO	NO

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: North **State:** Texas

Time Period: 1/1/2017 **to** 12/30/2021
Consolidation Period: No Time Consolidation
Consolidation Type: Average
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
4-AMINO-2,6-DINITROTOLUENE							
OW-WR-38	6	3	0.21	-8	89.8%	No	S
PTX01-1001	8	0	0.03	-10	86.2%	Yes	ND
PTX01-1008	8	0	0.02	-8	80.1%	Yes	ND
PTX04-1001	3	0	0.00	0	0.0%	Yes	ND
PTX04-1002	4	0	0.03	0	37.5%	Yes	ND
PTX06-1013	5	0	0.02	3	67.5%	Yes	ND
PTX06-1023	8	0	0.04	-2	54.8%	Yes	ND
PTX06-1048A	4	3	0.10	-3	72.9%	No	S
PTX06-1049	9	9	0.20	0	46.0%	No	S
PTX06-1050	8	8	0.30	-20	99.3%	No	D
PTX06-1069	1	0	0.00	0	0.0%	Yes	ND
PTX06-1071	1	0	0.00	0	0.0%	Yes	ND
PTX06-1079	1	0	0.00	0	0.0%	Yes	ND
PTX06-1081	3	0	0.00	0	0.0%	Yes	ND
PTX06-1117	2	0	0.00	0	0.0%	Yes	ND
PTX06-1128	3	0	0.00	0	0.0%	Yes	ND
PTX07-1O02	1	0	0.00	0	0.0%	Yes	ND
PTX07-1O03	5	0	0.02	0	40.8%	Yes	ND
PTX07-1P02	8	0	0.09	0	45.2%	Yes	ND
PTX07-1R03	1	0	0.00	0	0.0%	Yes	ND
PTX08-1001	5	1	0.14	-7	92.1%	No	PD
PTX08-1002	8	7	0.72	-12	91.1%	No	PD
PTX08-1010	1	0	0.00	0	0.0%	Yes	ND
BORON							
OW-WR-38	5	5	0.41	8	95.8%	No	I
PTX01-1001	8	8	0.09	20	99.3%	No	I

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: North **State:** Texas

BORON

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PTX01-1008	8	8	0.11	18	98.4%	No	I
PTX04-1001	3	3	0.00	0	0.0%	No	N/A
PTX04-1002	4	4	0.12	0	37.5%	No	S
PTX06-1013	5	5	0.03	-4	75.8%	No	S
PTX06-1023	8	8	0.05	-2	54.8%	No	S
PTX06-1048A	4	4	0.04	-6	95.8%	No	D
PTX06-1049	8	8	0.10	14	94.6%	No	PI
PTX06-1050	8	8	0.17	24	99.9%	No	I
PTX06-1069	1	1	0.00	0	0.0%	No	N/A
PTX06-1071	1	1	0.00	0	0.0%	No	N/A
PTX06-1079	1	1	0.00	0	0.0%	No	N/A
PTX06-1081	3	3	0.00	0	0.0%	No	N/A
PTX06-1117	2	2	0.00	0	0.0%	No	N/A
PTX06-1128	3	3	0.00	0	0.0%	No	N/A
PTX07-1O02	1	1	0.00	0	0.0%	No	N/A
PTX07-1O03	5	5	0.05	-4	75.8%	No	S
PTX07-1P02	8	8	0.20	26	100.0%	No	I
PTX07-1R03	1	1	0.00	0	0.0%	No	N/A
PTX08-1001	5	5	0.25	-2	59.2%	No	S
PTX08-1002	8	8	0.27	6	72.6%	No	NT
PTX08-1010	1	1	0.00	0	0.0%	No	N/A
CHROMIUM, HEXAVALENT							
OW-WR-38	1	1	0.00	0	0.0%	No	N/A
PTX01-1001	1	1	0.00	0	0.0%	No	N/A
PTX01-1008	1	1	0.00	0	0.0%	No	N/A
PTX04-1002	1	1	0.00	0	0.0%	No	N/A
PTX06-1013	5	4	1.72	0	40.8%	No	NT
PTX06-1023	8	8	0.21	2	54.8%	No	NT
PTX06-1069	1	1	0.00	0	0.0%	No	N/A
PTX06-1071	1	1	0.00	0	0.0%	No	N/A
PTX06-1117	2	2	0.00	0	0.0%	No	N/A
PTX06-1128	3	3	0.00	0	0.0%	No	N/A
PTX07-1O02	1	1	0.00	0	0.0%	No	N/A

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: North **State:** Texas

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
CHROMIUM, HEXAVALENT							
PTX07-1O03	1	1	0.00	0	0.0%	No	N/A
PTX07-1P02	1	1	0.00	0	0.0%	No	N/A
PTX07-1R03	1	1	0.00	0	0.0%	No	N/A
PTX08-1001	1	1	0.00	0	0.0%	No	N/A
PTX08-1002	8	7	2.43	-2	54.8%	No	NT
PTX08-1010	1	1	0.00	0	0.0%	No	N/A
CHROMIUM, TOTAL							
OW-WR-38	1	0	0.00	0	0.0%	Yes	ND
PTX01-1001	1	0	0.00	0	0.0%	Yes	ND
PTX01-1008	1	1	0.00	0	0.0%	No	N/A
PTX04-1002	1	1	0.00	0	0.0%	No	N/A
PTX06-1013	5	1	0.42	4	75.8%	No	NT
PTX06-1023	8	0	0.00	0	45.2%	Yes	ND
PTX06-1069	1	0	0.00	0	0.0%	Yes	ND
PTX06-1071	1	0	0.00	0	0.0%	Yes	ND
PTX06-1117	2	2	0.00	0	0.0%	No	N/A
PTX06-1128	3	3	0.00	0	0.0%	No	N/A
PTX07-1O02	1	1	0.00	0	0.0%	No	N/A
PTX07-1O03	1	1	0.00	0	0.0%	No	N/A
PTX07-1P02	1	0	0.00	0	0.0%	Yes	ND
PTX07-1R03	1	0	0.00	0	0.0%	Yes	ND
PTX08-1001	1	0	0.00	0	0.0%	Yes	ND
PTX08-1002	8	0	0.00	0	45.2%	Yes	ND
PTX08-1010	1	0	0.00	0	0.0%	Yes	ND
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZIN							
OW-WR-38	6	6	0.87	11	97.2%	No	I
PTX01-1001	8	0	0.03	-10	86.2%	Yes	ND
PTX01-1008	8	0	0.02	-8	80.1%	Yes	ND
PTX04-1001	3	2	0.00	0	0.0%	No	N/A
PTX04-1002	4	4	0.25	0	37.5%	No	S
PTX06-1013	5	5	0.19	-6	88.3%	No	S
PTX06-1023	8	3	0.93	1	50.0%	No	NT

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: North **State:** Texas

HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZIN

Well	Number of Samples	Number of Detects	Coefficient of Variation	Mann-Kendall Statistic	Confidence in Trend	All Samples "ND" ?	Concentration Trend
PTX06-1048A	4	1	0.12	0	37.5%	No	S
PTX06-1049	9	9	0.65	24	99.4%	No	I
PTX06-1050	8	8	0.47	20	99.3%	No	I
PTX06-1069	1	0	0.00	0	0.0%	Yes	ND
PTX06-1071	1	0	0.00	0	0.0%	Yes	ND
PTX06-1079	1	0	0.00	0	0.0%	Yes	ND
PTX06-1081	3	0	0.00	0	0.0%	Yes	ND
PTX06-1117	2	2	0.00	0	0.0%	No	N/A
PTX06-1128	3	3	0.00	0	0.0%	No	N/A
PTX07-1O02	1	1	0.00	0	0.0%	No	N/A
PTX07-1O03	5	5	0.14	-4	75.8%	No	S
PTX07-1P02	8	8	0.67	24	99.9%	No	I
PTX07-1R03	1	0	0.00	0	0.0%	Yes	ND
PTX08-1001	5	5	1.45	-4	75.8%	No	NT
PTX08-1002	8	8	1.74	0	45.2%	No	NT
PTX08-1010	1	0	0.00	0	0.0%	Yes	ND

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events).

The Number of Samples and Number of Detects shown above are post-consolidation values.

MAROS Spatial Moment Analysis Summary

Project: Pantex **User Name:** MV

Location: North **State:** Texas

Effective Date	0th Moment	1st Moment (Center of Mass)			2nd Moment (Spread)		
	Estimated Mass (Kg)	Xc (ft)	Yc (ft)	Source Distance	Sigma XX (sq ft)	Sigma YY (sq ft)	Number of Wells
4-AMINO-2,6-DINITROTOLUENE							
7/1/2017	9.5E+00	636,053	3,766,796	4,440	5,898,620	3,711,506	15
7/1/2018	8.6E+00	635,922	3,766,873	4,590	5,603,085	3,686,258	16
7/1/2019	7.5E+00	635,938	3,766,893	4,589	6,114,715	3,830,516	18
7/1/2020	6.2E+00	635,484	3,765,924	4,484	5,544,394	1,716,188	13
7/1/2021	5.2E+00	636,168	3,767,078	4,529	17,028,213	4,423,212	16
BORON							
7/1/2017	4.4E+03	637,760	3,766,381	2,918	6,477,358	4,410,382	15
7/1/2018	5.1E+03	637,731	3,766,332	2,898	6,367,812	4,252,203	16
7/1/2019	5.0E+03	637,684	3,766,290	2,896	6,586,084	4,235,662	18
7/1/2020	5.0E+03	637,444	3,765,473	2,539	6,192,919	1,965,257	13
7/1/2021	5.8E+03	638,230	3,766,038	2,361	13,096,482	4,741,926	16
CHROMIUM, HEXAVALENT							
7/1/2017	0.0E+00						3
7/1/2018	0.0E+00						5
7/1/2019	0.0E+00						5
7/1/2020	0.0E+00						4
7/1/2021	1.5E+01	638,673	3,767,746	3,756	18,450,196	4,343,010	14
CHROMIUM, TOTAL							
7/1/2017	0.0E+00						3
7/1/2018	0.0E+00						5
7/1/2019	0.0E+00						5
7/1/2020	0.0E+00						4
7/1/2021	1.5E+02	637,556	3,767,405	3,875	18,345,849	4,681,829	14
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZIN							
7/1/2017	7.8E+01	637,671	3,766,019	2,707	4,553,756	2,514,490	15
7/1/2018	1.1E+02	637,689	3,765,686	2,468	4,069,855	2,255,070	16
7/1/2019	1.3E+02	637,641	3,765,722	2,528	3,609,445	1,980,977	18
7/1/2020	2.2E+02	637,832	3,765,445	2,206	3,863,035	1,422,446	13
7/1/2021	1.1E+02	638,064	3,765,170	1,855	6,413,626	1,266,861	16

MAROS Spatial Moment Analysis Summary

Project: Pantex **User Name:** MV

Location: North **State:** Texas

Spatial Moment Analysis Summary:

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
0th Moment	4-AMINO-2,6-DINITROTOLU	0.24	-10	99.2%	D
0th Moment	BORON	0.10	4	75.8%	NT
0th Moment	CHROMIUM, HEXAVALENT	2.24	4	75.8%	NT
0th Moment	CHROMIUM, TOTAL	2.24	4	75.8%	NT
0th Moment	HEXAHYDRO-1,3,5-TRINITR	0.43	4	75.8%	NT
First Moment	4-AMINO-2,6-DINITROTOLU	0.01	0	40.8%	S
First Moment	BORON	0.09	-10	99.2%	D
First Moment	CHROMIUM, HEXAVALENT	0.00	0	0.0%	N/A
First Moment	CHROMIUM, TOTAL	0.00	0	0.0%	N/A
First Moment	HEXAHYDRO-1,3,5-TRINITR	0.14	-8	95.8%	D
Second Moment X	4-AMINO-2,6-DINITROTOLU	0.63	2	59.2%	NT
Second Moment X	BORON	0.39	2	59.2%	NT
Second Moment X	CHROMIUM, HEXAVALENT	0.00	0	0.0%	N/A
Second Moment X	CHROMIUM, TOTAL	0.00	0	0.0%	N/A
Second Moment X	HEXAHYDRO-1,3,5-TRINITR	0.25	0	40.8%	S
Second Moment Y	4-AMINO-2,6-DINITROTOLU	0.30	2	59.2%	NT
Second Moment Y	BORON	0.28	-2	59.2%	S
Second Moment Y	CHROMIUM, HEXAVALENT	0.00	0	0.0%	N/A
Second Moment Y	CHROMIUM, TOTAL	0.00	0	0.0%	N/A
Second Moment Y	HEXAHYDRO-1,3,5-TRINITR	0.28	-10	99.2%	D

Note: The following assumptions were applied for the calculation of the Zeroth Moment:

Porosity: 0.25 **Saturated Thickness:** Uniform: 30 ft

Mann-Kendall Trend test performed on all sample events for each constituent. Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events); (ND) Non Detect.

Note: The Sigma XX and Sigma YY components are estimated using the given field coordinate system and then rotated to align with the estimated groundwater flow direction. Moments are not calculated for sample events with less than 6 wells.

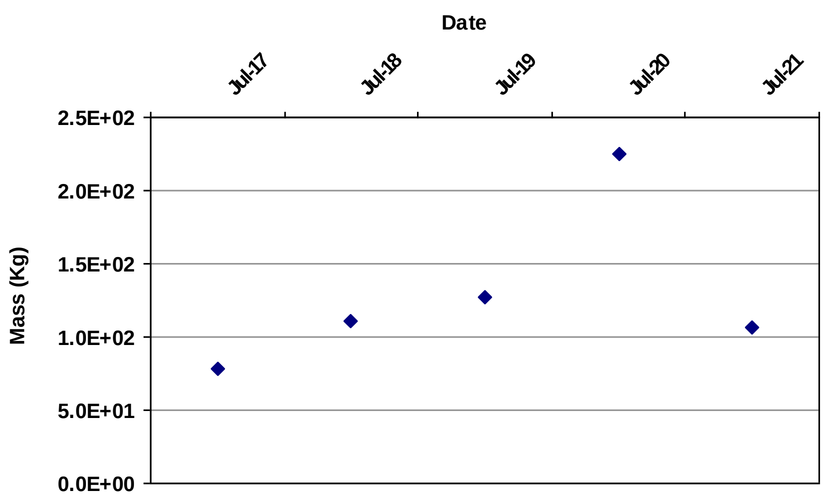
MAROS Zeroth Moment Analysis

Project: Pantex **User Name:** MV

Location: North **State:** Texas

Change in Dissolved Mass Over Time

COC: HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE



Porosity: 0.25

Saturated Thickness:
Uniform: 30 ft

Mann-Kendall S Statistic:
4

Confidence in Trend:
75.8%

Coefficient of Variation:
0.43

Zeroth Moment Trend:
NT

Data Table:

Effective Date	Constituent	Estimated Mass (Kg)	Number of Wells
7/1/2017	HEXAHYDRO-1,3,5-TRINITRO-1,3,	7.8E+01	15
7/1/2018	HEXAHYDRO-1,3,5-TRINITRO-1,3,	1.1E+02	16
7/1/2019	HEXAHYDRO-1,3,5-TRINITRO-1,3,	1.3E+02	18
7/1/2020	HEXAHYDRO-1,3,5-TRINITRO-1,3,	2.2E+02	13
7/1/2021	HEXAHYDRO-1,3,5-TRINITRO-1,3,	1.1E+02	16

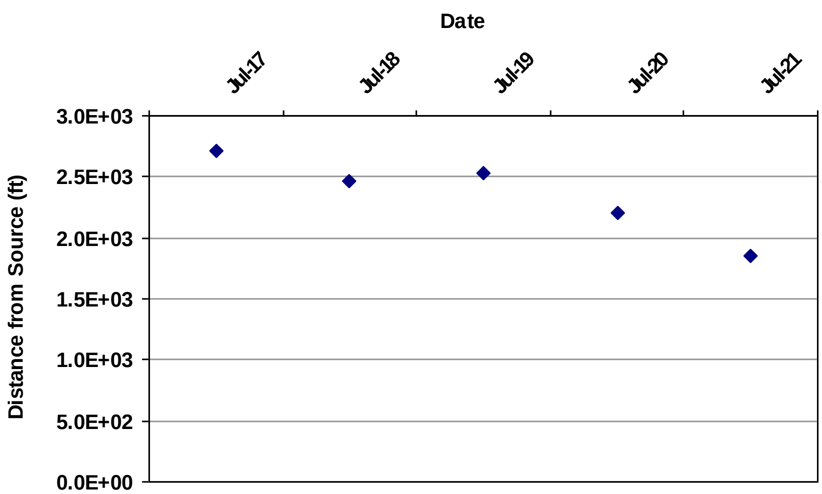
Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect. Moments are not calculated for sample events with less than 6 wells.

MAROS First Moment Analysis

Project: Pantex | **User Name:** MV
Location: North | **State:** Texas

COC: HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE

Distance from Source to Center of Mass



Mann-Kendall S Statistic:
-8

Confidence in Trend:
95.8%

Coefficient of Variation:
0.14

First Moment Trend:
D

DATA TABLE

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source	Number of Wells
7/1/2017	HEXAHYDRO-1,3,5-TRINITRO-	637,671	3,766,019	2,707	15
7/1/2018	HEXAHYDRO-1,3,5-TRINITRO-	637,689	3,765,686	2,468	16
7/1/2019	HEXAHYDRO-1,3,5-TRINITRO-	637,641	3,765,722	2,528	18
7/1/2020	HEXAHYDRO-1,3,5-TRINITRO-	637,832	3,765,445	2,206	13
7/1/2021	HEXAHYDRO-1,3,5-TRINITRO-	638,064	3,765,170	1,855	16

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

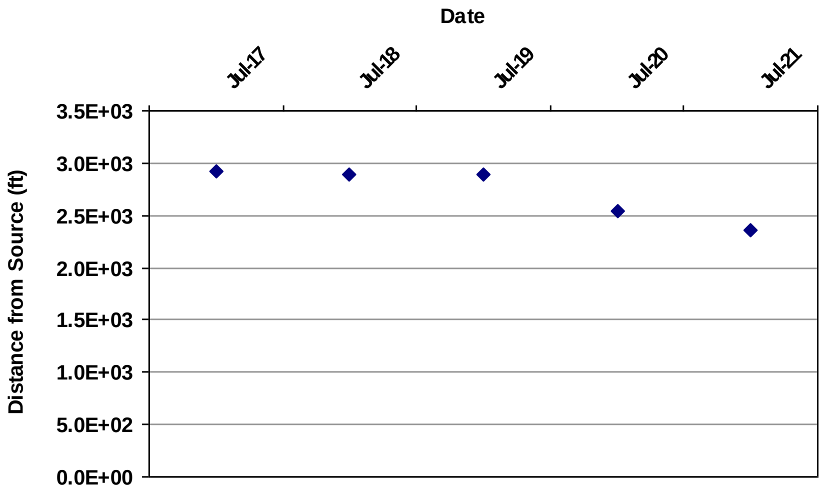
MAROS First Moment Analysis

Project: Pantex **User Name:** MV

Location: North **State:** Texas

COC: BORON

Distance from Source to Center of Mass



Mann-Kendall S Statistic:

-10

Confidence in Trend:

99.2%

Coefficient of Variation:

0.09

First Moment Trend:

D

DATA TABLE

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source	Number of Wells
7/1/2017	BORON	637,760	3,766,381	2,918	15
7/1/2018	BORON	637,731	3,766,332	2,898	16
7/1/2019	BORON	637,684	3,766,290	2,896	18
7/1/2020	BORON	637,444	3,765,473	2,539	13
7/1/2021	BORON	638,230	3,766,038	2,361	16

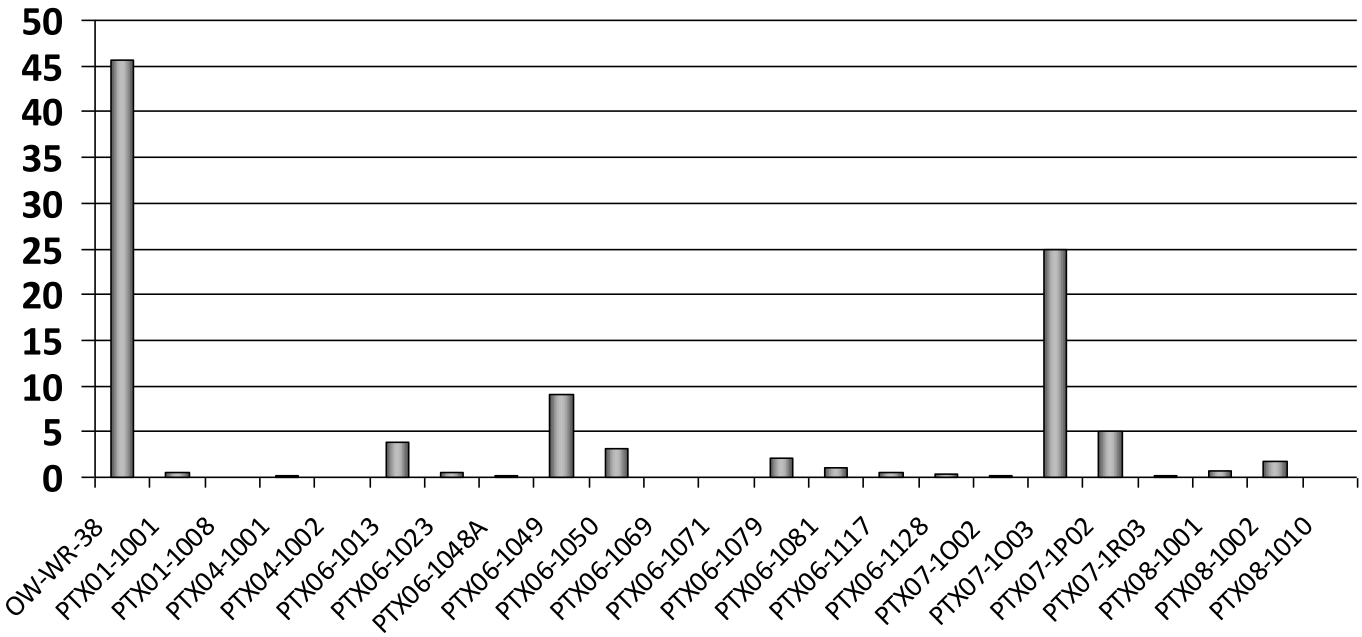
Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: North **State:** Texas

HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE 7/1/2021



Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
OW-WR-38	5,536,280.55	76,006.22	45.70	4.11
PTX01-1001	21,631,539.61	726.82	0.44	16.06
PTX01-1008	927,726.73	31.66	0.02	0.69
PTX04-1001	1,550,251.83	406.94	0.24	1.15
PTX04-1002	2,323,315.69	84.16	0.05	1.73
PTX06-1013	6,433,494.10	6,299.20	3.79	4.78
PTX06-1023	3,783,592.61	993.19	0.60	2.81
PTX06-1048A	11,625,006.68	413.49	0.25	8.63
PTX06-1049	8,886,248.74	15,138.84	9.10	6.60
PTX06-1050	19,985,463.48	5,246.18	3.15	14.84
PTX06-1069	1,506,131.57	51.79	0.03	1.12
PTX06-1071	522,396.13	17.96	0.01	0.39
PTX06-1079	12,887,759.11	3,383.04	2.03	9.57
PTX06-1081	6,890,357.81	1,808.72	1.09	5.12

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: North **State:** Texas

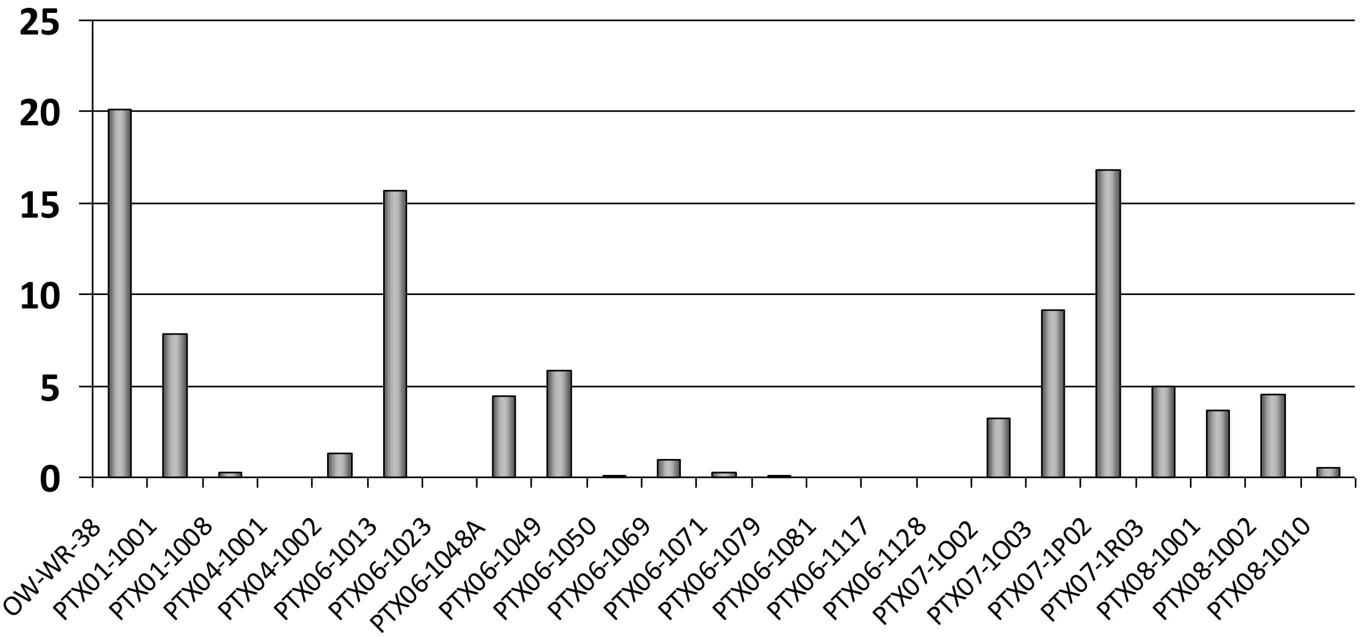
Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1117	3,057,064.59	802.48	0.48	2.27
PTX06-1128	2,445,143.03	641.85	0.39	1.82
PTX07-1O02	7,528,172.91	189.71	0.11	5.59
PTX07-1O03	4,524,645.22	41,332.64	24.85	3.36
PTX07-1P02	2,493,591.23	8,509.38	5.12	1.85
PTX07-1R03	7,407,780.52	253.76	0.15	5.50
PTX08-1001	865,855.38	1,047.79	0.63	0.64
PTX08-1002	1,060,275.08	2,894.55	1.74	0.79
PTX08-1010	798,081.82	27.13	0.02	0.59
	134,670,174.4	166,307.5	100	100

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: North **State:** Texas

BORON 7/1/2021



Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
OW-WR-38	5,536,280.55	1,026,011.24	20.14	4.11
PTX01-1001	21,631,539.61	398,615.22	7.83	16.06
PTX01-1008	927,726.73	14,197.70	0.28	0.69
PTX04-1001	1,550,251.83	406.94	0.01	1.15
PTX04-1002	2,323,315.69	68,305.48	1.34	1.73
PTX06-1013	6,433,494.10	800,487.54	15.72	4.78
PTX06-1023	3,783,592.61	993.19	0.02	2.81
PTX06-1048A	11,625,006.68	225,205.45	4.42	8.63
PTX06-1049	8,886,248.74	296,245.33	5.82	6.60
PTX06-1050	19,985,463.48	5,246.18	0.10	14.84
PTX06-1069	1,506,131.57	49,419.94	0.97	1.12
PTX06-1071	522,396.13	13,424.93	0.26	0.39
PTX06-1079	12,887,759.11	3,383.04	0.07	9.57
PTX06-1081	6,890,357.81	1,808.72	0.04	5.12

MAROS Percent of Mass by Well

Project: Pantex **User Name:** MV

Location: North **State:** Texas

Well	Area (ft2)	Mass (mg)	Percent of Mass	Percent of Area
PTX06-1117	3,057,064.59	802.48	0.02	2.27
PTX06-1128	2,445,143.03	641.85	0.01	1.82
PTX07-1O02	7,528,172.91	164,020.08	3.22	5.59
PTX07-1O03	4,524,645.22	465,586.02	9.14	3.36
PTX07-1P02	2,493,591.23	857,483.73	16.83	1.85
PTX07-1R03	7,407,780.52	254,735.06	5.00	5.50
PTX08-1001	865,855.38	187,284.53	3.68	0.64
PTX08-1002	1,060,275.08	231,285.77	4.54	0.79
PTX08-1010	798,081.82	28,072.53	0.55	0.59
	134,670,174.4	5,093,662.9	100	100

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: North **State:** Texas

Well: OW-WR-38

Well Type: Tail

COC: HEXAHYDRO-1,3,5-TRINITRO-1,3,5-

Time Period: 1/1/2017 **to** 12/30/2021

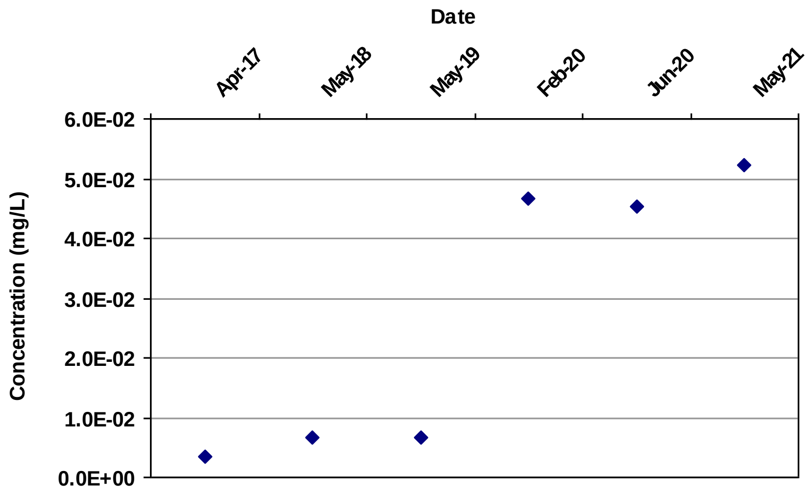
Consolidation Period: No Time Consolidation

Duplicate Consolidation: Average

Consolidation Type: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value



Mann Kendall S Statistic:

11

Confidence in Trend:

97.2%

Coefficient of Variation:

0.87

Mann Kendall Concentration Trend: (See Note)

I

Data Table:

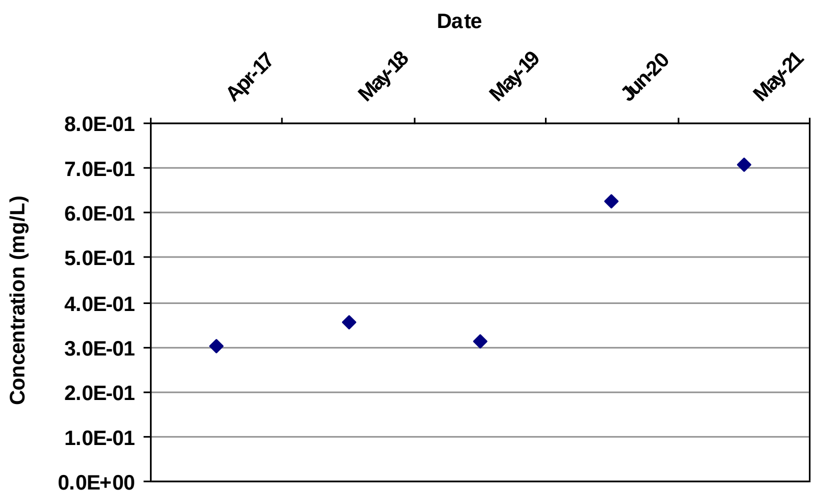
Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
OW-WR-38	4/25/2017	HEXAHYDRO-1,3,5-TRINITRO-	3.4E-03		1	1
OW-WR-38	5/8/2018	HEXAHYDRO-1,3,5-TRINITRO-	6.6E-03		1	1
OW-WR-38	5/1/2019	HEXAHYDRO-1,3,5-TRINITRO-	6.5E-03		1	1
OW-WR-38	2/28/2020	HEXAHYDRO-1,3,5-TRINITRO-	4.7E-02		2	2
OW-WR-38	6/29/2020	HEXAHYDRO-1,3,5-TRINITRO-	4.5E-02		2	2
OW-WR-38	5/20/2021	HEXAHYDRO-1,3,5-TRINITRO-	5.2E-02		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: Pantex | **User Name:** MV
Location: North | **State:** Texas

Well:	OW-WR-38	**Time Period:**	1/1/2017 **to** 12/30/2021
Well Type:	Tail	**Consolidation Period:**	No Time Consolidation
COC:	BORON	**Duplicate Consolidation:**	Average
		Consolidation Type:	Average
		ND Values:	1/2 Detection Limit
		J Flag Values :	Actual Value



Mann Kendall S Statistic:

8

Confidence in Trend:

95.8%

Coefficient of Variation:

0.41

Mann Kendall Concentration Trend: (See Note)

I

Data Table:

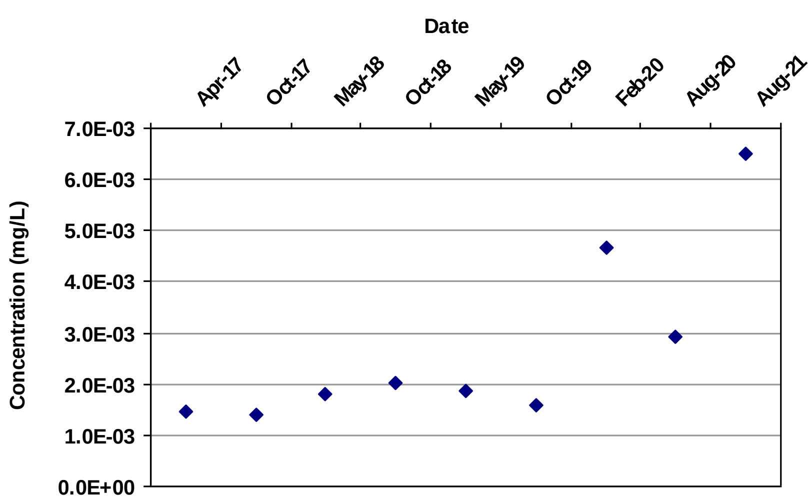
Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
OW-WR-38	4/25/2017	BORON	3.0E-01		1	1
OW-WR-38	5/8/2018	BORON	3.6E-01		1	1
OW-WR-38	5/1/2019	BORON	3.1E-01		1	1
OW-WR-38	6/29/2020	BORON	6.3E-01		2	2
OW-WR-38	5/20/2021	BORON	7.1E-01		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project:	Pantex	**User Name:**	MV
Location:	North	**State:**	Texas

Well:	PTX06-1049	**Time Period:**	1/1/2017 **to** 12/30/2021
Well Type:	Tail	**Consolidation Period:**	No Time Consolidation
COC:	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-	**Duplicate Consolidation:**	Average
		Consolidation Type:	Average
		ND Values:	1/2 Detection Limit
		J Flag Values :	Actual Value



Mann Kendall S Statistic:

24

Confidence in Trend:

99.4%

Coefficient of Variation:

0.65

Mann Kendall Concentration Trend: (See Note)

I

Data Table:

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1049	4/25/2017	HEXAHYDRO-1,3,5-TRINITRO-	1.5E-03		1	1
PTX06-1049	10/3/2017	HEXAHYDRO-1,3,5-TRINITRO-	1.4E-03		2	2
PTX06-1049	5/8/2018	HEXAHYDRO-1,3,5-TRINITRO-	1.8E-03		1	1
PTX06-1049	10/23/2018	HEXAHYDRO-1,3,5-TRINITRO-	2.0E-03		1	1
PTX06-1049	5/1/2019	HEXAHYDRO-1,3,5-TRINITRO-	1.9E-03		1	1
PTX06-1049	10/29/2019	HEXAHYDRO-1,3,5-TRINITRO-	1.6E-03		1	1
PTX06-1049	2/28/2020	HEXAHYDRO-1,3,5-TRINITRO-	4.7E-03		2	2
PTX06-1049	8/20/2020	HEXAHYDRO-1,3,5-TRINITRO-	2.9E-03		1	1
PTX06-1049	8/1/2021	HEXAHYDRO-1,3,5-TRINITRO-	6.5E-03		1	1

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: North **State:** Texas

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects

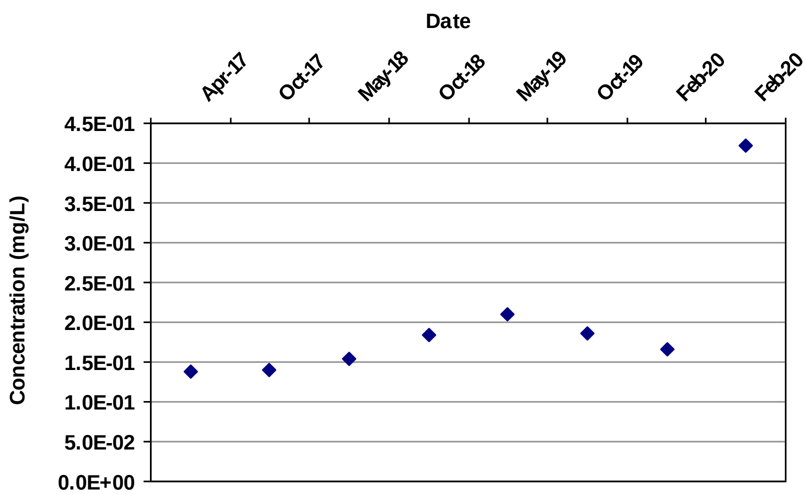
Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: North **State:** Texas

Well:	PTX06-1050	**Time Period:**	1/1/2017 **to** 12/30/2021
Well Type:	Tail	**Consolidation Period:**	No Time Consolidation
COC:	HEXAHYDRO-1,3,5-TRINITRO-1,3,5-	**Duplicate Consolidation:**	Average
		Consolidation Type:	Average
		ND Values:	1/2 Detection Limit
		J Flag Values :	Actual Value



Mann Kendall S Statistic:

20

Confidence in Trend:

99.3%

Coefficient of Variation:

0.47

Mann Kendall Concentration Trend: (See Note)

I

Data Table:

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
PTX06-1050	4/25/2017	HEXAHYDRO-1,3,5-TRINITRO-	1.4E-01		1	1
PTX06-1050	10/3/2017	HEXAHYDRO-1,3,5-TRINITRO-	1.4E-01		1	1
PTX06-1050	5/8/2018	HEXAHYDRO-1,3,5-TRINITRO-	1.5E-01		1	1
PTX06-1050	10/23/2018	HEXAHYDRO-1,3,5-TRINITRO-	1.8E-01		1	1
PTX06-1050	5/1/2019	HEXAHYDRO-1,3,5-TRINITRO-	2.1E-01		1	1
PTX06-1050	10/29/2019	HEXAHYDRO-1,3,5-TRINITRO-	1.9E-01		1	1
PTX06-1050	2/14/2020	HEXAHYDRO-1,3,5-TRINITRO-	1.7E-01		1	1
PTX06-1050	2/28/2020	HEXAHYDRO-1,3,5-TRINITRO-	4.2E-01		1	1

MAROS Mann-Kendall Statistics Summary

Project: Pantex **User Name:** MV

Location: North **State:** Texas

Well	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

APPENDIX D

ELECTRONIC DATA FILES
(INCLUDED SEPARATELY)

Southeast Sector
1. SE_Archive_2022.mdb
2. SE_Individual_Wells_2017-2021.mdb
3. SE_Location_Analysis_2017-2021.mdb
4. SE_Moment_Analysis_2017-2021.mdb

Southwest Sector
5. SW_Archive_2022.mdb
6. SW_Individual_Wells_2017-2021.mdb
7. SW_Location_Analysis_2012-2021.mdb
8. SW_Location_Analysis_2017-2021.mdb
9. SW_Moment_Analysis_2017_2021.mdb

North Sector
10. N_Archive_2022.mdb
11. N_Individual_Wells_2017-2021.mdb
12. N_Location_Analysis_2017-2021.mdb
13. N_Moment_Analysis_2017-2021.mdb

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Appendix B

Table of Long-Term Monitoring Wells and Coordinates

Long-Term Monitoring Wells and Coordinates

Well ID	Aquifer	Type	Completion Date	Easting	Northing
1114-MW4	Perched	IW	4/3/1992	636,151.93	3,757,809.40
OW-WR-38	Perched	IW	8/30/2011	640,649.01	3,765,214.16
PTX01-1001	Perched	IW	4/13/1994	630,592.95	3,769,641.90
PTX01-1004	Perched	IW	8/24/1999	630,729.82	3,770,768.71
PTX01-1008	Perched	IW	9/25/1999	629,942.97	3,770,782.89
PTX01-1009	Perched	IW	2/15/2000	630,594.67	3,769,018.50
PTX01-1010	Ogallala	IW	4/4/2000	630,576.88	3,771,397.26
PTX01-1011	Ogallala	IW	4/26/2000	629,986.45	3,771,397.29
PTX01-1012	Ogallala	IW	4/30/2000	632,664.21	3,773,264.13
PTX01-1013	Ogallala	IW	5/13/2000	628,976.89	3,773,218.25
PTX04-1002	Perched	IW	3/29/1998	641,818.01	3,772,165.27
PTX06-1002A	Perched	IW	2/9/1993	641,161.56	3,759,984.00
PTX06-1005	Perched	IW	1/11/1993	640,545.44	3,756,139.87
PTX06-1006	Perched	IW	12/9/1992	637,450.19	3,757,599.75
PTX06-1007	Perched	IW	1/24/1993	637,679.37	3,759,513.00
PTX06-1008	Perched	IW	12/8/1992	639,441.93	3,759,325.25
PTX06-1010	Perched	IW	10/23/1992	639,886.62	3,758,067.00
PTX06-1011	Perched	IW	11/5/1992	639,178.93	3,757,219.75
PTX06-1012	Perched	ISPM	5/3/1995	634,640.91	3,755,068.80
PTX06-1013	Perched	IW	5/24/1995	643,710.38	3,764,075.09
PTX06-1014	Perched	IW	5/23/1995	643,758.88	3,755,125.71
PTX06-1015	Perched	IW	3/10/1995	643,765.00	3,753,617.00
PTX06-1023	Perched	IW	10/5/1995	642,773.84	3,764,603.10
PTX06-1030	Perched	IW	5/9/1996	644,670.42	3,755,008.03
PTX06-1031	Perched	IW	5/6/1996	644,674.92	3,753,348.03
PTX06-1034	Perched	IW	2/6/1998	646,555.62	3,752,434.98
PTX06-1035	Perched	IW	2/26/1998	633,027.45	3,755,092.64
PTX06-1036	Perched	IW	2/11/1998	638,615.43	3,752,455.56
PTX06-1037	Perched	ISPM	3/12/1998	641,549.25	3,752,194.06
PTX06-1038	Perched	IW	3/5/1998	643,802.04	3,760,426.35
PTX06-1039A	Perched	IW	6/14/1998	643,807.47	3,759,272.56
PTX06-1040	Perched	IW	6/17/1998	643,811.23	3,758,262.93
PTX06-1041	Perched	IW	6/18/1999	643,803.61	3,757,622.78
PTX06-1042	Perched	IW	6/25/1999	643,812.20	3,755,779.88
PTX06-1043	Ogallala	IW	8/20/1999	640,711.00	3,765,225.21
PTX06-1044	Ogallala	IW	8/27/1999	642,706.18	3,764,538.54
PTX06-1045	Perched	ISPM	11/15/1999	642,697.65	3,752,300.00
PTX06-1046	Perched	IW	11/19/1999	643,802.63	3,752,292.55
PTX06-1047A	Perched	IW	2/29/2000	643,817.46	3,752,004.39
PTX06-1048A	Perched	IW	2/11/2000	642,103.43	3,766,957.63
PTX06-1049	Perched	IW	2/16/2000	633,343.53	3,763,376.96
PTX06-1050	Perched	IW	2/23/2000	636,746.04	3,766,622.06
PTX06-1051	Perched	IW	10/29/2015	640,325.13	3,752,259.66
PTX06-1052	Perched	IW	2/27/2000	639,100.91	3,753,957.66
PTX06-1053	Perched	IW	3/1/2000	636,576.74	3,753,672.06
PTX06-1056	Ogallala	IW	5/15/2000	643,767.03	3,754,642.87

Long-Term Monitoring Wells and Coordinates

Well ID	Aquifer	Type	Completion Date	Easting	Northing
PTX06-1057A	Ogallala	IW	8/29/2000	629,630.04	3,768,142.23
PTX06-1058	Ogallala	IW	8/26/2000	624,894.00	3,759,747.11
PTX06-1061	Ogallala	IW	9/22/2000	625,651.61	3,773,186.59
PTX06-1062A	Ogallala	IW	5/14/2001	633,017.18	3,771,685.22
PTX06-1064	Ogallala	IW	5/31/2001	635,900.45	3,773,557.90
PTX06-1068	Ogallala	IW	5/16/2001	643,403.70	3,773,360.30
PTX06-1069	Perched	IW	5/2/2001	646,317.00	3,762,879.60
PTX06-1071	Perched	IW	7/11/2016	642,605.58	3,773,227.97
PTX06-1072	Ogallala	IW	5/19/2001	635,047.45	3,758,434.63
PTX06-1073A	Perched	IW	12/5/2001	634,963.34	3,758,072.00
PTX06-1077A	Perched	IW	1/22/2002	637,201.80	3,760,689.50
PTX06-1082	Perched	IW	8/17/2002	653,856.27	3,780,321.59
PTX06-1083	Perched	IW	8/19/2002	658,643.46	3,779,777.76
PTX06-1085	Perched	IW	8/25/2002	629,059.82	3,760,418.31
PTX06-1086	Perched	IW	8/28/2002	631,411.81	3,759,843.32
PTX06-1088	Perched	IW	8/27/2002	639,902.10	3,757,059.42
PTX06-1089	Perched	IW	7/17/2003	646,637.32	3,760,258.95
PTX06-1090	Perched	IW	7/21/2003	647,727.51	3,757,684.39
PTX06-1091	Perched	IW	8/2/2003	646,554.01	3,756,363.40
PTX06-1093	Perched	IW	8/4/2003	645,529.01	3,759,922.32
PTX06-1095A	Perched	IW	8/29/2004	640,634.87	3,755,598.65
PTX06-1097	Perched	IW	8/29/2005	633,104.35	3,765,068.63
PTX06-1101	Perched	ISPM	9/29/2005	640,383.57	3,753,437.09
PTX06-1102	Perched	IW	10/2/1996	642,751.09	3,754,532.94
PTX06-1103	Perched	IW	8/5/2010	641,222.64	3,752,963.37
PTX06-1120	Perched	IW	7/22/2007	643,152.43	3,752,735.03
PTX06-1121	Perched	IW	7/24/2007	643,645.57	3,752,750.09
PTX06-1122	Perched	IW	7/11/2007	640,677.35	3,752,308.74
PTX06-1123	Perched	ISPM	7/26/2007	642,051.96	3,752,319.94
PTX06-1125	Perched	IW	7/9/2007	643,377.53	3,752,331.14
PTX06-1126	Perched	IW	1/15/2008	635,034.72	3,755,562.85
PTX06-1127	Perched	IW	1/9/2008	635,901.90	3,755,432.03
PTX06-1130	Perched	IW	10/23/2008	644,270.36	3,759,745.02
PTX06-1131	Perched	IW	10/15/2008	629,371.68	3,754,232.91
PTX06-1133A	Perched	IW	11/17/2008	645,287.37	3,751,315.73
PTX06-1134	Perched	IW	3/15/2009	633,520.06	3,754,409.17
PTX06-1135	Perched	IW	10/8/2008	638,343.76	3,753,631.93
PTX06-1136	Perched	IW	11/1/2008	634,860.83	3,766,771.76
PTX06-1137A	Ogallala	IW	2/15/2009	647,900.89	3,758,635.67
PTX06-1138	Ogallala	IW	1/21/2009	646,285.31	3,760,503.82
PTX06-1139	Ogallala	IW	1/29/2009	646,768.73	3,756,376.08
PTX06-1140	Ogallala	IW	2/5/2009	646,959.38	3,762,807.67
PTX06-1141	Ogallala	IW	2/17/2009	633,445.44	3,766,872.94
PTX06-1143	Ogallala	IW	2/25/2009	639,244.72	3,770,496.78
PTX06-1144	Ogallala	IW	2/26/2009	640,252.98	3,773,320.45
PTX06-1146	Perched	IW	10/30/2008	645,978.91	3,757,691.87

Long-Term Monitoring Wells and Coordinates

Well ID	Aquifer	Type	Completion Date	Easting	Northing
PTX06-1147	Perched	IW	11/5/2008	645,431.85	3,753,953.21
PTX06-1148	Perched	ISPM	8/29/2008	636,467.02	3,754,719.67
PTX06-1149	Perched	ISPM	9/7/2013	635,864.13	3,754,717.64
PTX06-1150	Perched	ISPM	8/28/2008	635,233.98	3,754,718.24
PTX06-1151	Perched	IW	3/13/2009	633,935.95	3,756,123.62
PTX06-1154	Perched	ISPM	8/22/2009	641,870.52	3,752,278.90
PTX06-1155	Perched	ISPM	9/17/2009	634,603.74	3,755,215.62
PTX06-1156	Perched	ISPM	9/17/2009	636,378.92	3,755,076.47
PTX06-1157	Ogallala	IW	4/1/2010	647,101.97	3,753,701.98
PTX06-1158	Perched	IW	8/12/2012	648,137.99	3,752,025.93
PTX06-1159	Perched	IW	8/15/2012	634,015.04	3,754,843.47
PTX06-1160	Perched	IW	8/13/2012	632,835.73	3,756,274.13
PTX06-1166	Perched	IW	9/19/2012	639,750.34	3,752,799.74
PTX06-1167	Perched	IW	7/30/2013	640,913.72	3,752,653.00
PTX06-1171	Perched	IW	7/28/2014	634,373.95	3,755,715.08
PTX06-1173	Perched	ISPM	9/7/2014	634,197.62	3,755,312.40
PTX06-1174	Perched	ISPM	6/20/2014	633,904.63	3,755,489.15
PTX06-1175	Perched	ISPM	8/22/2014	633,416.97	3,755,651.06
PTX06-1180	Perched	IW	11/2/2015	633,474.07	3,756,487.93
PTX06-1182	Perched	IW	7/8/2016	647,140.17	3,751,088.49
PTX06-1183	Perched	IW	7/13/2016	639,765.77	3,753,350.43
PTX06-1184	Perched	IW	5/4/2017	646,625.06	3,750,638.25
PTX06-1185	Perched	IW	5/6/2017	647,878.41	3,751,139.83
PTX06-1190	Perched	IW	11/20/2017	648,281.31	3,751,439.52
PTX06-1192	Perched	IW	1/19/2018	649,119.32	3,749,893.14
PTX06-1193	Perched	IW	1/24/2018	646,719.13	3,749,346.75
PTX06-1194	Perched	ISPM	1/27/2018	648,355.41	3,750,477.77
PTX06-1195	Perched	IW	1/30/2018	649,096.79	3,751,968.74
PTX06-1196	Perched	ISPM	7/20/2018	649,710.26	3,750,989.94
PTX06-1199	Perched	IW	7/11/2018	650,525.52	3,750,905.45
PTX06-1200	Perched	IW	1/7/2019	651,557.90	3,749,356.32
PTX06-1202	Perched	IW	1/12/2019	651,358.99	3,750,361.84
PTX06-1204	Perched	IW	1/29/2019	650,997.75	3,749,051.98
PTX06-1205	Perched	IW	1/23/2019	648,801.56	3,749,894.03
PTX06-1207	Perched	IW	1/16/2020	632,958.06	3,754,044.99
PTX06-1208	Perched	IW	4/26/2020	652,081.58	3,749,472.60
PTX06-1211	Perched	IW	8/22/2021	635,358.50	3,755,297.21
PTX06-1212	Perched	IW	8/29/2021	640,166.01	3,753,016.03
PTX06-1215	Perched	ISPM	4/24/2022	651,607.49	3,748,834.66
PTX06-1216	Perched	IW	6/24/2022	649,743.32	3,749,537.50
PTX06-1218	Perched	TZM	5/4/2022	649,667.96	3,749,890.07
PTX06-1221	Perched	TZM	4/27/2022	650,875.74	3,750,521.45
PTX06-1222	Perched	IW	8/22/2023	651,163.21	3,750,136.29
PTX06-1223	Ogallala	IW	5/2/2023	642,669.67	3,753,673.34
PTX06-1224	Ogallala	IW	4/19/2023	644,065.72	3,754,118.10
PTX06-1229	Ogallala	IW	9/17/2023	642,725.64	3,754,642.57

Long-Term Monitoring Wells and Coordinates

Well ID	Aquifer	Type	Completion Date	Easting	Northing
PTX06-1231	Ogallala	IW	Proposed	641,636.00	3,753,557.00
PTX06-1232	Ogallala	IW	Proposed	644,456.00	3,757,673.00
PTX06-1233	Ogallala	IW	Proposed	646,450.00	3,759,613.00
PTX06-1234	Perched	IW	Proposed	636,520.00	3,756,515.00
PTX06-1235	Perched	IW	Proposed	635,150.00	3,756,909.00
PTX06-1236	Perched	IW	Proposed	635,845.00	3,756,435.00
PTX06-1237	Ogallala	IW	Proposed	637,363.00	3,753,016.00
PTX06-1238	Perched	IW	Proposed	631,590.00	3,754,320.00
PTX07-1O02	Perched	IW	5/31/1994	639,106.56	3,768,117.46
PTX07-1O03	Perched	IW	6/14/1994	639,046.64	3,767,462.56
PTX07-1P02	Perched	IW	7/12/1994	637,817.70	3,763,019.08
PTX07-1P05	Perched	IW	9/28/1998	637,136.13	3,762,886.83
PTX07-1Q01	Perched	IW	4/12/1994	629,274.83	3,755,836.12
PTX07-1Q02	Perched	IW	4/22/1994	628,876.97	3,756,408.66
PTX07-1R01	Ogallala	IW	4/16/2000	627,914.28	3,764,159.91
PTX07-1R03	Perched	IW	8/22/1999	627,664.39	3,764,501.80
PTX08-1001	Perched	IW	8/4/2013	638,941.45	3,762,976.26
PTX08-1002	Perched	IW	8/27/2013	640,859.00	3,763,003.22
PTX08-1003	Perched	IW	10/7/1992	635,385.36	3,760,136.56
PTX08-1005	Perched	IW	10/20/1992	635,316.66	3,756,346.19
PTX08-1007	Perched	IW	9/1/2011	638,900.04	3,758,440.46
PTX08-1008	Perched	IW	1/10/1993	637,485.10	3,755,695.51
PTX08-1009	Perched	IW	2/10/1993	638,866.95	3,755,275.01
PTX08-1010	Perched	IW	9/16/1992	641,401.47	3,773,206.74
PTX10-1014	Perched	IW	6/29/1992	639,701.73	3,759,769.72

IW: Investigation/Monitoring Well
ISPM: In Situ Performance Monitoring
TZM: Treatment Zone Monitoring